Chapter 1: Large Numbers Around Us

NCERT CORNER

Intext Questions
1. Solution:
For 3 varieties of rice every day, they would need 1,00,000 ÷ 1095 ~ 91 years.
Here, they would be able to eat all 1 lakh varieties of rice in 100 years.

Choose a number for y. How close to one lakh is the number of days in y years, for the y of your choice?
Solution:
To get the number of days in y years, we have 365 × y years.
For 1,00,000 days we have 1,00,000 ÷ 365 ~ 273 years.

Thus, we have 365 × y = 365 × 273 ~ 99645 days (closest to 1 lakh)

Question2

Solution:

Similar to the first question, we calculate the total varieties tasted over 100 years at a rate of 3 per day.

– Number of days in 100 years:

100 years × 365 days/year
= 36500 days.

Total varieties tasted:

36500 days × 3 varieties/day
= 109500 varieties.

Since 109,500 is more than one lakh (100,000), yes, you would be able to taste all the lakh varieties in a 100-year lifetime if you ate 3 varieties per day.

Question3

Solution:

Let's choose two values for y and calculate the number of days, comparing it to one lakh (100,000). We use 365 days per year.

Choice 1: y = 100 years

– Number of days
= y years × 365 days/year
= 100 × 365
= 36500 days.

– How close to 1 lakh?

100000 − 36500 = 63500 days.

For y = 100 years, the number of days (36,500) is 63,500 days less than one lakh.

Choice 2: y = 274 years (mentioned on page 4 as roughly 1 lakh days)

– Number of days
= y years × 365 days/year
= 274 × 365
= 100010 days.

– How close to 1 lakh?

100010 − 100000 = 10 days.

For y = 274 years, the number of days (100,010) is very close, just 10 days more than one lakh.

Figure it Out

Question 1.
Solution:
One lakh = 1,00,000
Now, 1,00,000 – 75,000 = 25,000
Thus, the population of Chintamani in 2011 was 25,000 less than one lakh.

Question 2.

Solution:
1,06,000 – 1,00,000 = 6,000
Thus, the population in 2024 is 6,000 more than one lakh.

Question 3.

Solution:
The population increase from 2011 to 2024 = 1,06,000 – 75,000 = 31,000

Intext Questions

Solution:
(a) 1,23,456
(b) 4,07,704
(c) 50,05,050
(d) 10,00,235

Figure it Out
Solution:
(a) (i) $(8 \times 1000) + (3 \times 100) = 8300$
(ii) $(83 \times 100) = 8300$

(b) (i) $(4 \times 10000) + (6 \times 100) + (2 \times 10) + (9 \times 1) = 40629$
(ii) $(40 \times 1000) + (6 \times 100) + (29 \times 1) = 40629$

(c) (i) $(5 \times 10000) + (6 \times 1000) + (3 \times 100) + (54 \times 1) = 56354$
(ii) $(56 \times 1000) + (35 \times 10) + (4 \times 1) = 56354$

(d) (i) $(6 \times 10000) + (6 \times 1000) + (6 \times 100) + (66 \times 1) = 66666$
(ii) $(66 \times 1000) + (66 \times 10) + (6 \times 1) = 66666$

(e) (i) $(3 \times 100000) + (6 \times 10000) + (7 \times 1000) + (8 \times 100)+ (13 \times 1) = 367813$
(ii) $(36 \times 10000) + (7813 \times 1) = 367813$

Intext Questions

Solution:
1. (a) For the largest 3-digit number:
Press the +100 button 9 times: $9 \times 100 = 900$
Add 10 more presses using the +10 button: $10 \times 10 = 100$
Add the remaining 11 presses using the +1 button: $11 \times 1 = 11$
Sum: $900 + 100 + 11 = 1011$, but that's a 4-digit number.
Scale back by reducing the number of +10 presses to 8 and +1 presses to 13.
Largest 3-digit number: 993 $(9 \times 100 + 8 \times 10 + 13 \times 1)$
For the smallest 3-digit number
Press the +10 button 8 times: $8 \times 10 = 80$
Add 22 more presses using the +1 button: $22 \times 1 = 22$
Smallest 3-digit number: 102 $(8 \times 10 + 22 \times 1)$

1. (b) 997 with 34 Clicks
$9 \times (+100) = 900$

8 × (+10) = 80
17 × (+1) = 17

2. Solution

Buttons	5072
+10,00,000	
+1,00,000	
+10,000	
+1,000	5
+100	0
+10	6
+1	12

(a) 5 × (+1000) = 5000 (5 clicks)
7 × (+10) = 70 (7 clicks)
2 × (+1) = 2 (2 clicks)
Total clicks: 5 + 7 + 2 = 14 clicks
Expression: 5 × 1000 + 7 × 10 + 2 × 1 = 5072

(b)

Buttons	8300
+10,00,000	
+1,00,000	
+10,000	
+1,000	8
+100	3
+10	
+1	
Total Clicks	11

For 8300: 8 × (+1000) = 8000

For: $3 \times (+100) = 300$
Total = $8000 + 300 = 8300$

Figure it Out

Question 1.

Solution:
(a) 8300
$8 \times (+1000) = 8000$ (8 clicks)
$3 \times (+100) = 300$ (3 clicks)
Total clicks: $8 + 3 = 11$
Expression: $(8 \times 1000) + (3 \times 100) = 8300$

(b) 40629
$4 \times (+10000) = 40000$ (4 clicks)
$6 \times (+100) = 600$ (6 clicks)
$2 \times (+10) = 20$ (2 clicks)
$9 \times (+1) = 9$ (9 clicks)
Total clicks: $4 + 6 + 2 + 9 = 21$
Expression: $(4 \times 10000) + (6 \times 100) + (2 \times 10) + (9 \times 1) = 40629$

(c) 56354
$5 \times (+10000) = 50000$ (5 clicks)
$6 \times (+1000) = 6000$ (6 clicks)
$3 \times (+100) = 300$ (3 clicks)
$5 \times (+10) = 50$ (5 clicks)
$4 \times (+1) = 4$ (4 clicks)
Total clicks: $5 + 6 + 3 + 5 + 4 = 23$
Expression: $(5 \times 10000) + (6 \times 1000) + (3 \times 100) + (5 \times 10) + (4 \times 1) = 56354$

(d) 66666
$6 \times (+10000) = 60000$ (6 clicks)
$6 \times (+1000) = 6000$ (6 clicks)
$6 \times (+100) = 600$ (6 clicks)
$6 \times (+10) = 60$ (6 clicks)
$6 \times (+1) = 6$ (6 clicks)
Total clicks: $6 + 6 + 6 + 6 + 6 = 30$
Expression: $(6 \times 10000) + (6 \times 1000) + (6 \times 100) + (6 \times 10) + (6 \times 1) = 66666$

(e) 367813
$3 \times (+100000) = 300000$ (3 clicks)
$6 \times (+10000) = 60000$ (6 clicks)

$7 \times (+1000) = 7000$ (7 clicks)
$8 \times (+100) = 800$ (8 clicks)
$1 \times (+10)= 10$(1 click)
$3 \times (+1) = 3$ (3 dicks)
Total clicks: $3 + 6 + 7 + 8 + 1 + 3 = 28$
Expression: $(3 \times 100000) + (6 \times 10000) + (7 \times 1000) + (8 \times 100) + (1 \times 10) + (3 \times 1) = 367813$

Question 2.

Solution:
The smallest number of button clicks depends on the place value of the digit in the number. If the digit in a particular place is small, then less number of clicks are required and if it is big, then more number of clicks are required.

Question 3.
Do it yourself.

In-Text Questions

1.
Solution:
1,000 lakh = 10,00,00,000 (8 zeros)

2.
Solution:
100 thousand = 1,00,000 (5 zeros)

Figure it Out

Question 1.
Solution:
(a) Indian System
40.50.678 → 40 lakh 50 thousand and 678
Forty lakh fifty thousand six hundred seventy-eight

American System
4.050.678 → 4 million 50 thousand and 678
Four million fifty thousand six hundred seventy-eight

(b) Indian System
4.81.21.620 → 4 crore 81 lakh 21 thousand and 620
Four crore eighty-one lakh twenty-one thousand six hundred twenty

American System
48,121,620 → 48 million 121 thousand and 620
Forty-eight million one hundred twenty-one thousand six hundred twenty

(c) Indian System
2,0, 22,002 → 2 crore 22 thousand 2
Two crore twenty-two thousand two

American System:
20,022,002 → 20 million 22 thousand 2
Twenty million twenty-two thousand two

(d) Indian System
24,68,13,579 → 24 crore 68 lakh 13 thousand 579
Twenty-four crore sixty-eight lakh thirteen thousand five hundred seventy-nine

American System
246.813.579 → 246 million 813 thousand 579
Two hundred forty-six million eight hundred thirteen thousand five hundred seventy-nine

(e) Indian System:
34,50,00,543 → 34 crore 50 lakh 543
Thirty-four crore fifty lakh five hundred forty-three

American System:
345,000,543 → 345 million 543
Three hundred forty-five million five hundred forty-three

(f) Indian System:
1,020,304,050 → 1 arab 2 crore 3 lakh 4 thousand 50
One arab two crore three lakh four thousand fifty

American System:
1,020,304,050 → 1 billion 20 million 304 thousand 50
One billion twenty million three hundred four thousand fifty

Question 2.
Solution:
(a) 1,01,01,010
(b) 1,001,001,001
(c) 10,20,30,040
(d) 9,080,700,600

Question 3.

Solution:
(a) 30 thousand < 3 lakh
(b) 500 lakh > 5 million
(c) 800 thousand < 8 million
(d) 640 crore < 60 billion

In-Text Questions

1.
Solution:

(a) **Round Up:**
Ordering supplies for an event (like the school ordering 750 sweets for 732 people) to ensure there's enough; estimating project completion time to provide a buffer; calculating material needed for construction to avoid shortages.

(b) **Round Down:**
A shopkeeper estimating the cost for a customer might round down slightly (e.g., saying Rs 450 for a Rs 470 item) to make it sound more attractive; estimating remaining fuel in a car to be cautious.

(c) **Either is Okay:**
Casual conversation about large numbers where precision isn't important (e.g., "The city has about 10 lakh people"); rough estimations of distance or travel time for planning.

(d) **Exact Numbers Needed:**
Calculating financial transactions (bank balances, salaries, taxes); scientific measurements and experiments; engineering specifications; emergency contact numbers (like dialing 139 for Railway Enquiry, not a rounded number); recipes requiring precise ingredient amounts.

2.
Solution:

Numbers	3,87,69,957	29,05,32,481
Nearest Thousand	3,87,70,000	29,05,32,000
Nearest Ten Thousand	3,87,70,000	29,05,30,000
Nearest Lakh	3,88,00,000	29,05,00,000
Nearest Ten Lakh	3,90,00,000	29,10,00,000
Nearest crore	4,00,00,000	29,00,00,000

In-Text Questions

From the information given in the table, answer the following questions by approximation:

Rank	City	Population (2011)	Population (2001)
1	Mumbai	1,24,42,373	1,19,78,450
2	New Delhi	1,10,07,835	98,79,172
3	Bengaluru	84,25,970	43,01,326
4	Hyderabad	68,09,970	36,37,483
5	Ahmedabad	55,70,585	35,20,085
6	Chennai	46,81,087	43,43,645
7	Kolkata	44,86,679	45,72,876
8	Surat	44,67,797	24,33,835
9	Vadodara	35,52,371	16,90,000
10	Pune	31,15,431	25,38,473
11	Jaipur	30,46,163	23,22,575
12	Lucknow	28,15,601	21,85,927
13	Kanpur	27,67,031	25,51,337
14	Nagpur	24,05,665	20,52,066

Question 1.
Solution:
The data shows the population of Indian cities in the years 2001 and 2011.

Question 2.

Solution:
Population of 20 Indian Cities during the years 2001 and 2011.

Question 3.

Solution:

Population of Pune in 2011 = 31,15,431 and in 2001 = 25,38,473
Approximate Increase in population: 31,00,000 – 25,00,000 = 6,00,000

Question 4.
Solution:

Rank	City	Population (2011)	Population (2001)	Difference
1.	Mumbai	1,24,42,373	1,19,78,450	4,63,923
2.	New Delhi	1,10,07,835	98,79,172	11,28,663
3.	Bengaluru	84,25,970	43,01,326	41,24,644
4.	Hyderabad	68,09,970	36,37,483	31,72,487
5.	Ahmedabad	55,70,585	35,20,085	20,50,500
6.	Chennai	46,81,087	43,43,645	3,37,442
7.	Kolkata	44,86,679	45,72,876	– 86,197
8.	Surat	44,67,797	24,33,835	20,33,962
9.	Vadodara	35,52,371	16,90,000	18,62,371
10.	Pune	31,15,431	25,38,473	5,76,958
11.	Jaipur	30,46,163	23,22,575	7,23,588
12.	Lucknow	28,15,601	21,85,927	6,29,674
13.	Kanpur	27,67,031	25,51,337	2,15,694
14.	Nagpur	24,05,665	20,52,066	3,53,599

Bengaluru experienced the largest population increase, with a growth of 41,24,644 people.

Question 5.
Solution:
Bengaluru, Hyderabad, Surat, Vadodara, and nearly doubled their population between 2001 and 2011.

Question 6.
Solution:
Mumbai's population by Patna's population in 2011 = ~ 7
Patna's population needs to be multiplied by 7 to be close to Mumbai's population.

NCERT In-Text Questions

1.
Solution:
We know that 5 × 2 = 10 (multiplication fact) has two division facts: 10 ÷ 2 = 5 and 10 ÷ 5 = 2.
So, according to the question, we can use in place of 5. Either we 10 divide by 5 or by

2.

11 × 11 = 111 × 111 = 1111 × 1111 =	66 × 61 = 666 × 661 = 6666 × 6661 =
3 × 5 = 33 × 35 = 333 × 335 =	101 × 101 = 102 × 102 = 103 × 103 =

Solution:

11 × 11 = 121 111 × 111 = 12321 1111 × 1111 = 1234321 11111 × 11111 = 123454321 111111 × 111111 = 12345654321	66 × 61 = 4026 666 × 661 = 440226 6666 × 6661 = 44402226 66666 × 66661 = 4,444,022,226 666666 × 666661 = 444440222226
3 × 5 = 15 33 × 35 = 1155 333 × 335 = 111555 3333 × 3335 = 11115555 33333 × 33335 = 1111155555	101 × 101 = 10201 102 × 102 = 10404 103 × 103 = 10609 104 × 104 = 10816 105 × 105 = 11025

Figure it Out

Question 1.
Find quick ways to calculate these products:
(a) 2 × 1768 × 50 = = 1768 × 100 = 176800
(b) 72 × 125 = = 9 × 1000 = 9000
(c) 125 × 40 × 8 × 25

Solution: 125×8=1000

40×25=1000

Now multiply:

1000×1000=10,00,000

Question 2.

Solution:

(a) 25 × 12 = 25 × 4 × 3 = 100 × 3 = 300
(b) 25 × 240 = 25 × 4 × 60 = 100 × 60 = 6000
(c) 250 × 120 = 250 × 4 × 30 = 1000 × 30 = 30000
(d) 2500 × 12 = 2500 × 4 × 3 = 10000 × 3 = 30000
(e) 25000 × 4800 = 120000000

In-Text Questions

In-Text Questions

Solution:
Total population of Mumbai = 1,24,00,000
Capacity of 5000 ships = 5000 × 2500 = 1,25,00,000
Yes, Mumbai's population can fit easily into 5000 ships, as the capacity of the ship is more than the total population of Mumbai.

Inspired by this strange question, Roxie wondered, "If I could travel 100 kilometers every day, could I reach the Moon in 10 years?"
(The distance between the Earth and the Moon is 3,84,400 km.)

How far would she have travelled in a year?
Solution:
Distance travelled by Roxie in a year = 100 km/day × 365 days = 36500 km

How far would she have travelled in 10 years?
Solution:
Distance travelled by Roxie in 10 years = 100 km/day × 365 days × 10
= 36500 km × 10
= 365000 km

Is it not easier to perform these calculations in stages? You can use this method for all large calculations.
Solution:
Yes, it is easier to perform these calculations in stages.

2. Find out if you can reach the Sun in a lifetime, if you travel 1000 kilometres every day.

Solution:
Distance between the Earth and the Sun = 2100 × 70,000 = 147000000 km
Distance travelled by you = 1000 km/day
Time required = 147000000 km ÷ 1000 km/day

= 147000 days
= 147000 days ÷ 365 days/year
~ 403 years
Not possible, as an average human being has a life expectancy of less than 100 years.

3. Make necessary reasonable assumptions and answer the questions below:

Solution:
(a) Weight of a single sheet = 5 grams.
Weight of 1 lakh sheets = 1,00,000 × 5 = 5,00,000 g = 500 kg, which is too heavy for any person to lift at once, as it exceeds normal human lifting capacity.
Thus, we couldn't lift 1 lakh sheets together.

(b) Number of babies born every minute = 250
Total babies born in a day = 250 × 1440 = 3,60,000 babies
[Number of minutes in a day = 1440 minutes]
Thus, a million babies (1,000,000) will not be bom in a single day, as the daily count is 3,60,000 babies.

(c) Time taken to count 1 coin = 1 second.
In a single day, we can count 86,400 coins.
[Total seconds in a day = 24 × 60 × 60 = 86,400 seconds]
Thus, we cannot count 1 million coins in a day at the rate of 1 coin per second, since it would take approximately 1,000,000 ÷ 86,400 ~ 12 days to complete the task.

Figure it Out

Question 1.
Solution:
(a) To form the largest multiple of 5, the last digit must be 0 or 5.
Starting with the biggest digits in decreasing order, the largest multiple of 5 is 9876543210 (10 digits).

(b) To form the smallest even number, the last digit must be even (0, 2, 4, 6, 8), and the digits should be written in ascending order.
The even number is 1023456798 (10 digits).

Question 2.

Solution:
77,77,777 (Seventy-seven lakhs seventy-seven thousand seven hundred

seventy-seven).
This has 61 letters, making it one of the longest 7-digit numbers.

Question 3.
Solution:
To ensure swapping any two digits increases the value, the digits must increase from left to right. So the arrangement would be: 123456789. There is only 1 number that satisfies the given condition.

Question 4.
Solution:
The given number is 12345123451234512345.
After removing the 10 smallest digits from the left, the number we get is 5534512345.

Question 5.
Solution:
The problem involves finding two consecutive numbers whose English names share no common letters.
Here, zero and one share "e" and "o".
one (1) and two (2) share "o".
two (2) and three (3) share "t".
……………………………..
Nineteen and twenty share: 't', 'e', 'n'
…………….. and so on.
Therefore, there are no consecutive numbers that do not share a letter in common.

Question 6.
Solution:
Numbers 1-9 contribute 9 digits (1 digit each).
Numbers 10-99 contribute $90 \times 2 = 180$ digits (2 digits each).
Numbers 100-999 contribute $900 \times 3 = 2700$ digits (3 digits each).

(a) To find the 1000th digit:
Digits so far: $9 + 180 = 189$.
So, the 1000th digit will lie in the 3-digit numbers range.
Remaining digits: $1000 - 189 = 811$.
Number of 3-digit numbers to reach 811 digits:
$811 \div 3 = 270$, with 1 remaining number.
Thus, first we need to write the first 270 3-digit numbers starting from 100.
So, the 270th 3-digit number $= 100 + 270 - 1 = 369$.

The next number is 370.
Thus, the 1000th digit is the 1st digit of 370, which is 3.

(b) Using the same logic:
Numbers 1-9: 9 digits
Numbers 10-99: 180 digits
Numbers 100-999: 2700 digits
Numbers 1000-9999: $9000 \times 4 = 36{,}000$ digits
Numbers 10,000-99,999: $90{,}000 \times 5 = 4{,}50{,}000$ digits
Numbers 1,00,000-9,99,999: $9{,}00{,}000 \times 6 = 54{,}00{,}000$ digits

To reach the millionth digit:
Upto 5-digit numbers: $9 + 180 + 2700 + 36{,}000 + 4{,}50{,}000 = 4{,}88{,}889$
Remaining digits in the 6-digit range: 1,000,000 (or (10,00,000) – 4,88,889 = 5,11,111
The number of 6-digit numbers required: $5{,}11{,}111 \div 6 = 85{,}185$, with 1 remaining number.
So, the 85,185th 6-digit number is $85{,}185 + 1{,}00{,}000 - 1 = 1{,}85{,}184$.
The millionth digit occurs in the number $185184 + 1 = 1{,}85{,}185$.

(c) Single-digit numbers (1-9): 1 (only 5)
Two-digit numbers (10-99)

- (15, 25, 35,…, 95), totaling 9 occurrences.
- 50, 51, 52, …, 59, totaling 10 occurrences.

Thus, 19 occurrences of the digit 5 in the range 10-99.
Total occurrences so far: $1 + 19 = 20$

Three-digit numbers (100-999)
(i) Units position: Numbers like 105, 115, ….., 995 contribute 10 occurrences per 100 numbers. Across 900 numbers, there are 90 occurrences.

(ii) Tens position: Numbers like 150-159, 250-259, ……, 950-959 also contribute 10 occurrences per 100 numbers, and 90 occurrences in all.

(iii) Hundreds position: Numbers like 500-599 contribute 100 occurrences in this range.
Thus, 90 (units) + 90 (tens) + 100 (hundreds) = 280 occurrences
Total occurrences so far: $20 + 280 = 300$

Four-digit numbers (1000-9999)
Now it gets more intense! Here, 5 appears in four positions (units, tens, hundreds, thousands):

(i) Units position: Every 10 numbers, e.g., 1005, 1015, …, 9995 = 900 occurrences total.

(ii) Tens position: 1050-1059, 1150-1159, …, 9950-9959. That's 900 occurrences total.

(iii) Hundreds position: 1500-1599,2500-2599,…, 9500-9599 = 900 occurrences total.

(iv) Thousands position: 5000-5999 = 1000 occurrences
Adding these up: 900 (units) + 900 (tens) + 900 (hundreds) + 1000 (thousands) = 3700 occurrences
Total occurrences so far: 300 + 3700 = 4000
Numbers starting from 10000 onward
For the 5000th number, we require 5000 – 4000 = 1000 more numbers that lie in 10001-10999.

(v) Among 10000-10999, one digit 5 appears in 100 numbers (e.g., 10005, 10015,….., 10995).
The digit 5 appears in 100 numbers (e.g., 10050-10059, …, 10950-10959).
The digit 5 appears in 100 numbers (e.g., 10500-10599).
Total 4000 + 300 = 4300
In 11000-11999
5 at unit place = 100
5 at tens place = 100
5 at a hundred place = 100
Total 4300 + 300 = 4600
In 12000-12999
4600 + 300 = 4900
In 13000- 13999
Unit = 100
Total = 5000
Final number = 13995

Question 7.

Solution:
(a) 20,800 = 2 × 10,000 + 8 × 100
Number of clicks = 2 + 8 = 10 clicks

(b) 92,100 = 9 × 10,000 + 21 × 100
Number of clicks = 9 + 21 = 30 clicks

(c) 1,20,500 = 12 × 10,000 + 5 × 100
Number of clicks = 12 + 5 = 17 clicks

(d) 65,30,000 = 653 × 10,000 + 0 × 100
Number of clicks = 653 + 0 = 653 clicks

(e) 70,25,700 = 702 × 10,000 + 57 × 100
Number of clicks = 702 + 57 = 759 clicks

Question 8.

Solution:
1 lakh = 1,00,000
1 billion = 1,000,000,000
So, 1,000,000,000 ÷ 1,00,000 = 10,000.
Thus, 10,000 lakhs make a billion.

Question 9.

Solution:
(a) Largest possible sum = 9988776 + 65544 = 10054320
(b) Smallest possible difference = 1122334 – 99887 = 1022447

Question 10.

Solution:
(a) 4000 × (20 + 5) + 13000
= 4000 × 25 + 13000
= 100000+ 13000
= 113000
This gives us 1,13,000, which is very close to 1,10,000.

(b) 1,50,000 + 70,000 – 4000 × 5 = 2,00,000

(c) 70,000 × 5 + 1,50,000 + 4,000 × 20 = 5,80,000

(d) 70,000 × 20 – 1,50,000 – 4,000 – 300 × 5 = 12,44,500
This gives us 12,44,500, which is very close to 12,45,000.

(e) 13,000 × 300 – 70,000(20 + 5) – 1,50,000 + 4,000 = 20,04,000

Question 11.

Solution:

The approximate height of the Statue of Unity is 180 m (1,80,000 mm)
Thickness of one coin = 1 mm [Given]
To match the height, we need: 1,82,000 coins

Question 12.
Solution:
Using 900 km/day:
km ~ 13 days
So, it would take about 13 days.

Using 1000 km/day:
km = 12 days
So, it would take about 12 days.
It would take approximately 12-13 days to complete the 12,ooo km trip.

Question 13.
Solution:
Total distance = 13,560 km and duration = 11 days
Distance covered every day = 13,560 ÷ 11 ~ 1,233 km/day.
Thus, the godwit covers approximately 1,233 km per day.
One day = 24 hours
Distance covered every hour = 1,233 ÷ 24 ~ 51 km/hour.
Thus, the godwit covers approximately 51 km per hour.

Question 14.
Solution:
Let's compare these heights to Somu's building:
Bald eagle: 4500 – 6000 m;
Mount Everest: 8850 m;
Aeroplanes: 10,000 – 12,800 m
Somu's building is 44 m tall.
Ratios compared to Somu's building:
Bald eagle: (4500 ÷ 44 ~ 100) to (6000 ÷ 44 ~ 150)
The bald eagle's flying height is 100 – 150 times higher.
Mount Everest: 8850 ÷ 44 = 201
Mount Everest is 201 times bigger.
Aeroplanes: (10,000 ÷ 44 ~ 230) to (12,800 ÷ 44 ~ 290)
An aeroplane's flying height is 230 – 290 times higher.

Practice Time 1.1

Question 1

Write the number name for:

$$4{,}56{,}789$$

Solution

Step 1: Read the number using the Indian place value system

$$4{,}56{,}789$$

= 4 lakh + 56 thousand + 789

Step 2: Write in words

Four lakh fifty-six thousand seven hundred eighty-nine

Question 2

How many months will it take to save ₹50,000 if you save ₹1,000 every month?

Solution

Step 1: Write total amount and monthly savings

Total amount to save = ₹50,000

Monthly saving = ₹1,000

Step 2: Divide

$$50{,}000 \div 1{,}000 = 50$$

Final Answer

50 months

Question 3

A warehouse has delivery trucks. Each truck delivers 250 packages per day.
How many packages are delivered in 50 days?

Solution

Step 1: Packages delivered in one day

$$250$$

Step 2: Packages delivered in 50 days

$$250 \times 50$$

Step 3: Multiply

$$250 \times 50 = 12{,}500$$

Final Answer

12,500 packages

Question 4

A town has a population of 90,000. How much more than 1 lakh is this population?

Solution *Step 1: Write 1 lakh in numbers*

$$1 \text{ lakh} = 1{,}00{,}000$$

Step 2: Compare with town population

$$1{,}00{,}000 - 90{,}000 = 10{,}000$$

Final Answer

The population is 10,000 less than 1 lakh.

Question 5

A tower is 300 metres tall. How many 4-metre floors would it have?

Solution

Step 1: Total height of tower

$$300 \text{ metres}$$

Step 2: Height of one floor

$$4 \text{ metres}$$

Step 3: Divide

$$300 \div 4 = 75$$

Final Answer

The tower would have 75 floors.

Question 6

Write the number name for:

$$12{,}34{,}567$$

Solution *Step 1: Read according to Indian place value system*

$$12{,}34{,}567$$

= 12 lakh + 34 thousand + 567

Step 2: Write in words

Twelve lakh thirty-four thousand five hundred sixty-seven

Final Answer

Twelve lakh thirty-four thousand five hundred sixty-seven

Question 7

How many years are equal to 50,000 days, assuming 365 days in a year?

Solution

Step 1: Divide total days by days in one year

$$50{,}000 \div 365$$

Step 2: Calculate

$$50{,}000 \div 365 \approx 136$$

Final Answer

Approximately 136 years

Question 8

If 1 lakh people stand in a line, and each person occupies 0.5 metres, how long would the line be in kilometres?

Solution By Steps

Step 1: Write 1 lakh in numbers

$$1{,}00{,}000$$

Step 2: Find total length in metres

$$1{,}00{,}000 \times 0.5 = 50{,}000 \text{ metres}$$

Step 3: Convert metres into kilometres

$$50{,}000 \div 1000 = 50$$

Final Answer

The line would be 50 kilometres long.

Practice Time 1.2

Question 1

How many times would you need to press the +1000 button to get the number 40,000?

Solution By Steps

Step 1: Divide total number by 1000

$$40{,}000 \div 1000 = 40$$

Final Answer

40 times

Question 2

If you want to reach 7,800 using the +100 button, how many times would you press it?

Solution

Step 1: Divide 7,800 by 100

$$7800 \div 100 = 78$$

Final Answer

78 times

Question 3

Write 6,432 using thousands, hundreds, tens and ones.

Solution

Break the number according to place values:

$$\begin{aligned} &6{,}432 \\ &= 6 \times 1000 + 4 \times 100 + 3 \times 10 + 2 \times 1 \end{aligned}$$

Final Answer

$$6 \times 1000 + 4 \times 100 + 3 \times 10 + 2 \times 1$$

Question 4

To make the number 85,000, how many times would you press the +1000 button?

Solution

$$85{,}000 \div 1000 = 85$$

Final Answer

85 times

Question 5

How would you break down the number 9,634 using +100s, +10s and +1s?

Solution

$$9{,}634$$
$$= 96 \times 100 + 3 \times 10 + 4 \times 1$$

Final Answer

$$96 \times 100 + 3 \times 10 + 4 \times 1$$

Question 6

Using the +10 button, how many times do you need to press to get 670?

Solution

$$670 \div 10 = 67$$

Final Answer

67 times

Practice Time 1.3

Question 1

Write the number name of:

$$10{,}23{,}45{,}678$$

in both Indian and International systems.

Solution

Indian System

Step 1: Place commas in Indian system

$$10{,}23{,}45{,}678$$

= 10 crore 23 lakh 45 thousand 678

Step 2: Write in words

Ten crore twenty-three lakh forty-five thousand six hundred seventy-eight

International System

Step 3: Place commas in International system

$$102{,}345{,}678$$

= 102 million 345 thousand 678

Step 4: Write in words

One hundred two million three hundred forty-five thousand six hundred seventy-eight

Final Answer

Indian System:

Ten crore twenty-three lakh forty-five thousand six hundred seventy-eight

International System:

One hundred two million three hundred forty-five thousand six hundred seventy-eight

---

Question 2

Convert the number 40801000 into the Indian number system with commas and name it.

Solution

Step 1: Place commas according to Indian system

$$40801000 = 4{,}08{,}01{,}000$$

Step 2: Write number name

4 crore 8 lakh 1 thousand

Final Answer

$$4{,}08{,}01{,}000$$

Number name:

Four crore eight lakh one thousand

Question 3

How many lakhs make a crore?

Solution

Step 1: Write values

$$\begin{aligned} &1 \text{ crore} = 1{,}00{,}00{,}000 \\ &1 \text{ lakh} = 1{,}00{,}000 \end{aligned}$$

Step 2: Divide

$$1{,}00{,}00{,}000 \div 1{,}00{,}000 = 100$$

Final Answer

100 lakhs make 1 crore.

Question 4

How many crores make an arab?

Solution

Step 1: Write values

$$\begin{aligned} &1 \text{ arab} = 1{,}00{,}00{,}00{,}000 \\ &1 \text{ crore} = 1{,}00{,}00{,}000 \end{aligned}$$

Step 2: Divide

$$1,00,00,00,000 \div 1,00,00,000 = 100$$

Final Answer

100 crores make 1 arab.

Question 5

Which system uses terms like million and billion?

Solution

The International place value system uses terms like:

- thousand
- million
- billion

Final Answer

The International System uses terms like million and billion.

Question 6

Place commas correctly in the number:

$$1098765432$$

using both systems.

Solution

Indian System

$$1{,}09{,}87{,}65{,}432$$

International System

$$1{,}098{,}765{,}432$$

Final Answer

Indian System:

$$1{,}09{,}87{,}65{,}432$$

International System:

$$1{,}098{,}765{,}432$$

Question 7

The population of a country is:

$$1{,}27{,}00{,}00{,}000$$

Write this in words using the Indian system.

Solution

Step 1: Read according to Indian place values

$$1{,}27{,}00{,}00{,}000$$

= 127 crore

Step 2: Write in words

One hundred twenty-seven crore

Final Answer

One hundred twenty-seven crore

Question 8

Write the International system number name for:

$$5{,}67{,}89{,}000$$

Solution

Step 1: Convert into International comma style

$$56{,}789{,}000$$

Step 2: Read the number

56 million 789 thousand

Step 3: Write in words

Fifty-six million seven hundred eighty-nine thousand

Final Answer

Fifty-six million seven hundred eighty-nine thousand

Question 9

Read and write:

$$1{,}000{,}000$$

in the Indian system.

Solution

Step 1: Convert to Indian comma style

$$10{,}00{,}000$$

Step 2: Read the number

Ten lakh

Final Answer

$$10{,}00{,}000$$

Ten lakh

Question 10

Write one real-life situation where the Indian system is more useful than the International one.

Solution

In India, population, money, and business amounts are commonly written using lakhs and crores.

Example:

- A city population may be written as 2 crore people.

Final Answer

The Indian system is more useful in India for writing population, salaries, and large amounts of money using lakhs and crores.

Practice Time 1.4

Question 1

The population of a town is 89,643. What is its approximate population, rounded to:

(a) Nearest thousand

Solution By Steps

Step 1: Check hundreds digit

$$89{,}643$$

Hundreds digit = 6

Since 6 ≥ 5, round up.

Step 2: Round the number

$$89{,}643 \approx 90{,}000$$

Final Answer

$$90{,}000$$

(b) Nearest ten thousand

Solution

Step 1: Check thousands digit

Thousands digit = 9

Since 9 ≥ 5, round up.

Step 2: Round the number

$$89{,}643 \approx 90{,}000$$

Final Answer

$$90{,}000$$

(c) Nearest lakh

Solution By Steps

$$89{,}643$$

Since it is close to 1 lakh:

$$89{,}643 \approx 1{,}00{,}000$$

Final Answer

$$1{,}00{,}000$$

Question 2

A shopkeeper has 974 packets of biscuits. He wants to tell his customer an approximate number. What should he say?

Solution

974 is close to 1000.

So, approximate number:

$$1000$$

Final Answer

Approximately 1000 packets

Question 3

The price of a refrigerator is ₹47,860. Approximate this amount to:

(a) Nearest thousand

Solution By Steps

Hundreds digit = 8

Since 8 ≥ 5, round up.

$$47{,}860 \approx 48{,}000$$

Final Answer

₹48,000

(b) Nearest ten thousand

Solution By Steps

Thousands digit = 7

Since 7 ≥ 5, round up.

$$47{,}860 \approx 50{,}000$$

Final Answer

₹50,000

Question 4

Estimate the sum:

$$56{,}792 + 43{,}119$$

Will your answer be more or less than 1,00,000?

Solution By Steps

Step 1: Round numbers

$$56{,}792 \approx 57{,}000$$
$$43{,}119 \approx 43{,}000$$

Step 2: Add

$$57{,}000 + 43{,}000 = 1{,}00{,}000$$

Final Answer

Estimated sum = 1,00,000

Question 5

Estimate the difference:

$$98{,}605 - 46{,}920$$

Will your answer be more or less than 50,000?

Solution By Steps

Step 1: Round numbers

$$98{,}605 \approx 99{,}000$$

$$46{,}920 \approx 47{,}000$$

Step 2: Subtract

$$99{,}000 - 47{,}000 = 52{,}000$$

Step 3: Compare with 50,000

$$52{,}000 > 50{,}000$$

Final Answer

Estimated difference = 52,000

It is more than 50,000.

Practice Time 1.5

Question 1

Multiply:

$$144 \times 25$$

using the shortcut.

(Hint: $25 = \frac{100}{4}$)

Solution By Steps

Step 1: Rewrite 25

$$25 = \frac{100}{4}$$

Step 2: Apply shortcut

$$144 \times 25 = 144 \times \frac{100}{4}$$

Step 3: Divide first

$$144 \div 4 = 36$$

Step 4: Multiply by 100

$$36 \times 100 = 3600$$

Final Answer

$$144 \times 25 = 3600$$

Question 2

What will be the number of digits in:

$$222 \times 333$$

Solution By Steps

Step 1: Multiply

$$222 \times 333 = 73926$$

Step 2: Count digits

$$73926$$

has 5 digits.

Final Answer

5 digits

Question 3

Which is greater:

2-digit × 3-digit

or

3-digit × 2-digit?

Solution By Steps

Using multiplication property:

$$a \times b = b \times a$$

Both products are equal.

Example:

$$25 \times 300 = 7500$$
$$300 \times 25 = 7500$$

Final Answer

Both are equal.

Question 4

Find:

$$999 \times 1$$

and

$$999 \times 0$$

Solution By Steps

Step 1: Multiply by 1

Any number multiplied by 1 remains the same.

$$999 \times 1 = 999$$

Step 2: Multiply by 0

Any number multiplied by 0 becomes 0.

$$999 \times 0 = 0$$

Final Answer

$$999 \times 1 = 999$$
$$999 \times 0 = 0$$

Question 5

Predict the product of:

$$1111 \times 1111$$

Then solve and check.

Solution By Steps

Step 1: Multiply

$$1111 \times 1111$$

$$= 1234321$$

Final Answer

$$1111 \times 1111 = 1234321$$

Practice Time 1.6

Question 1

If a train carries 1000 passengers, how many trains are needed for 10 lakh people?

Solution By Steps

Step 1: Write 10 lakh in numbers

$$10{,}00{,}000$$

Step 2: Divide by passengers in one train

$$10{,}00{,}000 \div 1000$$

Step 3: Calculate

$$= 1000$$

Final Answer

1000 trains are needed.

Question 2

You walk 8 km a day. In how many years will you walk 1 lakh km?

Solution By Steps

Step 1: Distance walked in one year

$$8 \times 365 = 2920 \text{ km}$$

Step 2: Divide 1 lakh by yearly distance

$$1{,}00{,}000 \div 2920 \approx 34$$

Final Answer

Approximately 34 years

Question 3

Can a person read 1 crore words in a year if they read 5000 words daily?

Solution By Steps

Step 1: Find total words read in one year

$$5000 \times 365 = 18{,}25{,}000$$

Step 2: Compare with 1 crore

$$1 \text{ crore} = 1{,}00{,}00{,}000$$
$$18{,}25{,}000 < 1{,}00{,}00{,}000$$

Final Answer

No, a person cannot read 1 crore words in one year at that speed.

Question 4

If 5 g of sugar is in one spoon, how much sugar is there in 1 lakh spoons?

Solution By Steps

Step 1: Write 1 lakh in numbers

$$1{,}00{,}000$$

Step 2: Multiply

$$1{,}00{,}000 \times 5 = 5{,}00{,}000$$

Final Answer

$$5{,}00{,}000 \text{ g}$$

or

$$500 \text{ kg}$$

Question 5

How many seconds are there in 1 million seconds?

(Hint: divide by 60 and 60 again)

Solution By Steps

Step 1: Convert seconds to minutes

$$10{,}00{,}000 \div 60 = 16{,}666.67 \text{ minutes}$$

Step 2: Convert minutes to hours

$$16{,}666.67 \div 60 \approx 277.78 \text{ hours}$$

Final Answer

Approximately 278 hours

Exam Time

A. Multiple Choice Questions (MCQs)

Question 1

Which of the following is the smallest six-digit number?

Solution By Steps

The smallest 6-digit number is:

$$1{,}00{,}000$$

Final Answer

Correct option: **(c) 1,00,000**

Question 2

How many lakhs make a crore?

Solution By Steps

$$1 \text{ crore} = 100 \text{ lakhs}$$

Final Answer

Correct option: **(b) 100**

Question 3

Which number is equal to one lakh in the Indian number system?

Solution By Steps

$$1 \text{ lakh} = 1{,}00{,}000$$

Final Answer

Correct option: **(a) 1,00,000**

Question 4

If a warehouse has 5 delivery trucks, each delivering 200 packages per day, how many packages are delivered in 100 days?

Solution By Steps

Step 1: Packages delivered in one day

$$5 \times 200 = 1000$$

Step 2: Packages delivered in 100 days

$$1000 \times 100 = 1{,}00{,}000$$

Final Answer

Correct option: **(c) 1,00,000**

Question 5

Which is the correct number name for:

$$12{,}34{,}567$$

Solution By Steps

$$12{,}34{,}567$$

is read as:

Twelve lakh thirty-four thousand five hundred sixty-seven

Final Answer

Correct option: **(b)**

B. Fill in the Blanks

Question 1

One crore is equal to ______ zeroes.

Solution By Steps

$$1 \text{ crore} = 1{,}00{,}00{,}000$$

It has 7 zeroes.

Final Answer

7

Question 2

In the Indian system,

$$1{,}00{,}000$$

is read as ______.

Final Answer

One lakh

Question 3

The number 50,000 is made by pressing the +______ button 50 times.

Solution By Steps

$$50 \times 1000 = 50{,}000$$

Final Answer

1000

Question 4

The number name for 99,999 in the Indian system is ______.

Solution By Steps

$$99{,}999$$

is read as:

Ninety-nine thousand nine hundred ninety-nine

Final Answer

Ninety-nine thousand nine hundred ninety-nine

Question 5

If you save ₹1,000 every month, it will take ______ months to save ₹1,00,000.

Solution By Steps

$$1{,}00{,}000 \div 1000 = 100$$

Final Answer

100 months

C. Write True or False

Question 1

The number 50,000 is written as 50,000 in the Indian system and 50000 in the International system.

Solution By Steps

In both systems, the value remains the same.

Only comma placement differs for larger numbers.

For 50,000:

- Indian system: 50,000
- International system: 50,000

So the statement is incorrect.

Final Answer

False

Question 2

One lakh is equal to one hundred thousand.

Solution By Steps

$$1 \text{ lakh} = 1{,}00{,}000$$
$$100{,}000 = 1{,}00{,}000$$

Both are equal.

Final Answer

True

Question 3

The International System uses terms like crore and lakh.

Solution By Steps

The International system uses:

- thousand
- million
- billion

It does not use lakh or crore.

Final Answer

False

Question 4

A person can save ₹2,500 every month and reach ₹1,00,000 in 40 months.

Solution By Steps

Step 1: Multiply savings by months

$$2500 \times 40 = 1{,}00{,}000$$

Final Answer

True

Question 5

A building with 10 floors, each 4 metres tall, is 40 metres tall.

Solution By Steps

$$10 \times 4 = 40$$

Final Answer

True

D. Match the Columns

Column A	Column B
1. 1 lakh	a. 1,00,00,000
2. 1 crore	b. 1,00,000
3. 1 million	c. Ten lakhs

Column A	Column B
4. 1,00,000 people standing shoulder-to-shoulder	d. About 38 km long line
5. Rounding 76,068 to nearest ten thousand	e. 80,000

Solution By Ste8ps

1. 1 lakh

$$1 \text{ lakh} = 1{,}00{,}000$$

Matches with **(b)**

---

2. 1 crore

$$1 \text{ crore} = 1{,}00{,}00{,}000$$

Matches with **(a)**

---

3. 1 million

$$1{,}000{,}000 = 10 \text{ lakhs}$$

Matches with **(c)**

---

4. 1,00,000 people standing shoulder-to-shoulder

Approximate line length:

About 38 km

Matches with **(d)**

---

5. Rounding 76,068 to nearest ten thousand

$$76{,}068 \approx 80{,}000$$

Matches with **(e)**

Final Answer

Column A	Column B
1	b
2	a
3	c
4	d
5	e

E. Very Short Answer Type Questions

Question 1

How many zeroes are there in one crore?

Solution By Steps

$$1 \text{ crore} = 1{,}00{,}00{,}000$$

It has 7 zeroes.

Final Answer

7 zeroes

Question 2

Write 1 lakh in numeral form.

Solution By Steps

$$1 \text{ lakh} = 1{,}00{,}000$$

Final Answer

$$1{,}00{,}000$$

Question 3

How many thousands make one lakh?

Solution By Steps

$$1{,}00{,}000 \div 1000 = 100$$

Final Answer

100 thousands

Question 4

What is the population of Mumbai approximately according to the text?

Solution By Steps

The text mentions Mumbai's population as approximately:

$$1{,}24{,}00{,}000$$

Final Answer

Approximately 1 crore 24 lakh

Question 5

What is the smallest six-digit number?

Solution By Steps

The first 6-digit number is:

$$1{,}00{,}000$$

Final Answer

$$1{,}00{,}000$$

F. Short Answer Type Questions

Question 1

Define approximation with one example from daily life.

Solution

Approximation means finding a number close to the exact value for easier understanding.

Example:
A shopkeeper may say "about 1000 packets" instead of exactly 974 packets.

Final Answer

Approximation means using a nearby value instead of the exact number.

Example:
974 packets ≈ 1000 packets.

Question 2

What is the difference between the Indian and International place value systems?

Solution By Steps

Indian System

Uses:

- lakhs
- crores

Comma placement:

$$1,23,45,678$$

International System

Uses:

- millions
- billions

Comma placement:

$$123,456,678$$

Final Answer

The Indian system uses lakhs and crores, while the International system uses millions and billions.

Question 3

How many floors of 4 metres each will make a 200 metre-tall tower?

Solution By Steps

$$200 \div 4 = 50$$

Final Answer

50 floors

Question 4

Write the number name of:

$$4{,}56{,}789$$

in the Indian system.

Solution By Steps

$$4{,}56{,}789$$

= 4 lakh 56 thousand 789

Final Answer

Four lakh fifty-six thousand seven hundred eighty-nine

Question 5

Estimate the sum:

$$56{,}792 + 43{,}119$$

and say whether it is more or less than one lakh.

Solution By Steps

Step 1: Round numbers

$$56{,}792 \approx 57{,}000$$
$$43{,}119 \approx 43{,}000$$

Step 2: Add

$$57{,}000 + 43{,}000 = 1{,}00{,}000$$

Final Answer

Estimated sum = 1,00,000

G. Long Answer Type Questions

Question 1

Explain with examples how large numbers are used in daily life.

Solution

Large numbers are used in many real-life situations such as:

- population
- money
- distances
- business
- science

Examples:

- Population of cities is written in lakhs and crores.
- Government budgets use crores.
- Distances between planets use millions of kilometres.

Final Answer

Large numbers help us represent huge quantities easily in daily life such as population, money, and distance.

Question 2

Compare and contrast the Indian and International place value systems with one example each.

Solution By Steps

Indian System

Uses:

- lakh
- crore

Example:

$$12,34,567$$

= Twelve lakh thirty-four thousand five hundred sixty-seven

International System

Uses:

- million
- billion

Example:

$$1,234,567$$

= One million two hundred thirty-four thousand five hundred sixty-seven

---

Final Answer

The Indian system uses lakhs and crores, while the International system uses millions and billions.

Question 3

Describe how rounding helps in estimation. Give two examples.

Solution

Rounding helps us estimate numbers quickly without exact calculation.

Examples:

$$47{,}860 \approx 48{,}000$$
$$89{,}643 \approx 90{,}000$$

This makes calculations easier.

Final Answer

Rounding replaces a number with a nearby easier number for quick estimation.

Examples:

- $47{,}860 \approx 48{,}000$
- $89{,}643 \approx 90{,}000$

Question 4

A person saves ₹1,000 every month. How many months will it take to save ₹2,00,000?

Solution By Steps

$$2{,}00{,}000 \div 1000 = 200$$

Final Answer

200 months

Question 5

If a waterfall is 450 m tall, how many floors of 4 metres each would it take to reach the same height?

Solution By Steps

$$450 \div 4 = 112.5$$

Since half floors are not practical:

$$113$$

Final Answer

Approximately 113 floors

Competency-Based Questions

A. Assertion and Reason Type Questions

Question 1

Assertion (A):
The number 1,00,000 has six digits and is called one lakh.

Reason (R):
In the Indian system, the first comma comes after three digits from the right and then after every two digits.

Solution By Steps

- Assertion is true.
- Reason is also true.
- Reason correctly explains Indian comma placement.

Final Answer

Correct option: **(a)**
Both (A) and (R) are true and (R) is the correct explanation of (A).

Question 2

Assertion (A):
Approximation makes large numbers easier to communicate and calculate.

Reason (R):
Rounding off always increases the given number.

Solution By Steps

- Assertion is true.
- Reason is false because rounding may increase or decrease the number.

Final Answer

Correct option: **(c)**
(A) is true but (R) is false.

B. Case Study Based Questions

Race to One Lakh

Aarav and Myra start from 10,000.

(a) Aarav always chooses +10,000.

Solution By Steps

Target:

$$1{,}00{,}000$$

Difference:

$$1{,}00{,}000 - 10{,}000 = 90{,}000$$

Each move adds:

$$10{,}000$$

Moves needed:

$$90{,}000 \div 10{,}000 = 9$$

Final Answer

Aarav needs 9 moves.

(b) Myra chooses +1,000 ten times before using +10,000 once.

Solution By Steps

Ten +1000 moves:

$$10 \times 1000 = 10{,}000$$

This equals one +10,000 move.

So Myra takes more steps.

Final Answer

Myra needs more moves than Aarav.

Ch- 2 – Airthmetic Expressions

NCERT CORNER

In-Text Questions

1. Use “>”, “<” or “=” in each expression

(a) $\mathbf{245 + 289 \_\_ 246 + 285}$

Solution By Steps

Step 1: Compare the sums
Left side:

$$245 + 289 = 534$$

Right side:

$$246 + 285 = 531$$

Step 2: Compare 534 and 531

$$534 > 531$$

Final Answer

$$245 + 289 > 246 + 285$$

(b) $\mathbf{273 - 145 \_\_ 272 - 144}$

Solution By Steps

Step 1: Find both differences

$$273 - 145 = 128$$
$$272 - 144 = 128$$

Step 2: Compare
Both are equal.

Final Answer

$$273 - 145 = 272 - 144$$

(c) $\mathbf{364 + 587 \_\_ 363 + 589}$

Solution By Steps

Step 1: Add both sides

$$364 + 587 = 951$$
$$363 + 589 = 952$$

Step 2: Compare

$$951 < 952$$

Final Answer

$$364 + 587 < 363 + 589$$

(d) $\mathbf{124 + 245 \_\_ 129 + 245}$

Solution By Steps

Step 1: Add both sides

$$124 + 245 = 369$$
$$129 + 245 = 374$$

Step 2: Compare

$$369 < 374$$

Final Answer

$$124 + 245 < 129 + 245$$

(e) $\mathbf{213 - 77 \_\_ 214 - 76}$

Solution By Steps

Step 1: Find both differences

$$213 - 77 = 136$$
$$214 - 76 = 138$$

Step 2: Compare

$$136 < 138$$

Final Answer

$$213 - 77 < 214 - 76$$

Figure it Out

Question 1.
Fill in the blanks to make the expressions equal on both sides of the '=' sign:
(a) 13 + 4 = __________ + 6
(b) 22 + __________ = 6 × 5
(c) 8 × __________ = 64 ÷ 2
(d) 34 – __________ = 25
Solution:
(a) 13 + 4 = 17
11 + 6 = 17
Therefore, 13 + 4 = 11 + 6

(b) Since 6 × 5 = 30
22 + 8 = 30
Therefore, 22 + 8 = 6 × 5

(c) Since 64 ÷ 2 = 32
8 × 4 = 32
Therefore, 8 × 4 = 64 ÷ 2

(d) Since 34 – 25 = 9
Therefore, 34 – 9 = 25

Question 2.
Arrange the following expressions in ascending (increasing) order of their values.
(a) 67 – 19

(b) 67 – 20
(c) 35 + 25
(d) 5 × 11
(e) 120 ÷ 3
Solution:
(a) 67 – 19 = 48
(b) 67 – 20 = 47
(c) 35 + 25 = 60
(d) 5 × 11 = 55
(e) 120 ÷ 3 = 40
Clearly, 40 < 47 < 48 < 55 < 60
Therefore, 120 ÷ 3 < 67 – 20 < 67 – 19 < 5 × 11 < 35 + 25
Thus, (e) < (b) < (a) < (d) < (c).

Intext Questions

1.
Solution:
No. Since in the expression, each term is separated by a '+' sign.
So, changing the order in which the terms are added does not change the value.
As, 4 + 15 +(-9) = 10 or (-9) + 15 + 4 = 10

Yes, swapping the terms having negative numbers does not change the sum.
As (-3) + (-2) = -5 or (-2) + (-3) = -5
(Answer may vary)

2. Mnasa forgot to include 9055 while adding

Numbers:

$$1342,\ 774,\ 8611,\ 9055,\ 1022$$

She got answer:

$$11749$$

Solution By Steps

Step 1: Add the forgotten number to the obtained answer

$$11749 + 9055$$
$$= 20804$$

Final Answer
No, she does not need to start again. She only needs to add the forgotten number $9055$to 11749.

Correct answer:

$$20804$$

---

3. Manasa is going outside to play. Her mother says, "Wear your hat and shoes!" Which should she wear first?

Solution By Steps

Step 1: Think logically
To wear shoes properly, socks and shoes should come before the hat.

The order matters here.

Final Answer
She should wear her shoes first and then the hat.

In-Text Questions

1. If the total number of friends goes up to 7 and the tip remains the same, how much will they have to pay? Write an expression for this situation and identify its terms.
Solution:
Since the total number of friends = 7
and the cost of each dosa = ₹ 23
Therefore, the total cost of 7 dosas = 7 × 23
As the tip remains the same, that is ₹ 5.
So, the expression for describing the total cost is 7 × 23 + 5 = 7 × 23 + 5 = 161 + 5 = ₹ 166.
The terms in the expression 7 × 23 + 5 are 7 × 23, 5.

Think and discus

Solution:
Do it yourself.

3. For each of the cases below, write the expression and identify its terms:
If the teacher had called out ‘4’, Ruby would write _________
If the teacher had called out ‘7’, Ruby would write _________
Solution:
(i) If the teacher had called our ‘4’, Ruby would write 8 × 4 + 1
Terms: 8 × 4, 1
(ii) If the teacher had called our ‘7’, Ruby would write 4 × 7 + 5
Terms: 4 × 7, 5

(iii) Write an expression like the above for your class size.
Solution:
Do it yourself.

Identify the terms in the two expressions above.
Solution:
432 = 4 × 100 + 1 × 20 + 1 × 10 + 2 × 1
Terms: 4 × 100, 1 × 20, 1 × 10, and 2 × 1
432 = 8 × 50 + 1 × 10 + 4 × 5 + 2 × 1
Terms: 8 × 50, 1 × 10, 4 × 5, and 2 × 1

Figure it Out

Question 1.
Find the values of the following expressions by writing the terms in each case.
(a) 28 – 7 + 8
(b) 39 – 2 × 6 + 11
(c) 40 – 10 + 10 + 10
(d) 48 – 10 × 2 + 16 + 2
(e) 6 × 3 – 4 × 8 × 5
Solution:
(a) 28 – 7 + 8 = 28 + (-7) + 8
Terms: 28, -7, and 8
28 – 7 + 8
= 28 + (-7) + 8
= 21 + 8 = 29

(b) 39 – 2 × 6 + 11 = 39 + (-2 × 6) + 11
Terms: 39, -2 × 6, and 11
39 – 2 × 6 + 11

$= 39 + (-2 \times 6) + 11$
$= 39 + (-12) + 11$
$= 27 + 11$
$= 38$

(c) $40 – 10 + 10 + 10 = 40 + (-10) + 10 + 10$
Terms: 40, -10, 10, and 10
$40 – 10 + 10 + 10$
$= 40 + (-10) + 10 + 10$
$= 30 + 10 + 10$
$= 40 + 10$
$= 50$

(d) $48 – 10 \times 2 + 16 + 2 = 48 + (-10 \times 2) + (16 + 2)$
Terms: 48, -10×2, $16 + 2$
$48 – 10 \times 2 + 16 + 2$
$= 48 + (-10 \times 2) + (16 + 2)$
$= 48 + (-20) + (8)$
$= 28 + 8 = 36$

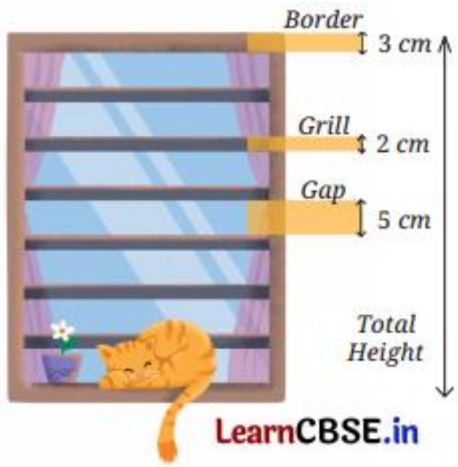
(e) $6 \times 3 – 4 \times 8 \times 5 = (6 \times 3) + (-4 \times 8 \times 5)$
Terms: 6×3, $4 \times 8 \times 5$
$6 \times 3 – 4 \times 8 \times 5$
$= (6 \times 3) + (-4 \times 8 \times 5)$
$= 18 + (-160)$
$= -142$

Question 2.
Write a story/situation for each of the following expressions and find their values.
(a) $89 + 21 – 10$
(b) $5 \times 12 – 6$
(c) $4 \times 9 + 2 \times 6$
Solution:
(a) $89 + 21 – 10$
Riya and Siya are cousins. They went to the beach, from where Riya collected 89 stones and Siya collected 21 stones. When they reached home, their other younger sister asked them for some stones. They give her 10 stones from their collection. How many stones were left with both Riya and Siya?
$89 + 21 – 10 = 89 + 21 + (-10) = 89 + 11 = 100$

(b) 5 × 12 – 6
Radha bought 5 pens from a stationery shop. The cost of each pen is ₹ 12. The shopkeeper also gave her a discount of ₹ 6 on the total cost. Find the total amount that she has to pay to the shopkeeper.
5 × 12 – 6 = 5 × 12 + (-6) = 60 + (-6) = 54

(c) 4 × 9 + 2 × 6
Sumit bought 4 pencils, the cost of each pencil is ₹ 9, and he also bought 2 erasers, which cost ₹ 6 each. How much money does he have to spend to buy these items?
4 × 9 + 2 × 6 = 36 + 12 = 48

Question 3.
For each of the following situations, write the expression describing the situation, identify its terms, and find the value of the expression.
(a) Queen Alia gave 100 gold coins to Princess Elsa and 100 gold coins to Princess Anna last year. Princess Elsa used the coins to start a business and doubled her coins. Princess Anna bought jewellery and has only half of the coins left. Write an expression describing how many gold coins Princess Elsa and Princess Anna together have.
(b) A metro train ticket between two stations is ₹ 40 for an adult and ₹ 20 for a child. What is the total cost of the tickets?
(i) for four adults and three children?
(ii) for two groups having three adults each?
(c) Find the total height of the window by writing an expression describing the relationship among the measurements shown in the picture.



Solution:
(a) Number of gold coins Princess Elsa got = 100
Number of gold coins Princess Anna got = 100

Princess Elsa used the coins to start the business and doubled her coins.
So, the number of coins Princess Elsa has = 2 × 100
Princess Anna bought jewellery and has only half of the coins left.
So, the number of coins Princess Anna has =

= 200 + 50 = 250

(b) (i) Metro train ticket for an adult = ₹ 40
So, the metro train ticket for four adults = 4 × 40
Metro train ticket for a child = ₹ 20
So, the metro train ticket for three children = 3 × 20
Therefore, the expression describing the total cost of tickets for four adults and three children is 4 × 40 + 3 × 20
Terms: 4 × 40, 3 × 20
Now, 4 × 40 + 3 × 20 = 160 + 60 = 220

(ii) Metro train ticket for an adult = ₹ 40
So, the metro train ticket for a group of three adults = 3 × 40
Therefore, the expression describing the total cost of tickets for the two groups having three adults each is 2 × (3 × 40).
Terms: 2 × (3 × 40)
Now, 2 × (3 × 40) = 2 × 120 = 240

(c) By observing the given picture, the total height of the window = number of gaps × 5 cm + number of grills × 2 cm + number of borders × 3 cm = 7 × 5 + 6 × 2 + 2 × 3
Terms: 7 × 5, 6 × 2, 2 × 3
Now, 7 × 5 + 6 × 2 + 2 × 3 = 35 + 12 + 6 = 47 + 6 = 53

Figure it Out

Question 1.
Fill in the blanks with numbers, and boxes with operation signs such that the expressions on both sides are equal.
(a) 24 + (6 – 4) = 24 + 6 $\square$ __________
(b) 38 + (__________ $\square$ __________) = 38 + 9 – 4
(c) 24 – (6 + 4) = 24 $\square$ 6 – 4
(d) 24 – 6 – 4 = 24 – 6 $\square$ __________
(e) 27 – (8 + 3) = 27 __________ 8 __________ 3

(f) 27 – (_________ $\square$ ________) = 27 – 8 + 3
Solution:
(a) 24 + (6 – 4) = 24 + 6 – 4
(b) 38 + (9 – 4) = 38 + 9 – 4
(c) 24 – (6 + 4) = 24 – 6 – 4
(d) 24 – 6 – 4 = 24 – 6 – 4
(e) 27 – (8 + 3) = 27 – 8 – 3
(f) 27 – (8 – 3) = 27 – 8 + 3

Question 2.
Remove the brackets and write the expression having the same value.
(a) 14 + (12 + 10)
(b) 14 – (12 + 10)
(c) 14 + (12 – 10)
(d) 14 – (12 – 10)
(e) -14 + 12 – 10
(f) 14 – (-12 – 10)
Solution:
(a) 14 + (12 + 10)
= 14 + 12 + 10
= 14 + 22
= 36

(b) 14 – (12 + 10)
= 14 – 12 – 10
= 14 – 22
= -8

(c) 14 + (12 – 10)
= 14 + 12 – 10
= 14 + 2
= 16

(d) 14 – (12 – 10)
= 14 – 12 + 10
= 14 – 2
= 12

(e) -14 + 12 – 10
= -14 + 2
= -12

(f) 14 – (-12 – 10)
= 14 + 12 + 10
= 14 + 22
= 36

Question 3.
Find the values of the following expressions. For each pair, first try to guess whether they have the same value. When are the two expressions equal?
(a) (6 + 10) – 2 and 6 + (10 – 2)
(b) 16 – (8 – 3) and (16 – 8) – 3
(c) 27 – (18 + 4) and 27 + (-18 – 4)
Solution:
(a) (6 + 10) – 2 and 6 + (10 – 2)
(6 + 10) – 2 = 16 – 2 = 14
and 6 + (10 – 2) = 6 + 8 = 14
Clearly, (6 + 10) – 2 = 6 + (10 – 2)
Hence, the expressions in part (a) have the same value.

(b) 16 – (8 – 3) and (16 – 8) – 3
16 – (8 – 3) = 16 – 5 = 11
and (16 – 8) – 3 = 8 – 3 = 5
16 – (8 – 3) ≠ (16 – 8) – 3
Hence, the expressions in part (b) do not have the same value.

(c) 27 – (18 + 4) and 27 + (-18 – 4)
27 – (18 + 4) = 27 – 22 = 5
and 27 + (-18 – 4) = 27 + (-22) = 5
Clearly, 27 – (18 + 4) = 27 + (-18 – 4)
Hence, the expressions in part (c) have the same value.

Question 4.
In each of the sets of expressions below, identify those that have the same value. Do not evaluate them, but rather use your understanding of terms.
(a) 319 + 537, 319 – 537, -537 + 319, 537 – 319
(b) 87 + 46 – 109, 87 + 46 – 109, 87 + 46 – 109, 87 – 46 + 109, 87 – (46 + 109), (87 – 46) + 109
Solution:
(a)

Expressions	Terms
319 + 537	319, 537
319 – 537	319, –537
–537 + 319	319, –537
537 – 319	–319, 537

Expressions having the same terms have the same value. Therefore, 319 – 537 and -537 + 319 have the same value.

(b)

Expressions	Terms
87 + 46 – 109	87, 46, –109
87 + 46 – 109	87, 46, –109
87 + 46 – 109	87, 46, –109
87 – 46 + 109	87, –46, 109
87 – (46 + 109)	87, –46, –109
(87 – 46) + 109	87, –46, 109

Expressions having the same terms have equal values.
Therefore, 87 + 46 – 109, 87 + 46 – 109, 87 + 46 – 109 have the same value.
Also, 87 – 46 + 109 and (87 – 46) + 109 have the same value.

Question 5.
Add brackets at appropriate places in the expressions such that they lead to the values indicated.
(a) 34 – 9 + 12 = 13
(b) 56 – 14 – 8 = 34
(c) -22 – 12 + 10 + 22 = – 22
Solution:
(a) 34 – (9 + 12) = 34 – 21 = 13
(b) (56 – 14) – 8 = 42 – 8 = 34
(c) -22 – (12 + 10) + 22 = -22 – 22 + 22 = -22

Question 6.
Using only reasoning of how terms change their values, fill the blanks to make the expressions on either side of the equality (=) equal.
(a) 423 + ________ = 419 + ________
(b) 207 – 68 = 210 – ________
Solution:
(a) 423 + 419 = 419 + 423
(b) 207 – 68 = 210 – 71

Question 7.
Using the numbers 2, 3, and 5, and the operators '+' and '-', and brackets, as necessary, generate expressions to give as many different values as possible.
For example, $2 - 3 + 5 = 4$ and $3 - (5 - 2) = 0$
Solution:
Here are a few expressions formed by using numbers 2, 3, and 5 and the operators '+' and '-' and brackets having different values.
$(2 + 3) - 5 = 5 - 5 = 0$,
$5 + (3 - 2) = 5 + 1 = 6$,
$-5 + (2 - 3) = -5 + (-1) = -6$,
$(-2 + 3) - 5 = 1 - 5 = -4$, etc.

Question 8.
Whenever Jasoda has to subtract 9 from a number, she subtracts 10 and adds 1 to it.
For example, $36 - 9 = 26 + 1$.
(a) Do you think she always gets the correct answer? Why?
(b) Can you think of other similar strategies? Give some examples.
Solution:
(a) Yes, she will always get the correct answer if she subtracts 10 from a number and then adds 1 to the result instead of directly subtracting 9 from the number, because subtracting 10 and adding 1, i.e., $-10 + 1 = -9$, is equivalent to subtracting 9 from the number.
As $36 - 9 = 27$ or $(36 - 10) + 1 = 26 + 1 = 27$
(b) Do it yourself.

Question 9.
Consider the two expressions:
(a) $73 - 14 + 1$
(b) $73 - 14 - 1$
For each of these expressions, identify the expressions from the following collection that are equal to it.
(a) $73 - (14 + 1)$
(b) $73 - (14 - 1)$
(c) $73 + (-14 + 1)$
(d) $73 + (-14 - 1)$
Solution:
Given expressions:
$73 - 14 + 1 = 60$ and $73 - 14 - 1 = 58$

Now,
(a) $73 - (14 + 1) = 73 - 15 = 58$
(b) $73 - (14 - 1) = 73 - 13 = 60$
(c) $73 + (-14 + 1) = 73 - 13 = 60$
(d) $73 + (-14 - 1) = 73 + (-15) = 58$
Hence, expressions (b) and (c) are equal to the expression $73 - 14 + 1$, and expressions (a) and (d) are equal to the expression $73 - 14 - 1$.

In-Text Questions

1. If another friend, Sangmu, joins them and orders the same items, what will be the expression for the total amount to be paid?
Solution:
If another friend, Sangmu, joins them (Lhamo and Norbu) and orders the same items, then the expression for the total amount will be $3 \times (43 + 24)$.

$5 \times 4 + 3 \neq 5 \times (4 + 3)$. Can you explain why?
Is $5 \times (4 + 3) = 5 \times (3 + 4) = (3 + 4) \times 5$?
Solution:
Expression $5 \times 4 + 3$ means 3 more than 5×4, which is equal to 23, but $5 \times (4 + 3)$ means 5 times $(4 + 3)$, which is equal to 35.
Hence, $5 \times 4 + 3 \neq 5 \times (4 + 3)$
$5 \times (4 + 3)$, $5 \times (3 + 4)$, and $(3 + 4) \times 5$ have the same meaning, which is 5 times the sum of 3 and 4, and give the same value.
Hence, $5 \times (4 + 3) = 5 \times (3 + 4) = (3 + 4) \times 5$

5. Use this method to find the following products:
(a) 95×8
(b) 104×15
(c) 49×50
Is this quicker than the multiplication procedure you use generally?
Solution:
(a) $95 \times 8 = (100 - 5) \times 8$
$= 100 \times 8 - 5 \times 8$
$= 800 - 40$
$= 760$

(b) $104 \times 15 = (100 + 4) \times 15$
$= 100 \times 15 + 4 \times 15$
$= 1500 + 60$
$= 1560$

(c) $49 \times 50 = (50 - 1) \times 50$
$= 50 \times 50 - 50 \times 1$
$= 2500 - 50$
$= 2450$
Yes, this procedure is quicker than the general multiplication procedure.

Which other products might be quicker to find, like the ones above?
Solution:
Do it yourself.

Figure it Out

Question 1.
Fill in the blanks with numbers and boxes by signs, so that the expressions on both sides are equal.
(a) $3 \times (6 + 7) = 3 \times 6 + 3 \times 7$
(b) $(8 + 3) \times 4 = 8 \times 4 + 3 \times 4$
(c) $3 \times (5 + 8) = 3 \times 5 \boxed{} 3 \times$ ________
(d) $(9 + 2) \times 4 = 9 \times 4 \boxed{} 2 \times$ ________
(e) $3 \times ($ ________ $+ 4) = 3$ ________ + ________
(f) (________ $+ 6) \times 4 = 13 \times 4 +$ ________
(g) $3 \times ($ ________ + ________ $) = 3 \times 5 + 3 \times 2$
(h) (________ + ________) $\times$ ________ $= 2 \times 4 + 3 \times 4$
(i) $5 \times (9 - 2) = 5 \times 9 - 5 \times$ ________
(j) $(5 - 2) \times 7 = 5 \times 7 - 2 \times$ ________
(k) $5 \times (8 - 3) = 5 \times 8 \boxed{} 5 \times$ ________
(l) $(8 - 3) \times 7 = 8 \times 7 \boxed{} 3 \times 7$
(m) $5 \times (12 -$ ________ $) =$ ________ $\boxed{} 5 \times$ ________
(n) $(15 -$ ________ $) \times 7 =$ ________ $\boxed{} 6 \times 7$
(o) $5 \times ($ ________ $-$ ________ $) = 5 \times 9 - 5 \times 4$
(p) (________ $-$ ________) $\times$ ________ $= 17 \times 7 - 9 \times 7$
Solution:
(a) $3 \times (6 + 7) = 3 \times 6 + 3 \times 7$
(b) $(8 + 3) \times 4 = 8 \times 4 + 3 \times 4$
(c) $3 \times (5 + 8) = 3 \times 5 + 3 \times 8$
(d) $(9 + 2) \times 4 = 9 \times 4 + 2 \times 4$
(e) $3 \times (10 + 4) = 30 + 12$
(f) $(13 + 6) \times 4 = 13 \times 4 + 24$
(g) $3 \times (5 + 2) = 3 \times 5 + 3 \times 2$

(h) $(2 + 3) \times 4 = 2 \times 4 + 3 \times 4$
(i) $5 \times (9 – 2) = 5 \times 9 – 5 \times 2$
(j) $(5 – 2) \times 7 = 5 \times 7 – 2 \times 7$
(k) $5 \times (8 – 3) = 5 \times 8 – 5 \times 3$
(l) $(8 – 3) \times 7 = 8 \times 7 – 3 \times 7$
(m) $5 \times (12 – 3) = 60 – 5 \times 3$
(n) $(15 – 6) \times 7 = 105 – 6 \times 7$
(o) $5 \times (9 – 4) = 5 \times 9 – 5 \times 4$
(p) $(17 – 9) \times 7 = 17 \times 7 – 9 \times 7$

Question 2.
In the boxes below, fill in '<', '>' or '=' after analysing the expressions on the LHS and RHS. Use reasoning and understanding of terms and brackets to figure this out, and not by evaluating the expressions.
(a) $(8 – 3) \times 29 \ \boxed{}\ (3 – 8) \times 29$
(b) $15 + 9 \times 18 \ \boxed{}\ (15 + 9) \times 18$
(c) $23 \times (17 – 9) \ \boxed{}\ 23 \times 17 + 23 \times 9$
(d) $(34 – 28) \times 42 \ \boxed{}\ 34 \times 42 – 28 \times 42$
Solution:
(a) $(8 – 3) \times 29 > (3 – 8) \times 29$
Because, $(3 – 8) \times 29 = -(8 – 3) \times 29$
$\Rightarrow (8 – 3) \times 29 > (3 – 8) \times 29$

(b) $15 + 9 \times 18 < (15 + 9) \times 18$
Because, $(15 + 9) \times 18 = 15 \times 18 + 9 \times 18$ and $15 \times 18 > 15$
So, $15 + 9 \times 18 < (15 + 9) \times 18$

(c) $23 \times (17 – 9) < 23 \times 17 + 23 \times 9$
Because, $23 \times (17 – 9) = 23 \times 17 – 23 \times 9$
Clearly, $23 \times 17 > 23 \times 17 – 23 \times 9$
$\Rightarrow 23 \times (17 – 9) < 23 \times 17 + 23 \times 9$

(d) $(34 – 28) \times 42 = 34 \times 42 – 28 \times 42$

Question 3.
Here is one way to make 14: $2 \times (1 + 6) = 14$. Are there other ways of getting 14? Fill them out below:
(a) ________ × (________ + ________) = 14
(b) ________ × (________ + ________) = 14

(c) ________ × (________ + ________) = 14
(d) ________ × (________ + ________) = 14
Solution:
(a) 2 × (5 + 2) = 14
(b) 2 × (3 + 4) = 14
(c) 2 × (4 + 3) = 14
(d) 2 × (6 + 1) = 14

Question 4.
Find out the sum of the numbers given in each picture below in at least two different ways. Describe how you solved it through expressions.

Solution:
For I: 5 × 4 + 4 × 8 = 20 + 32 = 52
or 4 × (4 + 8) + 4 = 4 × 12 + 4 = 52

For II: 8 × (5 + 6) = 8 × 11 = 88
or 8 × 5 + 8 × 6 = 40 + 48 = 88

Question 5.
Read the situations given below. Write appropriate expressions for each of them and find their values.
(a) The district market in Begur operates on all seven days of the week. Rahim supplies 9 kg of mangoes each day from his orchard, and Shyam supplies 11 kg of mangoes each day from his orchard to this market. Find the number of mangoes supplied by them in a week to the local district market.
(b) Binu earns ₹ 20,000 per month. She spends ₹ 5,000 on rent, ₹ 5,000 on food, and ₹ 2,000 on other expenses every month. What is the amount Binu will save by the end of the year?
(c) During the daytime, a snail climbs 3 cm up a post, and during the night, while asleep, accidentally slips down by 2 cm. The post is 10 cm high, and a delicious treat is on top. In how many days will the snail get the treat?
Solution:
(a) Supplies of mangoes by Rahim in the market each day = 9 kg
Supplies of mangoes by Shyam in the market each day = 11 kg
Total supplies of mangoes in the market on each day = (9 + 11) kg
Therefore, total supplies of mangoes in the market in all 7 days = 7 × (9 + 11) kg
= 7 × 20
= 140 kg

(b) Binu's per month earning = ₹ 20,000
Binu's total monthly expenditures = ₹ 5,000 on rent + ₹ 5,000 on food + ₹ 2,000 on other expenses
= 5,000 + 5,000 + 2,000
Therefore, Binu's monthly savings = ₹ 20,000 – ₹(5,000 + 5,000 + 2,000)
= ₹ 20,000 – ₹ 12,000
= ₹ 8,000
Thus, Binu's total yearly savings = 12 × 8000 = 96000
Hence, Binu will save ₹ 96000 by the end of the year.

(c) Since the snail climbs 3 cm up the post in daytime and slips down by 2 cm at night.
So, the distance climbed by the snail of the post = 3 – 2 = 1 cm in a day.
∴ The distance climbed in 7 days = 7 cm
The height of the post is 10 cm.
The distance climbed on the 8th day before slipping = 7 + 3 = 10 cm
So, the snail will take 8 days to reach the top of the post and get the delicious treat.

Question 6.
Melvin reads a two-page story every day except on Tuesdays and Saturdays. How many stories would he complete reading in 8 weeks? Which of the expressions below describes this scenario?
(a) 5 × 2 × 8
(b) (7 – 2) × 8
(c) 8 × 7
(d) 7 × 2 × 8
(e) 7 × 5 – 2
(f) (7 + 2) × 8
(g) 7 × 8 – 2 × 8
(h) (7 – 5) × 8
Solution:
Number of days in a week except Tuesday and Saturday = 7 – 2
Since Melvin reads a two-page story every day except Tuesday and Saturday.
Therefore, number of stories read in a week = 1 × (7 – 2)
So, number of stories read in 8 weeks = 8 × 1 × (7 – 2)
= 8 × (7 – 2) or (7 – 2) × 8 [Expression (b)]
or 7 × 8 – 2 × 8 [Expression (g)]
Only expressions (b) and (g) describe this scenario.

Question7.
Find different ways of evaluating the following expressions:
(a) 1 – 2 + 3 – 4 + 5 – 6 + 7 – 8 + 9 – 10
(b) 1 – 1 + 1 – 1 + 1 – 1 + 1 – 1 + 1 – 1
Solution:
(a) 1 – 2 + 3 – 4 + 5 – 6 + 7 – 8 + 9 – 10
= (1 + 3 + 5 + 7 + 9) + (-2 – 4 – 6 – 8 – 10)
= 25 + (-30)
= -5
or
1 – 2 + 3 – 4 + 5 – 6 + 7 – 8 + 9 – 10
= (1 – 2) + (3 – 4) + (5 – 6) + (7 – 8) +(9 – 10)
= (-1) + (-1) + (-1) + (-1) + (-1)
= -5

(b) 1 – 1 + 1 – 1 + 1 – 1 + 1 – 1 + 1 – 1
= (1 – 1) + (1 – 1) + (1 – 1) + (1 – 1) + (1 – 1)
= 0 + 0 + 0 + 0 + 0
= 0
or
1 – 1 + 1 – 1 + 1 – 1 + 1 – 1 + 1 – 1
= (1 + 1 + 1 + 1 + 1) + (-1 – 1 – 1 – 1 – 1)
= 5 + (-5)
= 0

Question 8.
Compare the following pairs of expressions using ‘<’, ‘>’, or ‘=,’ or by reasoning.

(a) 49 – 7 + 8 $\square$ 49 – 7 + 8

(b) 83 × 42 – 18 $\square$ 83 × 40 – 18

(c) 145 – 17 × 8 $\square$ 145 – 17 × 6

(d) 23 × 48 – 35 $\square$ 23 × (48 – 35)

(e) (16 – 11) × 12 $\square$ -11 × 12 + 16 × 12

(f) (76 – 53) × 88 $\square$ 88 × (53 – 76)

(g) 25 × (42 + 16) $\square$ 25 × (43 + 15)

(h) 36 × (28 – 16) $\square$ 35 × (27 – 15)
Solution:

(a) $49 - 7 + 8 = 49 - 7 + 8$
($\because$ All the terms on both sides are the same)

(b) $83 \times 42 > 83 \times 40$
$\therefore 83 \times 42 - 18 > 83 \times 40 - 18$

(c) $17 \times 8 > 17 \times 6$
$\Rightarrow -17 \times 8 < -17 \times 6$
$\therefore 145 - 17 \times 8 < 145 - 17 \times 6$

(d) $23 \times (48 - 35) = 23 \times 48 - 23 \times 35$
and $35 < 23 \times 35$ $23 \times 48 - 35 > 23 \times (48 - 35)$

(e) $(16 - 11) \times 12 = 16 \times 12 - 11 \times 12 = -11 \times 12 + 16 \times 12$
$\therefore (16 - 11) \times 12 = -11 \times 12 + 16 \times 12$

(f) $(76 - 53) \times 88 = 76 \times 88 - 53 \times 88 = -(53 - 76) \times 88$
$\therefore (76 - 53) \times 88 > 88 \times (53 - 76)$

(g) $43 + 15 = 42 + 1 + 15 = 42 + 16$
$\Rightarrow 25 \times (43 + 15) = 25 \times (42 + 16)$
$\therefore 25 \times (42 + 16) = 25 \times (43 + 15)$

(h) $35 \times (27 - 15) = 35 \times (28 - 16)$
$\therefore 36 \times (28 - 16) > 35 \times (27 - 15)$

Question 9.
Identify which of the following expressions are equal to the given expression without computation. You may rewrite the expressions using terms or removing brackets. There can be more than one expression that is equal to the given expression.
(a) $83 - 37 - 12$
(i) $84 - 38 - 12$
(ii) $84 - (37 + 12)$
(iii) $83 - 38 - 13$
(iv) $-37 + 83 - 12$
(b) $93 + 37 \times 44 + 76$
(i) $37 + 93 \times 44 + 76$
(ii) $93 + 37 \times 76 + 44$
(iii) $(93 + 37) \times (44 + 76)$
(iv) $37 \times 44 + 93 + 76$
Solution:

(a) $83 - 37 - 12 = 83 - 37 - 12 + (1 - 1)$
$= (83 + 1) - 37 - 1 - 12$
$= 84 - 38 - 12$ (option (i))
$= 34$
Or
$83 - 37 - 12 = -37 + 83 - 12$
$= 46 - 12$
$= 34$ (option (iv))
Hence, (i) and (iv) are equal to the given expression $83 - 37 - 12$.

(b) (iv) $37 \times 44 + 93 + 76$
Rearrange the terms, and we get $93 + 37 \times 44 + 76$, which is equal to the given expression.
Hence, (iv) is equal to the given expression $93 + 37 \times 44 + 76$.

Question 10.
Choose a number and create ten different expressions having that value.
Solution:
Do it yourself.

Practice Time 2.1

Question 1

A notebook costs ₹35. Tanish buys 6 notebooks. Write an arithmetic expression for the total cost of the notebooks. Also, list two more expressions that have the same value.

Solution By Steps

Step 1: Find the total cost expression
Cost of 1 notebook = ₹35
Number of notebooks = 6

Expression = 6×35

Step 2: Write two more equivalent expressions

1. 35×6
2. $30 \times 6 + 5 \times 6$

Final Answer

Expression = 6×35

Two more expressions:

- 35×6
- $30 \times 6 + 5 \times 6$

Question 2

A car travels 60 km in 1 hour. Write a suitable expression to find the distance travelled in 5 hours. Give two other expressions equal to your result.

Solution By Steps

Step 1: Write the expression
Distance travelled in 1 hour = 60 km
Distance in 5 hours = 60×5

Step 2: Write two equivalent expressions

1. 5×60
2. $50 \times 5 + 10 \times 5$

Final Answer

Expression = 60×5

Two more expressions:

- 5×60
- $50 \times 5 + 10 \times 5$

Question 3

A packet contains 24 biscuits. There are 4 such packets. Write an expression for the total number of biscuits. Write two other expressions with the same result.

Solution By Steps

Step 1: Write the expression
Biscuits in one packet = 24
Number of packets = 4

Expression = 24×4

Step 2: Write two equivalent expressions

1. 4×24
2. $(20 + 4) \times 4$

Final Answer

Expression = 24×4

Two more expressions:

- 4×24
- $(20 + 4) \times 4$

Question 4

Each chair in a classroom costs ₹850. A school buys 3 such chairs. Write the expression for the total cost. Find two more expressions with the same value.

Solution By Steps

Step 1: Write the expression
Cost of one chair = ₹850
Number of chairs = 3

Expression = 850×3

Step 2: Write two equivalent expressions

1. 3×850
2. $(800 + 50) \times 3$

Final Answer

Expression = 850×3

Two more expressions:

- 3×850
- $(800 + 50) \times 3$

Question 5

A water tank fills 15 litres every minute. How much water will be filled in 8 minutes? Write the expression. List two different expressions with the same value.

Solution By Steps

Step 1: Write the expression
Water filled in 1 minute = 15 litres
Water filled in 8 minutes = 15×8

Step 2: Write two equivalent expressions

1. 8×15
2. $(10 + 5) \times 8$

Final Answer

Expression = 15×8

Two more expressions:

- 8×15
- $(10 + 5) \times 8$

Practice Time 2.2

Question 1

Which is greater: $65 + 28$or $60 + 34$?

Solution By Steps

Step 1: Evaluate both expressions

$$65 + 28 = 93$$
$$60 + 34 = 94$$

Step 2: Compare

$$93 < 94$$

Final Answer

$$65 + 28 < 60 + 34$$

Question 2

A teacher gave ₹500 to two students. Rehan spent ₹245 and Ayaan spent ₹250. Who has more money left?

Solution By Steps

Step 1: Find money left with Rehan

$$500 - 245 = 255$$

Step 2: Find money left with Ayaan

$$500 - 250 = 250$$

Step 3: Compare

$$255 > 250$$

Final Answer

Rehan has more money left.

Question 3

Which expression has the higher value: 27×3or 30×2?

Solution By Steps

Step 1: Evaluate expressions

$$27 \times 3 = 81$$
$$30 \times 2 = 60$$

Step 2: Compare

$$81 > 60$$

Final Answer

$$27 \times 3 > 30 \times 2$$

So, 27×3has the higher value.

Question 4

A toy costs ₹120. Which is more: buying 3 toys or 2 toys?

Solution By Steps

Step 1: Find cost of 3 toys

$$3 \times 120 = 360$$

Step 2: Find cost of 2 toys

$$2 \times 120 = 240$$

Step 3: Compare

$$360 > 240$$

Final Answer

Buying 3 toys costs more.

Question 5

Priya read 96 pages in 3 days. Anjali read 108 pages in 4 days. Who read more pages per day?

Solution By Steps

Step 1: Find Priya's reading per day

$$96 \div 3 = 32$$

Step 2: Find Anjali's reading per day

$$108 \div 4 = 27$$

Step 3: Compare

$$32 > 27$$

Final Answer

Priya read more pages per day.

Practice Time 2.3

Question 1

Aman buys 2 packets of bread at ₹25 each and a jam bottle for ₹40. Write an expression for the total amount spent and solve it.

Solution By Steps

Step 1: Find the cost of bread packets

Cost of 1 packet = ₹25
Number of packets = 2

$$2 \times 25 = 50$$

Step 2: Add the cost of jam bottle

Cost of jam bottle = ₹40

Expression:

$$(2 \times 25) + 40$$

Step 3: Evaluate

$$50 + 40 = 90$$

Final Answer

Expression:

$$(2 \times 25) + 40$$

Total Amount = ₹90

Question 2

Shreya bought pens for ₹32 and markers for ₹38. She paid ₹100 to the shopkeeper. Write an expression using brackets to show how much money she got back.

Solution By Steps

Step 1: Find total money spent

$$32 + 38 = 70$$

Step 2: Write expression for money returned

$$100 - (32 + 38)$$

Step 3: Evaluate

$$100 - 70 = 30$$

Final Answer

Expression:

$$100 - (32 + 38)$$

Money returned = ₹30

Question 3

There are 4 shelves. Each shelf has 3 maths books and 5 science books. Write an expression to find the total number of books.

Solution By Steps

Step 1: Find books in one shelf

$$3 + 5 = 8$$

Step 2: Find books in 4 shelves

Expression:

$$4 \times (3 + 5)$$

Step 3: Evaluate

$$4 \times 8 = 32$$

Final Answer

Expression:

$$4 \times (3 + 5)$$

Total books = 32

Question 4

Ramesh bought 5 pencils at ₹6 each and one eraser for ₹10. Write an expression to show how much he paid in total.

Solution By Steps

Step 1: Find cost of pencils

$$5 \times 6 = 30$$

Step 2: Add eraser cost

Expression:

$$(5 \times 6) + 10$$

Step 3: Evaluate

$$30 + 10 = 40$$

Final Answer

Expression:

$$(5 \times 6) + 10$$

Total amount paid = ₹40

Question 5

A school group includes 6 boys and 4 girls in each van. There are 5 vans. Write an expression to calculate the total number of children.

Solution By Steps

Step 1: Find children in one van

$$6 + 4 = 10$$

Step 2: Find total children in 5 vans

Expression:

$$5 \times (6 + 4)$$

Step 3: Evaluate

$$5 \times 10 = 50$$

Final Answer

Expression:

$$5 \times (6 + 4)$$

Total number of children = 50

Practice Time 2.4

Question 1

Evaluate both forms:

Expression: $12 + (-7)$
Swapped: $(-7) + 12$

Do both give the same result?

Solution By Steps

Step 1: Evaluate first expression

$$12 + (-7) = 12 - 7 = 5$$

Step 2: Evaluate swapped expression

$$(-7) + 12 = 12 - 7 = 5$$

Step 3: Compare results

Both results are equal.

Final Answer

$$12 + (-7) = 5$$
$$(-7) + 12 = 5$$

Yes, both give the same result.

Question 2

Swap the terms and find if the result changes:

Expression: $(-3) + 9$
Swapped: $9 + (-3)$

Solution By Steps

Step 1: Evaluate first expression

$$(-3) + 9 = 6$$

Step 2: Evaluate swapped expression

$$9 + (-3) = 6$$

Step 3: Compare

Both are equal.

Final Answer

The result does not change.

Question 3

Consider the expression: $(-8) + (-2)$

Write the swapped form and compare the results.

Solution By Steps

Step 1: Write swapped form

Swapped form:

$$(-2) + (-8)$$

Step 2: Evaluate original expression

$$(-8) + (-2) = -10$$

Step 3: Evaluate swapped expression

$$(-2) + (-8) = -10$$

Final Answer

Original = -10

Swapped = -10

Both results are the same.

Question 4

Try swapping terms in:

$$15 + (-20)$$

Does the sum remain the same?

Solution By Steps

Step 1: Evaluate original expression

$$15 + (-20) = -5$$

Step 2: Swap terms

$$(-20) + 15 = -5$$

Step 3: Compare

Both sums are equal.

Final Answer

Yes, the sum remains the same.

Question 5

Swap and compare:

Expression: $(-6) + 6$

Swapped: $6 + (-6)$

What do you observe?

Solution By Steps

Step 1: Evaluate first expression

$$(-6) + 6 = 0$$

Step 2: Evaluate swapped expression

$$6 + (-6) = 0$$

Step 3: Observation

Both expressions give the same result.

Final Answer

Both expressions are equal to 0.

Observation: Swapping the order of addition does not change the sum.

Practice Time 2.5

Question 1(i)

Find 98×27using distributive property.

Solution By Steps

Step 1: Rewrite 98

$$98 = 100 - 2$$

Step 2: Apply distributive property

$$\begin{aligned} 98 \times 27 &= (100 - 2) \times 27 \\ &= 100 \times 27 - 2 \times 27 \end{aligned}$$

Step 3: Calculate

$$= 2700 - 54$$
$$= 2646$$

Final Answer

$$98 \times 27 = 2646$$

Question 1(ii)

Use a suitable method to find:

$$103 \times 6$$

Solution By Steps

Step 1: Rewrite 103

$$103 = 100 + 3$$

Step 2: Apply distributive property

$$103 \times 6 = (100 + 3) \times 6$$
$$= 100 \times 6 + 3 \times 6$$

Step 3: Calculate

$$= 600 + 18$$
$$= 618$$

Final Answer

$$103 \times 6 = 618$$

Key Concept

Distributive property helps us break numbers into easier parts for multiplication.

Key Concept Explanation

The distributive property states:

$$a \times (b + c) = a \times b + a \times c$$

and

$$a \times (b - c) = a \times b - a \times c$$

This method makes multiplication easier using nearby round numbers such as 100, 50, etc.

Example:

$$\begin{aligned} &98 \times 27 = (100 - 2) \times 27 \\ &= 100 \times 27 - 2 \times 27 \\ &= 2700 - 54 \\ &= 2646 \end{aligned}$$

Practice Time 2.5 (Continued)

Question 2(i)

An electronics store had ₹5,000 in the cash register. It gave a refund of ₹1,250 to one customer and ₹850 to another. How much money is left in the register?

Solution By Steps

Step 1: Write the expression

Initial money = ₹5000

Refunds given:

- ₹1250
- ₹850

Expression:

$$5000 - (1250 + 850)$$

Step 2: Add the refunds

$$1250 + 850 = 2100$$

Step 3: Subtract from total amount

$$5000 - 2100 = 2900$$

Final Answer

Money left in the register = ₹2900

Question 2(ii)

A warehouse stored 1,200 cartons. It shipped 375 cartons in the morning and 425 in the evening. How many cartons remain in the warehouse?

Solution By Steps

Step 1: Write the expression

$$1200 - (375 + 425)$$

Step 2: Add shipped cartons

$$375 + 425 = 800$$

Step 3: Subtract

$$1200 - 800 = 400$$

Final Answer

400 cartons remain in the warehouse.

Question 2(iii)

A school library bought 800 books. Later, it gave 350 books to Class 6 and 200 to Class 7. How many books are now left in the library?

Solution By Steps

Step 1: Write the expression

$$800 - (350 + 200)$$

Step 2: Add books distributed

$$350 + 200 = 550$$

Step 3: Find remaining books

$$800 - 550 = 250$$

Final Answer

250 books are left in the library.

Question 3(i)

Original Expression:

$$56 - 24 - 11$$

Changed Expression 1:

$$57 - 24 - 11$$

Changed Expression 2:

$$57 - 25 - 11$$

What will happen to the total value?

Solution By Steps

Step 1: Compare changes

- First number increased by 1:
$$56 \rightarrow 57$$
- Second number also increased by 1:
$$24 \rightarrow 25$$

Step 2: Observe effect

Increasing both by the same amount cancels the effect.

So, total value remains unchanged.

Final Answer

The value remains the same.

Correct option: **(c) Remains the same**

Question 3(ii)

Original Expression:

$$-45 - 13 - 8$$

Changed Expression 1:

$$-44 - 13 - 8$$

Changed Expression 2:

$$-44 - 12 - 8$$

What is the net change in value?

Solution By Steps

Step 1: Compare changes

- First number increases by 1:
$$-45 \rightarrow -44$$
- Second number also increases by 1:
$$-13 \rightarrow -12$$

Step 2: Effect on expression

Increase in first term adds 1.

Increase in subtracted term removes 1.

Net effect:

$$+1 - 1 = 0$$

Final Answer

Net change = 0

Correct option: **(c) 0**

Question 4(i)

A meal combo includes a sandwich for ₹55 and a drink for ₹25. Two people ordered the same combo. Write an expression using brackets and find the total amount paid.

Solution By Steps

Step 1: Find cost of one combo

$$55 + 25 = 80$$

Step 2: For two people

Expression:

$$2 \times (55 + 25)$$

Step 3: Evaluate

$$2 \times 80 = 160$$

Final Answer

Expression:

$$2 \times (55 + 25)$$

Total amount paid = ₹160

Correct option: **(c) ₹160**

Question 4(ii)

There are 3 shelves of storybooks and 2 shelves of comics. Each shelf has 6 books. Which expression shows the total number of books?

Solution By Steps

Step 1: Total shelves

$$3 + 2 = 5$$

Step 2: Multiply by books in each shelf

$$(3 + 2) \times 6$$

Step 3: Evaluate

$$5 \times 6 = 30$$

Final Answer

Correct expression:

$$(3 + 2) \times 6$$

Correct option: **(b)**

Question 4(iii)

A packet has 3 pens costing ₹12 each and 3 pencils costing ₹5 each. What is the total cost of 3 such packets?

Solution By Steps

Step 1: Cost of one packet

Pens:

$$3 \times 12 = 36$$

Pencils:

$$3 \times 5 = 15$$

Total:

$$36 + 15 = 51$$

Step 2: Cost of 3 packets

$$3 \times (12 + 5)$$

or

$$(3 \times 12) + (3 \times 5)$$

Both give same result.

Final Answer

Correct option: **(c) Both a and b**

Exam Time

A. Multiple Choice Questions (MCQs)

Question 1

What is the value of:

$$14 + 3 \times 2$$

Solution By Steps

Step 1: Multiply first

$$3 \times 2 = 6$$

Step 2: Add

$$14 + 6 = 20$$

Final Answer

20

Correct option: **(a)**

Question 2

Which of the following is an arithmetic expression?

Options:

- $5 + 8 \times 2$
- $5 \times (8 + 2)$
- $10 \div 2$

Solution By Steps

All options contain numbers and arithmetic operations.

Final Answer

All of the above

Correct option: **(d)**

Question 3

What is the expression for finding the total cost if one pencil costs ₹8 and 7 pencils are bought?

Solution By Steps

Cost of one pencil = ₹8

Number of pencils = 7

Expression:

$$8 \times 7$$

Final Answer

$$8 \times 7$$

Correct option: **(b)**

Question 4

If Rahul buys 3 movie tickets at ₹150 each, what is the arithmetic expression for the total cost?

Solution By Steps

Cost of one ticket = ₹150

Number of tickets = 3

Expression:

$$150 \times 3$$

Final Answer

$$150 \times 3$$

Correct option: **(a)**

Question 5

What is the result of:

$$25 - 10 + 5$$

Solution By Steps

Step 1: Subtract

$$25 - 10 = 15$$

Step 2: Add

$$15 + 5 = 20$$

Final Answer

20

Correct option: **(c)**

Key Concept Explanation

B. Fill in the Blanks

Question 1

The expression for the total cost of 6 notebooks, each costing ₹30, is ________.

Solution By Steps

Step 1: Identify cost and quantity

Cost of one notebook = ₹30

Number of notebooks = 6

Step 2: Write the expression

$$6 \times 30$$

Final Answer

$$6 \times 30$$

Question 2

$$25 \div 5 = \_\_\_\_$$

Solution By Steps

Step 1: Divide

$$25 \div 5 = 5$$

Final Answer

$$5$$

Question 3

To find the total cost of 5 items priced at ₹40 each, the expression is _________.

Solution By Steps

Step 1: Multiply quantity by cost

$$5 \times 40$$

Final Answer

$$5 \times 40$$

Question 4

The value of the expression:

$$12 + 15 \times 2$$

is ________.

Solution By Steps

Step 1: Multiply first

$$15 \times 2 = 30$$

Step 2: Add

$$12 + 30 = 42$$

Final Answer

42

Question 5

The result of the expression:

$$9 \times 4$$

is ________.

Solution By Steps

$$9 \times 4 = 36$$

Final Answer

36

C. Write True or False

Question 1

The expression $6 + 2 \times 5$is equal to 40.

Solution By Steps

Step 1: Multiply first

$$2 \times 5 = 10$$

Step 2: Add

$$6 + 10 = 16$$

Since $16 \neq 40$, the statement is false.

Final Answer

False

Question 2

$$12 \times 5 + 2$$

is the same as

$$(12 \times 5) + 2$$

Solution By Steps

According to order of operations, multiplication is done first.

Both expressions become:

$$60 + 2 = 62$$

Final Answer

True

Question 3

The expression:

$$10 + 3 \times 2$$

equals 26.

Solution By Steps

Step 1: Multiply first

$$3 \times 2 = 6$$

Step 2: Add

$$10 + 6 = 16$$

Since $16 \neq 26$, the statement is false.

Final Answer

False

Question 4

If an expression involves multiplication and addition, we solve the addition first.

Solution By Steps

According to order of operations, multiplication is solved before addition.

Final Answer

False

Question 5

$$15 + 20 \div 5$$

equals 20.

Solution By Steps

Step 1: Divide first

$$20 \div 5 = 4$$

Step 2: Add

$$15 + 4 = 19$$

Since $19 \neq 20$, the statement is false.

Final Answer

False

D. Match the Columns

Column A

(i) $7 \times (5 + 2)$

(ii) $100 - (25 + 50)$

(iii) $5 \times (10 - 5)$

(iv) $8 \times (6 + 1)$

(v) $(14 - 6) \times 5$

Column B

(a) 49

(b) 25

(c) 35

(d) 70

(e) 40

Solution By Steps

(i)

$$\begin{aligned} &7 \times (5 + 2) \\ &= 7 \times 7 \\ &= 49 \end{aligned}$$

Matches with **(a)**

(ii)

$$\begin{aligned} &100 - (25 + 50) \\ &= 100 - 75 \\ &= 25 \end{aligned}$$

Matches with **(b)**

(iii)

$$5 \times (10 - 5)$$
$$= 5 \times 5$$
$$= 25$$

Matches with **(b)**

(iv)

$$8 \times (6 + 1)$$
$$= 8 \times 7$$
$$= 56$$

(No matching option given in column B)

(v)

$$(14 - 6) \times 5$$
$$= 8 \times 5$$
$$= 40$$

Matches with **(e)**

Final Answer

Column A	Column B
(i)	(a)
(ii)	(b)
(iii)	(b)
(iv)	No matching option
(v)	(e)

E. Very Short Answer Type Questions

Question 1

What is an arithmetic expression?

Solution

An arithmetic expression is a mathematical statement made using numbers and operations like addition, subtraction, multiplication, and division.

Final Answer

An arithmetic expression combines numbers and operations to show a mathematical calculation.

Question 2

What is the value of:

$$12 + 5 \times 2$$

Solution By Steps

Step 1: Multiply first

$$5 \times 2 = 10$$

Step 2: Add

$$12 + 10 = 22$$

Final Answer

22

Question 3

Write one example of an expression using brackets.

Final Answer

Example:

$$5 \times (3 + 2)$$

Question 4

What does the equal sign ($=$)indicate in an expression?

Final Answer

The equal sign shows that both sides have the same value.

Question 5

Simplify:

$$30 - (10 + 5)$$

Solution By Steps

Step 1: Solve bracket first

$$10 + 5 = 15$$

Step 2: Subtract

$$30 - 15 = 15$$

Final Answer

F. Short Answer Type Questions

Question 1

Write any two arithmetic expressions that have the same value as 36.

Solution

Two expressions:

$$30 + 6$$
$$9 \times 4$$

Both equal 36.

Final Answer

$$30 + 6$$

and

$$9 \times 4$$

Question 2

Compare:

$$45 + 20 - 46 + 18$$

Solution By Steps

Step 1: Add and subtract in order

$$45 + 20 = 65$$

$$65 - 46 = 19$$
$$19 + 18 = 37$$

Final Answer

$$45 + 20 - 46 + 18 = 37$$

Question 3

Write an expression for the total cost of 4 apples at ₹15 each and 2 bananas at ₹10 each.

Solution

Cost of apples:

$$4 \times 15$$

Cost of bananas:

$$2 \times 10$$

Total expression:

$$(4 \times 15) + (2 \times 10)$$

Final Answer

$$(4 \times 15) + (2 \times 10)$$

Question 4

Explain with an example how changing one term in an expression can affect its value.

Solution

Example:

$$20 + 5 = 25$$

If we change 5 to 8:

$$20 + 8 = 28$$

The value increases by 3.

Final Answer

Changing a term changes the final value of the expression.

Example:

$$20 + 5 = 25$$
$$20 + 8 = 28$$

Question 5

Simplify using distributive property:

$$8 \times (10 + 5)$$

Solution By Steps

Step 1: Apply distributive property

$$8 \times 10 + 8 \times 5$$

Step 2: Multiply

$$80 + 40$$

Step 3: Add

$$120$$

Final Answer

$$8 \times (10 + 5) = 120$$

G. Long Answer Type Questions

Question 1

A fruit vendor sells 5 baskets of mangoes, each containing 12 mangoes, and 3 baskets of apples, each containing 8 apples. Write an expression for total fruits and find the value.

Solution By Steps

Step 1: Find total mangoes

Number of baskets of mangoes = 5

Mangoes in each basket = 12

$$5 \times 12 = 60$$

Step 2: Find total apples

Number of baskets of apples = 3

Apples in each basket = 8

$$3 \times 8 = 24$$

Step 3: Write the expression

$$(5 \times 12) + (3 \times 8)$$

Step 4: Find total fruits

$$60 + 24 = 84$$

Final Answer

Expression:

$$(5 \times 12) + (3 \times 8)$$

Total fruits = 84

Question 2

A shopkeeper had ₹1,500. He spent ₹450 on groceries and ₹250 on vegetables. Write the expression and find the amount left.

Solution By Steps

Step 1: Write the expression

$$1500 - (450 + 250)$$

Step 2: Add expenses

$$450 + 250 = 700$$

Step 3: Subtract from total money

$$1500 - 700 = 800$$

Final Answer

Expression:

$$1500 - (450 + 250)$$

Amount left = ₹800

Question 3

Riya buys 3 dresses for ₹750 each and 2 pairs of shoes for ₹600 each. Write and simplify the arithmetic expression to find the total cost.

Solution By Steps

Step 1: Find cost of dresses

$$3 \times 750 = 2250$$

Step 2: Find cost of shoes

$$2 \times 600 = 1200$$

Step 3: Write the expression

$$(3 \times 750) + (2 \times 600)$$

Step 4: Find total cost

$$2250 + 1200 = 3450$$

Final Answer

Expression:

$$(3 \times 750) + (2 \times 600)$$

Total cost = ₹3450

Question 4

A library had 1,200 books. It issued 425 books on Monday and 375 on Tuesday. Write an expression and find how many books remain.

Solution By Steps

Step 1: Write the expression

$$1200 - (425 + 375)$$

Step 2: Add issued books

$$425 + 375 = 800$$

Step 3: Subtract

$$1200 - 800 = 400$$

Final Answer

Expression:

$$1200 - (425 + 375)$$

Books remaining = 400

Question 5

Explain the difference between:

$$5 \times (4 + 3)$$

and

$$5 \times 4 + 3$$

with suitable calculations.

Solution By Steps

First Expression

$$5 \times (4 + 3)$$

Step 1: Solve bracket first

$$4 + 3 = 7$$

Step 2: Multiply

$$5 \times 7 = 35$$

Second Expression

$$5 \times 4 + 3$$

Step 1: Multiply first

$$5 \times 4 = 20$$

Step 2: Add

$$20 + 3 = 23$$

Step 3: Compare results

$$35 \neq 23$$

The two expressions are different because brackets change the order of operations.

Final Answer

$$5 \times (4 + 3) = 35$$
$$5 \times 4 + 3 = 23$$

Both expressions have different values.

Question 6

Use the distributive property to find:

$$97 \times 25$$

Hint: $97 = 100 - 3$

Solution By Steps

Step 1: Rewrite 97

$$97 = 100 - 3$$

Step 2: Apply distributive property

$$97 \times 25 = (100 - 3) \times 25$$
$$= 100 \times 25 - 3 \times 25$$

Step 3: Multiply

$$100 \times 25 = 2500$$
$$3 \times 25 = 75$$

Step 4: Subtract

$$2500 - 75 = 2425$$

Final Answer

$$97 \times 25 = 2425$$

Competency-Based Questions

A. Assertion and Reason Type Questions

Question 1

Assertion (A):

$$3 \times 5 + 2 = 17$$

Reason (R):
According to the order of operations, multiplication is solved first followed by addition.

Solution By Steps

Step 1: Evaluate the expression

$$3 \times 5 = 15$$
$$15 + 2 = 17$$

Assertion is true.

Step 2: Check the reason

The reason correctly explains the order of operations.

Reason is also true.

Final Answer

Correct option: **(a)**
Both (A) and (R) are true and (R) is the correct explanation of (A).

Question 2

Assertion (A):

$$10 + 5 \times 2 = 20$$

Reason (R):
According to the order of operations, multiplication is performed before addition.

Solution By Steps

Step 1: Evaluate expression

$$5 \times 2 = 10$$
$$10 + 10 = 20$$

Assertion is true.

Step 2: Check reason

The reason is correct.

Final Answer

Correct option: **(a)**
Both (A) and (R) are true and (R) is the correct explanation of (A).

B. Case Study Based Questions

Question

Nina and Arvind are planning a road trip. Their car consumes 12 litres of fuel for every 100 km travelled. How much fuel will they need to travel 250 km? Write the arithmetic expression and solve it.

Solution By Steps

Step 1: Write the expression

Fuel needed for 100 km = 12 litres

Fuel needed for 250 km:

$$(12 \div 100) \times 250$$

Step 2: Simplify

$$12 \div 100 = 0.12$$

Step 3: Multiply

$$0.12 \times 250 = 30$$

Final Answer

Expression:

$$(12 \div 100) \times 250$$

Fuel needed = 30 litres

Correct option: **(b)**

C. Maths Booster

Question 1: Decode the Hidden Expression

Arjun writes a mystery number as an arithmetic expression.
It uses exactly five symbols and its value is 40.

Solution

One possible expression is:

$$10 \times 4$$

Value:

$$10 \times 4 = 40$$

Final Answer

One possible expression:

$$10 \times 4$$

Question 2: Pizza Party Puzzle

Riya and Kabir are splitting pizzas.
Each pizza costs ₹120.
Riya buys 3 pizzas and Kabir buys 2 pizzas.

Write one arithmetic expression showing the total money spent.

Solution By Steps

Step 1: Total pizzas bought

$$3 + 2 = 5$$

Step 2: Multiply by cost of one pizza

$$(3 + 2) \times 120$$

Step 3: Evaluate

$$5 \times 120 = 600$$

Final Answer

Expression:

$$(3 + 2) \times 120$$

Total money spent = ₹600

Chapter – 3: A Peek Beyond The Point

NCERT CORNER

In-Text Questions

Q1. Use this method to find the following products

(a) 95 × 8

Using the distributive property:

$$\begin{aligned} 95 \times 8 &= (100 - 5) \times 8 \\ &= 100 \times 8 - 5 \times 8 \\ &= 800 - 40 \end{aligned}$$

$$= 760$$

Answer: 760

(b) 104 × 15

$$104 \times 15 = 104 \times (10 + 5)$$
$$= 104 \times 10 + 104 \times 5$$
$$= 1040 + 520$$
$$= 1560$$

Answer: 1560

(c) 49 × 50

$$49 \times 50 = (50 - 1) \times 50$$
$$= 50 \times 50 - 1 \times 50$$
$$= 2500 - 50$$
$$= 2450$$

Answer: 2450

Q2. Is this quicker than the multiplication procedure you use generally?

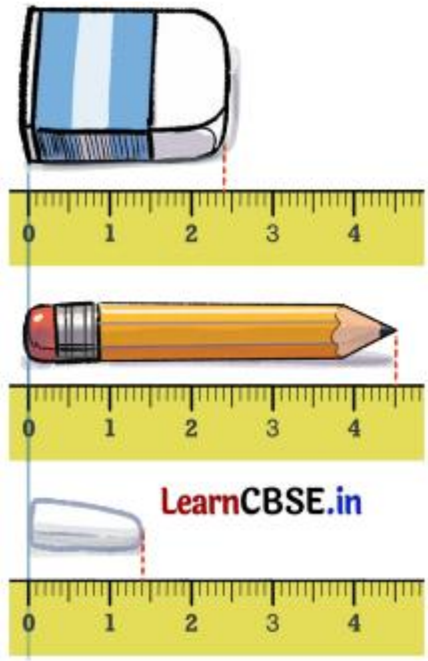
Answer:

Yes, this method is often quicker when one of the numbers is close to a multiple of 10, 100, etc. It simplifies the calculation by breaking numbers into easier parts and using addition or subtraction. However, for some numbers, the usual multiplication method may be more convenient.

Therefore, the quicker method depends on the numbers being multiplied.

3. Measure the following objects using a scale and write their measurements in centimetres (as shown earlier for the lengths of the screws): pen, sharpener, and any other object of your choice.
Solution:
Do it yourself.

4. Write the measurements of the objects shown in the picture:



Solution:
Length of the eraser is 2cm
Length of the pencil is 4cm
Length of the chalk is 1cm

5. Arrange these lengths in increasing order:

(a) 9/10 → nine-tenths

(b)17/10 → one and seven-tenths or seventeen tenths

(c) 130/10→ one hundred thirty-tenths

(d) 131/10→ Thirteen and one-tenths or one hundred thirty-one tenths

(e) 105/10→ Ten and five-tenths or one hundred five tenths

(f) 76/10→ Seven and six-tenths or seventh-six tenths

(g)67/10 → Six and seven-tenths or sixty-seven tenths

(h) 4/10→ four-tenths

These fractional units are in increasing order as:

$$\frac{4}{10} < \frac{9}{10} < 1\frac{7}{10} < 6\frac{7}{10} < 7\frac{6}{10} < 10\frac{5}{10} < \frac{130}{10} < 13\frac{1}{10}$$

6. *Step 1: Convert mixed numbers into improper fractional units*

We rewrite the mixed numbers with denominator 10:

$$4\frac{1}{10} = \frac{41}{10}$$
$$41\frac{1}{10} = \frac{411}{10}$$

Step 2: Compare the numerators

Now compare:

$$\frac{4}{10}, \frac{41}{10}, \frac{41}{10}, \frac{411}{10}$$

Since all have the same denominator, compare numerators:

$$4 < 41 < 411$$

Step 3: Arrange in increasing order

Therefore,

$$\frac{4}{10} < 4\frac{1}{10} = \frac{41}{10} < 41\frac{1}{10}$$

Final Answer

$$\frac{4}{10} < 4\frac{1}{10} = \frac{41}{10} < 41\frac{1}{10}$$

7. **Q7. Sonu is measuring some of the body parts.**

Length of lower arm = $2\frac{7}{10}$units

Length of upper arm = $3\frac{6}{10}$units

Total length of arm

$$2\frac{7}{10} + 3\frac{6}{10}$$

$$= (2+3) + \left(\frac{7}{10} + \frac{6}{10}\right)$$
$$= 5 + \frac{13}{10}$$
$$= 5 + 1\frac{3}{10}$$
$$= 6\frac{3}{10}$$

Answer: $6\frac{3}{10}$**units**

8. The lengths of the body parts of a honeybee are given. Find its total length.

Head: $2\frac{3}{10}$units

Thorax: $5\frac{4}{10}$units

Abdomen: $7\frac{5}{10}$units

Solution:

The total length of a honeybee

$$= \text{length of the head} + \text{length of the thorax} + \text{length of the abdomen}$$
$$= 2\frac{3}{10} + 5\frac{4}{10} + 7\frac{5}{10}$$
$$= (2+5+7) + \left(\frac{3}{10} + \frac{4}{10} + \frac{5}{10}\right)$$
$$= 14 + \frac{12}{10}$$
$$= 14 + 1\frac{2}{10}$$
$$= 15\frac{2}{10} \text{ units}$$

Q9. Length of the longest (middle) finger

Length of hand = $12\frac{4}{10}$units

Length of palm = $6\frac{7}{10}$units

Length of middle finger

$$12\frac{4}{10} - 6\frac{7}{10}$$

Borrow 1 from 12:

$$11\frac{14}{10} - 6\frac{7}{10}$$
$$= (11 - 6) + \left(\frac{14}{10} - \frac{7}{10}\right)$$
$$= 5 + \frac{7}{10}$$
$$= 5\frac{7}{10}$$

Answer: $5\frac{7}{10}$**units**

Q10. Compute the difference by converting both lengths to tenths

Length of hand

$$12\frac{4}{10} = \frac{124}{10}$$

Length of palm

$$6\frac{7}{10} = \frac{67}{10}$$

Difference

$$\frac{124}{10} - \frac{67}{10}$$
$$= \frac{57}{10}$$
$$= 5\frac{7}{10}$$

Answer: $5\frac{7}{10}$**units**

11. A Celestial Pearl Danio's length is $2\frac{4}{10}$cm, and the length of a Philippine Goby is $\frac{9}{10}$cm. What is the difference in their lengths?

How big are these fish compared to your figure?

Solution:

The length of a Celestial Pearl Danio fish

$$= 2\frac{4}{10}\text{ cm} = \frac{24}{10}\text{ cm}$$

The length of a Philippine Goby fish

$$= \frac{9}{10}\text{ cm}$$

So, the difference in their lengths

$$= \frac{24}{10}\text{ cm} - \frac{9}{10}\text{ cm}$$
$$= \frac{15}{10}\text{ cm}$$
$$= 1\frac{5}{10}\text{ cm}$$

12. How big are these fish compared to your figure?

Solution:

Do it yourself.

13. Observe the given sequences of numbers. Identify the change after each term and extend the pattern:

(a)

Since, the sequence is

$$4,\ 4+\frac{3}{10}=4\frac{3}{10},\ 4+\frac{3}{10}+\frac{3}{10}=4\frac{6}{10}$$

So, further terms are

$$4\frac{6}{10}+\frac{3}{10}=4\frac{9}{10},\ 4\frac{9}{10}+\frac{3}{10}=4\frac{12}{10}$$

$$=4+1+\frac{2}{10}=5\frac{2}{10}$$

$$5\frac{2}{10}+\frac{3}{10}=5\frac{5}{10},\ 5\frac{5}{10}+\frac{3}{10}=5\frac{8}{10}$$

So, the pattern is

$$4,\ 4\frac{3}{10},\ 4\frac{6}{10},\ \underline{4\frac{9}{10}},\ \underline{5\frac{2}{10}},\ \underline{5\frac{5}{10}},\ \underline{5\frac{8}{10}}$$

b.

Since, the sequence is

$$8\frac{2}{10}+\frac{5}{10}=8\frac{7}{10},\ 8\frac{7}{10}+\frac{5}{10}=8\frac{12}{10}$$

$$=8+1+\frac{2}{10}=9\frac{2}{10}$$

So, further terms are

$$9\frac{2}{10}+\frac{5}{10}=9\frac{7}{10},\ 9\frac{7}{10}+\frac{5}{10}=9\frac{12}{10}$$

$$=9+1+\frac{2}{10}=10\frac{2}{10}$$

So, the sequence is

$$8\frac{2}{10},\ 8\frac{7}{10},\ 9\frac{2}{10},\ \underline{9\frac{7}{10}},\ \underline{10\frac{2}{10}},\ \underline{10\frac{7}{10}},\ \underline{11\frac{2}{10}}$$

(c)

Solution:

We observe that,

$$5\frac{7}{10}-\frac{4}{10}=5\frac{3}{10},\ 5\frac{3}{10}-\frac{4}{10}=4+\frac{13}{10}-\frac{4}{10}=4\frac{9}{10},\ \ldots$$

So, subtracting $\frac{4}{10}$ from each previous term, we get the sequence as follows:

$$5\frac{7}{10},\ 5\frac{3}{10},\ 4\frac{9}{10},\ 4\frac{5}{10},\ 4\frac{1}{10},\ 3\frac{7}{10}$$

(d)

(d) $5\frac{7}{10}, 5\frac{3}{10}$, ________, ________, ________, ________

Solution:

We observe that,

$$5\frac{7}{10}-\frac{4}{10}=5\frac{3}{10},\ 5\frac{3}{10}-\frac{4}{10}=4+\frac{13}{10}-\frac{4}{10}=4\frac{9}{10},\ \ldots$$

So, subtracting $\frac{4}{10}$ from each previous term, we get the sequence as follows: LearnCBSE.in

$$5\frac{7}{10},\ 5\frac{3}{10},\ 4\frac{9}{10},\ 4\frac{5}{10},\ 4\frac{1}{10},\ 3\frac{7}{10}$$

(e)

(e) $13\frac{5}{10}, 13, 12\frac{5}{10}$, ________, ________, ________, ________

Solution:

Since, $13\frac{5}{10}-\frac{5}{10}=13,\ 13-\frac{5}{10}=12+1-\frac{5}{10}$

$=12+\frac{10}{10}-\frac{5}{10}=12\frac{5}{10}$

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So, by subtracting $\frac{5}{10}$ from each previous term, we get the sequence as follows:

$13\frac{5}{10}, 13, 12\frac{5}{10}, 12, 11\frac{5}{10}, 11, 10\frac{5}{10}$

(f) Solution:

Since, $11\frac{5}{10}-1\frac{1}{10}=10\frac{4}{10},\ 10\frac{4}{10}-1\frac{1}{10}=9\frac{3}{10}, \ldots$

So, by subtracting $1\frac{1}{10}$ from each previous term, we get the sequence as

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$11\frac{5}{10}, 10\frac{4}{10}, 9\frac{3}{10}, 8\frac{2}{10}, 7\frac{1}{10}, 6, 4\frac{9}{10}$

Q14. What is the length of this smaller part? How many such smaller parts make a unit length?

The next question (Q15) talks about **one-hundredths**, so the smaller division shown in the figure is:

$$\frac{1}{100}$$

unit.

Therefore,

Length of one smaller part = $\frac{1}{100}$**unit = 0.01 unit**

Number of such parts in 1 unit:

$$1 \div \frac{1}{100} = 100$$

Answer:

- Length of smaller part = $\frac{1}{100}$**unit**
- **100** such parts make **1 unit**

Q15. How many one-hundredths make one-tenth?

$$\frac{1}{10} = \frac{10}{100}$$

Therefore,

10 one-hundredths make one-tenth.

Also,

$$\begin{aligned} &4 + \frac{4}{10} + \frac{5}{100} \\ &= 4 + \frac{40}{100} + \frac{5}{100} \\ &= 4 + \frac{45}{100} \\ &= 4.45 \end{aligned}$$

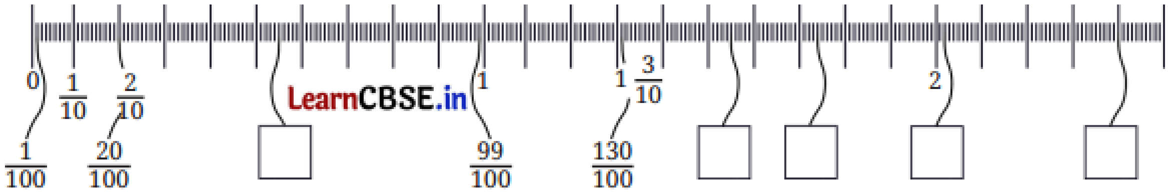
So yes, we can say:

4 units and 45 one-hundredths = 4 units, 4 one-tenths and 5 one-hundredths.

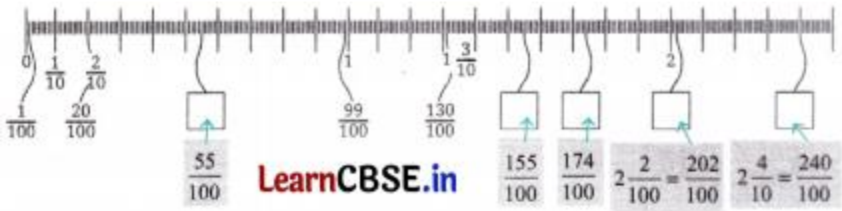
Answer:

1. **10 one-hundredths make one-tenth.**
2. **Yes,** 4.45 = 4**units,** 4**one-tenths and** 5**one-hundredths.**

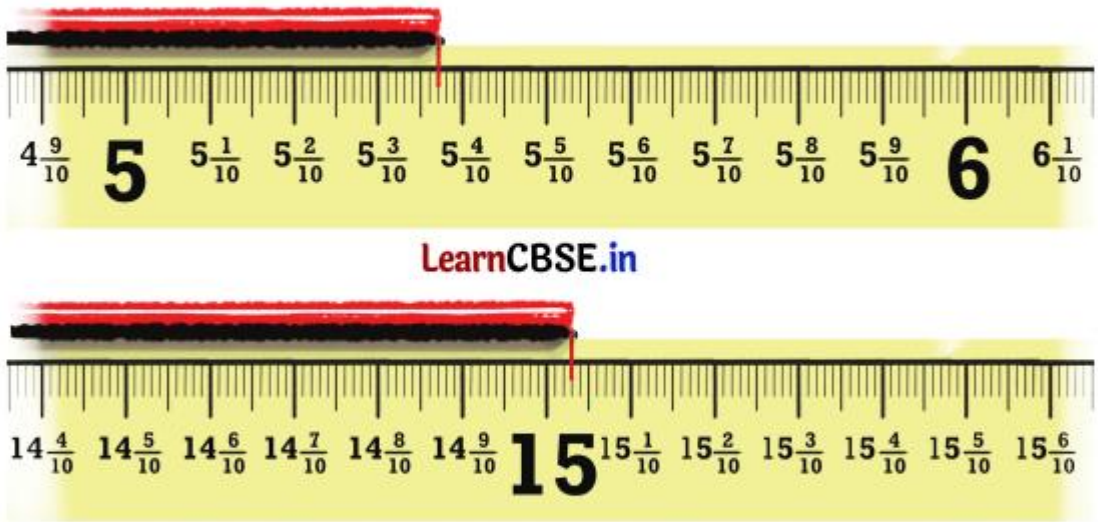
16. Observe the figure below. Notice the markings and the corresponding lengths written in the boxes when measured from 0. Fill in the lengths in the empty boxes.

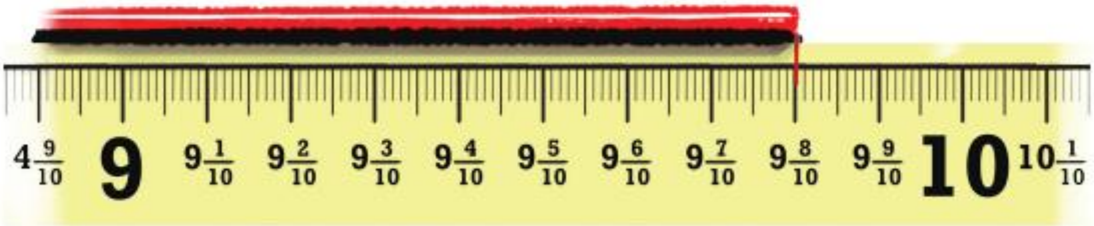


Solution:

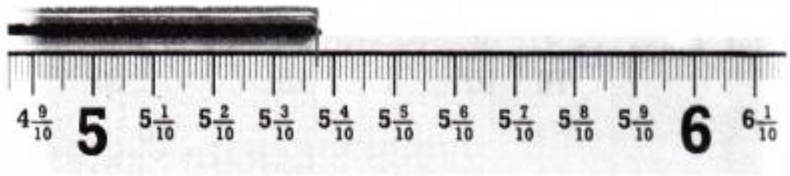


17. For the lengths shown below, write the measurements and read out the measures in words.





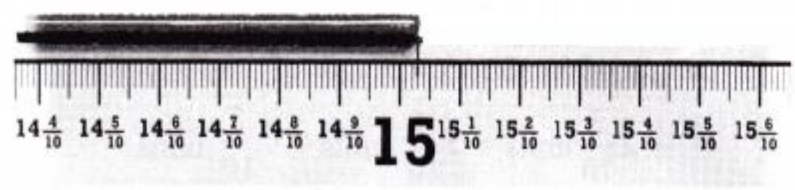
Solution:



$5\frac{3}{10}\frac{7}{100}$ Five and three-tenths and seven-hundredths

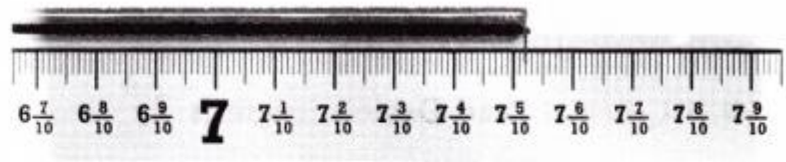
Or $5\frac{37}{100}$ Five and thirty-seven-hundredths

Or $\frac{537}{100}$ Five hundred thirty-seven-hundredths



$15\frac{3}{100}$ Fifteen and three-hundredths

Or $\frac{1503}{100}$ One thousand five hundred three-hundredths



$7\frac{5}{10}\frac{2}{100}$ Seven and five-tenths and two-hundredths

Or $7\frac{52}{100}$ Seven and fifty-two-hundredths

Or $\frac{752}{100}$ Seven hundred fifty-two-hundredths

$9\frac{8}{10}$ Nine and eight-tenths

Or $9\frac{80}{100}$ Nine and eighty-hundredths

Or $\frac{980}{100}$ Nine hundred eighty-hundredths

Intext question

Given:

$$25\frac{9}{10} - 6\frac{4}{10}\frac{7}{100}$$

The second mixed number is:

$$6\frac{4}{10}\frac{7}{100} = 6 + \frac{4}{10} + \frac{7}{100} = 6\frac{47}{100}$$

Convert both numbers to hundredths:

$$25\frac{9}{10} = 25\frac{90}{100}$$
$$6\frac{47}{100} = 6\frac{47}{100}$$

Now subtract:

$$\begin{aligned}
&25\frac{90}{100} - 6\frac{47}{100} \\
&= (25 - 6) + \left(\frac{90}{100} - \frac{47}{100}\right) \\
&= 19 + \frac{43}{100} \\
&= 19\frac{43}{100}
\end{aligned}$$

Answer:

$$\boxed{19\frac{43}{100}}$$

or in decimal form:

$$\boxed{19.43}$$

Figure it Out

Question 1.
Find the sums and differences:

(a) $\frac{3}{10} + 3\frac{4}{100}$

Solution By Steps

Step 1: Convert to the same denominator

$$\frac{3}{10} = \frac{30}{100}$$

So,

$$\frac{30}{100} + 3\frac{4}{100}$$

Step 2: Add the fractional parts

$$\frac{30}{100} + \frac{4}{100} = \frac{34}{100}$$

Step 3: Write the final answer

$$3\frac{34}{100}$$

Final Answer

$$\boxed{3\frac{34}{100}}$$

(b) $\mathbf{9\frac{5}{10}\frac{7}{100} + 2\frac{1}{10}\frac{3}{100}}$

This means:

$$9 + \frac{5}{10} + \frac{7}{100} + 2 + \frac{1}{10} + \frac{3}{100}$$

Solution By Steps

Step 1: Add whole numbers

$$9 + 2 = 11$$

Step 2: Add tenths

$$\frac{5}{10} + \frac{1}{10} = \frac{6}{10}$$

Step 3: Add hundredths

$$\frac{7}{100} + \frac{3}{100} = \frac{10}{100}$$
$$\frac{10}{100} = \frac{1}{10}$$

Step 4: Add tenths again

$$\frac{6}{10} + \frac{1}{10} = \frac{7}{10}$$

Step 5: Final answer

$$11\frac{7}{10}$$

Final Answer

$$\boxed{11\frac{7}{10}}$$

(c) $15\frac{6}{10}\frac{4}{100} + 14\frac{3}{10}\frac{6}{100}$

Solution By Steps

Step 1: Add whole numbers

$$15 + 14 = 29$$

Step 2: Add tenths

$$\frac{6}{10} + \frac{3}{10} = \frac{9}{10}$$

Step 3: Add hundredths

$$\frac{4}{100} + \frac{6}{100} = \frac{10}{100}$$
$$\frac{10}{100} = \frac{1}{10}$$

Step 4: Add the tenths

$$\frac{9}{10} + \frac{1}{10} = \frac{10}{10} = 1$$

Step 5: Add to the whole number

$$29 + 1 = 30$$

Final Answer

$$\boxed{30}$$

(d) $\mathbf{7\frac{7}{100} - 4\frac{4}{100}}$

Solution By Steps

Step 1: Subtract whole numbers

$$7 - 4 = 3$$

Step 2: Subtract hundredths

$$\frac{7}{100} - \frac{4}{100} = \frac{3}{100}$$

Step 3: Final answer

$$3\frac{3}{100}$$

Final Answer

$$\boxed{3\frac{3}{100}}$$

(e) $\mathbf{8\frac{6}{100} - 5\frac{3}{100}}$

Solution By Steps

Step 1: Subtract whole numbers

$$8 - 5 = 3$$

Step 2: Subtract hundredths

$$\frac{6}{100} - \frac{3}{100} = \frac{3}{100}$$

Step 3: Final answer

$$3\frac{3}{100}$$

Final Answer

$$\boxed{3\frac{3}{100}}$$

(f) $\mathbf{12\frac{6}{100}\frac{2}{100} - \frac{9}{10}\frac{9}{100}}$

This means:

$$12 + \frac{6}{100} + \frac{2}{100} - \left(\frac{9}{10} + \frac{9}{100}\right)$$

Solution By Steps

Step 1: Add the hundredths on the left

$$\frac{6}{100} + \frac{2}{100} = \frac{8}{100}$$

So we have:

$$12\frac{8}{100}-\frac{9}{10}\frac{9}{100}$$

Step 2: Convert tenths to hundredths

$$\frac{9}{10}=\frac{90}{100}$$

So,

$$\frac{90}{100}+\frac{9}{100}=\frac{99}{100}$$

Step 3: Subtract

$$12\frac{8}{100}-\frac{99}{100}$$

Borrow 1 from 12:

$$11+\frac{108}{100}-\frac{99}{100}$$

Step 4: Subtract hundredths

$$\frac{108}{100}-\frac{99}{100}=\frac{9}{100}$$

Step 5: Final answer

$$11\frac{9}{100}$$

Final Answer

$$\boxed{11\frac{9}{100}}$$

In-Text Questions

1. Make a place value table similar to the one above. Write each quantity in decimal form and terms of place value, and read the number:

	Quantity	Decimal form	Place value							Number in words
			Hundreds	Tens	Ones	Decimal point	Tenths	Hundredths	Thousandths	
(a)	2 ones, 3 tenths and 5 hundredths	$2 + \frac{3}{10} + \frac{5}{100} = 2.35$			2×1	·	$3 \times \frac{1}{10}$	$5 \times \frac{1}{100}$		Two point three five
(b)	1 ten and 5 tenths	$10 + \frac{5}{10} = 10.5$		1×10	0×1	·	$5 \times \frac{1}{10}$			Ten point five
(c)	4 ones and 6 hundredths	$4 + 0 + \frac{6}{100} = 4.06$			4×1	·	$0 \times \frac{1}{10}$	$6 \times \frac{1}{100}$		Four point zero six
(d)	1 hundred, 1 one and 1 hundredth	$100 + 0 + 1 + 0 + \frac{1}{100} = 101.01$	1×100	0×10	1×1	·	$0 \times \frac{1}{10}$	$1 \times \frac{1}{100}$		One hundred one point zero one
(e)	$\frac{8}{100}$ and $\frac{9}{10}$	$\frac{9}{10} + \frac{8}{100} = 0.98$			0×1	·	$9 \times \frac{1}{10}$	$8 \times \frac{1}{100}$		Zero point nine eight
(f)	$\frac{5}{100}$	$\frac{5}{100} = 0.05$			0×1	·	$0 \times \frac{1}{10}$	$5 \times \frac{1}{100}$		Zero point zero five
(g)	$\frac{1}{10}$	$\frac{1}{10} = 0.1$			0×1	·	$1 \times \frac{1}{10}$			Zero point one
(h)	$2\frac{1}{100}$, $4\frac{1}{10}$ and $7\frac{7}{1000}$	$4 + \frac{1}{10} + 2\frac{1}{100} + 7\frac{7}{1000}$ $= (4+2+7) + \frac{1}{10} + \frac{1}{100} + \frac{7}{1000}$ $= 13.117$		1×10	3×1	·	$1 \times \frac{1}{10}$	$1 \times \frac{1}{100}$	$7 \times \frac{1}{1000}$	Thirteen point one one seven

12 mm = 1.2 cm	56 mm = 5.6 cm	70 mm = ____
____ = 0.9 cm	134 mm = ____	____ = 203.6 cm

3.
Solution:

12 mm = 1.2 cm	56 mm = 5.6 cm	70 mm = 7.0 cm
9 mm = 0.9 cm	134 mm = 13.4 cm	2036 mm = 203.6 cm

4. Fill in the blanks below (cm ↔ m)

36 cm = ______	50 cm = ______	______ = 0.89 m
4 cm = ______	325 cm = ______	_______ = 2.07 m

Solution:

36 cm = 0.36 m	50 cm = 0.5 m	89 cm = 0.89 m
4 cm = 0.04 m	325 cm = 3.25 m	207 cm = 2.07 m

5. Fill in the blanks below (g ↔ kg)

465 g = ______	68 g = ________	1560 g = _______
704 g = ______	_______ = 0.56 kg	______ = 2.5 kg

Solution:

465 g = 0.465 kg	68 g = 0.068 kg	1560 g = 1.56 kg
704 g = 0.704 kg	560 g = 0.56 kg	2500 g = 2.5 kg

6.Fill in the blanks below (rupee ↔ paise)

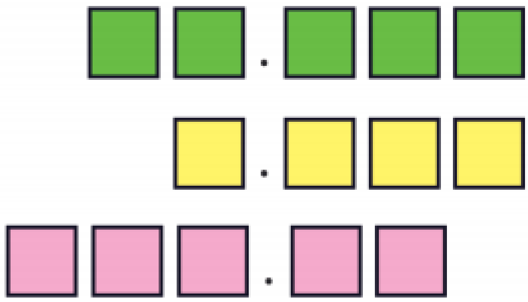
10 p = ________	______p = ₹ 0.05	_______p = ₹ 0.36
________ = ₹ 0.50	99 p = ________	250 p = ________

Solution:

10 p = ₹0.1	5 p = ₹0.05	36 p = ₹0.36
50 p = ₹0.50	99 p = ₹0.99	250 p = ₹2.50

Intext Question

In each case below, use the digits 4, 1, 8, 2, and 5 exactly once and try to make a decimal number as close as possible to 25.



Solution:
We can make a decimal number closest to 25 using the digits 4, 1, 8, 2, and 5 with the given conditions as follows:

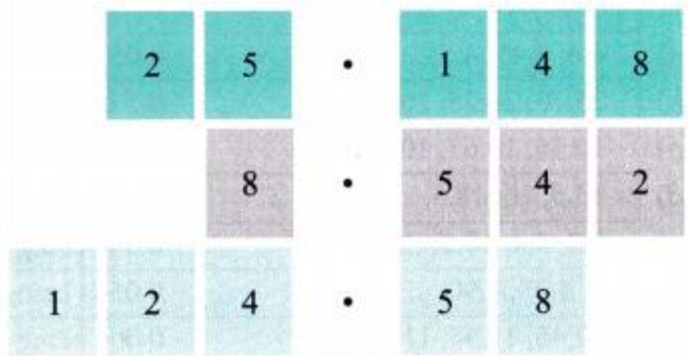


Figure It Out

Question 1.
Find the sums.
(a) 5.3 + 2.6
(b) 18 + 8.8
(c) 2.15 + 5.26
(d) 9.01 + 9.10
(e) 29.19 + 9.91
(f) 0.934 + 0.6
(g) 0.75 + 0.03
(h) 6.236 + 0.487
Solution:

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
	1	1		1 1	1		1 1
5.3	18.0	2.15	9.01	29.19	0.934	0.75	6.236
+ 2.6	+ 8.8	+ 5.26	+ 9.10	+ 9.91	+ 0.600	+ 0.03	+ 0.487
= 7.9	= 26.8	= 7.41	= 18.11	= 39.10	= 1.534	= 0.78	= 6.723

Question 2.
Find the differences.
(a) 5.6 – 2.3
(b) 18 – 8.8
(c) 10.4 – 4.5
(d) 17 – 16.198
(e) 17 – 0.05
(f) 34.505 – 18.1
(g) 9.9 – 9.09
(h) 6.236 – 0.487
Solution:

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
	17 10	9 14	16 9 9 10	6 9 10	2 14	8 10	5 11 12 16
5.6	~~18~~.~~0~~	~~10~~.~~4~~	~~17~~.~~000~~	~~17~~.~~00~~	~~34~~.505	9.~~90~~	~~6~~.~~236~~
− 2.3	− 8.8	− 4.5	− 16.198	− 0.05	− 18.100	− 9.09	− 0.487
= 3.3	= 9.2	= 5.9	= 0.802	= 16.95	= 16.405	= 0.81	= 5.749

Intext Question

Similarly, identify the change and write the next 3 terms for each sequence given below. Try to do this computation mentally.
(a) 4.4, 4.45, 4.5,.….
(b) 25.75, 26.25, 26.75,……
(c) 10.56, 10.67, 10.78,…….
(d) 13.5, 16, 18.5,…….
(e) 8.5, 9.4, 10.3,……

(f) 5, 4.95, 4.90,……
(g) 12.45, 11.95, 11.45,……
(h) 36.5, 33, 29.5,……
Solution:

	Sequence	Rule	Next 3 terms
(a)	4.4, 4.45, 4.5, ...	0.05 is being added to each term to get the next term	4.55, 4.6, 4.65
(b)	25.75, 26.25, 26.75, ...	0.5 is being added to each term to get the next term	27.25, 27.75, 28.25
(c)	10.56, 10.67, 10.78, ...	0.11 is being added to each term to get the next term	10.89, 11, 11.11
(d)	13.5, 16, 18.5, ...	2.5 is being added to each term to get the next term	21, 23.5, 26
(e)	8.5, 9.4, 10.3, ...	0.9 is being added to each term to get the next term	11.2, 12.1, 13
(f)	5, 4.95, 4.90, ...	0.05 is being subtracted from each term to get the next term	4.85, 4.80, 4.75
(g)	12.45, 11.95, 11.45, ...	0.5 is being subtracted from each term to get the next term	10.95, 10.45, 9.95
(h)	36.5, 33, 29.5, ...	3.5 is being subtracted from each term to get the next term	26, 22.5, 19

First Section: Practice Time 3.1

Solution By Steps

Question 1

A screw's tip is at 0. Its other end reaches the 3 cm mark and 4 small divisions more.

Since each small division = 1 mm,

$$3 \text{ cm } 4 \text{ mm}$$

Final Answer

Length = **3.4 cm = 34 mm**

Question 2

Left end = 2.3 cm

Right end = 5.6 cm

Length of screw

$$5.6 - 2.3 = 3.3$$

Final Answer

Length = **3.3 cm**

Question 3

Screw A = 3.3 cm

Screw B = 3.1 cm

Difference

$$3.3 - 3.1 = 0.2$$

Final Answer

Screw **A** is longer by **0.2 cm = 2 mm**

Question 4

Wire lengths:

$$1.8 \text{ cm and } 2.7 \text{ cm}$$

Total

$$1.8 + 2.7 = 4.5$$

Final Answer

Total length = **4.5 cm = 45 mm**

Question 5

Slot depth = 3.0 cm

Screw length = 3.4 cm

Extra part

$$3.4 - 3.0 = 0.4$$

Convert to mm

$$0.4 \text{ cm} = 4 \text{ mm}$$

Final Answer

Cut off **4 mm**

Practice Time 3.2

Question 1

Write $\frac{67}{10}$as:

(a) Units + Tenths

Solution

$$\frac{67}{10} = \frac{60}{10} + \frac{7}{10} = 6 + \frac{7}{10}$$

Answer

$$\boxed{\text{6 units 7 tenths}}$$

(b) Decimal

$$6 + \frac{7}{10} = 6.7$$

Answer

$$\boxed{6.7}$$

Question 2

A box measures

$$2\frac{7}{10}$$

units.

Write the same length as:

(a) Tenths only

Solution

$$2 = \frac{20}{10}$$

So,

$$2\frac{7}{10} = \frac{20}{10} + \frac{7}{10} = \frac{27}{10}$$

Answer

$$\boxed{\frac{27}{10}}$$

(27 tenths)

(b) Decimal

$$2 + \frac{7}{10} = 2.7$$

Answer

$$\boxed{2.7}$$

Question 3

Arrange from smallest to largest:

$$3\frac{4}{10}, 2\frac{9}{10}, \frac{41}{10}, 2\frac{5}{10}, 3\frac{1}{10}$$

Step 1: Convert to decimals

$$3\frac{4}{10} = 3.4$$

$$2\frac{9}{10} = 2.9$$
$$\frac{41}{10} = 4.1$$
$$2\frac{5}{10} = 2.5$$
$$3\frac{1}{10} = 3.1$$

Step 2: Arrange

$$2.5 < 2.9 < 3.1 < 3.4 < 4.1$$

Answer

$$\boxed{2\frac{5}{10}, 2\frac{9}{10}, 3\frac{1}{10}, 3\frac{4}{10}, \frac{41}{10}}$$

Question 4

Add with regrouping (tenths)

Find:

$$4\frac{8}{10} + 3\frac{6}{10}$$

Step 1: Add tenths

$$\frac{8}{10} + \frac{6}{10} = \frac{14}{10} = 1\frac{4}{10}$$

Step 2: Add whole numbers

$$4 + 3 + 1 = 8$$

Remaining tenths

$$\frac{4}{10}$$

Answer as units + tenths

$$\boxed{8\frac{4}{10}}$$

Answer as decimal

$$\boxed{8.4}$$

Question 5

Find:

$$12\frac{2}{10} + 6\frac{7}{10}$$

Give answer as:

(a) Units + Tenths

(b) Decimal

Step 1: Add tenths

$$\frac{2}{10} + \frac{7}{10} = \frac{9}{10}$$

Step 2: Add units

$$12 + 6 = 18$$

Final Answer

(a)

$$\boxed{18\frac{9}{10}}$$

(b)

$$\boxed{18.9}$$

Question 6

On a scale marked in tenths:

- USB cable = $4\frac{3}{10}$
- Thumb = $1\frac{6}{10}$
- Leaf = $3\frac{7}{10}$

(a) Total length

Convert to decimals:

$$4.3, 1.6, 3.7$$

Add:

$$\begin{aligned} &4.3 + 1.6 + 3.7 \\ &= 5.9 + 3.7 \\ &= 9.6 \end{aligned}$$

Answer

$$\boxed{9.6 \text{ units}}$$

(b) Longest object

Compare:

$$4.3, 1.6, 3.7$$

Largest = 4.3

So USB cable is longest.

Difference between longest and shortest:

$$4.3 - 1.6 = 2.7$$

Answer

$$\boxed{\text{USB cable}}$$

It is

$$\boxed{2.7\text{ units}}$$

longer than the shortest object.

Practice Time 3.3

Question 1

Write

$$3\frac{47}{100}$$

as:

(a) Denominator 100

Solution

Convert mixed fraction into an improper fraction.

$$3 = \frac{300}{100}$$

Therefore,

$$3\frac{47}{100} = \frac{300}{100} + \frac{47}{100} = \frac{347}{100}$$

Answer

$$\boxed{\frac{347}{100}}$$

(b) Decimal (two places)

$$3 + \frac{47}{100} = 3.47$$

Answer

$$\boxed{3.47}$$

Question 2

Write 9.06 as:

(a) Units + Tenths + Hundredths

Solution

$$9.06 = 9 + \frac{0}{10} + \frac{6}{100}$$

Answer

$$\boxed{\text{9 units 0 tenths 6 hundredths}}$$

(b) Fraction with denominator 100

$$9.06 = \frac{906}{100}$$

Answer

$$\boxed{\frac{906}{100}}$$

Question 3

Point P is at:

3 tenths and 4 hundredths from 0

Write its value as:

(a) Hundredths fraction

Solution

3 tenths

$$= \frac{30}{100}$$

4 hundredths

$$= \frac{4}{100}$$

Total

$$\frac{30}{100} + \frac{4}{100} = \frac{34}{100}$$

Answer

$$\boxed{\frac{34}{100}}$$

(b) Decimal

$$\frac{34}{100} = 0.34$$

Answer

$$\boxed{0.34}$$

Question 4

Arrange from smallest to largest:

$$\frac{3}{100}, \frac{30}{100}, \frac{33}{100}, \frac{7}{100}, \frac{4}{100}$$

Step 1: Convert to decimals

$$\frac{3}{100} = 0.03$$
$$\frac{30}{100} = 0.30$$
$$\frac{33}{100} = 0.33$$
$$\frac{7}{100} = 0.07$$
$$\frac{4}{100} = 0.04$$

Step 2: Arrange

$$0.03 < 0.04 < 0.07 < 0.30 < 0.33$$

Answer

$$\boxed{\frac{3}{100}, \frac{4}{100}, \frac{7}{100}, \frac{30}{100}, \frac{33}{100}}$$

Number Line Positions

0 ----0.03----0.04----0.07----------------0.30--0.33----1

Question 5

Put in increasing order and identify shortest and longest:

$$7\frac{6}{100}, 7\frac{29}{100}, 7\frac{3}{10}, 7\frac{5}{100}$$

Step 1: Convert into decimals

$$7\frac{6}{100} = 7.06$$
$$7\frac{29}{100} = 7.29$$
$$7\frac{3}{10} = 7.30$$
$$7\frac{5}{100} = 7.05$$

Step 2: Arrange

$$7.05 < 7.06 < 7.29 < 7.30$$

Answer

$$\boxed{7.05, 7.06, 7.29, 7.30}$$

Shortest

$$\boxed{7.05}$$

Longest

$$\boxed{7.30}$$

Practice Time 3.4

Question 1

Write **6.08** as:

(a) Units + Tenths + Hundredths

Solution

$$6.08 = 6 + \frac{0}{10} + \frac{8}{100}$$

So,

- Units = 6
- Tenths = 0
- Hundredths = 8

Answer

$$\boxed{\text{6 units 0 tenths 8 hundredths}}$$

(b) Mixed Fraction

$$6.08 = 6 + \frac{8}{100}$$
$$= 6\frac{8}{100}$$

Answer

$$\boxed{6\frac{8}{100}}$$

Question 2

Convert

$$\frac{731}{100}$$

to:

(a) Mixed Form

Solution

Divide 731 by 100.

$$731 = 7 \times 100 + 31$$

Therefore,

$$\frac{731}{100} = 7\frac{31}{100}$$

Answer

$$\boxed{7\frac{31}{100}}$$

(b) Decimal

$$\frac{731}{100} = 7.31$$

Answer

$$\boxed{7.31}$$

Question 3

3 tens, 2 units, 4 tenths and 7 hundredths.

Write as:

(a) Decimal

Solution

3 tens = 30

2 units = 2

4 tenths = 0.4

7 hundredths = 0.07

Add:

$$30 + 2 + 0.4 + 0.07 = 32.47$$

Answer

$$\boxed{32.47}$$

(b) Fraction with denominator 100

$$32.47 = \frac{3247}{100}$$

Answer

$$\boxed{\frac{3247}{100}}$$

Question 4

Compute:

(a)

$$2.47 \times 10$$

Solution

When multiplying by 10, decimal point moves one place right.

$$2.47 \times 10 = 24.7$$

Answer

$$\boxed{24.7}$$

(b)

$$2.47 \div 10$$

Solution

When dividing by 10, decimal point moves one place left.

$$2.47 \div 10 = 0.247$$

Answer

$$\boxed{0.247}$$

(c)

$$0.706 \times 10$$

Solution

Move decimal one place right.

$$0.706 \times 10 = 7.06$$

Answer

$$\boxed{7.06}$$

(d)

$$0.706 \div 10$$

Solution

Move decimal one place left.

$$0.706 \div 10 = 0.0706$$

Answer

$$\boxed{0.0706}$$

Question 5

Put in increasing order:

$$6.05,\ 6.5,\ 6.50,\ 6.506$$

Also identify equal numbers.

Step 1

Write all numbers with three decimal places.

$$\begin{aligned} &6.05 = 6.050 \\ &6.5 = 6.500 \\ &6.50 = 6.500 \\ &6.506 = 6.506 \end{aligned}$$

Step 2 Compare

$$6.050 < 6.500 < 6.506$$

Since

$$6.5 = 6.50$$

they are equal.

Answer

$$\boxed{6.05,\ 6.5,\ 6.50,\ 6.506}$$

Equal numbers:

$$\boxed{6.5 = 6.50}$$

Practice Time 3.5

Question 1

(a) Convert 138 mm to centimetres

Solution

We know:

$$10 \text{ mm} = 1 \text{ cm}$$

Therefore,

$$138 \text{ mm} = \frac{138}{10} \text{ cm}$$
$$= 13.8 \text{ cm}$$

Answer

$$\boxed{13.8 \text{ cm}}$$

(b) Convert 7.2 cm to millimetres

Solution

We know:

$$1 \text{ cm} = 10 \text{ mm}$$
$$7.2 \times 10 = 72$$

Answer

$$\boxed{72 \text{ mm}}$$

Question 2

(a) Convert 315 cm to metres

Solution

We know:

$$100 \text{ cm} = 1 \text{ m}$$
$$315 \div 100 = 3.15$$

Answer

$$\boxed{3.15 \text{ m}}$$

(b) Convert 0.08 m to centimetres

Solution

$$1 \text{ m} = 100 \text{ cm}$$
$$0.08 \times 100 = 8$$

Answer

$$\boxed{8 \text{ cm}}$$

Question 3

A pencil is 9.7 cm long and a pen is 85 mm long.

Find the total length in cm and mm.

Solution

Convert 85 mm to cm:

$$85 \div 10 = 8.5 \text{ cm}$$

Now add:

$$9.7 + 8.5 = 18.2 \text{ cm}$$

Convert into mm:

$$18.2 \times 10 = 182 \text{ mm}$$

Answer

$$\boxed{18.2 \text{ cm}}$$

or

$$\boxed{182 \text{ mm}}$$

Question 4

(a) Convert 0.84 kg to grams

Solution

We know:

$$1 \text{ kg} = 1000 \text{ g}$$
$$0.84 \times 1000 = 840$$

Answer

$$\boxed{840 \text{ g}}$$

(b)

A bag has mass 2.1 kg.

After removing 250 g, what is the remaining mass?

Solution

Convert 2.1 kg to grams.

$$2.1 \times 1000 = 2100 \text{ g}$$

Remaining mass:

$$2100 - 250 = 1850 \text{ g}$$

Convert back to kg:

$$1850 \div 1000 = 1.85 \text{ kg}$$

Answer

$$\boxed{1.85 \text{ kg}}$$

Question 5

(a) Write 275 paise in rupees

Solution

We know:

$$100 \text{ paise} = 1 \text{ rupee}$$
$$275 \div 100 = 2.75$$

Answer

$$\boxed{₹2.75}$$

(b)

A notebook costs ₹37.85 and a pen costs ₹0.75.

Find the total and the change from ₹50.

Solution

Total cost:

$$37.85 + 0.75 = 38.60$$

Change from ₹50:

$$50.00 - 38.60 = 11.40$$

Answer

Total cost

$$\boxed{₹38.60}$$

Change

$$\boxed{₹11.40}$$

Question 6

A tailor needs:

- 1.25 m ribbon
- 36 cm ribbon
- 145 mm ribbon

Find the total length in cm and m.

Step 1: Convert all to centimetres

First ribbon

$$1.25 \text{ m} = 125 \text{ cm}$$

Second ribbon

$$36 \text{ cm}$$

Third ribbon

$$145 \text{ mm} = 14.5 \text{ cm}$$

Step 2: Add

$$125 + 36 + 14.5 = 175.5$$

Therefore,

$$\boxed{175.5 \text{ cm}}$$

Step 3: Convert into metres

$$175.5 \div 100 = 1.755$$

Therefore,

$$\boxed{1.755 \text{ m}}$$

Practice Time 3.6

1(a) Mark 1.37 on a 1–2 number line

Solution By Steps

Step 1: Locate 1.3
Between 1 and 2, divide into 10 equal parts. The 3rd tenth after 1 is 1.3.

Step 2: Locate 1.37
Divide the segment from 1.3 to 1.4 into 10 equal parts (hundredths). Move 7 small divisions after 1.3.

Final Answer
1.37 is the **7th hundredth after 1.3**.

1(b) Mark 2.04 on a 2–3 number line

Solution By Steps

Step 1: Start at 2.0.

Step 2: Move 4 hundredths to the right.

Final Answer
2.04 is the **4th small division after 2.00**.

---

2. Find the values of the points

Big marks: 5.1, 5.2, 5.3, 5.4
Each tenth divided into 10 parts.

A = 2nd small tick after 5.1

5.10 + 0.02 = 5.12

B = 8th small tick after 5.1

5.10 + 0.08 = 5.18

C = 3rd small tick after 5.2

5.20 + 0.03 = 5.23

D = 6th small tick after 5.3

5.30 + 0.06 = 5.36

Final Answer

A = 5.12
B = 5.18
C = 5.23
D = 5.36

---

3. Every division between 1.00 and 1.10

Final Answer

1.00, 1.01, 1.02, 1.03, 1.04, 1.05, 1.06, 1.07, 1.08, 1.09, 1.10

4(a) Do 0.6, 0.60, 0.600 represent the same value?

Yes.

Final Answer

0.6 = 0.60 = 0.600

4(b) Which is larger: 0.08 or 0.8?

Solution By Steps

Write with equal decimal places:

0.08 = 8 hundredths

0.8 = 80 hundredths

80 hundredths > 8 hundredths

Final Answer

0.8 is larger.

5(a) Arrange in increasing order

Numbers: 0.3, 0.30, 0.03, 0.300

Since 0.3 = 0.30 = 0.300

Final Answer

0.03, 0.3, 0.30, 0.300

5(b) Arrange in increasing order

Numbers: 7.06, 7.3, 7.29

Write equally:

7.06, 7.30, 7.29

Final Answer

7.06, 7.29, 7.30

6(a) Which is closest to 1?

Numbers: 0.9, 1.1, 1.01, 1.11

Distances from 1:

0.9 → 0.1

1.1 → 0.1

1.01 → 0.01

1.11 → 0.11

Final Answer

1.01

6(b) Which is closest to 6?

Numbers: 5.92, 6.08, 6.015, 6.2

Distances from 6:

5.92 → 0.08

6.08 → 0.08

6.015 → 0.015

6.2 → 0.2

Final Answer

6.015

Practice Time 3.7

1. Total cost

Milk = ₹23.75
Bread = ₹12.50
Eggs = ₹8.40

Solution By Steps

23.75 + 12.50 = 36.25

36.25 + 8.40 = 44.65

Final Answer

₹44.65

---

2. Distance left to ride

Total = 12.4 km

Already ridden = 3.75 km

$$12.40 - 3.75$$

Solution By Steps

12.40 − 3.75 = 8.65

Final Answer

8.65 km

3(i) Constant change

3.15 → 3.42 → 3.69 → 3.96

Difference:

3.42 − 3.15 = 0.27

3.69 − 3.42 = 0.27

3.96 − 3.69 = 0.27

Final Answer

Common difference = 0.27

3(ii) Next three terms

3.96 + 0.27 = 4.23

4.23 + 0.27 = 4.50

4.50 + 0.27 = 4.77

Final Answer

4.23, 4.50, 4.77

---

4. Add 25.936 and 8.202

(i) Bounds using whole parts

25 + 8 = 33

Answer: About 33

(ii) One-decimal estimate

25.9 + 8.2 = 34.1

Answer: About 34.1

(iii) Exact sum

$$25.936 + 8.202$$

25.936 + 8.202 = 34.138

Final Answer

(i) 33
(ii) 34.1
(iii) 34.138

---

5. Change from ₹200

Total cost:

68.45 + 19.90 + 47.75 = 136.10

Change:

200.00 − 136.10 = 63.90

Final Answer

₹63.90

Practice Time 3.8

1(a) Convert 0.25 g to mg

1 g = 1000 mg

0.25 × 1000 = 250

Final Answer

250 mg

1(b) Mistaking .25 g as 25 g

Factor:

$25 \div 0.25 = 100$

Final Answer

100 times larger

---

2. Train leaves 2.4 hours after 9:35 a.m.

2.4 hours = 2 hours + 0.4 hour

0.4 hour = $0.4 \times 60 = 24$ minutes

9:35 + 2 h = 11:35

11:35 + 24 min = 11:59

Final Answer

11:59 a.m.

---

3. Find the bill

₹287.60 + ₹212.05 + ₹20.50

= ₹520.15

Final Answer

₹520.15

---

4. Pole and platform

Pole = 1.8 m

Platform = 90 cm = 0.9 m

Total:

$1.8 + 0.9 = 2.7$ m

In centimetres:

270 cm

Final Answer

2.7 m = 270 cm

5(a) Rewrite 3,75 l in Indian style

Final Answer

3.75 L

5(b) Convert to millilitres

1 L = 1000 mL

3.75 × 1000 = 3750

Final Answer

3750 mL

5(c) Mistake if read as thousands format

3,75 may be interpreted as 375 litres.

Final Answer

The volume could be wrongly read as **375 L instead of 3.75 L**, causing a huge error.

Exam Time

A. Multiple Choice Questions

1. (d) 5.34
2. (b) 0.2 = 0.20
3. (c) 235 paise
4. (b) 13.4 cm

B. Fill in the Blanks

1. 10
2. 100
3. 1,000,000

4. 30
5. 7, 0, 5

C. True or False

1. True
2. True
3. False
4. False
5. True

D. Match the Columns

Column A	Column B
3.47	e
0.5	c
7.08	d
24 h	a
0.01	b

E. Very Short Answer Questions

1

3.4 = 3 units + 4 tenths

2

72 mm = 7.2 cm

3

0.2 > 0.182

4

1 tenth = 10 hundredths

5

₹1.75 = 175 paise

F. Short Answer Questions

1

7.08

Mixed form:

7 units 0 tenths 8 hundredths

Hundredths fraction:

$$\frac{708}{100}$$

= 708/100

2

0.03, 0.3, 0.30, 0.300

3

2.7 − 2.4 = 0.3 cm

4

315 cm = 3.15 m

5

4.8 + 2.5 = 7.3

G. Long Answer Questions

1

(a)

5.1 + 0.34 = 5.44

(b)

544/100

(c)

Point lies at 5.44 between 5.4 and 5.5.

2

Convert all to metres:

145 cm = 1.45 m

Total:

1.6 + 1.45 + 0.75 = 3.80 m

In cm:

380 cm

3

(a)

₹12.50, ₹8.40, ₹0.75

(b)

Total:

12.50 + 8.40 + 0.75 = ₹21.65

(c)

₹.75 may be misread or altered; ₹0.75 is safer.

4

Distance:

3.42 + 4.78 + 0.95

= 9.15 km

5

Compare:

4.507 and 4.57

Write as:

4.507 and 4.570

Since 570 thousandths > 507 thousandths:

4.57 > 4.507

Trailing zeros do not change value.

Competency-Based Questions

Assertion–Reason 1

Assertion: 0.20 = 20 → False

Reason: Adding zeros to the right of a decimal does not change value → True

Answer: (d) A is false but R is true

Assertion–Reason 2

Assertion: To compare 4.507 and 4.57, it is enough to stop at hundredths place → True

Reason: Once a higher place differs, lower places cannot change the comparison → True

Answer: (a) Both A and R are true and R correctly explains A

Chapter-4: Expressing Using Letter- Numbers

NCERT CORNER

In-Text Questions

1.

Shabnam is 3 years older than Aftab. When Aftab's age 10 years, Shabnam's age will be 13 years. Now, Aftab's age is 18 years, what will Shabnam's age be?

Solution:

Shabnam's age will be 18 + 3 = 21 years

2. Use this expression to find A'ftab's age if Shabnam's age is 20.

Solution:

According to the expression,

Aftab's age = Shabnam's Age – 3

∴ Aftab's age = 20 – 3 = 17 years

3.

Solution:

Cost of 8 coconuts = 8 × ₹ 35 = ₹ 280

Cost of 9 kg jaggery = 9 × ₹ 60 = ₹ 540

Total cost = ₹ 280 + ₹ 540 = ₹ 820

4. Solution:

Expression for total amount is c × 35 + j × 60

Replacing c by 7 and j by 4 in the expression, we get

c × 35 + j × 60 = 7 × 35 + 4 × 60

= 245 + 240

= 485

Hence, the total amount to be paid for 7 coconuts and 4 kg of jaggery is ₹ 485.

5.

Solution:

We have, perimeter of a square of sidelength q = 4 × q

Perimeter of a square of sidelength 7 cm = 4 × 7 cm = 28 cm

Q6. Let us revise these concepts and find the values of the following expressions

(a) $\mathbf{23 - 10 \times 2}$

$$= 23 - 20$$
$$= 3$$

Answer: 3

(b) $\mathbf{83 + 28 - 13 + 32}$

$$= 111 - 13 + 32$$
$$= 98 + 32$$
$$= 130$$

Answer: 130

(c) $\mathbf{34 - 14 + 20}$

$$= 20 + 20$$
$$= 40$$

Answer: 40

(d) $\mathbf{42 + 15 - (8 - 7)}$

$$= 42 + 15 - 1$$
$$= 57 - 1$$
$$= 56$$

Answer: 56

(e) $\mathbf{68 - (18 + 13)}$

$$= 68 - 31$$
$$= 37$$

Answer: 37

(f) $\mathbf{7 \times 4 + 9 \times 6}$

$$= 28 + 54$$
$$= 82$$

Answer: 82

(g) $\mathbf{20 + 8 \times (16 - 6)}$

$$= 20 + 8 \times 10$$
$$= 20 + 80$$
$$= 100$$

Answer: 100

Figure it out

Question 1.

(a) Triangle with all sides equal (Equilateral Triangle)

Let the length of one side be a.

Perimeter

$$= a + a + a$$
$$= 3a$$

Formula: $\boxed{3a}$

(b) Regular Pentagon

A regular pentagon has **5 equal sides**.

Let the length of one side be a.

Perimeter

$$= 5a$$

Formula: $\boxed{5a}$

(c) Regular Hexagon

A regular hexagon has **6 equal sides**.

Let the length of one side be a.

Perimeter

$$= 6a$$

Formula: $\boxed{6a}$

Question 2.
Munirathna has a 20 m long pipe. However, he wants a longer watering pipe for his garden. He joins another pipe of some length to this one. Give the expression for the combined length of the pipe. Use the letter-number 'k' to denote the length in meters of the other pipe.
Solution:
Length of pipe Munirathna has = 20 m
Length of another pipe he wants to join in meters = k
The combined length of the pipe = (20 + k) m

Question 3.
What is the total amount Krithika has, if she has the following number of notes ₹ 100, ₹ 20 and ₹ 5? Complete the following table:

No. of ₹100 notes	No. of ₹20 notes	No. of ₹5 notes	Expression and total amount
3	5	6	
			6 × 100 + 4 × 20 + 3 × 5 = 695
8	4	z	
x	y	z	

Solution:

No. of ₹100 notes	No. ₹20 notes	No. ₹5 notes	Expression and total amount
3	5	6	$3 \times 100 + 5 \times 20 + 6 \times 5 = 430$
6	4	3	$6 \times 100 + 4 \times 20 + 3 \times 5 = 695$
8	4	z	$8 \times 100 + 4 \times 20 + z \times 5 = 880 + 5z$
x	y	z	$x \times 100 + y \times 20 + z \times 5 = 100x + 20y + 5z$

Question 4.
Venkatalakshmi owns a flour mill. It takes 10 seconds for the roller mill to start running. Once it is running, each kg of grain takes 8 seconds to grind into powder. Which of the expressions below describes the time taken to complete grind 'y' kg of grain, assuming the machine is off initially?
(a) 10 + 8 + y
(b) (10 + 8) × y
(c) 10 × 8 × y
(d) 10 + 8 × y
(e) 10 × y + 8
Solution:
Time taken by the roller mill to start running = 10 seconds
Time taken by the roller mill to grind each kg of grain to powder = 8 seconds
Therefore, expression for the time taken to complete grind y kg of grain = 10 + 8 × y
Thus, expression (d) 10 + 8 × y describe the given condition.

Question 5.
Write algebraic expressions using letters of your choice.
(a) 5 more than a number
(b) 4 less than a number
(c) 2 less than 13 times a number
(d) 13 less than 2 times a number
Solution:
Let letter 'n' represents the number, then
(a) n + 5
(b) n – 4

(c) $13 \times n - 2$
(d) $2 \times n - 13$

Question 6.
Describe situations corresponding to the following algebraic expressions:
(a) $8 \times x + 3 \times y$
(b) $15 \times j - 2 \times k$
Solution:
(a) Kritika bought x number of notebooks andy number of pencils. What is the. total amount she has to pay to the shopkeeper, if the cost of each notebook is ₹ 8 and cost of each pencil is ₹ 3?

(b) Rohan earns ₹ 15 per glass by selling lemonade in his school fete. To maintain the cleanliness he further announced ₹ 2 discount on each glass, the customer return to him. If he sold j number of glasses and k number of glasses were returned to him, what is the total earnings at the end of the day?

Question 7.
In a calendar month, if any 2 × 3 grid full of dates is chosen as shown in the picture, expression for the dates in the blank cells if the bottom middle cell has date 'w'.

November 2024

Mon	Tue	Wed	Thu	Fri	Sat	Sun
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

w – 1	w	

Solution:

w – 8	w – 7	w – 6
w – 1	w	w + 1

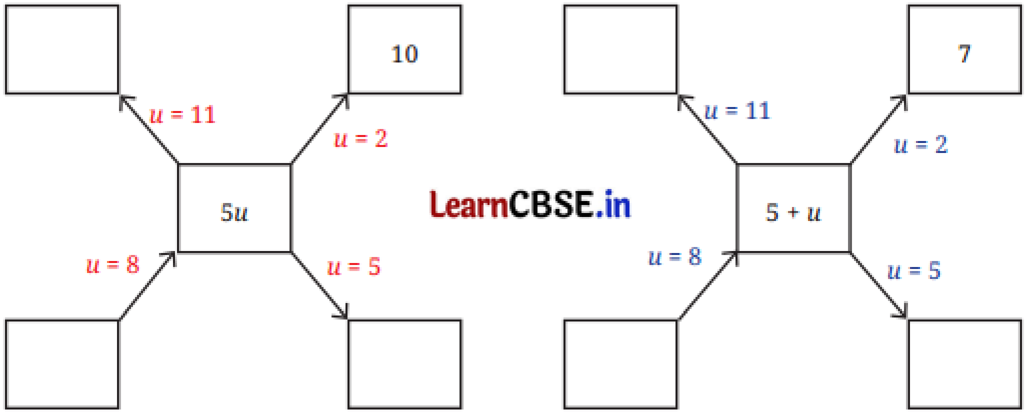
In-Text Questions

1. Could we have written the initial expression as $(40x + 75y) + (-6x - 10y)$?
Solution:
Yes, as $(40x + 75y) + (-6x - 10y)$
$= (40x + 75y) + -(6x + 10y)$
$= (40x + 75y) - (6x + 10y)$

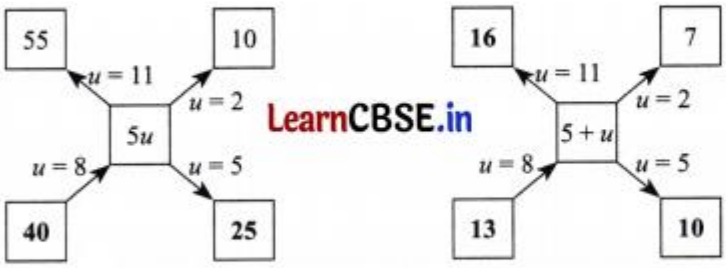
2. Give some possible scores for Krishita in the three rounds so that they add up to give $23p - 7q$.

Solution:
Some possible scores of Krishita in three rounds may be 8p – 4q, 9p – 2q, and 6p – q
or 7p – 3q, 10p – 3q, and 6p – q
Here 8p – 4q + 9p – 2q + 6p – q
= (8 + 9 + 6)p – (4 + 2 + 1)q
= 23p – 7q
Also 7p – 3q + 10p – 3q + 6p – q
= (7 + 10 + 6)p – (3 + 3 + 1)q
= 23p – 7q

3.Fill in the blanks below by replacing the letter-numbers with numbers; an example is shown. Then compare the values that 5u and 5 + u take.

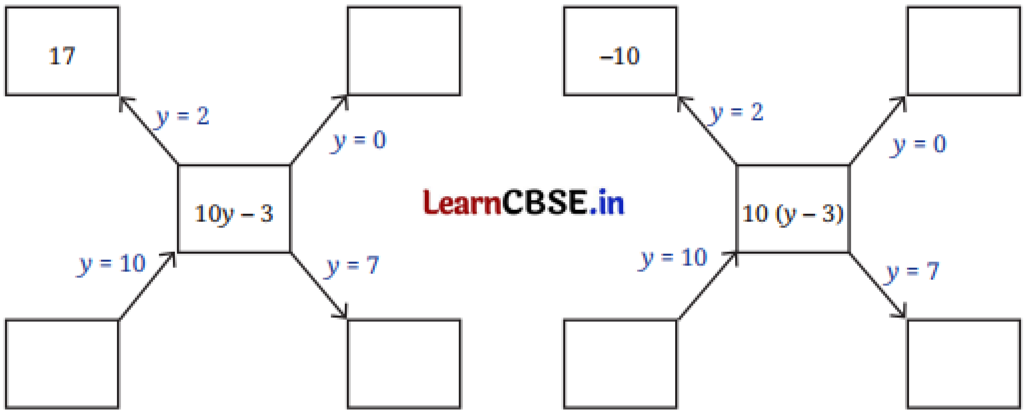


Solution:



We see that the values of 5u and 5 + u are not equal for different values of u. So, the expressions 5u and 5 + u are not equal.

Are the expressions 10y – 3 and 10(y – 3) equal?
10y – 3, short for 10 × y – 3, means 3 less than 10 times y,
10(y – 3), short for 10 × (y – 3), means 10 times (3 less than y).
Let us compare the values that these expressions take for different values of y.



Solution:

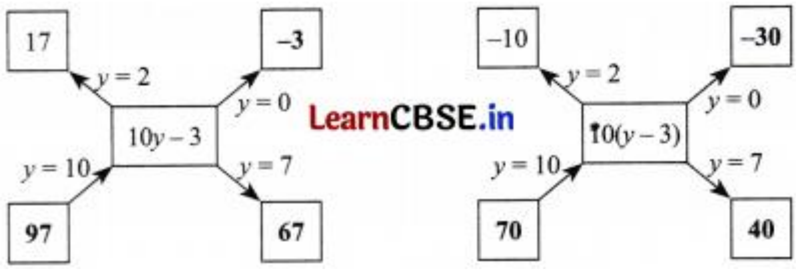
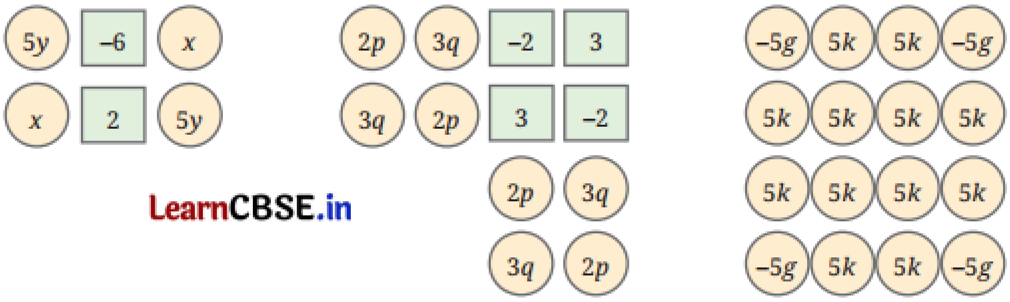
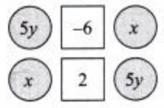


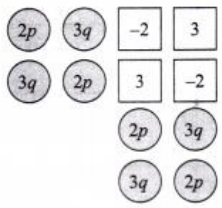
Figure it Out

Question 1.
Add the numbers in each picture below. Write their corresponding expressions and simplify them. Try adding the numbers in each picture in a couple of different ways and see that you get the same thing.



Solution:

	Way I	Way II	Way III
	$5y + -6 + x + x + 2 + 5y$ $= 5y + 5y + x + x + -6 + 2$ $= 10y + 2x - 4$	$(2 \times 5y) + (2 \times x) + (-6 + 2)$ $= 2(5y) + (2x) + (-4)$ $= 10y + 2x - 4$	$2 \times (5y + x) + (-6 + 2)$ $= 10y + 2x - 4$

	Way I	Way II	Way III
	$2p + 3q + -2 + 3 + 3q + 2p + 3 + -2 + 2p + 3q + 3q + 2p$ $= 2p + 2p + 2p + 2p + 3q + 3q + 3q + 3q + -2 + -2 + 3 + 3$ $= 8p + 12q + 2$	$4 \times (2p) + 4 \times (3q) + 2 \times (-2) + 2 \times (3)$ $= 8p + 12q - 4 + 6$ $= 8p + 12q + 2$	$4 \times (2p + 3q) + 2 \times (-2 + 3)$ $= 8p + 12q + 2$

	Way I	Way II	Way III
	$-5g + 5k + 5k + -5g + 5k + 5k + 5k + 5k + 5k + 5k + 5k + 5k + -5g + 5k + 5k + -5g$ $= -5g + -5g + -5g + -5g + 5k + 5k + 5k + 5k + 5k + 5k + 5k + 5k + 5k + 5k + 5k + 5k = -20g + 60k$	$4 \times (-5g) + 12 \times (5k)$ $= -4 \times 5g + 12 \times 5k$ $= -20g + 60k$	$2 \times (-5g) + 2 \times (5k) + 8 \times (5k) + 2 \times (-5g) + 2 \times (5k)$ $= 4 \times (-5g) + 12 \times (5k)$ $= -20g + 60k$

Hence, we see that while we add the expressions in different ways but the sums are always the same.

Question 2.
Simplify each of the following expressions:
(a) p + p + p + p, p + p + p + q, p + q + p – q
(b) p – q + p – q, p + q – p + q
(c) p + q – (p + q), p – q – p – q
(d) 2d – d – d – d, 2d – d – d – c
(e) 2d – d – (d – c), 2d – (d – d) – c
(f) 2d – d – c – c
Solution:
(a) p + p + p + p = 4p
p + p + p + q = 3p + q
p + q + p – q = 2p

(b) p – q + p – q = 2p – 2q
p + q – p + q = 2q

(c) p + q – (p + q) = 0
p – q – p – q = -2q

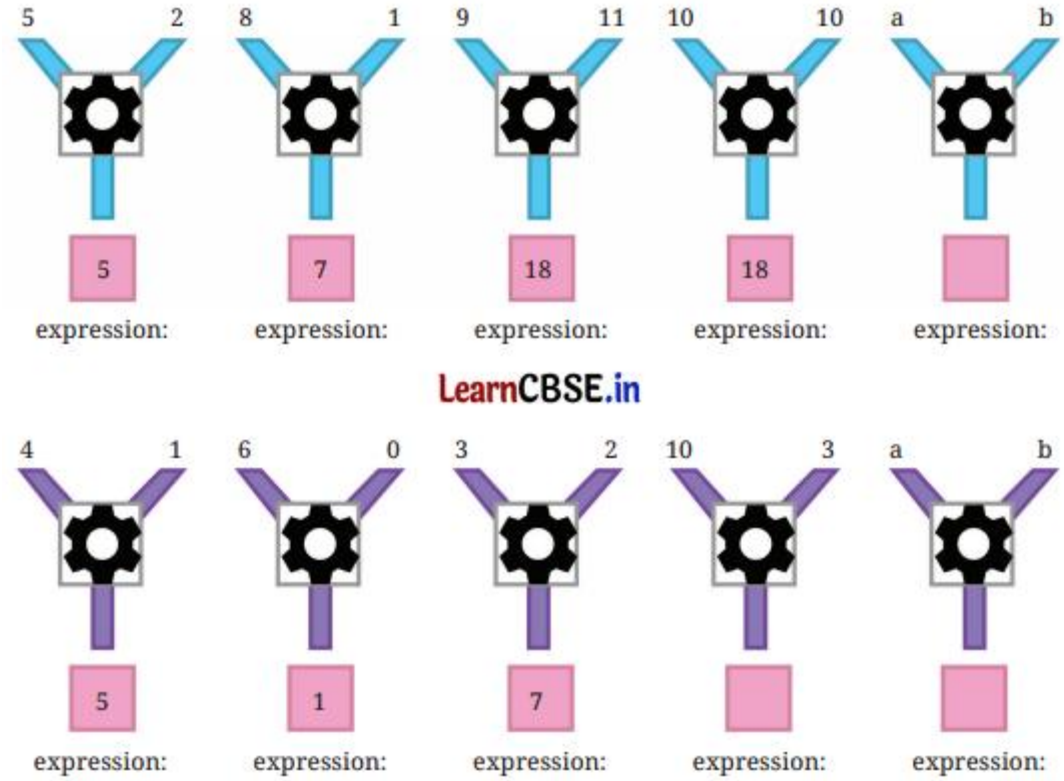
(d) 2d – d – d – d = -d
2d – d – d – c = -c

(e) $2d - d - (d - c) = c$
$2d - (d - d) - c = 2d - c$

(f) $2d - d - c - c = d - 2c$

Intext Question

1. Find the formulas of the number machines below and write the expression for each set of inputs.



Solution:
The formula for the number machines in the first row is "sum of first number and second number minus two," and the expression is $a + b - 2$.
The expression for each set of inputs is:
$5 + 2 - 2 = 5$, $8 + 1 - 2 = 7$, $9 + 11 - 2 = 18$, $10 + 10 - 2 = 18$, and $a + b - 2$
The formula for the number machines in the second row is "product of first number and second number plus one," and the expression is $a \times b + 1$.
The expression for each set of inputs is:
$4 \times 1 + 1 = 5$, $6 \times 0 + 1 = 1$, $3 \times 2 + 1 = 7$, $10 \times 3 + 1 = 31$, and $a \times b + 1 = ab + 1$.

Q2. How many matchsticks will there be in Step 33, Step 84, and Step 108?

From the pattern:

- Step 1 = 3 matchsticks
- Each new step adds **2 matchsticks**

Therefore, for Step y:

$$\text{Number of matchsticks} = 3 + 2(y - 1)$$
$$= 2y + 1$$

Step 33

$$2(33) + 1 = 66 + 1 = 67$$

Answer: 67 matchsticks

Step 84

$$2(84) + 1 = 168 + 1 = 169$$

Answer: 169 matchsticks

Step 108

$$2(108) + 1 = 216 + 1 = 217$$

Answer: 217 matchsticks

Q3. Does the above expression also give the number of matchsticks at each step correctly? Are these expressions the same?

Given expressions:

$$3 + 2(y - 1)$$

and

$$2y + 1$$

Simplifying the first expression:

$$3 + 2(y - 1)$$
$$= 3 + 2y - 2$$

$$= 2y + 1$$

Thus,

$$3 + 2(y - 1) = 2y + 1$$

Both expressions give the same number of matchsticks for every step.

Answer: Yes, both expressions give the correct number of matchsticks. They are equivalent expressions.

Q4. How does the number of matchsticks change as the steps increase? Write an expression for the number of matchsticks at Step $y$in each orientation. Do the two expressions add up to $2y + 1$?

Orientation 1

- First step has **1 vertical matchstick**.
- Each step adds **1 vertical matchstick**.

So at Step y:

$$y$$

vertical matchsticks.

Orientation 2

- Top and bottom horizontal matchsticks together contribute:
  - Step 1 → 2
  - Every new step adds 2 more.

Thus,

$$2y + 1 - y = y + 1$$

horizontal matchsticks.

Therefore the two expressions are:

$$y$$

and

$$y + 1$$

Adding them:

$$y + (y + 1)$$
$$= 2y + 1$$

Answer:

Expression for first orientation = y

Expression for second orientation = $y + 1$

Their sum is:

$$y + (y + 1) = 2y + 1$$

Yes, the two expressions add up to $2y + 1$.

Figure it out

For the problems asking you to find suitable expression(s), first try to understand the relationship between the different quantities in the situation described. If required, assume some values for the unknowns and try to find the relationship.

Question 1.

One plate of Jowar roti costs ₹ 30, and one plate of Pulao costs ₹ 20. If x plates of Jowar roti and y plates of pulao were ordered in a day, which expression(s) describe the total amount in rupees earned that day?

(a) 30x + 20y
(b) (30 + 20) × (x + y)
(c) 20x + 30y
(d) (30 + 20) × x + y
(e) 30x – 20y

Solution:

(a) The cost of one plate of Jowar roti is ₹30, so the cost of x plates is 30x.

The cost of one plate of Pulao is ₹20, so the cost of y plates is $20y$.

Therefore, the expression for the total amount earned that day is:

$30x + 20y$.

Question 2.

Pushpita sells two types of flowers on Independence Day: champak and marigold. ‘p’ customers only bought champak, ‘q’ customers only bought marigold, and ‘r’ customers bought both. On the same day, she gave away a tiny national flag to every customer. How many flags did she give away that day?

(a) $p + q + r$
(b) $p + q + 2r$
(c) $2 \times (p + q + r)$
(d) $p + q + r + 2$
(e) $p + q + r + 1$
(f) $2 \times (p + q)$

Solution:

(a) Let the number of customers who bought only Champak be p, those who bought only Marigold be q, and those who bought both flowers be r.

Since Pushpita gave one tiny national flag to every customer, the total number of flags she distributed that day is:

$p + q + r$.

Question 3.

A snail is trying to climb up the wall of a deep well. During the day it climbs up ‘u’ cm and during the night it slowly slips down ‘d’ cm. This happens for 10 days and 10 nights.

(a) Write an expression describing how far away the snail is from its starting position.

(b) What can we say about the snail’s movement if $d > u$?

Solution:

(a) During the daytime, the snail climbs u cm, and during the night it slips down d cm.

So, the net distance covered in one full day is $u - d$.

In 10 days and 10 nights, the snail will cover a net distance of:

$10(u - d)$ cm.

Thus, the expression that shows how far the snail is from its starting point after this duration is $10(u - d)$ cm.

(b) If $d > u$, the snail slips down more than it climbs up.

In this situation, the snail will never be able to reach the top.

Question 4.

Radha is preparing for a cycling race and practices daily. The first week, she cycles 5 km every day. Every week, she increases the daily distance cycled by 'z' km. How many kilometers would Radha have cycled after 3 weeks?

Solution:

In the first week, Radha cycled 5 km each day.

So, in 7 days she cycled:

$5 \times 7 = 35$ km

In the second week, she cycled $(5 + z)$ km per day.

Thus, the total for the week is:

$(5 + z) \times 7 = 35 + 7z$ km

In the third week, her daily distance becomes $5 + z + z = 5 + 2z$ km.

So, in that week she cycles:

$(5 + 2z) \times 7 = 35 + 14z$ km

Therefore, the total distance Radha cycles in three weeks is:

$35 + (35 + 7z) + (35 + 14z)$

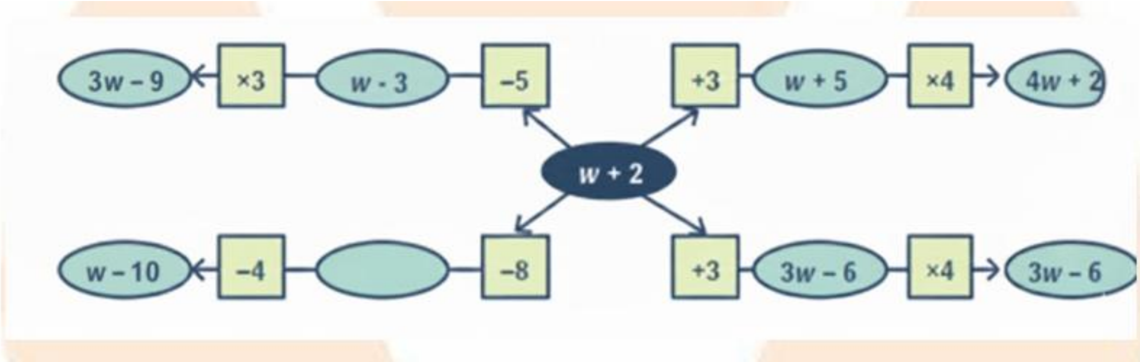
$= (35 + 35 + 35) + (7z + 14z)$

$= 105 + 21z$ km

Question 5.

In the following figure, observe how the expression w + 2 becomes 4w + 20 along one path. Fill in the missing blanks on the remaining paths. The ovals contain expressions, and the boxes contain operations.

Solution:



Question 6.

A local train from Yahapur to Vahapur stops at three stations at equal distances along the way. The time taken in minutes to travel from one station to the next station is the same and is denoted by t. The train stops for 2 minutes at each of the three stations.

(a) If t = 4, what is the time taken to travel from Yahapur to Vahapur?

(b) What is the algebraic expression for the time taken to travel from Yahapur to Vahapur?

Solution:

(a) The train travelling from Yahapur to Vahapur stops at 3 stations, and at each station it stops for 2 minutes.

Time taken for travelling between the stations = 4t.

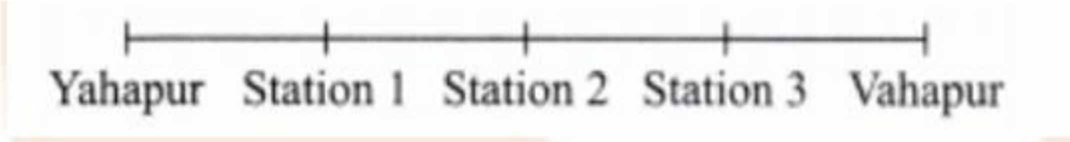
For t = 4, the travelling time becomes:

$4 \times 4 = 16$ minutes

Time spent during the stoppages = $3 \times 2 = 6$ minutes

Therefore, the total time taken to travel from Yahapur to Vahapur is:

$16 + 6 = 22$ minutes



(b)

Let the time taken to travel between two consecutive stations be t.

Then the total travelling time from Yahanpur to Vahapur is 4t.

Since the train stops 3 times, and each stop lasts 2 minutes, the total stoppage time is:

$3 \times 2 = 6$ minutes

Thus, the algebraic expression for the total travel time is:

$4t + 6$.

Question 7.

Simplify the following expressions:

(a) $3a + 9b – 6 + 8a – 4b – 7a + 16$

(b) $3(3a – 3b) – 8a – 4b – 16$

(c) $2(2x – 3) + 8x + 12$

(d) $8x – (2x – 3) + 12$

(e) $8h – (5 + 7h) + 9$

(f) $23 + 4(6m – 3n) – 8n – 3m – 18$

Solution:
(a) $3a + 9b – 6 + 8a – 4b – 7a + 16$
$= (3a + 8a – 7a) + (9b – 4b) + (-6 + 16)$
$= 4a + 5b + 10$

(b) $3(3a – 3b) – 8a – 4b – 16$
$= 9a – 9b – 8a – 4b – 16$
$= (9a – 8a) + (-9b – 4b) – 16$
$= a – 13b – 16$

(c) $2(2x – 3) + 8x + 12$
$= 4x – 6 + 8x + 12$

= (4x + 8x) + (-6 + 12)
= 12x + 6

(d) 8x – (2x – 3) + 12
= 8x – 2x + 3 + 12
= 6x + 15

(e) 8h – (5 + 7h) + 9
= 8b – 5 – 7b + 9
= (8b – 7b) + (-5 + 9)
= b + 4

(f) 23 + 4(6m – 3n) – 8n – 3m – 18
= 23 + 24m – 12n – 8n – 3m – 18
= (23 – 18) + (24m – 3m) + (-12n – 8n)
= 5 + 21m – 20n

Question 8.
Add the expressions given below:
(a) 4d – 7c + 9 and 8c – 11 + 9d
(b) -6f + 19 – 8s and -23 + 13f + 12s
(c) 8d – 14c + 9 and 16c – (11 + 9d)
(d) 6f – 20 + 8s and 23 – 13f – 12s
(e) 13m – 12n and 12n – 13m
(f) -26m + 24n and 26m – 24n
Solution:
(a) 4d – 7c + 9 and 8c – 11 + 9d
= 4d – 7c + 9 + 8c – 11 + 9d
= (4d + 9d) + (-7c + 8c) + (9 – 11)
= 13d + c – 2

(b) -6f + 19 – 8s and -23 + 13f + 12s
= -6f + 19 – 8s + -23 + 13f + 12s
= (-6f + 13f) + (-8s + 12s) + (19 – 23)
= 7f + 4s – 4

(c) 8d – 14c + 9 and 16c – (11 + 9d)
= 8d – 14c + 9 + 16c – 11 – 9d
= 8d – 9d – 14c + 16c + 9 – 11
= -d + 2c – 2
= 2c – d – 2

(d) 6f – 20 + 8s and 23 – 13f – 12s
= 6f – 20 + 85 + 23 – 13f – 125

= (6f – 13f) + (8s – 12s) + (-20 + 23)
= -7f – 4s + 3

(e) 13m – 12n and 12n – 13m
= 13m – 12n + 12n – 13m
= (13m – 13m) + (-12n + 12n)
= 0

(f) -26m + 24n and 26m – 24n
= -26m + 24n + 26m – 24n
= (-26m + 26m) + (24n – 24n)
= 0

Question 9.
Subtract the expressions given below:
(a) 9a – 6b + 14 from 6a + 9b – 18
(b) -15x + 13 – 9y from 7y – 10 + 3x
(c) 17g + 9 – 7h from 11 – 10g + 3h
(d) 9a – 6b + 14 from 6a – (9b + 18)
(e) 10x + 2 + 10y from -3y + 8 – 3x
(f) 8g + 4h – 10 from 7h – 8g + 20
Solution:
(a) (6a + 9b – 18) – (9a – 6b + 14)
= 6a + 9b – 18 – 9a + 6b – 14
= (6a – 9a) + (9b + 6b) + (-18 – 14)
= -3a + 15b – 32

(b) (7y – 10 + 3x) – (-15x + 13 – 9y)
= 7y – 10 + 3x + 15x – 13 + 9y
= (7y + 9y) + (3x + 15x) + (-10 – 13)
= 16y + 18x – 23

(c) (11 – 10g + 3h) – (17g + 9 – 7h)
= 11 – 10g + 3h – 17g – 9 + 7h
= (11 – 9) + (-10g – 17g) + (3h + 7h)
= 2 – 27g + 10h
= 10h – 27g + 2

(d) 6a – (9b + 18) – (9a – 6b + 14)
= 6a – 9b – 18 – 9a + 6b – 14
= (6a – 9a) + (-9b + 6b) + (-18 – 14)
= -3a – 3b – 32
= -(3a + 3b + 32)

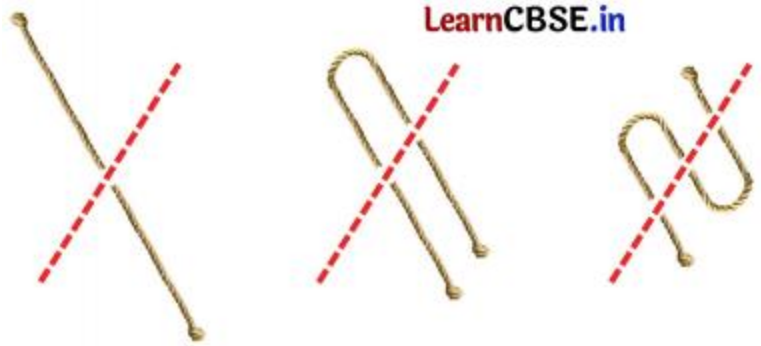
(e) (-3y + 8 – 3x) – (10x + 2 + 10y)
= -3y + 8 – 3x – 10x – 2 – 10y
= (-3y – 10y) + (-3x – 10x) + (8 – 2)
= -13y – 13x + 6

(f) (7h – 8g + 20) – (8g + 4h – 10)
= 7h – 8g + 20 – 8g – 4h + 10
= (7h – 4h) + (-8g – 8g) + (20 + 10)
= 3h – 16g + 30

Question 10.
Describe situations corresponding to the following algebraic expressions:
(a) 8x + 3y
(b) 15x – 2x
Solution:
(a) A notebook costs ₹ 8 and a pen costs ₹ 3. If you buy x notebooks and y pens. Then the total cost bear by you is ₹ (8x + 3y).

(b) A fruit seller has 15 boxes of apples, each box containing x apples. Before selling them, he found that 2 boxes of apples were rotten. The number of fresh apples left is 15x – 2x.

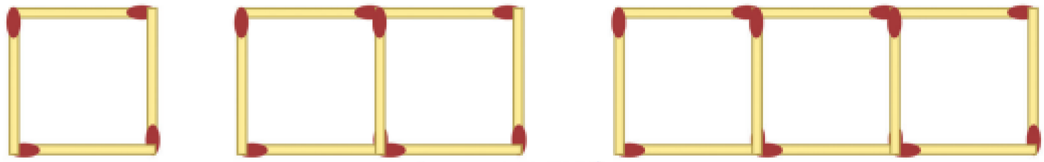
Question 11.
Imagine a straight rope. If it is cut once as shown in the picture, we get 2 pieces. If the rope is folded once and then cut as shown, we get 3 pieces. Observe the pattern and find the number of pieces if the rope is folded 10 times and cut. What is the expression for the number of pieces when the rope is folded r times and cut?



Solution:
Step 1 (0 fold): We get 0 + 2 = 2 pieces
Step 2 (1 fold): We get 1 + 2 = 3 pieces
Step 3 (2 folds): We get 2 + 2 = 4 pieces
In the same way, if the rope is folded 10 times and cut, we get 10 + 2 = 12

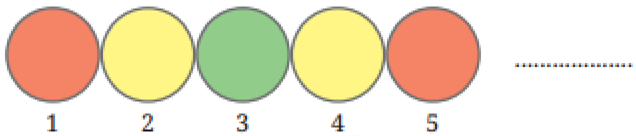
pieces.
In the same way, when the rope is folded r times and cut, we get r + 2 pieces.

Question 12.
Look at the matchstick pattern below. Observe and identify the pattern. How many matchsticks are required to make 10 such squares? How many are required to make w squares?



Solution:
Step 1: To make 1 square, we need 4 matchsticks.
Step 2: To make 2 squares, we need 4 + 3 = 7 matchsticks
Step 3: To make 3 squares, we need 4 + 3 + 3 = 10 matchsticks.
And to make w squares we need = 4 + (w – 1) × 3
= 4 + 3(w – 1)
= (4 + 3w – 3)
= 3w + 1 matchsticks.
To make 10 squares, substitute 10 for w:
3(10) + 1 = 30 + 1 = 31 matchsticks

Question 13.
Have you noticed how the colours change in a traffic signal? The sequence of colour changes is shown below. Find the colour at positions 90, 190, and 343. Write expressions to describe the positions for each colour.



Solution:
The sequence of red light: 1, 5, 9, …..
In general, 4n – 3 positions
The sequence of green light: 3, 7, 11,…..
In general; 4n – 1 positions
The sequence of yellow light: 2, 4, 6, …..
In general, 2n positions
Since 90 and 190 are even numbers, it will be 2n positions.
Now, 343 ÷ 4 = 85 quotient + 3 remainder.
So, it matches a 4n-1 position.

So, colour at positions 90, 190, and 343 are yellow, yellow, and green, respectively.

Question 14.
Observe the pattern below. How many squares will be there in Step 4, Step 10, Step 50? Write a general formula. How would the formula change if we want to count the number of vertices of all the squares?

Solution:
Number of squares in step 1 = 5
Number of squares in step 2 = 5 + 4 = 9
Number of squares in step 3 = 5 + 4 + 4 = 5 + 2 × 4 = 13
So, number of squares in step 4 = 5 + 4 + 4 + 4 = 5 + 3 × 4 = 17
So, number of squares in step 10 = 5 + 9 × 4 = 41
And, number of squares in step 50 = 5 + 49 × 4 = 201
So, the general formula = 5 + (n – 1) × 4 = 5 + 4(n – 1) = 5 + 4n – 4 = 4n + 1.
Since 1 square has 4 vertices, the number of vertices (4n + 1) squares have 4(4n + 1) = 16n + 4.

Question 15.
Numbers are written in a particular sequence in this endless 4-column grid.

1	2	3	4
1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

(a) Give expressions to generate all the numbers in a given column (1, 2, 3, 4).
(b) In which row and column will the following numbers appear:
(i) 124
(ii) 147

(iii) 201
(c) What number appears in row r and column c?
(d) Observe the positions of multiples of 3.
Do you see any pattern in it? List other patterns that you see.
Solution:
(a) Expression to generate all the numbers in a given column (1, 2, 3, 4)
Let r be the row number.
Column 1: 1, 5, 9, 13,…… which starts at 1 and adds 4 each row.
So, number in the rth row of column 1 = $4 \times (r - 1) + 1$
Column 2: $4 \times (r - 1) + 2$
Column 3: $4 \times (r - 1) + 3$
Column 4: $4 \times (r - 1) + 4$
If c is the column number, then the general formula to generate all numbers is $4 \times (r - 1) + c$.

(b) (i) We divide each number by 4 to find its row and column
$124 \div 4 \Rightarrow$ Quotient = 31 and remainder is 0
$\therefore 124 = 4 \times 31 + 0$ or $4 \times 30 + 4$
Comparing it with $4 \times (r - 1) + c$, we get
$r - 1 = 30$, $c = 4$
So, $r = 31$ and $c = 4$
So, row is 31 and column is 4

(ii) $147 \div 4 \Rightarrow$ Quotient = 36 and remainder is 3
$\therefore 147 = 4 \times 36 + 3$
Comparing it with $4 \times (r - 1) + c$, we get
$r - 1 = 36$, $c = 3$
So, 147 will appear at row $36 + 1 = 37$ and column 3

(iii) $201 \div 4 \Rightarrow$ Quotient = 50 and remainder is 1
$\therefore 201 = 4 \times 50 + 1$
Comparing it with $4 \times (r - 1) + c$, we get
$r - 1 = 50$, $c = 1$
So, 201 will appear at row 51 and column 1.

(c) The number that appears in row r and column c is $4(r - 1) + c$.

(d) Every third number is a multiple of 3.
We can observe that even numbers always appear in column 2 and column 4.
Odd numbers always appear in column 1 and column 3.
Every row has 2 odd and 2 even numbers.
The sum of each row increases by 16.

(e.g., Row 1: 1 + 2 + 3 + 4 = 10, Row 2: 5 + 6 + 7 + 8 = 26, Row 3: 9 + 10 + 11 + 12 = 42)

Practice Time 4.1

1. A student earns ₹20 for each hour of tutoring.

(a) h = 3

Solution By Steps

Step 1: Expression for earnings

$$20h$$

Step 2: Substitute $h = 3$

$$20 \times 3 = 60$$

Final Answer

₹60

(b) h = 6

Solution By Steps

$$\begin{aligned} 20h &= 20 \times 6 \\ &= 120 \end{aligned}$$

Final Answer

₹120

---

2. A cab driver charges ₹100 per ride.

(a) r = 5

Solution By Steps

Expression:

$$100r$$

Substitute $r = 5$

$$100 \times 5 = 500$$

Final Answer

₹500

(b) r = 9

Solution By Steps

$$100 \times 9 = 900$$

Final Answer

₹900

---

3. A factory produces 150 boxes every day.

(a) d = 2

Solution By Steps

Expression:

$$150d$$

Substitute $d = 2$

$$150 \times 2 = 300$$

Final Answer

300 boxes

(b) d = 7

Solution By Steps

$$150 \times 7 = 1050$$

Final Answer

1050 boxes

---

4. Cost of one pen = ₹15

(a) p = 4

Solution By Steps

Expression:

$$15p$$
$$15 \times 4 = 60$$

Final Answer

₹60

(b) p = 10

Solution By Steps

$$15 \times 10 = 150$$

Final Answer

₹150

---

5. Taxi charges ₹12 per kilometre.

(a) k = 7

Solution By Steps

Expression:

$$12k$$
$$12 \times 7 = 84$$

Final Answer

₹84

(b) k = 15

Solution By Steps

$$12 \times 15 = 180$$

Final Answer

₹180

Practice Time 4.2

1. Find the value of

$$24 \div 4 + 6 \times 2$$

Solution By Steps

Using BODMAS:

$$\begin{aligned} &24 \div 4 = 6 \\ &6 \times 2 = 12 \\ &6 + 12 = 18 \end{aligned}$$

Final Answer

18

---

2. Find the value of

$$45 - 5 \times 3 + 4$$

Solution By Steps

$$\begin{aligned} &5 \times 3 = 15 \\ &45 - 15 + 4 \\ &30 + 4 = 34 \end{aligned}$$

Final Answer

34

---

3. Find the value of

$$18 + (12 \div 3) \times 2$$

Solution By Steps

$$\begin{aligned}12 \div 3 &= 4\\ 4 \times 2 &= 8\\ 18 + 8 &= 26\end{aligned}$$

Final Answer

26

---

4. Verify

$$(8 + 2) + 5 = 8 + (2 + 5)$$

Solution By Steps

LHS:

$$10 + 5 = 15$$

RHS:

$$8 + 7 = 15$$

LHS = RHS

Final Answer

Verified.

Property: **Associative Property of Addition**

---

5. Verify

$$7 \times 3 = 3 \times 7$$

Solution By Steps

LHS:

$$21$$

RHS:

$$21$$

LHS = RHS

Final Answer

Verified.

Property: **Commutative Property of Multiplication**

Practice Time 4.3

1. Write $7 \times m$in algebraic shorthand.

Solution

$$7m$$

Final Answer

$$7m$$

---

2. Write $2 \times x \times y$without multiplication sign.

Solution

$$2xy$$

Final Answer

$$2xy$$

3. Convert $9 \times \boldsymbol{p} \times \boldsymbol{q} \times \boldsymbol{r}$

Solution

$$9pqr$$

Final Answer

$$9pqr$$

4. Write $6 \times \boldsymbol{z}$in standard algebraic notation.

Solution

$$6z$$

Final Answer

$$6z$$

5. Convert $\boldsymbol{x} \times \boldsymbol{y} \times 8$

Solution

Number comes first.

$$8xy$$

Final Answer

$$8xy$$

Practice Time 4.4

1. Simplify

$$5(x-7)$$

Solution By Steps

Step 1: Apply distributive property.

$$5(x-7)=5(x)+5(-7)$$

Step 2: Multiply.

$$=5x-35$$

Final Answer

$$5x-35$$

---

2. Simplify

$$-2(p+6q)$$

Solution By Steps

Step 1: Multiply $-2$by each term.

$$-2(p+6q)=(-2)p+(-2)(6q)$$

Step 2: Simplify.

$$=-2p-12q$$

Final Answer

$$-2p-12q$$

---

3. Simplify

$$3y(4-y)$$

Solution By Steps

Step 1: Apply distributive property.

$$3y(4 - y) = 3y(4) - 3y(y)$$

Step 2: Multiply.

$$= 12y - 3y^2$$

Final Answer

$$12y - 3y^2$$

---

4. The side of a square is p. Find its area.

Solution By Steps

Area of square

$$\begin{aligned} &= \text{side} \times \text{side} \\ &= p \times p \\ &= p^2 \end{aligned}$$

Final Answer

$$p^2$$

---

5. A rectangle has length $2a$and breadth $3b$. Find its perimeter.

Solution By Steps

Perimeter of rectangle

$$= 2(\text{length} + \text{breadth})$$

Substitute values:

$$= 2(2a + 3b)$$

Apply distributive property:

$$= 4a + 6b$$

Final Answer

$$4a + 6b$$

Practice Time 4.5

1. First row has 5 chairs, second row 10 chairs, third row 15 chairs. Write an expression for the number of chairs in the nth row.

Solution By Steps

Pattern:

$$5,10,15,20, \ldots$$

Each term is a multiple of 5.

$$5 \times n$$

Final Answer

$$5n$$

---

2. Each stair step is decorated with 2 lights. How many lights are needed for $n$steps?

Solution By Steps

Lights per step = 2

For $n$steps:

$$2 \times n$$

Final Answer

$$2n$$

3. A pattern of bricks has:

1st layer = 7 bricks

2nd layer = 11 bricks

3rd layer = 15 bricks

Find the nth layer.

Solution By Steps

Pattern:

$$7,11,15,\ldots$$

Common difference:

$$11-7=4$$

Arithmetic sequence formula:

$$a_n=a+(n-1)d$$

Substitute:

$$\begin{aligned}&a=7,\ d=4\\&a_n=7+4(n-1)\\&=7+4n-4\\&=4n+3\end{aligned}$$

Final Answer

$$4n+3$$

4. A student earns ₹20 on the first day, ₹25 on the second day, ₹30 on the third day and so on. Write a formula for the amount earned on the nth day.

Solution By Steps

Pattern:

$$20, 25, 30, \ldots$$

Common difference = 5

Formula:

$$a_n = a + (n-1)d$$

Substitute:

$$\begin{aligned} &a = 20,\ d = 5 \\ &a_n = 20 + 5(n-1) \\ &= 20 + 5n - 5 \\ &= 5n + 15 \end{aligned}$$

Final Answer

$$5n + 15$$

---

5. Number Machine

Given:

a b Output

4 3 5

6 2 7

8 1 9

Find the rule.

Solution By Steps

Check first row:

$$4 + 3 - 2 = 5$$

Second row:

$$6 + 2 - 1 = 7$$

Third row:

$$8 + 1 - 0 = 9$$

Rule fitting all rows:

$$a + b - 2$$

Final Answer

$$\boxed{a + b - 2}$$

EXAM TIME

A. Multiple Choice Questions

1. In $7x + 5$, the coefficient of $x$is

Solution By Steps

Step 1: Identify the coefficient

The coefficient is the number multiplying the variable.

$$7x + 5$$

The coefficient of $x$is 7.

Final Answer

(b) 7

---

2. The expression for "₹30 per kg for $w$kg apples" is

Solution By Steps

Cost = Rate × Quantity

$$30 \times w = 30w$$

Final Answer

(c) $30w$

---

3. Which property is shown by

$$(a + b) + c = a + (b + c)$$

Solution By Steps

Only the grouping changes.

This is the Associative Property of Addition.

Final Answer

(b) Associative Property of Addition

---

4. Standard algebraic notation for $2 \times x \times y$

Solution By Steps

Multiplication signs are omitted.

$$2xy$$

Final Answer

(c) $2xy$

---

5. If side of a square is p, area is

Solution By Steps

Area of square

$$\begin{aligned} &= \text{side} \times \text{side} \\ &= p \times p \\ &= p^2 \end{aligned}$$

Final Answer

(b) p^2

B. Fill in the Blanks

1.

$$4 \times n = 4n$$

Answer: $4n$

2.

Terms in $9y - 7$

Answer: $9y, \ -7$

3.

$$36 \div 6 + 8$$

Using BODMAS:

$$36 \div 6 = 6$$
$$6 + 8 = 14$$

Answer: 14

4.

$$a(b - c) = ab - ac$$

Answer: $ab - ac$

5.

Rectangle perimeter

$$2(l + b)$$

Answer: $2(l + b)$

C. True or False

1.

$$a + b = b + a$$

Commutative property of addition.

Answer: True

2.

Variables are always written before numbers.

Example:

$$3x$$

Not $x3$.

Answer: False

3.

Like terms are added by adding coefficients.

Example:

$$5x + 2x = 7x$$

Answer: True

4.

Brackets are solved after addition and subtraction.

Actually brackets are solved first.

Answer: False

5.

Pattern $6, 11, 16, \ldots$

Difference = 5

Answer: True

D. Match the Columns

Column A	**Column B**
$4(a+b)$	$4a+4b$
$7x+5$	Expression with variable x
Side = p→ Area	p^2
Lights for $n$steps	$2n$
Chairs in nth row	$5n$

Answers

1 → c

2 → d

3 → e

4 → b

5 → a

E. Very Short Answer Questions

1. Write $6 \times y$in algebraic shorthand.

$$6y$$

Answer: $6y$

---

2. Coefficient of $x$in $9x+7$

Answer: 9

---

3. Simplify

$$3p + 2p$$
$$= 5p$$

Answer: $5p$

---

4. If $x = 5$, find $4x$

$$4(5) = 20$$

Answer: 20

---

5. Perimeter of square with side s

$$4s$$

Answer: $4s$

F. Short Answer Questions

1. Simplify

$$9p + 4q - 3p - q$$

Combine like terms:

$$(9p - 3p) + (4q - q)$$
$$= 6p + 3q$$

Answer: $6p + 3q$

---

2. Find $7m + 5$when $m = 3$

$$7(3) + 5$$
$$21 + 5 = 26$$

Answer: 26

---

3. Total cost of 3 pencils at ₹x each and 2 erasers at ₹y each

$$3x + 2y$$

Answer: $3x + 2y$

---

4. Perimeter of triangle with sides $\boldsymbol{a, b, c}$

$$a + b + c$$

Answer: $a + b + c$

---

5. Simplify

$$2a(b + 3)$$

Distributive law:

$$= 2ab + 6a$$

Answer: $2ab + 6a$

Long Answer Type Questions

1. A cab charges ₹12 per km. Write an expression for fare for $\boldsymbol{k}$km and find fare when $\boldsymbol{k = 18}$.

Solution By Steps

Expression:

$$12k$$

Substitute $k = 18$:

$$12 \times 18$$
$$= 216$$

Final Answer

Expression:

$$12k$$

Fare for 18 km:

$$₹216$$

---

2. Student earns ₹20, ₹25, ₹30, ... Find earning on the 10th day.

Solution By Steps

Arithmetic pattern:

$$20,25,30,\ldots$$

First term = 20

Difference = 5

Formula:

$$a_n = 20 + 5(n-1)$$

For $n = 10$:

$$\begin{aligned}&20 + 5(9)\\&20 + 45\\&65\end{aligned}$$

Final Answer

$$₹65$$

---

3. Shopkeeper sells notebooks at ₹a and pens at ₹b. Customer buys 5 notebooks and 3 pens.

Expression

$$5a + 3b$$

Given:

$$a = 40,\ b = 10$$

Substitute:

$$\begin{aligned}&5(40) + 3(10)\\&200 + 30\\&230\end{aligned}$$

Final Answer

Expression:

$$5a + 3b$$

Total Cost:

$$₹230$$

---

4. Simplify

$$3x(4 - x) + 2(x + 5)$$

Solution By Steps

Expand first bracket:

$$12x - 3x^2$$

Expand second bracket:

$$2x + 10$$

Combine:

$$\begin{aligned}&12x - 3x^2 + 2x + 10\\&= -3x^2 + 14x + 10\end{aligned}$$

Final Answer

$$-3x^2 + 14x + 10$$

---

5. Matchstick Pattern

First design = 7 matchsticks

Each new design adds 6 matchsticks.

Find formula and 15th design.

Solution By Steps

Formula:

$$\begin{aligned} a_n &= 7 + (n-1)6 \\ &= 7 + 6n - 6 \\ &= 6n + 1 \end{aligned}$$

For 15th design:

$$\begin{gathered} 6(15) + 1 \\ 90 + 1 \\ 91 \end{gathered}$$

Final Answer

Formula:

$$6n + 1$$

15th design:

$$91 \text{ matchsticks}$$

COMPETENCY-BASED QUESTIONS

A. Assertion–Reasoning

1.

Assertion:

$$(4 + 6) \times 2 = 20$$

True.

Reason:

Brackets are evaluated before multiplication.

True.

Reason correctly explains Assertion.

Answer: (a)

2.

Assertion:

$$a(b + c) = ab + ac$$

True.

Reason:

This is distributive property.

True.

Correct explanation.

Answer: (a)

B. Case-Based Question

Table:

a	b	O
5	2	8
8	1	15

a	b	O
9	11	7
10	10	10
6	4	8

1. Find rule

Observe:

$$2a - b$$

Check first row:

$$2(5) - 2 = 8$$

Correct.

Second row:

$$2(8) - 1 = 15$$

Correct.

Answer

$$O = 2a - b$$

---

2. Verify for $\boldsymbol{a = 8, b = 1}$

$$\begin{aligned} O &= 2(8) - 1 \\ &= 16 - 1 \\ &= 15 \end{aligned}$$

Answer: 15

---

3. Find $\boldsymbol{O}$for $\boldsymbol{(12, 3)}$

$$O = 2(12) - 3$$

$$= 24 - 3$$
$$= 21$$

Answer: 21

C. Maths Booster

1. Student earns ₹20 per hour

Expression:

$$20h$$

Given:

$$80 < 20h < 120$$

Divide by 20:

$$4 < h < 6$$

Whole number value:

$$h = 5$$

Earning:

$$20 \times 5 = 100$$

Answer

$$h = 5, \text{earning} = ₹100$$

---

2. Sister is 5 years older

$$s = g + 5$$

Given:

- Sister between 10 and 20
- Girl's age even

Possible sister ages:

$$11,12,13,14,15,16,17,18,19$$

Corresponding girl ages:

$$6,7,8,9,10,11,12,13,14$$

Keeping only even girl ages:

$$6,8,10,12,14$$

Therefore:

Girl	**Sister**
6	11
8	13
10	15
12	17
14	19

Final Answer

Possible pairs:

$$(6,11),\ (8,13),\ (10,15),\ (12,17),\ (14,19)$$

Chapter – 5: Parallel and Intersecting Lines

NCERT CORNER

In-Text Questions

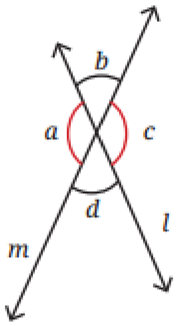
1. Can two straight lines intersect at more than one point?
Solution:
No, two straight lines can only intersect at one point. If they are parallel, they never intersect. But if two lines appear to intersect at more than one point, it means they are the same.

2. Do it yourself

3. Is this always true for any pair of intersecting lines?
Solution:
Yes. When two lines intersect, they form four angles at a point of intersection. The angles directly opposite each other at this point are called vertically opposite angles, and they are always equal in measure.

Figure it Out

1. List all the linear pairs and vertically opposite angles you observe from Figure:



Linear Pairs	$\angle a$ and $\angle b$, ...
Pairs of Vertically Opposite Angles	$\angle b$ and $\angle d$, ...

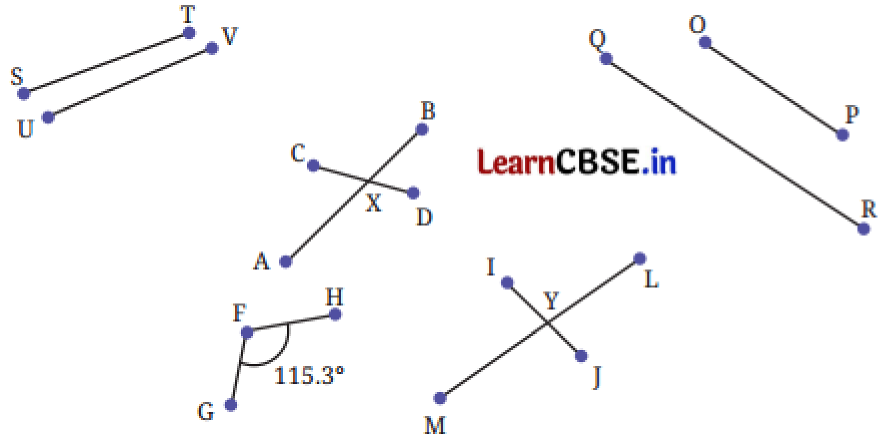
Solution:

Linear Pairs	$\angle a$ and $\angle b$, $\angle b$ and $\angle c$, $\angle c$ and $\angle d$, $\angle d$ and $\angle a$.
Pairs of Vertically Opposite Angles	$\angle b$ and $\angle d$, $\angle a$ and $\angle c$

In-Text Questions

1. Observe Figure and describe the way the line segments meet or cross each other in each case, with appropriate mathematical words (a point, an endpoint, the midpoint, meet, intersect) and the degree measure of each angle.

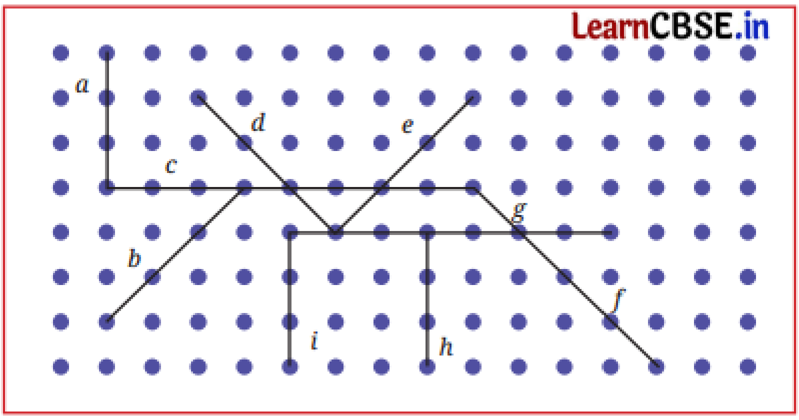
For example, line segments FG and FH meet at the endpoint F at an angle of 115.3°.



Are line segments ST and UV likely to meet if they are extended?
Solution:
If the lines are not parallel, they will likely intersect at some point. Thus, line segments ST and UV are likely to meet when extended, as they are not parallel.

Are line segments OP and QR likely to meet if they are extended?
Solution:
If two lines are parallel, they will never meet, regardless of how far they are extended. Thus, line segments OP and QR didn't meet when extended, as they are parallel.

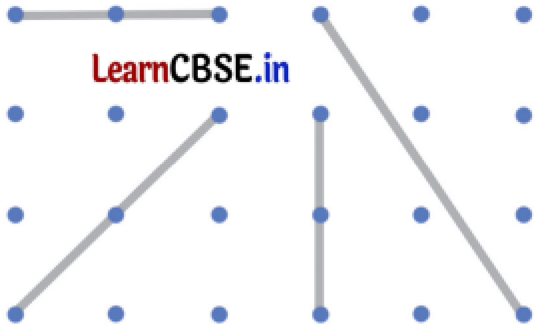
2. Which pairs of lines appear to be parallel in the Figure below?



Solution:
Two lines are said to be parallel when they do not meet at any point.
Here, lines a, i, and h are parallel to each other;
Line c is parallel to line g;
Line d is parallel to line f;
Line e is parallel to line b.

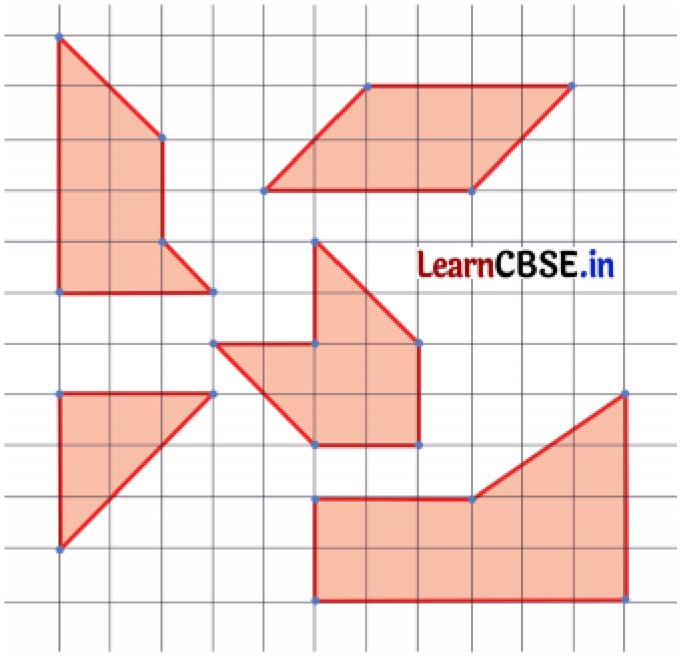
Figure it Out

Question 1.
Draw some lines perpendicular to the lines given on the dot paper in the Figure.

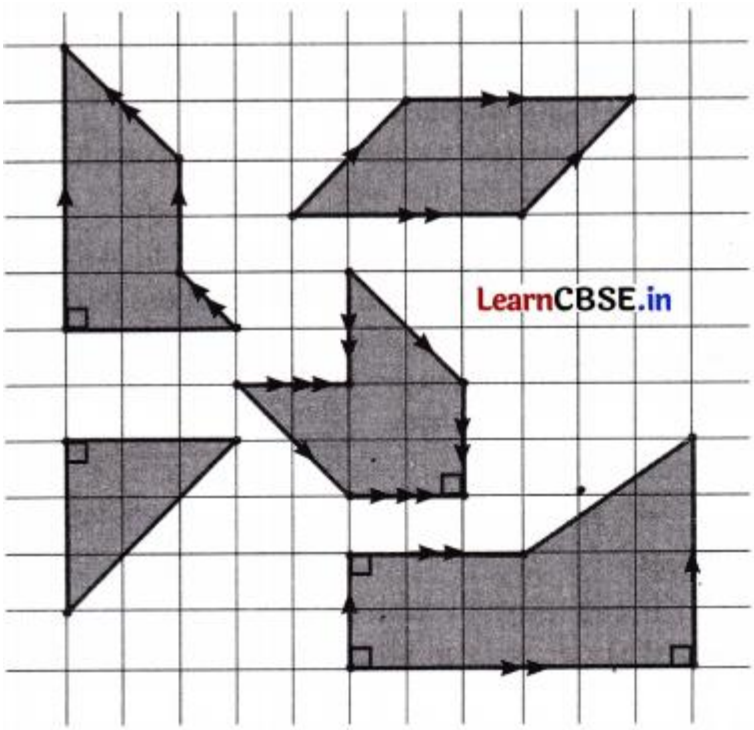


Solution:
Do it yourself.

Question 2.
In the given figure, mark the parallel lines using the notation given above (single arrow, double arrow, etc). Mark the angle between perpendicular lines with a square symbol.



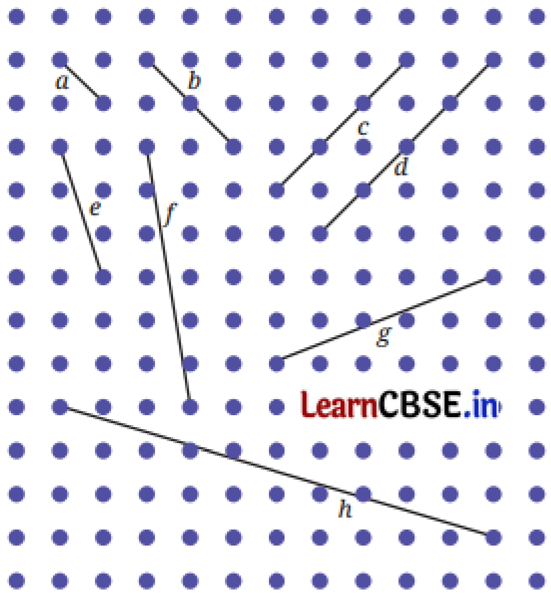
(a) How did you spot the perpendicular lines?
(b) How did you spot the parallel lines?
Solution:



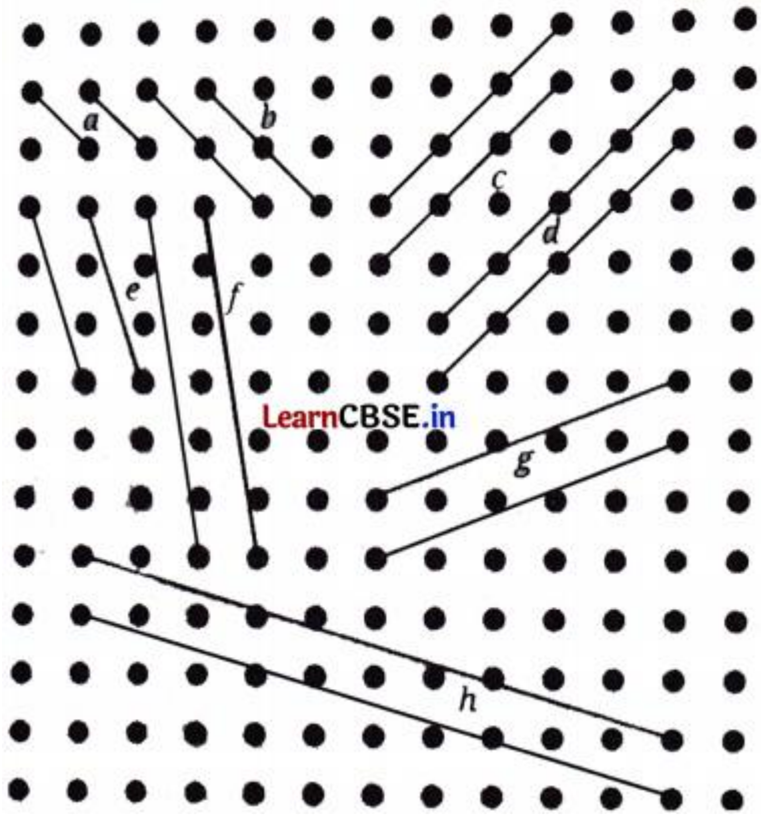
(a) To spot perpendicular lines in a geometric figure, observe if lines intersect at a 90° angle.
(b) To spot parallel lines in a geometric figure, observe if lines never intersect at any point.

Question 3.
In the dot paper following, draw different sets of parallel lines. The line segments can be of different lengths but should have dots as endpoints.
Solution:
Do it Yourself.

Question 4.
Using your sense of how parallel lines look, try to draw lines parallel to the line segments on this dot paper.

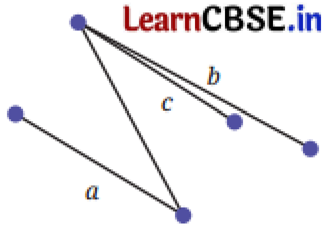


(a) Did you find it challenging to draw some of them?
(b) Which ones?
(c) How did you do it?
Solution:



(a) – (c) Do it yourself

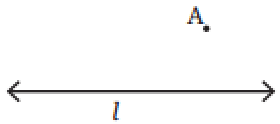
Question 5.
In the figure, which line is parallel to line a—line b or line c? How do you decide this?



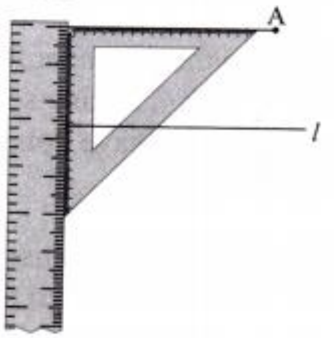
Solution:
In the given figure, line a is parallel to line c because these two lines are always the same distance apart and never meet, no matter how far they go.

Figure it Out

1. Can you draw a line parallel to l, that goes through point A? How will you do it with the tools from your geometry box? Describe your method.



Solution:
Tools needed: Ruler, Set-squares (right-angled triangle), Pencil



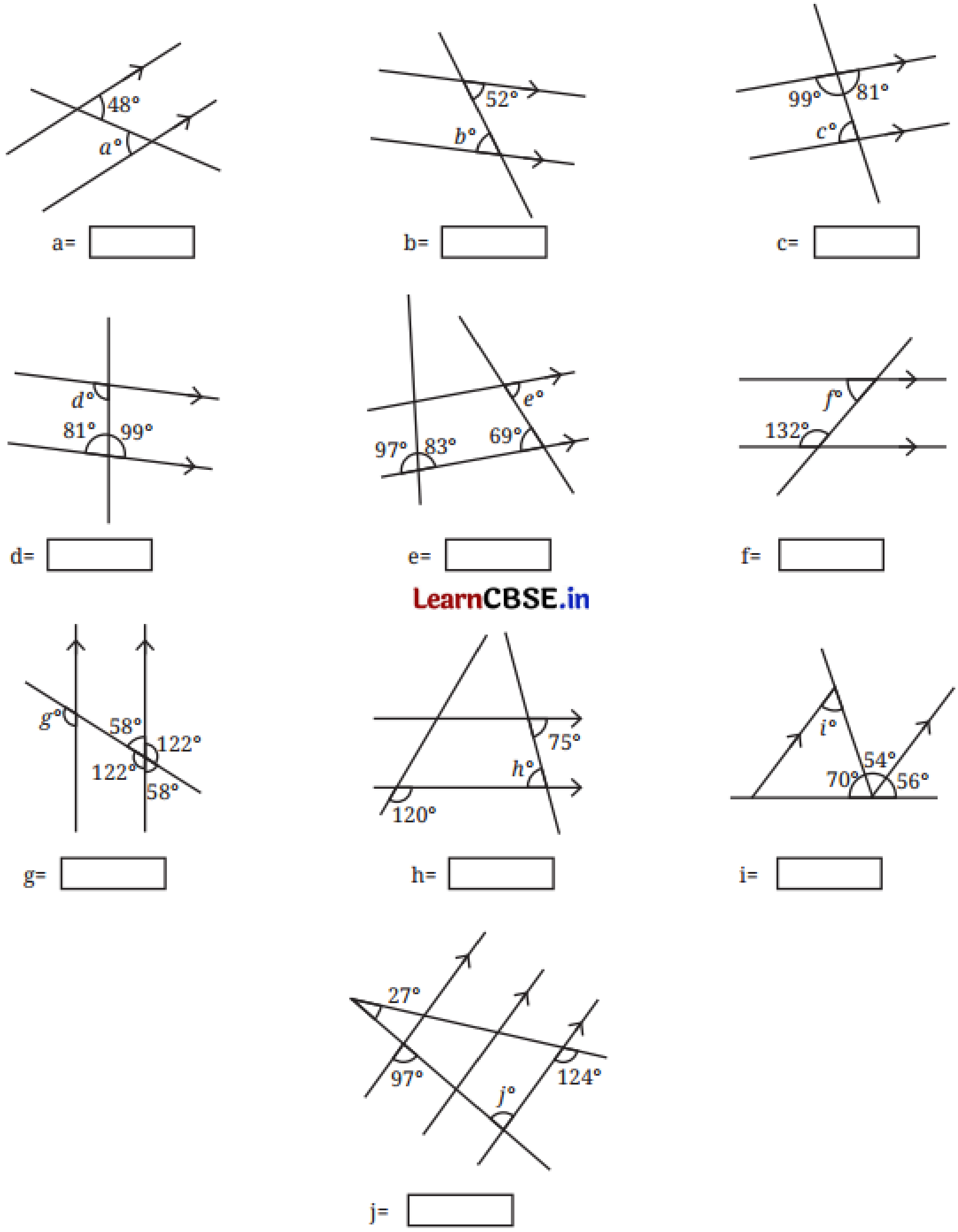
Steps:

1. Place the set square so that one side is along the line l.
2. Hold the ruler against the other side of the set square (the ruler won't move).
3. Slide the set square along the ruler until one side reaches point A.
4. Draw a line along the edge of the set square through point A.

5. This new line is parallel to line l and passes through point A.

Figure it Out

Question 1.
Find the angles marked below.



Solution:
Since alternate interior angles formed by a transversal intersecting a pair of parallel lines are always equal to each other. Therefore, a = 48°.

Since alternate angles formed by a transversal intersecting a pair of parallel lines are always equal to each other. Therefore, b = 52°.

The sum of the interior angles on the same side of the transversal always adds up to 180°.
So, 180° – 99° = 81°. Therefore, c = 81°.

The sum of the interior angles on the same side of the transversal always adds up to 180°.
So, 180° – 81° = 99°. Therefore, d = 99°.

Alternate interior angles formed by a transversal intersecting a pair of parallel lines are always equal to each other. Therefore, e = 69°.

The sum of the interior angles on the same side of the transversal always adds up to 180°. So, 180°- 132° = 48°. Therefore, f = 48°.

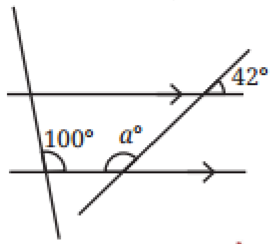
Corresponding angles formed by a transversal intersecting a pair of parallel lines are always equal to each other. Therefore, g = 122°.

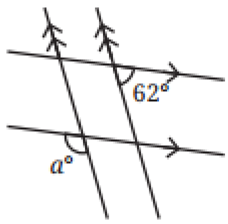
Alternate interior angles formed by a transversal intersecting a pair of parallel lines are always equal to each other. Therefore, h = 15°.

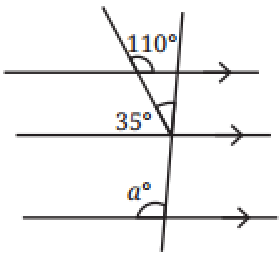
Alternate interior angles formed by a transversal intersecting a pair of parallel lines are always equal to each other. Therefore, i = 54°.

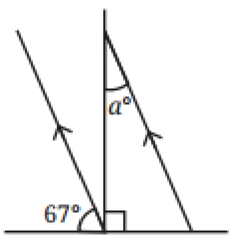
Alternate interior angles formed by a transversal intersecting a pair of parallel lines are always equal to each other. Therefore, j = 97°.

Question 2.
Find the angle represented by a.

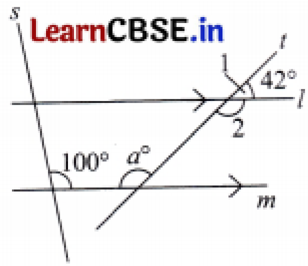




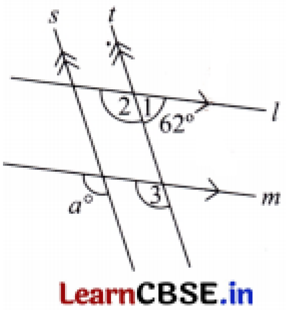




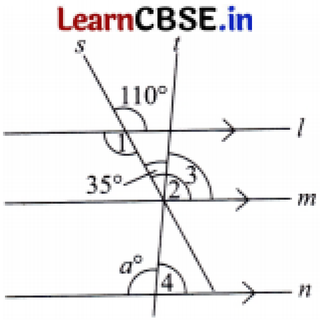
Solution:



Here, ∠1 is 42°, so ∠2 is 180° – 42° = 138°, because ∠1 and ∠2 form a linear pair and linear pair always add up to 180°.
Now, since lines l and m are parallel and t is a transversal.
Therefore, ∠2 and a are alternate angles and equal.
Thus, a = 138°

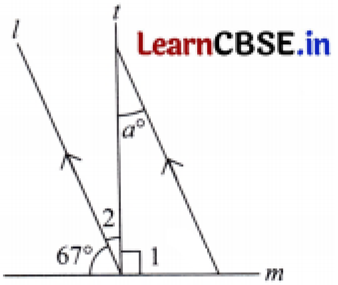


Here, ∠1 is 62°, and ∠1 and ∠2 form a linear pair, and a linear pair always adds up to 180°.
So, ∠2 is 180° – 62°= 118°.
Now, ∠2 and ∠3 are corresponding angles, and equal lines l and m are parallel, and t is a transversal.
So, ∠3 = 118°
Now, ∠3 and a are corresponding angles and equal since lines s and t are parallel and line m is a transversal. Thus, a = 118°



Here, lines s and l are intersecting lines.
So, ∠1 = 110° [Vertically opposite angles]
And ∠1 = ∠2 = 110° because lines l and m are parallel and line s is a transversal.
Therefore ∠3 = ∠2 – 35° = 110° – 35° = 75°
Also, ∠3 = ∠4 = 75° [Corresponding angles]

So, a° = 180° – 75° = 105° [Linear pair angles]



Using angles on a straight line, we have

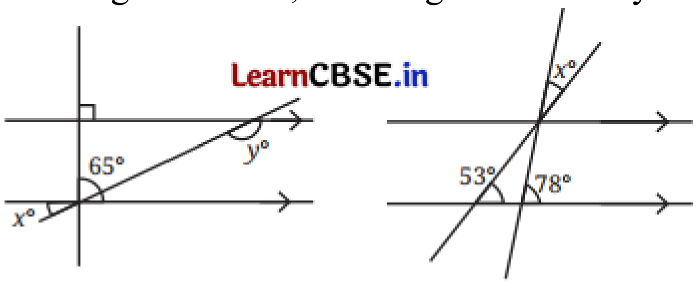
∠1 + ∠2 + 67° = 180°

∠2 = 180° – 67° – 90° = 23° [Since ∠1 = 90°]

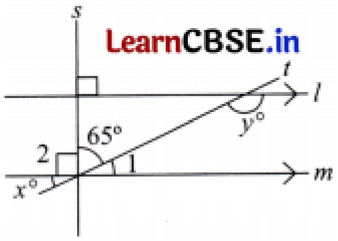
Thus, a = 23° as ∠2 = ∠a [Alternate angles as lines l and t are parallel]

Question 3.

In the figures below, what angles do x and y stand for?



Solution:



Since lines 5 and m are perpendicular to each other.

So ∠2 = 90°

Now, ∠2 + 65° + x° = 180° [Linear Pair]

So, x° = 180° – 90° – 65° = 25°

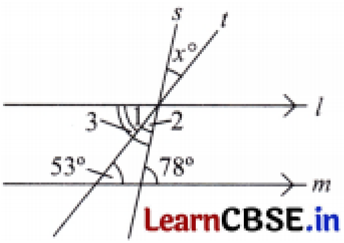
Now, lines t and m are two intersecting lines.

So, x = ∠1 = 25°. [Vertically Opposite Angles]

Lines l and m are parallel to each other, and t is a transversal.

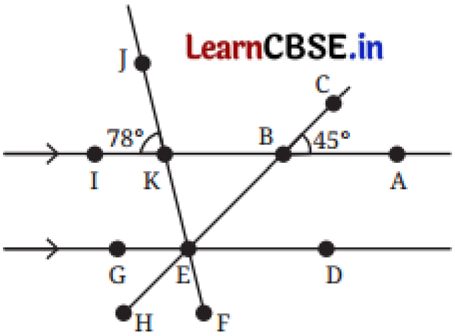
So, y° = ∠2 + 65° = 90° + 65° = 155° [Altemate angles]

Therefore, y = 155°.

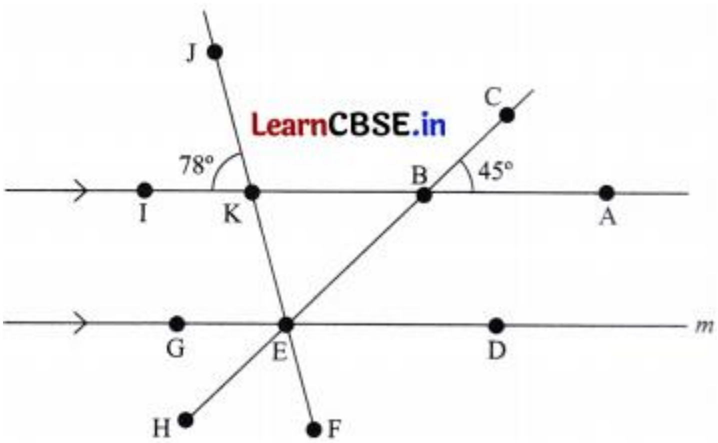


Since lines l and m are parallel and line s is a transversal.
So, ∠3 = 78° [Alternate Angles]
Also, lines l and m are parallel, and line t is a transversal.
So, ∠1 = 53° [Alternate Angles]
Therefore, ∠2 = ∠3 – ∠1 = 78° – 53° = 25°
Lines s and t are intersecting lines.
Therefore, x° = ∠2 = 25° [Vertically Opposite Angles]

Question 4.
In Figure, ∠ABC = 45° and ∠IKJ = 78°. Find angles ∠GEH, ∠HEF, ∠FED.



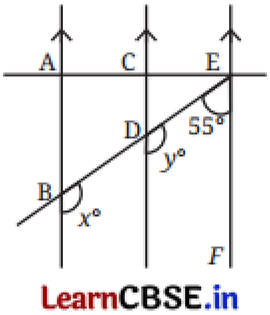
Solution:



Line segments IA and HC intersect at point B.
So, ∠ABC = ∠KBE = 45° [Vertically Opposite Angles]
Similarly, line segments JF and IA intersect at point K.
So, ∠IKJ = ∠BKE = 78° [Vertically Opposite Angles]
∠KBE = ∠GEH = 45° [Corresponding Angles]

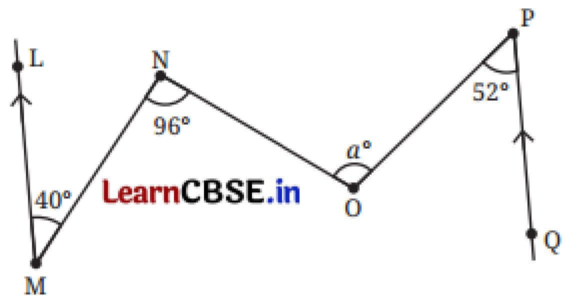
Similarly, ∠BKE = ∠FED = 78° [Corresponding Angles]
Now, ∠GEH + ∠HEF + ∠FED = 180° [Linear Pair]
∠HEF = 180° – 45° – 78° = 57°

Question 5.
In the Figure, AB is parallel to CD, and CD is parallel to EF. Also, EA is perpendicular to AB. If ∠BEF = 55°, find the values of x and y.

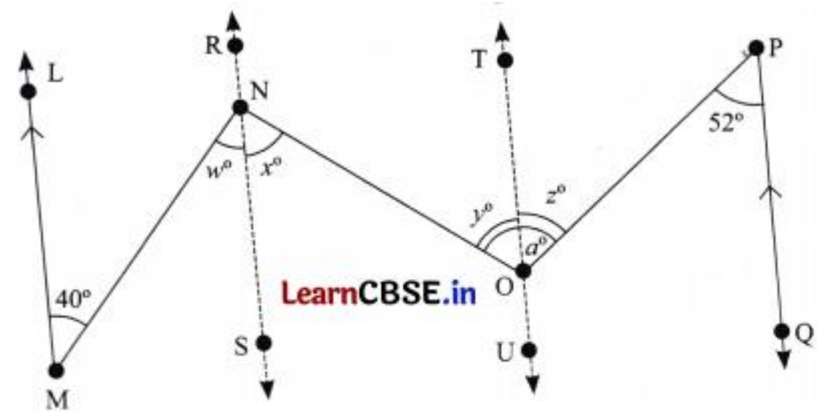


Solution:
Given AB is parallel to CD and CD is parallel to EF.
So, AB is parallel to EF.
Now, EF is parallel to CD, and DE is a transversal.
So, y° + 55° = 180° [Sum of interior angles]
y = 125°
Now, AB is parallel to CD, and BD is a transversal.
So, x° =y° = 125° [Corresponding Angles]

Question 6.
What is the measure of angle ∠NOP in the given figure?



[Hint: Draw lines parallel to LM and PQ through points N and O]
Solution:
Draw a line RS through N, which is parallel to line LM, and line TU through O, which is parallel to line PQ.



∠LMN = ∠MNS [Alternate Angles]
Therefore, w° = 56°
Given, ∠MNO = 96°
w° + x° = 96°
x° = 96° – 40° = 56°
Now, RS is parallel to TU, and NO is a transversal.
So, ∠SNO = ∠NOT [Alternate Angles]
Therefore, y° = x° = 56°
Now TU is parallel to PQ, and OP is a transversal.
So, ∠TOP = ∠OPQ [Alternate Angles]
z° = 52° [Given ∠OPQ = 52°]
Thus, a° = y° + z° = 56° + 52° = 108°

Practice Time 5.1

1. If ∠PQR = 136°, find adjacent angle ∠RQS.

Solution

Linear pair angles sum to 180°.

$$\angle RQS = 180^\circ - 136^\circ$$
$$= 44^\circ$$

Answer: 44°

---

2. If ∠1 = 103°

Vertically opposite angles are equal.

$$\angle 3 = 103^\circ$$

Adjacent angles:

$$\angle 2 = 180^\circ - 103^\circ = 77^\circ$$
$$\angle 4 = 77^\circ$$

Answer:

$$\angle 2 = 77^\circ, \angle 3 = 103^\circ, \angle 4 = 77^\circ$$

---

3. ∠x and ∠y form a linear pair and ∠x = 3y

$$3y + y = 180^\circ$$
$$4y = 180^\circ$$
$$y = 45^\circ$$
$$x = 135^\circ$$

Answer:

$$x = 135^\circ, y = 45^\circ$$

---

4. ∠a=(2x+10)°, ∠b=(3x-20)° are vertically opposite

$$2x + 10 = 3x - 20$$
$$x = 30$$
$$\angle a = 70^\circ$$
$$\angle b = 70^\circ$$

Answer:

$$x = 30, \angle a = \angle b = 70^\circ$$

---

5. If ∠POQ=(4x+12)° and adjacent angle ∠QOR=(2x+48)°

Linear pair:

$$(4x + 12) + (2x + 48) = 180$$
$$6x + 60 = 180$$
$$x = 20$$

Angles:

$$\angle POQ = 92^\circ$$
$$\angle QOR = 88^\circ$$

Other two angles:

$$92^\circ,\ 88^\circ$$

Answer: $92^\circ, 88^\circ, 92^\circ, 88^\circ$

Practice Time 5.2

1. One angle = 90°

All four angles become 90°.

Answer: $90^\circ, 90^\circ, 90^\circ, 90^\circ$

---

2. ∠1=(2x+10)°

Perpendicular lines ⇒ angle = 90°

$$2x + 10 = 90$$
$$x = 40$$

Answer: $x = 40$

All angles $= 90^\circ$

---

3. Adjacent angles = (3x−15)° and (x+45)°

Linear pair:

$$(3x - 15) + (x + 45) = 180$$
$$4x + 30 = 180$$
$$x = 37.5$$

Angles:

$$97.5^\circ, 82.5^\circ$$

Not perpendicular.

---

4. Vertically opposite angles

$$\begin{aligned} &5x - 25 = 3x + 15 \\ &2x = 40 \\ &x = 20 \end{aligned}$$

Angle:

$$75^\circ$$

Adjacent angle:

$$105^\circ$$

Not perpendicular.

---

5. Road junction angle = 88°

(a) Roads perpendicular? **No**

(b) Other angles:

$$92^\circ,\ 88^\circ,\ 92^\circ$$

Practice Time 5.3

1. FG and FH meet at F

Vertex: F

They meet at endpoint.

---

2. AB and BC share point B

Answer: They are connected line segments.

B is the common endpoint.

---

3. Gap between lines is not constant

1.8 cm at one place and 2.1 cm elsewhere.

Answer: Not parallel.

---

4. Classify

(a) PQ and RS cross inside both segments

Intersecting segments

(b) MN lies partly over MO

Overlapping segments

(c) JK and LM remain same distance apart

Parallel segments

---

5. XY: X(0,1), Y(6,1)

UV: U(2,4), V(8,4)

Both horizontal.

Slope:

$$m = \frac{1-1}{6-0} = 0$$
$$m = \frac{4-4}{8-2} = 0$$

Equal slopes.

Answer: Parallel.

Practice Time 5.4

1(a)

Horizontal crease H is parallel to top and bottom edges.

1(b)

H and V intersect at centre.

1(c)

Angle formed = 90°

2(a)

Parallel creases:

H_1, H_2, H_3

2(b)

Perpendicular to V:

H_1, H_2, H_3

2(c)

Each intersection gives 4 right angles.

3 intersections:

$$3 \times 4 = 12$$

Answer: 12 right angles.

3

D_1 and D_2 are diagonals of square.

Answer: They are perpendicular.

Practice Time 5.5

1. If ∠2 = 75° and ∠2 = ∠4

$$\angle 4 = 75^\circ$$

Property: Vertically opposite angles.

2. ∠x=(3k+8)°, ∠y=(5k−28)°

Vertically opposite:

$$
\begin{aligned}
&3k + 8 = 5k - 28 \\
&2k = 36 \\
&k = 18 \\
&x = y = 62^\circ
\end{aligned}
$$

3. ∠1=(4x+20)°, ∠2=(5x−20)°

Linear pair:

$$
\begin{aligned}
&4x + 20 + 5x - 20 = 180 \\
&9x = 180 \\
&x = 20 \\
&\angle 1 = 100^\circ
\end{aligned}
$$

Vertically opposite angle:

$$\angle 3 = 100^\circ$$

4. Vertically opposite pairs

$$(\angle 1, \angle 3), (\angle 2, \angle 4), (\angle 5, \angle 7), (\angle 6, \angle 8)$$

5. Given

$$
\begin{aligned}
&\angle 5 = 122^\circ \\
&\angle 5 = \angle 7
\end{aligned}
$$

So

$$\angle 7 = 122^\circ$$

Linear pair:

$$\angle 6 = 58^\circ$$

Vertically opposite:

$$\angle 8 = 58^\circ$$

Practice Time 5.6

1.

$$\angle 3 = 110^\circ$$

Corresponding angle:

$$\angle 7 = 110^\circ$$

2.

$$\angle 2 = 73^\circ, \angle 6 = 73^\circ$$

These are corresponding angles.

Equal corresponding angles ⇒ lines are parallel.

Answer: Yes, $l \parallel m$.

Exam Time

MCQs

1. (c) 90°
2. (b) Parallel lines
3. (b) Vertically opposite angles
4. (a) 110°
5. (a) Parallel

Fill in the Blanks

1. Four
2. Linear pair
3. Equal
4. Perpendicular
5. Parallel

True / False

1. True
2. False
3. True
4. False
5. True

Match the Columns

Column A	Column B
Linear pair	Sum = 180°
Vertically opposite angles	Equal and opposite angles
Parallel lines	Lines that never meet
Perpendicular lines	Angle = 90°
Corresponding angles	Same relative position

E. Very Short Answer Type Questions

1. What is the sum of angles in a linear pair?

Solution

Angles in a linear pair always form a straight line.

$$180^\circ$$

Answer: 180°

---

2. Vertically opposite angles are always ______.

Answer: Equal

---

3. What symbol is used for perpendicular lines?

Answer: $\perp$

---

4. How many angles are formed when two lines intersect?

Answer: 4 angles

---

5. If ∠3 = 110° in parallel lines, what is ∠7?

Corresponding angles are equal.

$$\angle 7 = \angle 3 = 110^\circ$$

Answer: 110°

F. Short Answer Type Questions

1. Define a transversal with an example.

Solution

A transversal is a line that intersects two or more lines at different points.

Example: A road crossing two parallel railway tracks.

Answer: A transversal is a line that cuts two or more lines at distinct points.

---

2. If ∠4 = 125°, find its adjacent linear pair angle.

Solution

Linear pair angles sum to 180°.

$$180^\circ - 125^\circ = 55^\circ$$

Answer: 55°

---

3. Why are vertically opposite angles always equal?

Solution

When two lines intersect, adjacent angles form linear pairs (sum = 180°).

Since both vertically opposite angles are supplementary to the same angle, they must be equal.

Answer: Vertically opposite angles are equal because each forms a linear pair with the same adjacent angle.

---

4. How do you identify parallel lines in a window grill diagram?

Solution

Check whether the bars:

- Remain the same distance apart
- Never meet even when extended

Answer: Lines that stay equidistant and never intersect are parallel.

---

5. If ∠5 = 60° in a transversal figure, find ∠7.

Solution

∠5 and ∠7 are vertically opposite angles.

$$\angle 7 = \angle 5$$
$$\angle 7 = 60^\circ$$

Answer: 60°

G. Long Answer Type Questions

1. Two lines intersect at a point. One angle is 90°. Prove the lines are perpendicular and find the other three angles.

Solution By Steps

Step 1: Given

One angle = 90°

Step 2: Vertically opposite angle

Vertically opposite angles are equal.

$$90^\circ$$

Step 3: Adjacent angles

Linear pair:

$$180^\circ - 90^\circ = 90^\circ$$

Both adjacent angles are 90°.

Step 4: Conclusion

All four angles are 90°.

Therefore the lines are perpendicular.

Final Answer

The other three angles are:

$$90^\circ,\ 90^\circ,\ 90^\circ$$

The lines are perpendicular.

---

2. A transversal cuts two lines. Give all angle pairs and explain parallelism using:

(a) Corresponding angles

Angles in same relative position:

$$(\angle 1, \angle 5),\ (\angle 2, \angle 6),\ (\angle 3, \angle 7),\ (\angle 4, \angle 8)$$

If corresponding angles are equal, the lines are parallel.

(b) Alternate Interior Angles

Pairs:

$$(\angle 3, \angle 6)$$
$$(\angle 4, \angle 5)$$

If alternate interior angles are equal, the lines are parallel.

(c) Co-interior Angles

Pairs:

$$(\angle 3, \angle 5)$$
$$(\angle 4, \angle 6)$$

If co-interior angles add to 180°, the lines are parallel.

---

3. Using a ruler and set square, explain how to draw a line parallel to a given line through point A not on it.

Solution

1. Draw the given line l.
2. Place a ruler along line l.
3. Put a set square against the ruler.
4. Hold the ruler fixed.
5. Slide the set square until one edge passes through point A.
6. Draw the new line.

Answer

The drawn line passes through A and is parallel to the given line.

---

4. Alternate interior angles are $(5x - 10)^\circ$and $(3x + 26)^\circ$. Find x and all relevant angles.

Solution By Steps

Alternate interior angles are equal.

$$\begin{aligned}&5x - 10 = 3x + 26\\&2x = 36\\&x = 18\end{aligned}$$

Angle value:

$$\begin{aligned}&5(18) - 10\\&90 - 10\\&80^\circ\end{aligned}$$

Other interior supplementary angle:

$$180^\circ - 80^\circ = 100^\circ$$

Final Answer

$$x = 18$$

Equal angles:

$$80^\circ$$

Supplementary angles:

$$100^\circ$$

Thus the eight angles are:

$$80^\circ,\ 100^\circ,\ 80^\circ,\ 100^\circ,\ 80^\circ,\ 100^\circ,\ 80^\circ,\ 100^\circ$$

---

5. Describe how paper folding helps identify parallel and perpendicular lines.

Solution

Horizontal Fold

Creates a horizontal crease.

Vertical Fold

Creates a vertical crease.

Horizontal and vertical creases intersect at:

$$90^\circ$$

Hence they are perpendicular.

Diagonal Fold

Creates diagonal creases.

Two diagonal creases of a square intersect at right angles.

Multiple horizontal folds remain equally spaced and never meet, so they are parallel.

Final Answer

Paper folding helps visualize:

- Parallel lines through equally spaced folds.
- Perpendicular lines through vertical and horizontal folds.
- Diagonal relationships through diagonal creases.

Competency-Based Questions

Assertion–Reason

1

Assertion: True

Reason: True

Reason correctly explains assertion.

Answer: (a)

2

Assertion: False

Reason: True

Answer: (d)

Case-Based Question

Given:

$$\angle 1 = 110^\circ$$

(a)

Corresponding angles:

$$\angle 5 = 110^\circ$$

(b)

Vertically opposite:

$$\angle 4 = 110^\circ$$

(c)

Adjacent angle:

$$180 - 110 = 70^\circ$$

(d)

$$\angle 3, \angle 5$$

are **co-interior/interior same-side angles**.

(e)

Yes.

$$\angle 6 = \angle 2$$

because corresponding angles are equal in parallel lines.

Chapter -6: Number Play

NCERT CORNER

In-Text Questions

What do the numbers in the figure below tell us?

Solution:
Yes, the number each child says matches this rule in both arrangements.

Write down the number each child should say based on this rule for the arrangement shown below.

Solution:

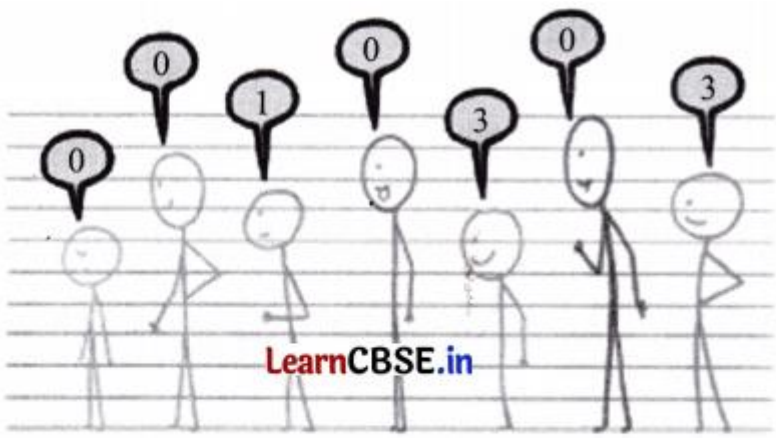
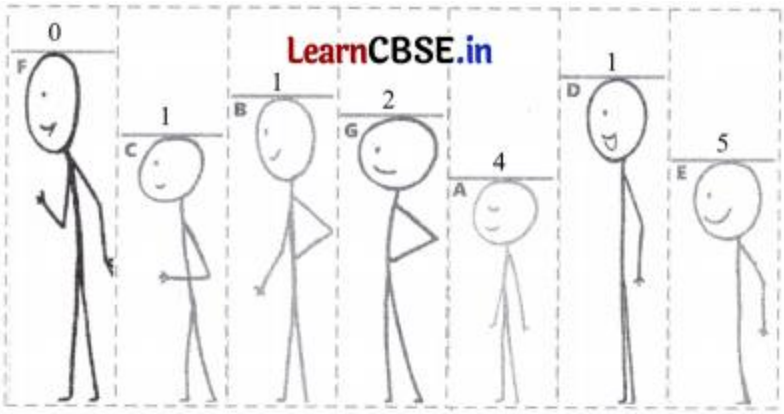
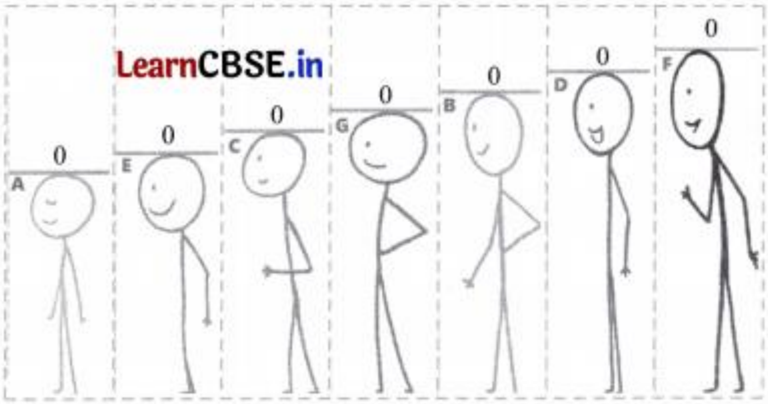


Figure it Out

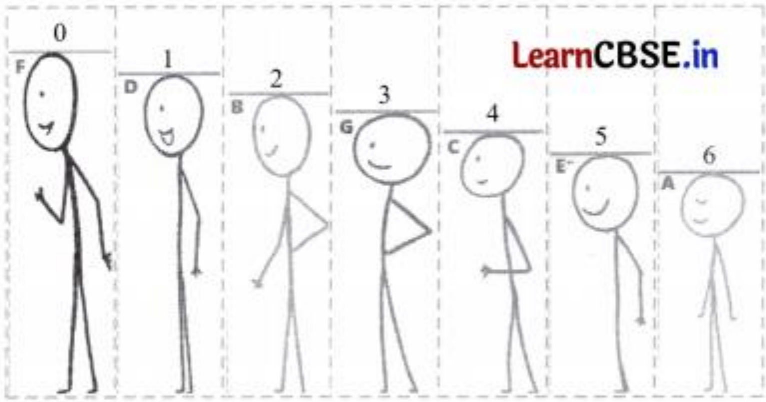
Question 1.
Arrange the stick figure cutouts given at the end, or draw a height arrangement such that the sequence reads:
(a) 0, 1, 1, 2, 4, 1, 5
(b) 0, 0, 0, 0, 0, 0, 0
(c) 0, 1, 2, 3, 4, 5, 6
(d) 0, 1, 0, 1, 0, 1, 0
(e) 0, 1, 1, 1, 1, 1, 1
(f) 0, 0, 0, 3, 3, 3, 3
Solution:
(a) The required arrangement is FCBGADE.



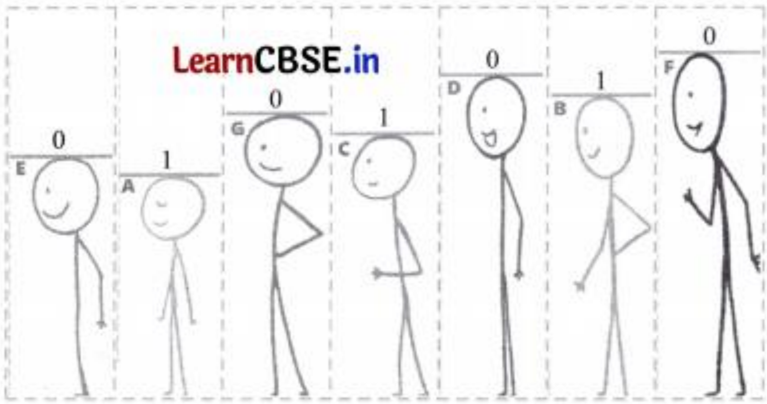
(b) The required arrangement is AECGBDF.



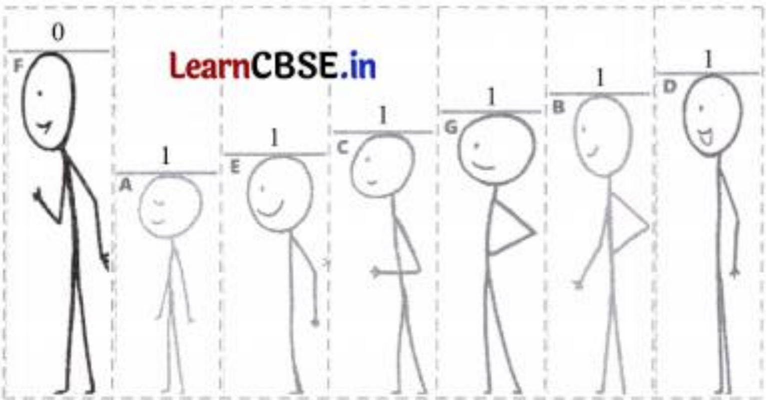
(c) The required arrangement is FDBGCEA.



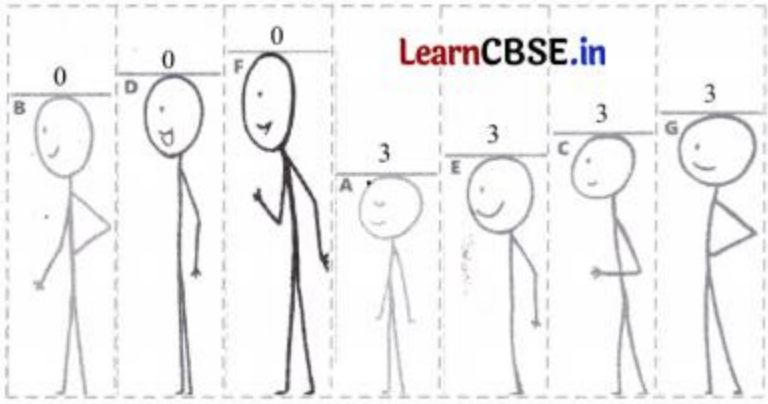
(d) The required arrangement is EAGCDBF.



(e) The required arrangement is FAECGBD.



(f) The required arrangement is BDFAECG.



Question 2.
For each of the statements given below, think and identify if it is Always True, Only Sometimes True, or Never True. Share your reasoning.
(a) If a person says ‘0’, then they are the tallest in the group.
(b) If a person is the tallest, then their number is ‘0’.
(c) The first person’s number is ‘0’.
(d) If a person is not first or last in line (i.e., if they are standing somewhere in between), then they cannot say ‘0’.
(e) The person who calls out the largest number is the shortest.
(f) What is the largest number possible in a group of 8 people?
Solution:
(a) Only Sometimes True: A person says ‘0’ when they see no one taller than themselves. The tallest person will always say ‘0’, but a shorter person can also say ‘0’ if they are at the front or in a position where no one taller is ahead of them. Thus, the given statement is only sometimes true.

(b) Always True: If a person is the tallest, then no one is taller than them, so they will always say ‘0’. So, the given statement is always true.

(c) Always True: Each person is assigned a number that represents how many taller people are ahead of them. Since there is no one ahead of the first person, their number will always be ‘0’. Hence, the given statement is always true.

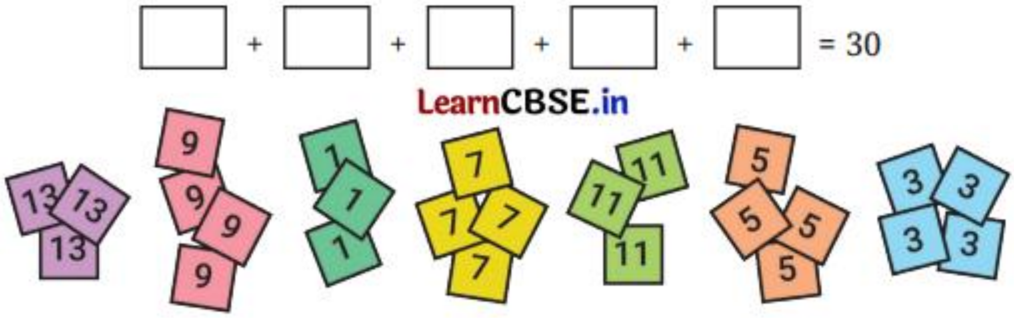
(d) Only Sometimes True: The statement is only sometimes true. A person standing in between can still be assigned ‘0’ if there are no taller people ahead of them.

(e) Only Sometimes True: The statement is only sometimes true. A person who calls out the largest number has many taller people in front but may not be the shortest overall. For example, if the shortest person is standing at the front, they will call out ‘0’. Meanwhile, the second shortest person could be at the back and might call out the largest number.

(f) If there are 8 people, then the shortest person will see 7 taller people. So the maximum number someone can say is 7.

In-Text Questions

1. Kishor has some number cards and is working on a puzzle: There are 5 boxes, and each box should contain exactly 1 number card. The numbers in the boxes should sum to 30. Can you help him fid a way to do it?



Can you figure out which 5 cards add to 30? Is it possible?
Solution:
No, it is not possible, as the sum of 5 odd numbers is always odd and 30 is an even number.

2. In a 3 × 3 grid, there are 9 small squares, which is an odd number.
Meanwhile, in a 3 × 4 grid, there are 12 small squares, which is an even number.

Given the dimensions of a grid, can you tell the parity of the number of small squares without calculating the product?
Solution:
Yes, we can determine the parity of the number of small squares in a grid without directly calculating the full product, simply by observing the parity of the dimensions.
Rule: The product of two numbers is:

- Even if at least one of the numbers is even.

- Odd if both numbers are odd.

Find the parity of the number of small squares in these grids:
(a) 27 × 13
(b) 42 × 78
(c) 135 × 654
Solution:
(a) Both 27 and 13 are odd numbers, and Odd × Odd = Odd.
So, the parity of the number of small squares is odd.
(b) Both 42 and 78 are even numbers, and Even × Even = Even.
So, the parity of the number of small squares is even.
(c) 135 is odd, 654 is even, and Odd × Even = Even.
So, the parity of the number of small squares is even.

Figure it Out

Question 1.
Using your understanding of the pictorial representation of odd and even numbers, find out the parity of the following sums:
(a) Sum of 2 even numbers and 2 odd numbers (e.g., even + even + odd + odd)
(b) Sum of 2 odd numbers and 3 even numbers
(c) Sum of 5 even numbers
(d) Sum of 8 odd numbers
Solution:
(a) Even + Even = Even and Odd + Odd = Even.
Adding the two results, we get Even + Even = Even.
The parity of the result is even.
Example: 2 + 4 + 3 + 5 = 6 + 8 = 14 (Even)

(b) Odd + Odd = Even and Even + Even + Even = Even.
Adding the two results, we get Even + Even = Even.
The parity of the result is even.
Example: 3 + 5 + 2 + 4 + 6 = 8 + 12 = 20 (Even)

(c) Adding any 5 even numbers always gives an even number.
The parity of the result is even.
Example: 2 + 4 + 6 + 8 + 10 = 30 (Even)

(d) Odd + Odd = Even (4 such pairs).
Adding the 4 such results, we get
Even + Even + Even + Even = Even
The parity of the result is even.
Example: 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 = 64 (Even)

Question 2.
Lakpa has an odd number of ₹ 1 coins, an odd number of ₹ 5 coins, and an even number of ₹ 10 coins in his piggy bank. He calculated the total and got ₹ 205. Did he make a mistake? If he did, explain why. If he didn't, how many coins of each type could he have?
Solution:
Lapka has an odd number of ₹ 1 coins, so their total value is odd.
He also has an odd number of ₹ 5 coins, so their total is also odd.
The ₹ 10 coins are even in numbers, so their total is even.
Now, adding two odd sums, we get
Odd (from ₹ 1) + Odd (from ₹ 5) = Even
Adding the ₹ 10 coins' total (even sum) to this even sum,
Even + Even = Even
Since 205 is an odd number, the total of ₹ 205 is not possible with an odd number of ₹ 1 and ₹ 5 coins and an even number of ₹ 10 coins. Therefore, Lakpa made a mistake.

Question 3.
We know that:
(a) even + even = even
(b) odd + odd = odd
(c) even + odd = odd
Similarly, find out the parity for the following scenarios:
(d) even – even = ____________________
(e) odd – odd = ____________________
(f) even – odd = ____________________
(g) odd – even = ____________________
Solution:
(d) even – even
Example:
$6 - 2 = 4 \rightarrow$ even
$8 - 4 = 4 \rightarrow$ even
Parity of result = even
∴ even – even = even

(e) odd-odd
Example:
$7 - 3 = 4 \rightarrow$ even
$9 - 5 = 4 \rightarrow$ even

Parity of result = even
∴ odd – odd = even

(f) even-odd
Example:
8 – 3 = 5
12 – 5 = 7
Parity of result = odd
∴ even – odd = odd

(g) odd-even
Example:
7 – 2 = 5
9 – 6 = 3
Parity of result = odd
∴ odd – even = odd

In-Text Questions

1. Solution

9	1	3	13
8	2	4	14
7	6	5	18
24	9	12	

7	8	9	24
4	6	5	15
1	2	3	6
12	16	17	

Figure it Out

Question 1.
How many different magic squares can be made using numbers 1-9?
Solution:
Using the numbers 1-9, there is exactly one unique magic square (excluding rotations and reflections).

8	1	6
3	5	7
4	9	2

If transformations like rotations are allowed, then there are 8 variations of this magic square.

Question 2.
Create a magic square using numbers 2-10. What strategy would you use for this? Compare it with the magic squares made using 1-9.
Solution:
The numbers 2-10 are 9 consecutive numbers, just like 1-9, but increased by 1.

8	1	6
3	5	7
4	9	2

Strategy: Start with the classic 1-9 magic square, and add 1 to each number.
Original: After adding 1 to each:

9	2	7
4	6	8
5	10	3

The magic square for numbers 2-10 would have a different magic sum (18) compared to numbers 1-9 (15). The structure remains similar, but the values are shifted up by 1.

Question 3.
Take a magic square, and
(a) Increase each number by 1
(b) Double each number
In each case, is the resulting grid also a magic square? How do the magic sums change in each case?
Solution:
Original:

8	1	6
3	5	7
4	9	2

(a) After increasing each number by 1:
This is still a magic square.
New magic sum = 18

9	2	7
4	6	8
5	10	3

(b) After doubling each number

Still a magic square
New magic sum = 30

16	2	12
6	10	14
8	18	4

In case (a), adding a constant to every number, → magic sum increases by 3 × that constant.
In case (b), multiplying all by a constant → magic sum multiplied by that constant.

Question 4.
What other operations can be performed on a magic square to yield another magic square?
Solution:
Do it yourself.

Question 5.
Discuss ways of creating a magic square using any set of 9 consecutive numbers (like 2-10, 3-11, 9-17, etc.).
Solution:
The magic square for numbers 2-10 can be seen in solution 2 above.

10	3	8
5	7	9
6	11	4

For the magic square using numbers 3-11, add 2 to each number in the original, and we get the adjoining magic square.

16	9	14
11	13	15
12	17	10

Here, magic sum = 21
For the magic square using numbers 9-17, add 8 to each number in the original, and we get a square as shown alongside.
Here, magic sum = 39

In-Text Questions

1. Choose any magic square that you have made so far using consecutive numbers. If m is the letter-number of the number in the centre, express how other numbers are related to m, how much more or less than m.
[Hint: Remember how we described a 2 × 2 grid of a calendar month in the Algebraic Expressions chapter].
Solution:
Consider the magic square

8	1	6
3	5	7
4	9	2

We can express it using the letter-number m as:

$m+3$	$m-4$	$m+1$
$m-2$	m	$m+2$
$m-1$	$m+4$	$m-3$

2.

The first ever recorded 4 × 4 magic square is found in a 10th-century inscription at the Parshvanath Jain temple in Khajuraho, India, and is known as the Chautisa Yantra

7	12	1	14
2	13	8	11
16	3	10	5
9	6	15	4

The first ever recorded 4 × 4 magic square, the Chautlsa Yantra, at Khajuraho, India
Chautls means 34. Why do you think they called it the Chautisa Yantra?
Every row, column, and diagonal in this magic square adds up to 34.

Can you find other patterns of four numbers in the square that add up to 34?
Solution:
Yes, we can find different combinations of 4 numbers that add up 34 in the given square.

- Sum of 4 comer numbers: 7 + 14 + 4 + 9 = 34

- Sum of 4 central numbers: $13 + 8 + 10 + 3 = 34$
- Sum of 4 numbers in any 2×2 squares:
- For example, top-left square: $7 + 12 + 13 + 2 = 34$

Figure it Out

Question 1.
Using this generalised form, find a magic square if the centre number is 25.
Solution:

25 + 3	25 – 4	25 + 1
25 – 2	25	25 + 2
25 – 1	25 + 4	25 – 3

➡

28	21	26
23	25	27
24	29	22

Question 2.
What is the expression obtained by adding the 3 terms of any row, column, or diagonal?
Solution:
Row sum (1st row) = $28 + 21 + 26 = 75$
Column sum (1st column) = $28 + 23 + 24 = 75$
Diagonal sum (1st column) = $28 + 25 + 22 = 75$
The expression obtained = $3 \times m$
where m is the letter-number representing the number in the centre.

Question 3.
Write the result obtained by
(a) Adding 1 to every term in the generalised form.
(b) Doubling every term in the generalised form.
Solution:

(a)

$m + 4$	$m - 3$	$m + 2$
$m - 1$	$m + 1$	$m + 3$
m	$m + 5$	$m - 2$

(b)

$2m + 6$	$2m - 8$	$2m + 2$
$2m - 4$	$2m$	$2m + 4$
$2m - 2$	$2m + 8$	$2m - 6$

Question 4.
Create a magic square whose magic sum is 60.

Solution:
A 3 × 3 magic square's sum is 3 × the middle element.
So, for a sum of 60, the middle element should be = 20.
To get a magic sum of 60, we will multiply the original magic square by 4, i.e.,

8	1	6
3	5	7
4	9	2

→

8 × 4	1 × 4	6 × 4
3 × 4	5 × 4	7 × 4
4 × 4	9 × 4	2 × 4

→

32	4	24
12	20	28
16	36	8

Question 5.
Is it possible to get a magic square by filling nine non-consecutive numbers?
Solution:
Yes, it is possible.
Justification: Let us consider the two magic squares with a magic sum 45.

18	11	16
13	15	17
14	19	12

9 consecutive numbers

and

24	3	18
9	15	21
12	27	6

9 non-consecutive numbers

6. Use the systematic method to write down all 6-beat rhythms, i.e., write 6 as the sum of 1's and 2's in all possible ways. Did you get 13 ways?
Solution:
Here n = 6
Write a '1+' in front of all rhythms having 5 beats and then a '2+' in front of all rhythms having 4 beats. This gives us all the rhythms having 6 beats.

1 + 1 + 1 + 1 + 1 + 1	2 + 2 + 1 + 1
1 + 1 + 1 + 1 + 2	2 + 1 + 2 + 1
1 + 1 + 1 + 2 + 1	2 + 1 + 1 + 2
1 + 1 + 2 + 1 + 1	1 + 2 + 1 + 2
1 + 2 + 1 + 1 + 1	2 + 2 + 2
2 + 1 + 1 + 1 + 1	
1 + 1 + 2 + 2	
1 + 2 + 2 + 1	

Yes, we get a total of 13 ways.

7. Write the next 3 numbers in the sequence:
1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ____, ____, ____, ……
If you have to write one more number in the sequence above, can you tell whether it will be an odd number or an even number (without adding the two

previous numbers)?
Solution:
The next 3 terms in the sequence are:
55 + 89 = 144
89 + 144 = 233
144 + 233 = 377
To determine if the next number after 377 is odd or even without adding the previous terms, let's examine the parity of the sequence.
Parity pattern: 1 (odd), 2 (even), 3 (odd), 5 (odd), 8 (even), 13 (odd), 21 (odd), 34 (even), 55 (odd), 89 (odd), 144 (even), 233 (odd), 377 (odd).

8. What is the parity of each term in the sequence? Do you notice any pattern in the sequence of parities?
Solution:
Here, the parity alternates as follows:
odd, odd, eve,n i.e., two odd numbers are followed by one even number.
So, the next number (after 377) will be even, as per the repeating parity cycle.
The pattern of parities: Repeats every 3 terms as Odd, Odd, Even.

9. Let us look at one more example shown on the right.

$$\begin{array}{r} K2 \\ +\ K2 \\ \hline HMM \end{array}$$

Here, K2 means that the number is a 2-digit number having the digit '2' in the units place and 'K' in the tens place. K2 is added to itself to give a 3-digit sum HMM. What digit should the letter M correspond to?
Both the tens place and the units place of the sum have the same digit.

$$\begin{array}{r} 72 \\ +\ 72 \\ \hline 144 \\ \hline \end{array}$$

What about H? Can it be 2? Can it be 3?
Solution:
The possible value of two 2-digit numbers 72 with unit digit 2 is 72 + 72 = 144.
M corresponds to 4 and H corresponds 144 to 1.
So, H cannot be 2 or 3.

10. These types of questions can be interesting and fun to solve! Here are some more questions like this for you to try out. Find out what each letter stands for. Share how you thought about each question with your classmates; you may find

some new approaches.

$$\begin{array}{r} YY \\ +\ \ Z \\ \hline ZOO \end{array} \qquad \begin{array}{r} B5 \\ +\ 3D \\ \hline ED5 \end{array} \qquad \begin{array}{r} KP \\ +\ KP \\ \hline PRR \end{array} \qquad \begin{array}{r} C1 \\ +\ \ C \\ \hline 1FF \end{array}$$

Solution:
YY is a 1 two-digit number where both digits are the same.
So it can be 99, 88,…..
But, Z is a 1-digit number and ZOO is a 1 3-digit number.
So, Y = 9, Z = 1, and O = 0.

$$\begin{array}{cccc} & & Y & Y \\ + & & & Z \\ \hline & Z & O & O \end{array} \qquad \begin{array}{cccc} & & 9 & 9 \\ + & & & 1 \\ \hline & 1 & 0 & 0 \end{array}$$

Here, $5 + D = 5 \Rightarrow D = 0$
Now, $B + 3 = E0 \Rightarrow B = 7$
If B = 7, then E = 1
So, we have B = 7, D = 0, and E = 1

$$\begin{array}{ccc} & B & 5 \\ + & 3 & D \\ \hline E & D & 5 \end{array} \qquad \begin{array}{ccc} & 7 & 5 \\ + & 3 & 0 \\ \hline 1 & 0 & 5 \end{array}$$

Here, KP is a 2-digit number and PRR is a 3-digit number.
Basically, $2 \times (KP) = PRR$. So, P = 1.
If P = 1, then R = 2.
Hence, K = 6, P = 1, R = 2.

$$\begin{array}{ccc} & K & P \\ + & K & P \\ \hline P & R & R \end{array} \qquad \begin{array}{ccc} & 6 & 1 \\ + & 6 & 1 \\ \hline 1 & 2 & 2 \end{array}$$

Here, C + 1 is a two-digit number i.e., 10.
So, $C = 9 \Rightarrow F = 0$

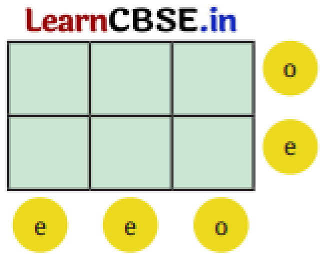
$$\begin{array}{cccc} & & C & I \\ + & & & C \\ \hline & I & F & F \end{array} \qquad \begin{array}{cccc} & & 9 & 1 \\ + & & & 9 \\ \hline & 1 & 0 & 0 \end{array}$$

Figure it Out

Question 1.
A light bulb is ON. Doijee toggles its switch 77 times. Will the bulb be on or off? Why?
Solution:

Dorjee toggles the switch 77 times.
Each toggle changes the state of the bulb (ON to OFF or OFF to ON).
Starting from ON:
An odd number of toggles will leave the bulb OFF, and an even number of toggles will leave the bulb ON.
Since 77 is odd, after 77 toggles, the bulb will be OFF.

Question 2.
Liswini has a large old encyclopaedia. When she opened it, several loose pages fell out of it. She counted 50 sheets in total, each printed on both sides. Can the sum of the page numbers of the loose sheets be 6000? Why or why not?
Solution:
Suppose there are 50 random sheets from a book. Each sheet has two page numbers, one odd page number on the front in the form $2n – 1$, one even page number on the back, in the form $2n$.
So, the total of both page numbers on one sheet is: $(2n – 1) + (2n) = 4n – 1$
For 50 sheets, if $n1, n2, \ldots, n50$ are the respective sheet numbers (not necessarily consecutive), then the total sum of all 50 sheets is:
$(4n1 – 1) + (4n2 – 1) + \ldots + (4n50 – 1)$
This can be written as: $4(n1 + n2 + \ldots + n50) – 50$
Now, $4(n1 + n2 + \ldots + n50)$ is always divisible by 4 because it is a multiple of 4. But when we subtract 50 from it, the result is not divisible by 4 (because 50 is not a multiple of 4). So, the total sum of the 50 page numbers will not be divisible by 4. Hence, the sum of the page numbers of the loose sheets can never be 6000, because 6000 is divisible by 4 (since $6000 \div 4 = 1500$).

Question 3.
Here is a 2×3 grid. For each row and column, the parity of the sum is written in the circle; ‘e’ for even and ‘o’ for odd. Fill the 6 boxes with 3 odd numbers (‘o’) and 3 even numbers (‘e’) to satisfy the parity of the row and column sums.


Solution:
Let’s label the cells as:

A	B	C
D	E	F

So the constraints are:

- Row 1 (A, B, C): sum is odd
- Row 2 (D, E, F): sum is even
- Column 1 (A, D): sum is even
- Column 2 (B, E): sum is even
- Column 3 (C, F): sum is odd

We'll track parities only (o or e), not actual numbers.
Row 1: A = o, B = e, C = e, then o + e + e = odd
Column 1 (A, D) = e means A must be paired with D to get the sum as even.
So, if A = o, D = o, then o + o = even
Similarly, if B = e, E = e, then e + e = even
Again, if C = e, F = o, then e + o = odd
So, the 6 boxes with 3 odd numbers and 3 even numbers are as follows:

o	*e*	*e*	*o*
o	*e*	*o*	*e*
e	*e*	*o*	

as

1	2	4	*o*
3	6	9	*e*
e	*e*	*o*	

Question 4.
Make a 3 × 3 magic square with 0 as the magic sum. All numbers can not be zero. Use negative numbers, as needed.
Solution:
It is given that

- The magic square is 3 × 3.
- The magic sum is 0.
- All numbers in the square cannot be zero; we can use negative numbers as needed.

So, we will use the numbers (-4) to 4 to create a magic square whose magic sum is 0.

–3	2	1
4	0	–4
–1	–2	3

Question 5.
Fill in the following blanks with 'odd' or 'even':
(a) Sum of an odd number of even numbers is _______
(b) Sum of an even number of odd numbers is _______
(c) Sum of an even number of even numbers is _______
(d) Sum of an odd number of odd numbers is _______
Solution:
(a) Sum of odd number of even numbers is even.
(b) Sum of even number of odd numbers is even.
(c) Sum of even number of even numbers is even.
(d) Sum of odd number of odd numbers is odd.

Question 6.
What is the parity of the sum of numbers from 1 to 100?
Solution:
The sum of numbers from 1 to 100 is as follows:

$$1+2=\frac{2\times 3}{2}=3$$

$$1+2+3=\frac{3\times 4}{2}=6$$

$$1+2+3+4=\frac{4\times 5}{2}=10$$

$$1+2+3+\ldots+100=\frac{100\times 101}{2}=5050$$

Since 5050 is an even number, the parity is even.

Question 7.
Two consecutive numbers in the Virahanka sequence are 987 and 1597. What are the next 2 numbers in the sequence? What are the previous 2 numbers in the sequence?
Solution:

The given numbers are 987 and 1597.
In the Virahanka sequence, each number is the sum of the two preceding numbers.
The next two numbers are:
987 + 1597 = 2584
1597 + 2584 = 4181
The previous two numbers are:
1597 – 987 = 610
987 – 610 = 377
The sequence is …..,377, 610, 987, 1597, 2584, 4181,…..

Question 8.
Angaan wants to climb an 8-step staircase. His playful rule is that he can take either 1 step or 2 steps at a time. For example, one of his paths is 1, 2, 2, 1, 2. In how many different ways can he reach the top?
Solution:
Ways in which Angaan can climb 8 steps with 1 or 2 steps are as follows:
For n = 8

Different ways	Number of Ways
1 + 1 + 1 + 1 + 1+ 1 + 1 + 1	1
1 + 1 + 1 + 1 + 1 + 1 + 2	7
1 + 1 + 1 + 1 + 1 + 2 +1	
1 + 1 + 1 + 1 + 2 + 1 + 1	
1 + 1 + 1 + 2 + 1 + 1 + 1	
1 + 1 + 2 + 1 + 1 + 1 + 1	
1 + 2 + 1 + 1 + 1 + 1 +1	
2 + 1 + 1 + 1 + 1 + 1 + 1	
1 + 1 + 1 + 1 + 2 + 2	15
1 + 1 + 1 +2 + 1 + 2	
1 + 1 + 2 + 1 + 1 + 2	
1 + 2 + 1 + 1 + 1 + 2	
2 + 1 + 1 + 1 + 1 + 2	
1 + 1 + 1 + 2 + 2 + 1	
1 + 1 + 2 + 1 + 2 + 1	
1 + 2 + 1 + 1 + 2 + 1	
2 + 1 + 1 + 1 + 2 + 1	
1 + 1 + 2 + 2 + 1 + 1	
1 + 2 + 1 + 2 + 1 + 1	
2 + 1 + 1 + 2 + 1 + 1	
1 + 2 + 2 + 1 + 1 + 1	
2 + 1 + 2 + 1 + 1 + 1	
2 + 2 + 1 + 1 + 1 + 1	
1 + 1 + 2 + 2 + 2	10
1 + 2 + 2 + 2 + 1	
2 + 2 + 2 + 1 + 1	
1 + 2 + 1 + 2 + 2	
2 + 1 + 1 + 2 + 2	
2 + 1 + 2 + 2 +1	
1 + 2 + 2 + 1 + 2	
2 + 1 + 2 + 1 + 2	
2 + 2 + 1 + 1 + 2	
2 + 1 + 1 + 2 + 2	
2 + 2 + 2 + 2	1

So, the total ways in which Angaan reaches the top = 1 + 7 + 15 + 10 + 1 = 34 ways.

Question 9.
What is the parity of the 20th term of the Virahanka sequence?
Solution:
Consider the Virahanka sequence given below:
1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, 610, 987,…..
Let us observe the pattern of odd/even in Virahanka numbers given above:
Here 1 → odd
2 → even
3 → odd
5 → odd
8 → even
13 → odd
21 → odd
34 → even
So parity cycle is: odd, even, odd, (repeats every 3 terms)
So the 20th term of the Virahanka sequence is even.

Question 10.
Identify the true statements.
(a) The expression 4m – 1 always gives odd numbers.
(b) All even numbers can be expressed as 6j – 4.
(c) Both expressions 2p + 1 and 2q – 1 describe all odd numbers.
(d) The expression 2f + 3 gives both even and odd numbers.
Solution:
(a) Substituting m = 1 in 4m – 1 = 4 × 1 – 1 = 3 (odd).
Substituting m = 2 in 4m – 1= 4 × 2 – 1 = 7 (odd).
Thus, the expression 4m – 1 always gives odd numbers.
This statement is true.

(b) Substituting j = 1 in 6j – 4 = 6 × 1 – 4 = 2 (even).
Substituting j = 2 in 6j – 4 = 6 × 2 – 4 = 8 (even).
This expression produces even numbers, but it does not produce all even numbers (for e.g., it skips 4 and 6).
This statement is false.

(c) Substituting p = 1, 2, 3,….. in 2p + 1, we get 3, 5, 7,…..
Substituting q = 1, 2, 3,…. in 2q + 1, we get 1, 3, 5, 7,…….
Here, 2q – 1 describes all the odd numbers but 2p + 1 does not describe 1.
Thus, this statement is false.

(d) Substituting f = 1, 2f + 3 = 2 × 1 + 3 = 5 (odd).
Substituting f = 2, 2f + 3 = 2 × 2 + 3 = 7 (odd).
The expression 2f + 3 always gives odd numbers because 2f is even and adding 3 makes it odd.
This statement is false.

Question 11.
Solve this cryptarithm:

$$\begin{array}{r} UT \\ +\ TA \\ \hline TAT \end{array}$$

Solution:
Here, T is at hundreds place, so T = 1
⇒ A = 0 and U = 9.
So, we have U = 9, T = 1, and A = 0.

$$\begin{array}{rrr} & U & T \\ + & T & A \\ \hline T & A & T \\ \hline \end{array} \qquad \begin{array}{rrr} & 9 & 1 \\ + & 1 & 0 \\ \hline 1 & 0 & 1 \\ \hline \end{array}$$

Practice Time 6.1

1. Arrange the cut-outs so the sequence matches.

Possible height orders (Tallest = T, Shortest = S):

(a) 0,1,2,3,3,2,1 → Possible order: T, next, next, S, next, next, next

(b) 0,0,0,1,2,3,4 → One tallest among first three, shortest at end

(c) 0,2,2,2,2,2 → One tallest at front, others arranged suitably

(d) 0,1,1,1,2,2,2 → Valid arrangement with equal counts repeated

(e) 0,1,0,1,0,1,0,1 → Alternate tall-short arrangement

(f) 0,0,0,0,4,4,4,4 → Four tallest first, four shortest later

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2. Think and Reason

(a) Tallest person always says 0.

Answer: Always True

(b) Shortest person always says the largest number.

Answer: Sometimes True

(c) First person in line can sometimes say a number greater than 0.

Answer: Never True

(d) Two different people can say the same number.

Answer: Always True

(e) In a group of 5 children, largest possible number is 4.

Answer: Always True

(f) If two children have the same height, they always say the same number.

Answer: Never True

Practice Time 6.2

1. Decide parity

(a) Sum of 3 even numbers = Even

(b) Sum of 3 odd numbers = Odd

(c) Sum of 2 even + 1 odd = Odd

(d) Sum of 4 odd + 2 even = Even

---

2. Asha's coins

- Even number of ₹2 coins → Even amount
- Odd number of ₹5 coins → Odd amount
- Odd number of ₹10 coins → Even amount

Total:

Even + Odd + Even = Odd

137 is odd.

Answer: Yes, she calculated correctly.

Practice Time 6.3

1. Decide parity

(a)

$$19 \times 21$$

Odd × Odd = Odd

Answer: Odd

(b)

$$18 \times 27$$

Even × Odd = Even

Answer: Even

(c)

$$33 \times 40$$

Odd × Even = Even

Answer: Even

---

2. Odd product

Possible:

✓ (odd, odd)

Not possible:

✗ (even, odd)

✗ (even, even)

---

3. Smallest even value of $\boldsymbol{a \times 17}$

Smallest even $a = 2$

$$2 \times 17 = 34$$

Answer: 34

---

4. If $a \times b$is even and $a$is odd

Then $b$must be even.

---

5. Three pairs with odd totals

(1,2)

(3,4)

(5,6)

---

6. Three pairs with even totals but both not even

(1,3)

(5,7)

(9,11)

---

7. Board = $25 \times k$

25 is odd.

Total odd ⇒ $k$must be odd.

Among {22,23,24,25}

Answer: $k = 23$or 25

---

8. If $a \times b$is odd, then $a + b$is even?

Odd product ⇒ both odd.

Odd + Odd = Even.

Answer: True

Practice Time 6.4

1. Show row sums = 45

Numbers 1–9 sum to

$$1+2+3+4+5+6+7+8+9=45$$

Three rows each sum to magic sum M

$$3M=45$$

Hence

$$M=15$$

---

2. Derive magic sum

$$\frac{45}{3}=15$$

Answer: 15

---

3. Centre cannot be 9 or 1

Centre must balance all rows, columns and diagonals.

Only 5 works.

---

4. Fill a 3×3grid

One example:

$$\begin{pmatrix} 4 & 9 & 2 \\ 3 & 5 & 7 \\ 8 & 1 & 6 \end{pmatrix}$$

All rows, columns and diagonals sum to 15.

---

5. Double every entry

Magic sum:

15

After doubling:

30

Answer: Magic sum doubles.

Practice Time 6.5

1. Rhythms for 3 beats

Possible:

111

12

21

Total = 3

---

2. Rhythms for 4 beats

1111

112

121

211

22

Total = 5

Matches Virahanka sequence.

---

3. Find rhythms for 7 beats

Virahanka sequence:

1,2,3,5,8,13,21

$$V_7 = 21$$

Answer: 21

---

4. 9-beat line

$$V_9 = 55$$

Answer: 55 rhythms

---

5. Next three terms

1,2,3,5,8,13,21

Next:

$$34,\ 55,\ 89$$

---

6. Daisy with 34 petals

34 is a Virahanka/Fibonacci number.

Examples:

21 petals, 55 petals, 89 petals.

Practice Time 6.6

1. Solve A + A = B

B two-digit

$$2A \geq 10$$

Smallest:

$$A = 5,\ B = 10$$

---

2. Find digits

$$\begin{aligned}&C + C + C = DC\\&3C = 10D + C\\&2C = 10D\end{aligned}$$

Possible:

$$C = 5,\ D = 1$$

since

$$5 + 5 + 5 = 15$$

Answer: $C = 5,\ D = 1$

---

3. Solve

$$\begin{aligned}&M2 + M2 = N44\\&2(10M + 2) = 100N + 44\\&20M + 4 = 100N + 44\\&20M = 100N + 40\\&M = 5N + 2\end{aligned}$$

Taking $N = 1$

$$M = 7$$

Check:

$$72 + 72 = 144$$

Answer: $M = 7,\ N = 1$

---

4. If $\boldsymbol{XY + XY = ZZZ}$

$$2(10X + Y) = 111Z$$

Only possibility:

$$37 + 37 = 74$$

No 3-digit result possible.

Answer: No solution in digits.

---

5. $\boldsymbol{AB + AB = CDE}$

Example:

$$55 + 55 = 110$$

Thus

$$A = 5,\ B = 5,\ C = 1,\ D = 1,\ E = 0$$

---

6. $\boldsymbol{PQ + R = RSS}$

One solution:

$$95 + 4 = 99$$

So

$$P = 9,\ Q = 5,\ R = 4,\ S = 9$$

---

7. $\boldsymbol{K1 + K1 = MM}$

$$2(10K + 1) = 11M$$
$$20K + 2 = 11M$$

Try $K = 3$:

$$31 + 31 = 62$$

Not same digits.

Try $K = 4$:

$$41 + 41 = 82$$

Not.

Try $K = 5$:

$$51 + 51 = 102$$

No.

No valid repeated-digit solution.

Answer: No solution.

Q8

Challenge:

$$SEND + MORE = MONEY$$

This is the famous cryptarithm where each letter represents a unique digit.

Step 1: Find the digits

The correct assignment is:

Letter	Digit
S	9
E	5
N	6
D	7
M	1
O	0
R	8
Y	2

Step 2: Substitute the digits

$$SEND = 9567$$
$$MORE = 1085$$
$$MONEY = 10652$$

Step 3: Verify

$$9567 + 1085$$
$$= 10652$$

Thus,

$$\boxed{9567 + 1085 = 10652}$$

Answer

$$\boxed{S = 9,\ E = 5,\ N = 6,\ D = 7,\ M = 1,\ O = 0,\ R = 8,\ Y = 2}$$

and

$$\boxed{9567 + 1085 = 10652}$$

✔ Cryptarithm solved.

EXAM TIME

A. Multiple Choice Questions (MCQs)

1. Sum of two odd numbers is always:
   Answer: (b) Even
2. Magic sum of a 3×3magic square using 1–9:
   Answer: (b) 15
3. Number of rhythms for 6 beats in Virahanka-Fibonacci sequence:
   Sequence: 1, 2, 3, 5, 8, **13**

Answer: (b) 13

4. Grid dimensions 27×13:

$$27 \times 13 = 351$$

351 is odd.

Answer: (b) odd

5. $T + T + T = UT$

$$3T = 10U + T$$
$$2T = 10U$$
$$T = 5, U = 1$$

Answer: (b) 5

B. Fill in the Blanks

1. The sum of two consecutive numbers is always **odd**.
2. The 10th term of Virahanka-Fibonacci sequence:

$$1,2,3,5,8,13,21,34,55,89$$

Answer: 89

3. In a 3×3magic square, the centre number is always **5**.
4. Odd × Odd = **Odd**
5. $K2 + K2 = HMM$

$$72 + 72 = 144$$

So $K = 7,\ H = 1,\ M = 4$

Answer: 4

C. True / False

1. Product of two even numbers is always even.
   True
2. Sum of five odd numbers can be even.
   False

3. Every row, column and diagonal in Chautisa Yantra adds to 34.
   True
4. The 20th Virahanka-Fibonacci term is 6765.
   True
5. Same letter can stand for different digits in a cryptarithm.
   False

D. Match the Columns

Column A	**Column B**
Odd + Odd	Even
Even × Odd	Even
Magic sum of 3×3square	15
V (Virahanka number)	Height Pattern
Sequence: 3,2,3,1,1,0	Height Pattern

Answers

1 → b

2 → e

3 → a

4 → c

5 → d

E. Very Short Answer Questions

1. Centre number of a 3×3magic square?

Answer: 5

2. Parity of 27×13?

Odd × Odd = Odd

Answer: Odd

3. Next Virahanka-Fibonacci number after 21?

Answer: 34

4. What is V_6?

Sequence: 1,2,3,5,8,13

Answer: 13

5. What does $A + A = B$(B two-digit) give for A?

$$2A \geq 10$$

Smallest possibility:

$$A = 5, B = 10$$

Answer: $A \geq 5$(least value 5)

F. Short Answer Type Questions

1. Why is the sum of two consecutive numbers always odd?

Let the numbers be $n$and $n + 1$.

$$n + (n + 1) = 2n + 1$$

Since $2n + 1$is always odd, the sum is always odd.

---

2. How many 7-beat rhythms exist using 1s and 2s?

Virahanka-Fibonacci sequence:

$$1,2,3,5,8,13,21$$

Thus,

$$V_7 = 21$$

Answer: 21 rhythms.

---

3. What must be true of $b$if $a \times b$is odd?

A product is odd only when both factors are odd.

Answer: $b$must be odd.

---

4. Identify which terms in $\mathbf{2, 5, 8, 11, 14}$, ...are odd.

Sequence alternates:

$$2(E),\ 5(O),\ 8(E),\ 11(O),\ 14(E), \ldots$$

Answer: 5, 11, 17, 23, … (every second term).

---

5. What is the parity of $\boldsymbol{n(n+1)}$?

Two consecutive numbers contain one even number.

Therefore,

$$n(n+1)$$

is always divisible by 2.

Answer: Always even.

G. Long Answer Type Questions

1. Construct a 3×3magic square using 1–9 and verify its magic sum.

$$\boxed{\begin{matrix} 8 & 1 & 6 \\ 3 & 5 & 7 \\ 4 & 9 & 2 \end{matrix}}$$

Verification:

Rows:

$$\begin{gathered} 8+1+6=15 \\ 3+5+7=15 \\ 4+9+2=15 \end{gathered}$$

Columns:

$$8 + 3 + 4 = 15$$
$$1 + 5 + 9 = 15$$
$$6 + 7 + 2 = 15$$

Diagonals:

$$8 + 5 + 2 = 15$$
$$6 + 5 + 4 = 15$$

Magic Sum = 15

---

2. Explain why the centre of a 3×3magic square cannot be 1 or 9.

In a 3×3magic square using 1–9:

- Total sum = 45
- Magic sum = 15
- Centre must balance all rows, columns and diagonals.

The middle value among 1–9 is 5.

If 1 or 9 is placed at the centre, equal sums of 15 in every row, column and diagonal cannot be obtained.

Therefore, the centre must be 5 and cannot be 1 or 9.

Additional Questions (Above Competency Section)

3. A child sequence is 3, 2, 3, 1, 1, 0. What does it tell about height arrangement?

Each number shows how many taller children are ahead.

- Last child says 0 → tallest child.
- Equal numbers can occur when children have different positions but the same count of taller children ahead.

Answer: The sequence represents a valid height arrangement with the tallest child at the end.

---

4. Asha mixes even number of ₹2 coins, odd number of ₹5 coins and odd number of ₹10 coins. Total = ₹137. Explain the error.

Parity:

- Even × ₹2 = Even
- Odd × ₹5 = Odd
- Odd × ₹10 = Even

Total:

$$Even + Odd + Even = Odd$$

137 is odd.

Answer: No error. The total can indeed be ₹137.

---

5. Show that doubling every entry in a magic square doubles its magic sum.

Suppose magic sum = M.

If every number is doubled:

Each row sum becomes

$$2M$$

Similarly every column and diagonal sum becomes

$$2M$$

Therefore, doubling every entry doubles the magic sum.

Competency-Based Questions

A. Assertion–Reason

1.

Assertion: Sum of an even number of odd numbers is always even.

Reason: Pairing odd numbers always produces even sums.

Both statements are true and Reason explains Assertion.

Answer: (a)

2.

Assertion: The 8-beat rhythms in Virahanka sequence total 34.

Sequence:

$$1,2,3,5,8,13,21,34$$

Assertion is true.

Reason: Each term equals sum of previous two terms.

Also true and explains the sequence.

Answer: (a)

B. Case-Based Question

Sequence:

$$3,2,3,1,1,0$$

(1) How many children are in the line?

There are 6 entries.

Answer: 6 children.

---

(2) Who must be at the back of the line?

The tallest child.

Answer: Tallest child.

---

(3) If the second child says “2”, what does it tell?

There are exactly 2 taller children ahead of that child.

---

(4) Can two different children say the same number?

Yes.

Example: sequence contains two 3's and two 1's.

Answer: Yes.

C. Math Booster

1.

Sequence:

$$2,0,3,1,1,0$$

(a) How many children are taller than child in position 3?

Position 3 says 3.

Answer: 3 taller children.

(b) Total number of children?

There are 6 entries.

Answer: 6 children.

2.

Group A = 4 (even)

Group B = 7 (odd)

Exactly two groups must be odd.

Thus Group C must be odd.

(a) Parity of n

Answer: Odd

(b) Any two values of n

Examples:

$$n = 1,\ 3$$

or

$$n = 5,\ 7$$

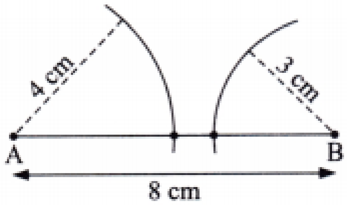
Chapter- 7:A Tale of Three Intersecting Lines

NCERT CORNER

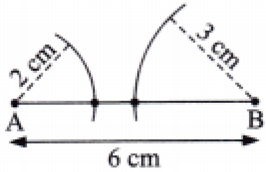
In-Text Questions

1. What happens when the three vertices lie on a straight line?
Solution:
When the three vertices lie on a straight line, they become collinear. This means they no longer form a triangle because the three points do not enclose any area; they simply align along the same straight path.

2.Construct a triangle with sidelengths 3 cm, 4 cm, and 8 cm.
What is happening? Are you able to construct the triangle?
Solution:
Since the arcs from the points A and B do not meet. So, we are not able to construct the triangle with sidelengths 3 cm, 4 cm, and 8 cm.

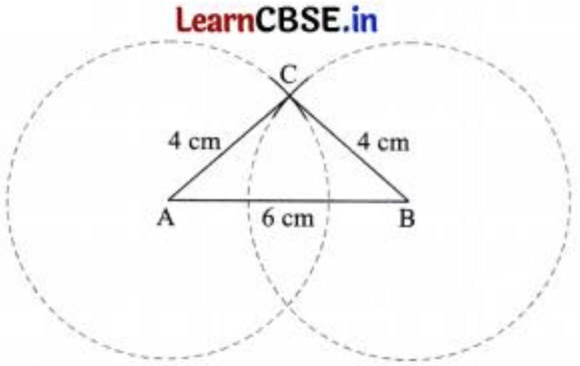


3. Here is another set of lengths: 2 cm, 3 cm, and 6 cm. Check if a triangle is possible for these side lengths.
Solution:
The arcs from points A and B do not meet. So, a triangle is not possible for sidelengths 2 cm, 3 cm, and 6 cm.



4. Construct triangles having the following sidelengths (all the units are in cm):
(a) 4, 4, 6
(b) 3, 4, 5
(c) 1, 5, 5
(d) 4, 6, 8
(e) 3.5, 3.5, 3.5
Solution:
(a) Steps of Construction:
Step 1: Construct the base AB with one of the side lengths.
Let us choose AB = 6 cm.
Step 2: From A, construct a long arc of radius 4 cm.
Step 3: From B, construct an arc of radius 4 cm such that it intersects the first arc.

Step 4: The point where both the arcs meet is the required third vertex C.
Join AC and BC to get ΔABC.

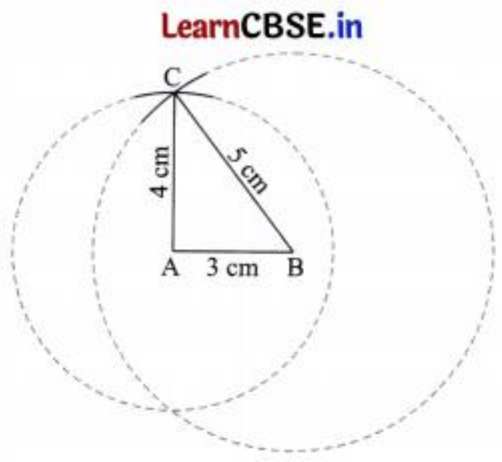


Note: All the figures drawn in this chapter are proportionally reduced.

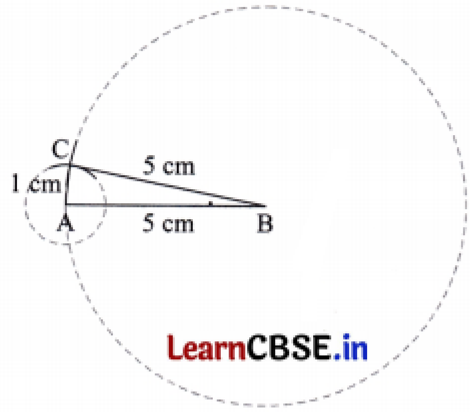
(b) Steps of Construction:
Step 1: Construct the base AB with one of the side lengths.
Let us choose AB = 3 cm.
Step 2: From A, construct a sufficiently long arc of radius 4 cm.
Step 3: From B, construct an arc of radius 5 cm such that it intersects the first arc.

Step 4: The point where both the arcs meet is the required third vertex C.

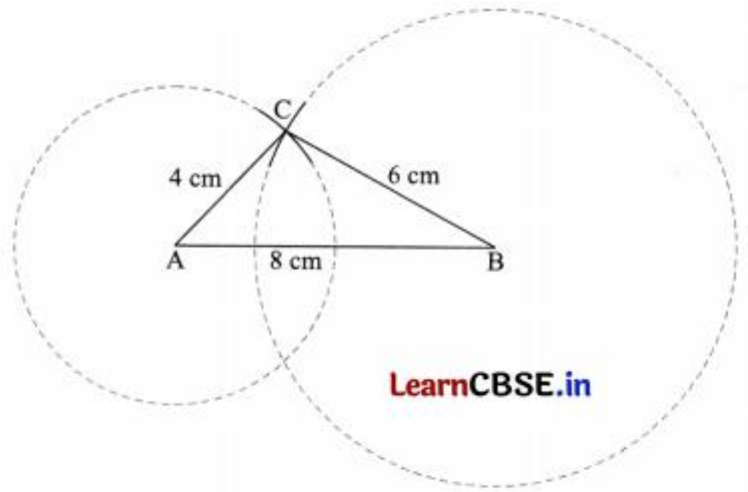
Join AC and BC to get ΔABC.



(c) Steps of Construction.
Do it yourself.



(d) Steps of Construction.
Do it yourself.



(e) Steps of Construction:
Step 1: Construct the base AB with a side length of 3.5 cm.
Step 2: From A, construct a long arc of radius 3.5 cm.

Step 3: Construct another arc of radius 3.5 cm from B.
Step 4: The point where both the arcs meet is the required third vertex C.
Join AC and BC to get ΔABC.

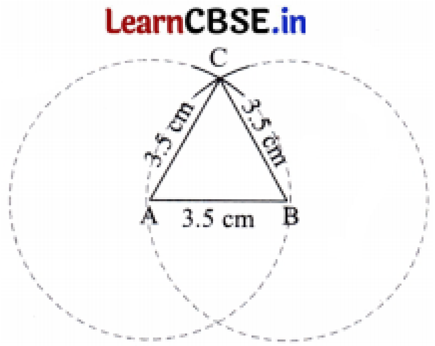
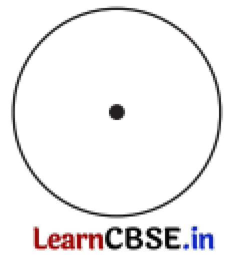
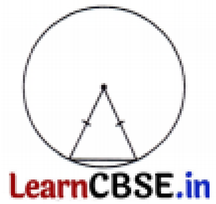


Figure it Out

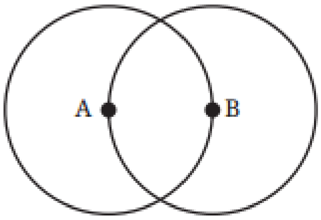
Question 1.
Use the points on the circle and/or the centre to form isosceles triangles.



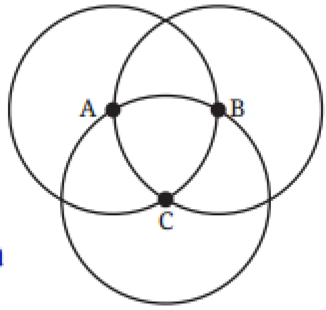
Solution:
Select any two points on the circle and connect them to the centre of the circle. Also, join these points to each other. This will form an isosceles triangle as the two radii are equal in length.



Question 2.
Use the points on the circles and/or their centres to form isosceles and equilateral triangles. The circles are of the same size.

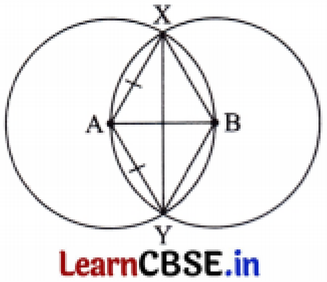


A and B are the centres of circles of the same size

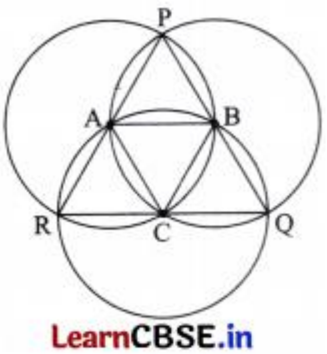


A, B, and C are the centres of circles of the same size

Solution:
An isosceles triangle can be formed by connecting the intersecting points of two circles and the centres of either circle.
Here, isosceles triangles are AXY and BXY.



An equilateral triangle can be formed by connecting the centers of the 2 equal circles and one of their intersecting point.
Here, triangle AXB or triangle AYB is an equilateral triangle.

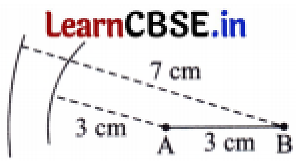


An equilateral triangle can be formed by connecting the centres of the 3 equal circles.
Here, triangle ABC is an equilateral triangle.
In addition, ΔPAB, ΔQBC, and ΔRAC are also equilateral triangles.
Also, the equilateral triangle is a special case of an isosceles triangle.
So, all these equilateral triangles are also isosceles.

In-Text Questions

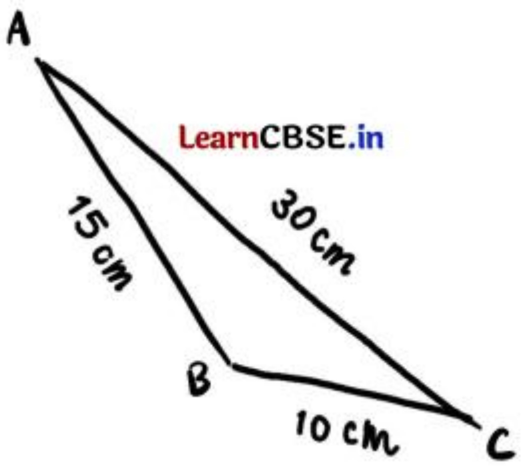
1. Can we say anything about the existence of a triangle having sidelengths 3 cm, 3 cm, and 7 cm? Verify your answer by construction.

Solution:



Here, let us choose the direct path length AB = 7 cm.
And, the round about path length = BC + CA = 3 cm + 3 cm = 6 cm.
Since the direct path between two vertices is longer than the roundabout path via the third vertex. So, this triangle is not possible.
Also, by construction existence of a triangle having side lengths 3 cm, 3 cm, and 7 cm is not possible because if we draw arcs from point A and B then they do not meet.

2. "In the rough diagram given alongside, is it possible to assign lengths in a different order such that the direct paths are always coming out to be shorter than the roundabout paths? If this is possible, then a triangle might exist."



Solution:
No

3. Is such a rearrangement of lengths possible in the triangle?
Solution:
No

4. Further, for a given set of lengths, is it possible to identify which lengths will immediately be less than the sum of the other two, without calculations?
[Hint: Consider the direct lengths in the increasing order]
Solution:
Yes, it is possible to identify which lengths will immediately be less than the sum of the other two, if we take the direct lengths in increasing order.

Figure it out

Question 1.
We checked by construction that there are no triangles having sidelengths 3 cm, 4 cm, and 8 cm; and 2 cm, 3 cm, and 6 cm. Check if you could have found this without trying to construct the triangle.
Solution:
(a) Consider AB = 4 cm, BC = 3 cm and AC = 8 cm.
Now, direct path length = BC = 3 cm
And, roundabout path length = BA + AC
= 4 cm + 8 cm
= 12 cm
The direct path length is shorter than the roundabout path length.
Also, direct path length = AB = 4 cm
Roundabout path length = AC + BC
= 8 cm + 3 cm
= 11 cm
The direct path length is shorter than the roundabout path length.
Again, direct path length = AC = 8 cm
Then, roundabout path length = AB + BC
= 4 cm + 3 cm
= 7 cm
In this case, the direct path is longer than the roundabout path.
So, a triangle cannot exist.

(b) Consider AB = 3 cm, BC = 2 cm, AC = 6 cm
If we take the direct path = AC = 6 cm.
And, roundabout path length = AB + BC
= 3 cm + 2 cm
= 5 cm
Since the direct path is longer than the roundabout path. So, a triangle cannot exist.

Question 2.
Can we say anything about the existence of a triangle for each of the following sets of lengths?
(a) 10 km, 10 km, and 25 km
(b) 5 mm, 10 m,m and 20 mm
(c) 12 cm, 20 c,m and 40 cm
You would have realised that using a rough figure and comparing the direct path lengths with their corresponding roundabout path lengths is the same as comparing each length with the sum of the other two lengths. There are three such comparisons to be made.

Solution:
(a) When we take the direct path = 25 km.
Then the roundabout path = 10 km + 10 km = 20 km.
Since the direct path is longer than the roundabout path.
So, the existence of a triangle is not possible.

(b) When we take the direct path = 20 mm.
Then the roundabout path = 10 mm + 5 mm = 15 mm.
Since the direct path is longer than the roundabout path.
So, the existence of a triangle is not possible.

(c) When we take the direct path = 40 cm.
Then the roundabout path = 12 cm + 20 cm = 32 cm.
Since the direct path is longer than the roundabout path.
So, the existence of a triangle is not possible.

Question 3.
For each set of lengths seen so far, you might have noticed that in at least two of the comparisons, the direct length was less than the sum of the other two (if not, check again!).
For example, for the set of lengths 10 cm, 15 cm, and 30 cm, there are two comparisons where this happens:
$10 < 15 + 30$
$15 < 10 + 30$
But this doesn't happen for the third length: $30 > 10 + 15$.
Solution:
Do it yourself.

Will this always happen? That is, for any set of lengths, will there be at least two comparisons where the direct length is less than the sum of the other two? Explore different sets of lengths.
Solution:
(i) 5 mm, 10 mm, 20 mm.
There are two comparisons where this happens:
$10 < 5 + 20$ and $5 < 10 + 20$ But $20 > 10 + 5$

(ii) 12 cm, 20 cm and 40 cm.
There are two comparisons where this happens:
$12 < 20 + 40$ and $20 < 12 + 40$ But $40 > 12 + 20$

Figure it Out

Question 1.
Which of the following lengths can be the sidelengths of a triangle? Explain

your answers. Note that for each set, the three lengths have the same unit of measure.
(a) 2, 2, 5
(b) 3, 4, 6
(c) 2, 4, 8
(d) 5, 5, 8
(e) 10, 20, 25
(f) 10, 20, 35
(g) 24, 26, 28
We observe from the previous problems that whenever there is a set of lengths satisfying the triangle inequality (each length < sum of the other two lengths), there is a triangle with those three lengths as sidelengths.
Solution:
A set of lengths can be the sidelengths of a triangle if each length < the sum of the other two lengths.
(a) $2 < 5 + 2$ but $5 > 2 + 2$
So, 2, 2, 5 cannot be the sidelengths of a triangle.

(b) $3 < 4 + 6$, $4 < 3 + 6$, $6 < 4 + 3$
So, 3, 4, 6 can be the sidelengths of a triangle.

(c) $2 < 4 + 8$, $4 < 2 + 8$, but $8 > 4 + 2$
So, 2, 4, 8 cannot be the sidelengths of a triangle.

(d) $5 < 5 + 8$, $8 < 5 + 5$
So, 5, 5, 8 can be the sidelengths of a triangle.

(e) $10 < 20 + 25$, $20 < 25 + 10$, $25 < 10 + 20$
So, 10, 20, 25 can be the sidelengths of a triangle.

(f) $10 < 20 + 35$, $20 < 10 + 35$, but $35 > 10 + 20$
So, 10, 20, 35 cannot be the sidelengths of a triangle.

(g) $24 < 26 + 28$, $26 < 24 + 28$, $28 < 24 + 26$
So, 24, 26, 28 can be the sidelengths of a triangle.

In-Text Questions

1. How will the two circles turn out for a set of lengths that do not satisfy the triangle inequality? Find 3 examples of sets of lengths for which the circles:
(a) touch each other at a point,
(b) Do not intersect.
Solution:
When a set of three segment lengths does not satisfy the triangle inequality, it

means those segments cannot form a triangle.
However, two circles with these lengths as distances between their centres and points on their circumference can behave differently.
(a) (i) 3, 4, 7 (ii) 5, 2, 3 (iii) 6, 2, 4
(b) (i) 3, 4, 8 (ii) 6, 2, 3 (iii) 5, 1, 2

Figure it Out

Question 1.
Check if a triangle exists for each of the following set of lengths:
(a) 1, 100, 100
(b) 3, 6, 9
(c) 1, 1, 5
(d) 5, 10, 12
Solution:
We know that when each length is smaller than the sum of the other two, we say that the lengths satisfy the triangle inequality, and when a set of lengths satisfies the triangle inequality, then a triangle exists.
(a) Here $1 < 100 + 100$, $100 < 100 + 1$
So, for sidelengths 1, 100, 100, a triangle exists.

(b) $3 < 6 + 9$, $6 < 3 + 9$, but $9 = 6 + 3$
So, for sidelengths 3, 6, 9, a triangle does not exist.

(c) $1 < 1 + 5$, but $5 > 1 + 1$
So, for sidelengths 1, 1, 5, a triangle does not exist.

(d) $5 < 10 + 12$, $10 < 5 + 12$, $12 < 10 + 5$
So, for sidelengths 5, 10, and 12, a triangle exists.

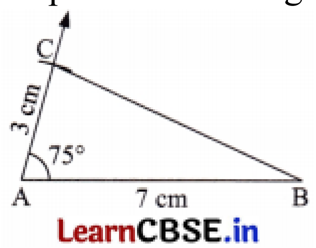
Question 2.
Does there exist an equilateral triangle with sides 50, 50, 50? In general, does there exist an equilateral triangle of any sidelength? Justify your answer.
Solution:
Yes, an equilateral triangle with sides 50, 50, 50 exists because the sum of two sides is greater than the third side.
In an equilateral triangle, all sides are equal, so this condition is satisfied.
Yes, an equilateral triangle always exists for any positive sidelength.
For any positive number, say $x > 0$, an equilateral triangle with all sidelengths x' exists.

Question 3.
For each of the following, give at least 5 possible values for the third length so there exists a triangle having these as sidelengths (decimal values could also be chosen):
(a) 1, 100
(b) 5, 5
(c) 3, 7
Solution:
(a) 5 possible values for the third length would be 99.5, 99.8, 100, 100.5, 100.9
Since, 100 < 1 + 99.5, 100 < 1 + 99.8, 100 < 1 + 100, 100 < 1 + 100.5, and 100 < 1 + 100.9

(b) 5 possible values for the third length would be 1, 3.5, 5, 7.5, 8.9
Since, 5 < 1 + 5, 5 < 5 + 3.5, 5 < 5 + 5, 5 < 5 + 7.5, and 5 < 5 + 8.9

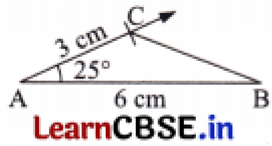
(c) 5 possible values for the third length would be 4.5, 5, 6.9, 8, 9.8
Since, 7 < 3 + 4.5, 7 < 5 + 3, 7 < 3 + 6.9, 7 < 3 + 8, 7 < 3 + 9.8

Question 4.
Construct triangles for the following measurements, where the angle is included between the sides:
(a) 3 cm, 75°, 7 cm
(b) 6 cm, 25°, 3 cm
(c) 3 cm, 120°, 8 cm
Solution:
(a) Step 1: Construct a side AB of length 7 cm.
Step 2: Construct ∠A = 75° by drawing the other arm of the angle.
Step 3: Mark the point C on the other arm such that AC = 3 cm.
Step 4: Join BC to get the required triangle.

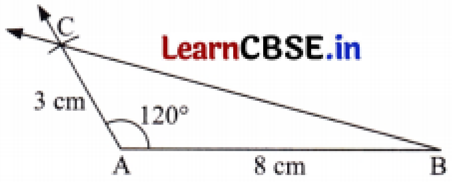


(b) Step 1: Construct a side AB of length 6 cm.
Step 2: Construct ∠A = 25° by drawing the other arm of the angle.
Step 3: Mark the point C on the other arm such that AC = 3 cm.

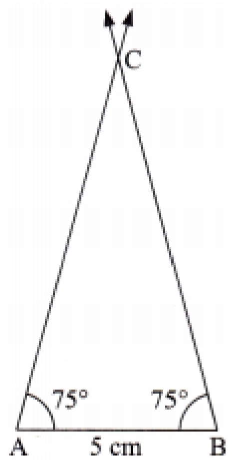
Step 4: Join BC to get the required triangle.



(c) Step 1: Construct a side AB of length 8 cm.
Step 2: Construct ∠A = 120° by drawing the other arm of the angle.
Step 3: Mark the point C on the other arm such that AC = 3 cm.
Step 4: Join BC to get the required triangle.

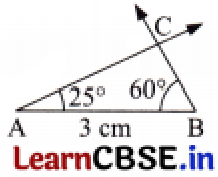


Question 5.
Construct triangles for the following measurements:
(a) 75°, 5 cm, 75°
(b) 25°, 3 cm, 60°
(c) 120°, 6 cm, 30°
Solution:
(a) Step 1: Draw the base AB of length 5 cm.
Step 2: Draw ∠A and ∠B of measure 75° each.
Step 3: The point of intersection of the two new arms of ∠A and ∠B is the third vertex, C.

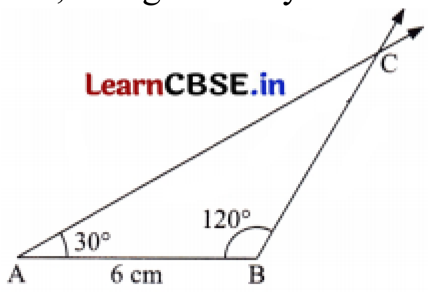


(b) Step 1: Draw the base AB of length 3 cm.
Step 2: Draw ∠A and ∠B of measure 25°, and 60° respectively.
Step 3: The point of intersection of the two new arms of ∠A and ∠B is the third

vertex, C.



(c) Step 1: Draw the base AB of length 6 cm.
Step 2: Draw ∠A and ∠B of measure 30°, and 120° respectively.
Step 3: The point of intersection of the two new arms of ∠A and ∠B is the third vertex, C.
Yes, triangles always exist.



Question 6.
For each of the following angles, find another angle for which a triangle is (a) possible, (b) not possible. Find at least two different angles for each category:
(a) 30°
(b) 70°
(c) 54°
(d) 144°
Solution:
(a) Another angle for which a triangle is possible will be any angle less than 150°.
Two different angles are 60°, 90°.
Another angle for which a triangle is not possible will be any angle greater than or equal to 150°.
Two different angles are 170°, 160°.

(b) Another angle for which a triangle is possible will be any angle less than 110°.
Two different angles are 70°, 40°.
Another angle for which a triangle is not possible will be any angle greater than or equal to 110°.
Two different angles are 120°, 150°.

(c) Another angle for which a triangle is possible will be any angle less than 126°.
Two different angles are 72°, 54°.
Another angle for which a triangle is not possible will be any angle greater than or equal to 126°.
Two different angles are 140°, 130°.

(d) Another angle for which a triangle is possible will be any angle less than 36°.
Two different angles are 10°, 26°.
Another angle for which a triangle is not possible will be any angle greater than or equal to 36°.
Atleast two different angles are 40°, 50°.

Question 7.
Determine which of the following pairs can be the angles of a triangle and which cannot:
(a) 35°, 150°
(b) 70°, 30°
(c)90°, 85°
(d) 50°, 150°
Solution:
(a) The sum of the given angles = 35° + 150° = 185°.
This is not possible because the total exceeds 180°.

(b) The sum of the given angles = 70° + 30° = 100°.
Possible third angle = 180° – 100° = 80°.
The pairs can be the angles of a triangle.

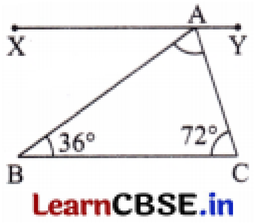
(c) The sum of the given angles = 90° + 85° = 175°.
Possible third angle = 180° – 175° = 5°.
The pairs can be the angles of a triangle.

(d) The sum of the given angles = 50° + 150° = 200°.
This is not possible because the total exceeds 180°.

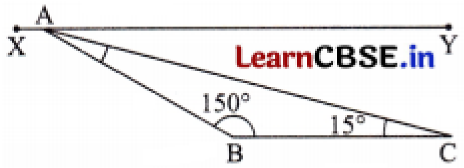
Figure it Out

Question 1.
Find the third angle of a triangle (using a parallel line) when two of the angles are:
(a) 36°, 72°
(b) 150°, 15°
(c) 90°, 30°

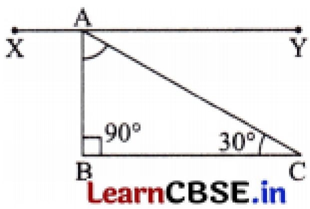
(d) 75°, 45°
Solution:
(a) Here ∠B = 36° and ∠C = 72°.
Since the line BC is parallel to XY.
So, ∠XAB = ∠B = 36° [Alternate angles] ….. (i)
and ∠YAC = ∠C = 72° [Alternate angles] …… (ii)
Also, ∠XAB + ∠BAC + ∠YAC = 180° [∵∠XAY is a straight angle]
⇒ 36° + ∠BAC + 72° = 180° [Using (i) and (ii)]
⇒ ∠BAC = 180°- 108° = 72°.



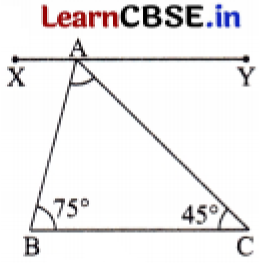
(b) Here ∠B = 150° and ∠C = 15°.
Since the line BC is parallel to XY.
So, ∠XAB = ∠B = 150° [Alternate angles] ….. (i)
and ∠YAC = ∠C = 15° [Alternate angles] …… (ii)
Also, ∠XAB + ∠BAC + ∠YAC = 180° [∠XAY is a straight angle]
⇒ 150° + ∠BAC + 15° = 180° [Using (i) and (ii)]
⇒ ∠BAC = 180° – 165° = 15°



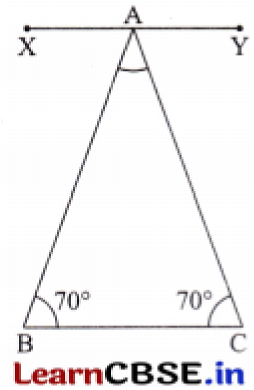
(c) Here ∠B = 90° and ∠C = 30°.
Since the line BC is parallel to XY.
So, ∠XAB = ∠B = 90° [Alternate angles] …… (i)
and ∠YAC = ∠C = 30° [Alternate angles] …… (ii)
Also, ∠XAB + ∠BAC + ∠YAC = 180° [∠XAY is a straight angle]
⇒ 90° + ∠BAC + 30° = 180° [Using (i) and (ii)]
⇒ ∠BAC = 180°- 120° = 60°



(d) Here ∠B = 75° and ∠C = 45°.
Since the line BC is parallel to XY.
So, ∠XAB = ∠B = 75° [Alternate angles] ….. (i)
and ∠YAC = ∠C = 45° [Alternate angles] ….. (ii)
Also, ∠XAB + ∠BAC + ∠YAC = 180° [∠XAY is a straight angle]
⇒ 75° + ∠BAC + 45° = 180° [Using (i) and (ii)]
⇒ ∠BAC = 180° – 120° = 60°

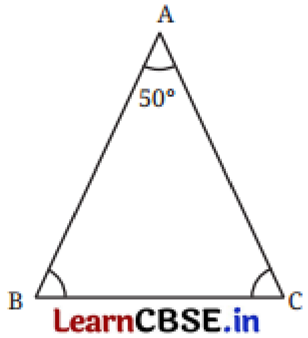


Question 2.
Can you construct a triangle all of whose angles are equal to 70°? If two of the angles are 70°, what would the third angle be? If all the angles in a triangle have to be equal, then what must its measure be? Explore and find out.
Solution:
No, it is not possible to construct a triangle with all angles equal to 70°.

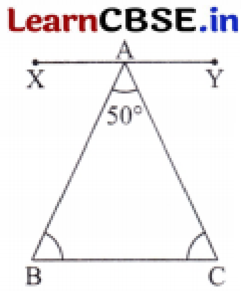


If we take two base angles as 70° that is, ∠B and ∠C = 70°, then we have to find ∠BAC.
Since XY is parallel to BC.
So, ∠XAB = ∠B = 70° ….. (i)
and ∠YAC = ∠C = 70° …… (ii)
Also, ∠XAB + ∠BAC + ∠YAC = 180°
⇒ 70° + ∠BAC + 70° = 180° [Using (i) and (ii)]
⇒ ∠BAC = 180° – 140° = 40°.
So, the third angle would be 40°.
If all the angles in a triangle have to be equal, then each angle must measure 60°. This type of triangle is called an equilateral triangle.

Question 3.
Here is a triangle in which we know ∠B = ∠C and ∠A = 50°. Can you find ∠B and ∠C?



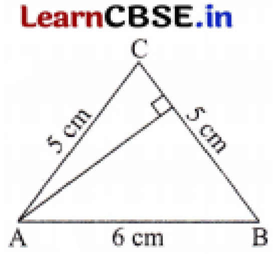
Solution:
Given ∠A = 50° and ∠B = ∠C.
Draw a line XY that is parallel to BC.
Now, ∠XAB = ∠B and ∠YAC = ∠C [Alternate angles] …… (i)



Also, ∠XAB + ∠BAC + ∠YAC = 180°
⇒ ∠B + 50° + ∠C = 180° [Using (i)]
∠B + ∠C = 180° – 50° = 130°
⇒ 2∠B = 130°
⇒ ∠B = 65° = ∠C

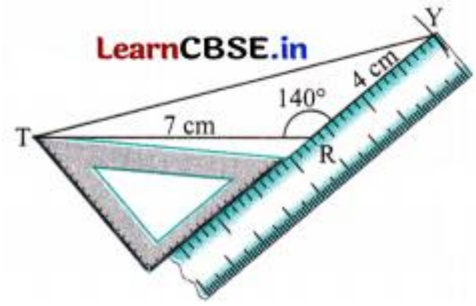
Question 4.
Construct a triangle ABC with BC = 5 cm, AB = 6 cm, CA = 5 cm. Construct an altitude from A to BC.
Solution:
Steps of Construction:
Step 1: Draw the base AB = 6 cm.
Step 2: Using a compass, construct a sufficiently long arc of radius 5 cm from A.
Step 3: Construct another arc of radius 5 cm from B such that it intersects the first arc.

Step 4: The point where both the arcs meet is the required third vertex C. Join AC and BC to get ΔABC.
Step 5: Keep the ruler aligned to BC. Place the set square on the ruler such that one of the edges of the right angle touches the ruler.
Step 6: Slide the set square along the ruler till the perpendicular edge of the set square touches the vertex A.



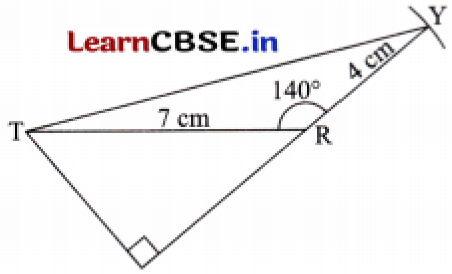
Step 7: Draw the altitude through A to BC using the perpendicular edge of the set square.

Question 5.
Construct a triangle TRY with RY = 4 cm, TR = 7 cm, ∠R = 140°. Construct an altitude from T to RY.
Solution:
Steps of Construction:
Step 1: Construct a side TR of length 7 cm.
Step 2: Construct ∠R = 140° by drawing the other arm of the angle.
Step 3: Mark the point Y on the other arm such that RY = 4 cm.

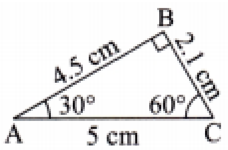


Step 4: Join TY to get the required triangle.
Step 5: Keep the ruler aligned to RY. Place the set square on the ruler such that one of the edges of the right angle touches the ruler.
Step 6: Slide the set square along the ruler till the perpendicular edge of the set

square touches the vertex T.
Step 7: Extend the line YR and then draw the altitude through T on YR using the perpendicular edge of the set square.

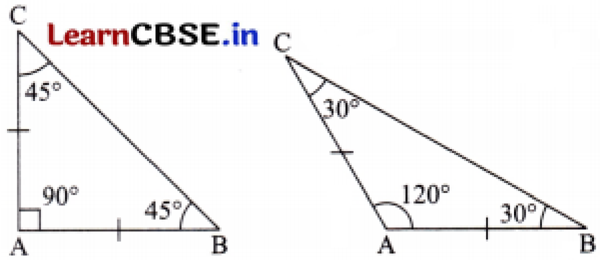


Question 6.
Construct a right-angled triangle ΔABC with ∠B = 90°, AC = 5 cm. How many different triangles exist with these measurements?
[Hint: Note that the other measurements can take any values. Take AC as the base. What values can ∠A and ∠C take so that the other angle is 90°?]
Solution:
Given, ∠B = 90°, and AC = 5 cm (hypotenuse)
Since ∠B = 90°, ∠A and ∠C add upto 90°.
If we fixed AC = 5 cm and ∠A and ∠C vary, then there are infinitely many triangles possible.
Because the shape of the triangle can change with the different values of angles A and C.
One such example is given here:



Question 7.
Through construction, explore if it is possible to construct an equilateral triangle that is (i) right-angled, (ii) obtuse-angled. Also construct an isosceles triangle that is (i) right-angled, (ii) obtuse-angled.
Solution:
An equilateral triangle that is right-angled and obtuse-angled is not possible because each angle of an equilateral triangle is always 60°.
An isosceles right-angled triangle has one angle of 90° and the other two angles of 45° each.
An isosceles obtuse-angled triangle can have one angle as 120° and the other

two angles of 30° each.



Practice Time 7.1

1. How many sides does a triangle have?

Answer: 3 sides

2. What are the corner points of a triangle called?

Answer: Vertices

3. What is the name of the triangle with vertices A, B and C?

Answer: ΔABC (Triangle ABC)

4. Can three collinear points form a triangle?

Answer: No.

5. How many angles are there in a triangle?

Answer: 3 angles

6. In ΔPQR, what is the angle at vertex Q called?

Answer: ∠PQR or ∠Q

7. Write three different ways of naming the triangle with vertices X, Y and Z.

Answer: ΔXYZ, ΔYZX, ΔZXY

8. What is the simplest closed figure in geometry?

Answer: Triangle

Practice Time 7.2

1. Measure of each interior angle in an equilateral triangle

Answer: 60°

2. One side is 6 cm. Length of other two sides?

Answer: 6 cm and 6 cm

3. Lines of symmetry in an equilateral triangle

Answer: 3

4. Why can't we construct an equilateral triangle accurately using only a ruler?

Answer: Because equal lengths cannot be marked accurately without a compass.

5. Which geometric tool is mainly used?

Answer: Compass

6. Why are arcs drawn from A and B?

Answer: To locate the third vertex at equal distance from A and B.

7. If AB = 5 cm, find AC and BC.

Answer: AC = 5 cm, BC = 5 cm

8. Longest side in an equilateral triangle

Answer: No longest side; all sides are equal.

9. Do medians, altitudes and angle bisectors coincide?

Answer: Yes.

10. Why is a triangle with all sides equal always equiangular?

Answer: Equal sides subtend equal angles, so all angles are 60°.

Practice Time 7.3

1. Define triangle inequality property.

Answer: Sum of any two sides of a triangle is greater than the third side.

2. Why important before construction?

Answer: To check whether a triangle can be formed.

3. Properties of an equilateral triangle.

Answer:

- Three equal sides

- Three equal angles (60° each)
- Three lines of symmetry
- Medians, altitudes and angle bisectors coincide

4. Difference between isosceles and scalene triangle.

Answer:

- Isosceles: Two equal sides
- Scalene: All sides unequal

5. If two circles touch at exactly one point during construction?

Answer: Only one triangle is possible.

Practice Time 7.4

1. Construct ΔPQR with PQ = 5 cm, PR = 4 cm, ∠P = 60°

Steps:

1. Draw PQ = 5 cm.
2. At P draw ∠QPR = 60°.
3. Mark PR = 4 cm on the ray.
4. Join RQ.
5. ΔPQR obtained.

---

2. Construct ΔXYZ with XY = 7 cm, XZ = 5 cm, ∠X = 45°

Steps:

1. Draw XY = 7 cm.
2. At X draw 45° angle.
3. Mark XZ = 5 cm.
4. Join YZ.
5. Verify by measuring.

---

3. Construct triangle with AB = 6 cm, AC = 5 cm, ∠A = 75°

Steps:

1. Draw AB = 6 cm.
2. At A construct 75°.
3. Mark AC = 5 cm.
4. Join BC.
5. Required triangle formed.

---

4. Construct ΔLMN with LM = 4 cm, LN = 3.5 cm, ∠L = 90°

Type: Right-angled triangle

---

5. Construct ΔDEF with DE = 5 cm, ∠D = 45°, ∠E = 75°

Steps:

1. Draw DE = 5 cm.
2. At D construct 45°.
3. At E construct 75°.
4. Rays meet at F.
5. Join DF and EF.

Practice Time 7.5

1. Define altitude.

Answer: A perpendicular drawn from a vertex to the opposite side.

2. How many altitudes?

Answer: 3

3. Why can one side act as altitude in a right triangle?

Answer: Two sides are already perpendicular.

4. Which triangle has all altitudes inside?

Answer: Acute-angled triangle

Which triangle has one altitude outside?
Answer: Obtuse-angled triangle

5. Draw altitude from A to BC in triangle ABC.

Answer: Draw AD ⊥ BC. AD is the altitude.

Exam Time

(MCQs)

1.

Equilateral triangle angle =
Answer: (c) 60°

2.

Longest side in a right triangle =
Answer: (d) Hypotenuse

3.

Triangle that does not exist =
Answer: (c) Equilateral Right-Angled

4.

In a scalene triangle =
Answer: (b) All sides are different

5.

Altitude from obtuse angle falls =
Answer: (a) Inside the triangle

Fill in the Blanks

1. Isosceles
2. Three
3. Hypotenuse
4. Acute-angled

5. Outside

True / False

1. True
2. False
3. False
4. True
5. True

Match the Columns

Column A	**Column B**
Equilateral triangle	All sides equal
Scalene triangle	No sides equal
Isosceles triangle	Two sides equal
Right-angled triangle	One angle = 90°
Obtuse-angled triangle	One angle > 90°

Answers:
1–a, 2–e, 3–c, 4–d, 5–b

Very Short Answers

1.

3

2.

180°

3.

Equilateral triangle

4.

Scalene triangle

5.

Obtuse triangle

Short Answers

1. Define a scalene triangle.

A triangle having all sides unequal.

2. Triangle inequality rule.

Sum of any two sides is greater than the third side.

3. Why is a compass used?

To draw arcs and mark equal distances accurately.

4. What is an altitude?

A perpendicular from a vertex to the opposite side.

5. If ∠A = 60° and ∠B = 80°, find ∠C.

$$\angle C = 180^\circ - (60^\circ + 80^\circ)$$
$$\angle C = 40^\circ$$

Answer: 40°

Long Answers

1. Construction of a triangle when all sides are given (SSS)

1. Draw the longest side AB.
2. With centre A and radius AC draw an arc.
3. With centre B and radius BC draw another arc.
4. Let arcs intersect at C.
5. Join AC and BC.
6. ΔABC is obtained.

---

2. Angle Sum Property

The sum of the three interior angles of a triangle is always:

$$\angle A + \angle B + \angle C = 180^\circ$$

60.0°60.0°60.0°

---

3. Properties

Equilateral Triangle

- Three equal sides
- Three equal angles (60°)

Isosceles Triangle

- Two equal sides
- Base angles equal

Scalene Triangle

- All sides unequal
- All angles unequal

---

4. Drawing an Altitude using Set-Square

1. Place set-square along opposite side.
2. Slide it till vertex is reached.
3. Draw perpendicular line.
4. Mark foot of perpendicular.
5. This line is the altitude.

---

5. Can sides 4 cm, 7 cm, 12 cm form a triangle?

Check triangle inequality:

$$4 + 7 = 11$$
$$11 < 12$$

Condition fails.

Answer: No, a triangle cannot be formed.

Competency-Based Questions

A. Assertion–Reason

1.

Assertion: An equilateral obtuse triangle is not possible.

Reason: In an equilateral triangle each angle is 60°.

Answer: (a) Both A and R are true and R explains A.

2.

Assertion: A right-angled triangle can never be equilateral.

Reason: Right angle forces other two angles to be 45° each.

Answer: (a) Both A and R are true and R explains A.

B. Case-Based Questions

1. Type of ΔPQR (all sides 5 cm)

Answer: Equilateral triangle

2. Type of ΔLMN (6 cm, 6 cm, 8 cm)

Answer: Isosceles triangle

3. Type of ΔXYZ (one angle 120°)

Answer: Obtuse-angled triangle

4. Altitude from X in ΔXYZ falls

Answer: Outside the triangle

C. Math Booster

1. Name the hypotenuse.

Answer: AC

2. Which two sides act as altitudes?

Answer: AB and BC

Chapter 8: Working with Fractions

NCERT CORNER

Figure it Out

Question 1

Tenzin drinks $\frac{1}{2}$glass of milk every day.

How many glasses of milk does he drink in a week?

How many glasses of milk did he drink in the month of January?

Solution

Number of glasses of milk drunk in a day

$= \frac{1}{2}$

There are 7 days in a week.

Number of glasses of milk drunk in 1 week

$= 7 \times \frac{1}{2}$

$= \frac{7}{2}$

$= 3\frac{1}{2}$

Therefore, Tenzin drinks **3½ glasses** of milk in a week.

There are 31 days in January.

Number of glasses of milk drunk in January

$= 31 \times \frac{1}{2}$

$= \frac{31}{2}$

$= 15\frac{1}{2}$

Therefore, Tenzin drinks **15½ glasses** of milk in January.

Question 2

A team of workers can make 1 km of a water canal in 8 days.

So, in one day, the team can make ______ km of the water canal.

If they work 5 days a week, they can make ______ km of the water canal in a week.

Solution

Water canal made in 8 days = 1 km

Water canal made in 1 day

= $\frac{1}{8}$km

Water canal made in 5 days

= $5 \times \frac{1}{8}$

= $\frac{5}{8}$km

Hence, the team can make $\frac{5}{8}$**km** of the water canal in one week.

Question 3

Manju and two of her neighbours buy 5 litres of oil every week and share it equally among the 3 families.

How much oil does each family get in a week?

How much oil will one family get in 4 weeks?

Solution

Oil received by each family in a week

= $\frac{5}{3}$litres

Oil received by one family in 4 weeks

= $4 \times \frac{5}{3}$

$= \frac{20}{3}$

$= 6\frac{2}{3}$ litres

Question 4

Safia saw the Moon setting on Monday at 10 pm.

Her mother, who is a scientist, told her that every day the Moon sets $\frac{5}{6}$ hours later than the previous day.

How many hours after 10 pm will the Moon set on Thursday?

Solution

Monday to Thursday = 3 days

Delay in moonset

$= 3 \times \frac{5}{6}$

$= \frac{15}{6}$

$= \frac{5}{2}$ hours

1 hour = 60 minutes

$$\frac{5}{2} \times 60$$

$= \frac{300}{2}$

= 150 minutes

150 minutes

= 120 minutes + 30 minutes

= 2 hours 30 minutes

Hence, on Thursday the Moon will set **2 hours 30 minutes after 10 pm**.

Question 5

Multiply and then convert into a mixed fraction:

(a) $7 \times \frac{3}{5}$

(b) $4 \times \frac{4}{3}$

(c) $\frac{9}{7} \times 6$

(d) $\frac{13}{11} \times 6$

Solution

(a)

$$7 \times \frac{3}{5} = \frac{21}{5} = 4\frac{1}{5}$$

(b)

$$4 \times \frac{4}{3} = \frac{16}{3} = 5\frac{1}{3}$$

(c)

$$\frac{9}{7} \times 6 = \frac{54}{7} = 7\frac{5}{7}$$

(d)

$$\frac{13}{11} \times 6 = \frac{78}{11} = 7\frac{1}{11}$$

Question 6

Find the following products. Use a unit square as a whole for representing the fractions:

(a) $\frac{1}{3} \times \frac{1}{5}$

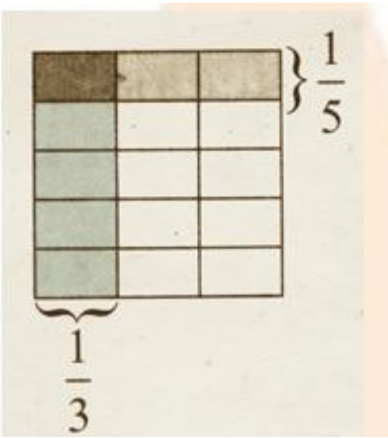
(b) $\frac{1}{4} \times \frac{1}{3}$

(c) $\frac{1}{5} \times \frac{1}{2}$

(d) $\frac{1}{6} \times \frac{1}{5}$

Solution

(a) $\frac{1}{3} \times \frac{1}{5}$

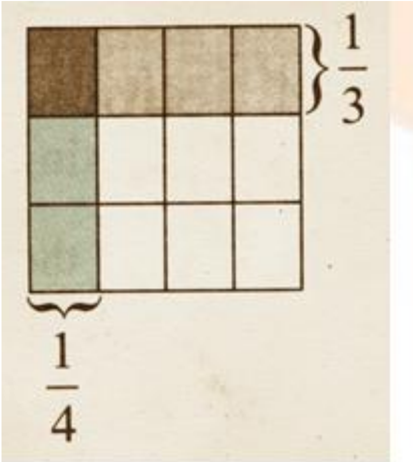


- Each row represents $\frac{1}{5}$
- Each column represents $\frac{1}{3}$
- Whole square divided into $5 \times 3 = 15$ equal parts
- 1 part is double shaded

Therefore,

$$\frac{1}{3} \times \frac{1}{5} = \frac{1}{15}$$

(b) $\frac{1}{4} \times \frac{1}{3}$

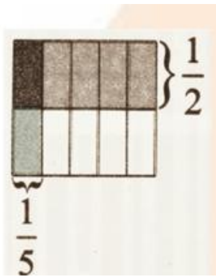


- Whole divided into 3 rows and 4 columns
- Total parts = 12
- Double shaded parts = 1

Therefore,

$$\frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$$

(c) $\frac{1}{5} \times \frac{1}{2}$

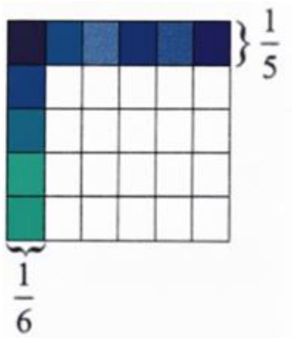
- 

- Whole divided into 2 rows and 5 columns
- Total parts = 10
- Double shaded parts = 1

Therefore,

$$\frac{1}{5} \times \frac{1}{2} = \frac{1}{10}$$

(d) $\frac{1}{6} \times \frac{1}{5}$

- 

Whole divided into 5 rows and 6 columns
- Total parts = 30
- Double shaded parts = 1

Therefore,

$$\frac{1}{6} \times \frac{1}{5} = \frac{1}{30}$$

Question 7

Find the following products. Use a unit square as a whole for representing the fractions and carrying out the operations.

(a)

$$\frac{2}{3} \times \frac{4}{5}$$

(b)

$$\frac{1}{4} \times \frac{2}{3}$$

(c)

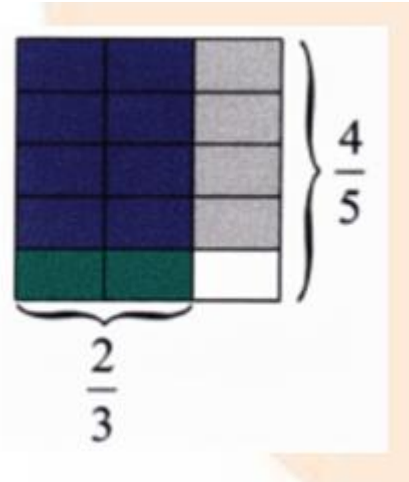
$$\frac{3}{5} \times \frac{1}{2}$$

(d)

$$\frac{4}{6} \times \frac{3}{5}$$

Solution

(a)



B Rows represent $\frac{4}{5}$

- Columns represent $\frac{2}{3}$

Total parts

$$5 \times 3 = 15$$

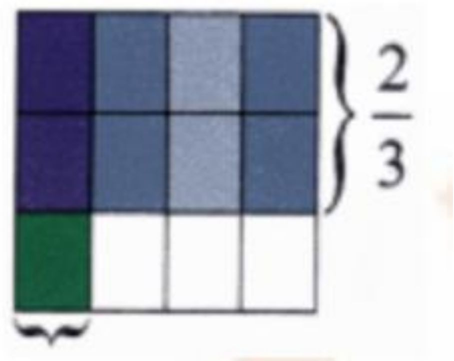
Double shaded parts

$$2 \times 4 = 8$$

Therefore,

$$\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$$

(b)



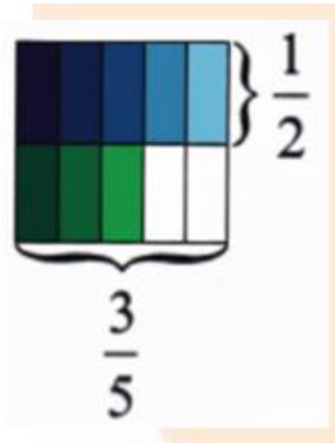
Total parts = 12

Double shaded = 2

Therefore,

$$\frac{1}{4} \times \frac{2}{3} = \frac{2}{12} = \frac{1}{6}$$

(c)



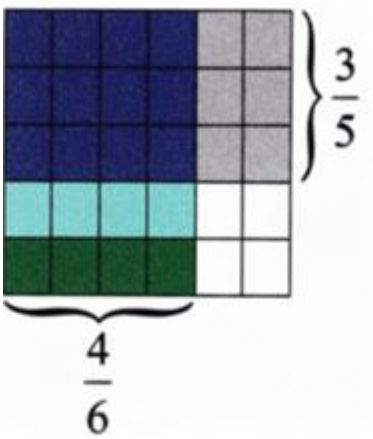
Total parts = 10

Double shaded = 3

Therefore,

$$\frac{3}{5} \times \frac{1}{2} = \frac{3}{10}$$

(d)



Total parts

$$6 \times 5 = 30$$

Double shaded

$$4 \times 3 = 12$$

Therefore,

$$\frac{4}{6} \times \frac{3}{5} = \frac{12}{30} = \frac{2}{5}$$

Question 8

A water tank is filled from a tap.

If the tap is open for **1 hour**, $\frac{7}{10}$ of the tank gets filled.

How much of the tank is filled if the tap is open for:

(a) $\frac{1}{2}$ hour

(b) $\frac{3}{4}$ hour

(c) $\frac{2}{7}$ hour

(d) $\frac{5}{14}$ hour

(e) For the tank to be full, how long should the tap be running?

Solution

Given

In 1 hour,

$$\frac{7}{10}$$

of the tank is filled.

(a) In $\frac{1}{2}$hour

$$\frac{1}{2} \times \frac{7}{10} = \frac{7}{20}$$

Therefore,

$$\boxed{\frac{7}{20}}$$

of the tank gets filled.

(b) In $\frac{3}{4}$hour

$$\frac{3}{4} \times \frac{7}{10} = \frac{21}{40}$$

Therefore,

$$\boxed{\frac{21}{40}}$$

of the tank gets filled.

(c) In $\frac{2}{7}$hour

$$\frac{2}{7} \times \frac{7}{10} = \frac{2}{10} = \frac{1}{5}$$

Therefore,

$$\boxed{\frac{1}{5}}$$

of the tank gets filled.

(d) In $\frac{5}{14}$hour

$$\frac{5}{14} \times \frac{7}{10} = \frac{35}{140} = \frac{1}{4}$$

Therefore,

$$\boxed{\frac{1}{4}}$$

of the tank gets filled.

(e) Time needed to fill the whole tank

In 1 hour,

$$\frac{7}{10}$$

of the tank is filled.

Time required for full tank

$$1 \div \frac{7}{10} = 1 \times \frac{10}{7} = \frac{10}{7}$$

hours

$$= 1\frac{3}{7}$$

hours

Therefore,

$$\boxed{1\frac{3}{7}\text{ hours}}$$

Question 9

The government has taken $\frac{1}{3}$of Somu's land to build a road.

What part of the land remains with Somu now?

She gives:

- Half of the remaining land to Krishna.
- $\frac{1}{4}$of the remaining land to Bora.

After giving them their shares, she keeps the remaining land.

Find:

(a) What part of the original land did Krishna get?

(b) What part of the original land did Bora get?

(c) What part of the original land did Somu keep?

Solution

Step 1: Land remaining after government acquisition

Government takes

$$\frac{1}{3}$$

Remaining land

$$1 - \frac{1}{3} = \frac{2}{3}$$

(a) Krishna's Share

Krishna receives half of remaining land.

Remaining land

$$\frac{2}{3}$$

Half of remaining land

$$\frac{1}{2} \times \frac{2}{3} = \frac{1}{3}$$

Therefore,

$$\boxed{\frac{1}{3}}$$

of the original land went to Krishna.

(b) Bora's Share

Bora receives

$$\frac{1}{4}$$

of the remaining land.

$$\frac{1}{4} \times \frac{2}{3} = \frac{1}{6}$$

Therefore,

$$\boxed{\frac{1}{6}}$$

of the original land went to Bora.

(c) Somu's Share

Total distributed:

Government

$$\frac{1}{3}$$

Krishna

$$\frac{1}{3}$$

Bora

$$\frac{1}{6}$$

Total

$$\frac{1}{3}+\frac{1}{3}+\frac{1}{6}=\frac{2}{6}+\frac{2}{6}+\frac{1}{6}=\frac{5}{6}$$

Land left

$$1-\frac{5}{6}=\frac{1}{6}$$

Therefore,

$$\boxed{\frac{1}{6}}$$

of the original land remained with Somu.

Question 10

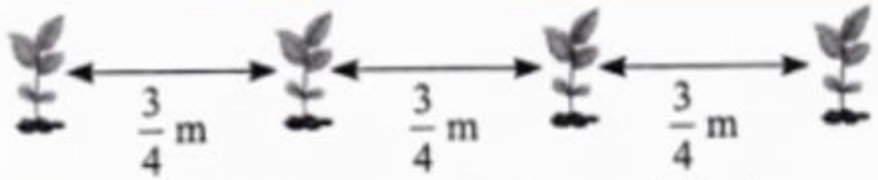
$$3\frac{3}{4} = \frac{15}{4},\ 9\frac{3}{5} = \frac{48}{5}$$

$$\text{Area of the rectangle} = 3\frac{3}{4}\text{ ft} \times 9\frac{3}{5}\text{ ft} = \frac{15}{4}\text{ ft} \times \frac{48}{5}\text{ ft}$$

$$= \frac{\cancel{15}^{3} \times \cancel{48}^{12}}{\cancel{4}_{1} \times \cancel{5}_{1}}\text{ sq ft}$$

$$= \frac{3 \times 12}{1 \times 1} = 36\text{ sq ft}$$

Question 11



The distance between the first and the last sapling

$$= \frac{3}{4}\text{ m} + \frac{3}{4}\text{ m} + \frac{3}{4}\text{ m} = 3 \times \frac{3}{4}\text{ m} = \frac{3 \times 3}{4}\text{ m}$$

$$= \frac{9}{4}\text{ m} = 2\frac{1}{4}\text{ m}$$

Question 12

Which is heavier?

(a)

$$\frac{3}{5} \text{ of } 500 \text{ g}$$

or

(b)

$$\frac{1}{4} \text{ of } 4 \text{ kg}$$

Solution

$$\frac{12}{15} \text{ of } 500 \text{ g} = \frac{12}{15} \times 500 \text{ g} = \frac{\cancel{12}^{4} \times \cancel{500}^{100}}{\cancel{15}_{5}} = 400 \text{ g}$$

$$\text{And } \frac{3}{20} \times 4000 \text{ g} = \frac{3 \times \cancel{4000}^{200}}{\cancel{20}} \text{ g}$$

$$= 600 \text{ g} \qquad (\because 1 \text{ kg} = 1000 \text{ g})$$

$\because$ 600 g is heavier than 400 g

$\therefore \frac{3}{20}$ of 4 kg is heavier than $\frac{12}{15}$ of 500 grams.

Question 13

Evaluate the following.

$$3+\frac{7}{9}=3\times\frac{9}{7}=\frac{3\times 9}{7}=\frac{27}{7}=3\frac{6}{7}$$

$$\frac{14}{4}+2=\frac{\cancel{14}^{7}}{4}\times\frac{1}{\cancel{2}_{1}}=\frac{7}{4}=1\frac{3}{4}$$

$$\frac{2}{3}+\frac{2}{3}=\frac{2}{3}\times\frac{3}{2}=\frac{\cancel{2}^{1}\times\cancel{3}^{1}}{\cancel{3}_{1}\times\cancel{2}_{1}}=1$$

$$\frac{14}{6}+\frac{7}{3}=\frac{14}{6}\times\frac{3}{7}=\frac{14\times 3}{6\times 7}=\frac{42}{42}=1$$

$$\frac{4}{3}+\frac{3}{4}=\frac{4}{3}\times\frac{4}{3}=\frac{16}{9}=1\frac{7}{9}$$

$$\frac{7}{4}+\frac{1}{7}=\frac{7}{4}\times\frac{7}{1}=\frac{49}{4}=12\frac{1}{4}$$

$$\frac{8}{2}+\frac{4}{15}=\frac{8}{2}\times\frac{15}{4}=\frac{8\times 15}{2\times 4}=\frac{\cancel{8}^{1}\times 15}{\cancel{8}_{1}}=15$$

$$\frac{1}{5}+\frac{1}{9}=\frac{1}{5}\times\frac{9}{1}=\frac{9}{5}=1\frac{4}{5}$$

$$\frac{1}{6}+\frac{11}{12}=\frac{1}{6}\times\frac{12}{11}=\frac{1\times\cancel{12}^{2}}{\cancel{6}_{1}\times 11}=\frac{2}{11}$$

$$3\frac{2}{3}+1\frac{3}{8}=\frac{11}{3}+\frac{11}{8}=\frac{11}{3}\times\frac{8}{11}=\frac{\cancel{11}\times 8}{3\times\cancel{11}}=\frac{8}{3}=2\frac{2}{3}$$

Question 2

For each question, choose the correct expression and simplify.

(a)

Maria bought 8 m of lace.

She used

$$\frac{1}{4}\text{ m}$$

for each bag.

How many bags did she decorate?

Correct Expression

$$8 \div \frac{1}{4}$$

Solution

$$8 \times 4 = 32$$

Answer

$$\boxed{32}$$

bags

(b)

$$\frac{3}{4}$$

metre ribbon is used to make 8 badges.

Find ribbon used for one badge.

Correct Expression

$$\frac{3}{4} \div 8$$

Solution

$$\frac{3}{4} \times \frac{1}{8} = \frac{3}{32}$$

Answer

$$\boxed{\frac{3}{32}\ \text{m}}$$

(c)

A baker needs

$$\frac{1}{6}$$

kg flour for one loaf.

He has 5 kg flour.

How many loaves can be made?

Correct Expression

$$5 \div \frac{1}{6}$$

Solution

$$5 \times 6 = 30$$

Answer

$$\boxed{30}$$

loaves

Question 15

If

$$\frac{3}{4}$$

kg flour is used to make 12 rotis,

how much flour is needed for 6 rotis?

Solution

6 rotis is half of 12 rotis.

Therefore flour needed is half of

$$\frac{3}{4}$$

kg.

$$\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$$

Answer

$$\boxed{\frac{3}{8} \text{ kg}}$$

Question 4

Patiganita, written by Sridharacharya in the 9th century CE, asks:

What sum is obtained by adding together

$$\frac{1}{2}, \frac{1}{3}, \frac{1}{4},$$

and

$$1 \div \frac{1}{5}$$

Solution

First,

$$1 \div \frac{1}{5} = 5$$

Now,

$$\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + 5$$

LCM = 12

$$\begin{aligned} &= \frac{6}{12} + \frac{4}{12} + \frac{3}{12} + 5 \\ &= \frac{13}{12} + 5 \\ &= \frac{73}{12} \\ &= 6\frac{1}{12} \end{aligned}$$

Answer

$$\boxed{6\frac{1}{12}}$$

Question 17

Mira is reading a 400-page novel.

Yesterday she read

$$\frac{1}{5}$$

of the pages.

Today she read

$$\frac{3}{10}$$

of the pages.

How many pages remain unread?

Solution

Yesterday:

$$\frac{1}{5} \times 400 = 80$$

Today:

$$\frac{3}{10} \times 400 = 120$$

Total read:

$$80 + 120 = 200$$

Remaining:

$$400 - 200 = 200$$

Answer

$$\boxed{\text{200 pages}}$$

Question 18

A car runs 16 km using 1 litre of petrol.

How far will it go using

$$2\frac{1}{2}$$

litres?

Solution

$$2\frac{1}{2} = \frac{5}{2}$$

Distance

$$16 \times \frac{5}{2} = 40$$

Answer

$$\boxed{40 \text{ km}}$$

Question 19

Amritpal decides on a destination for his vacation.

- By train → 5 hours
- By plane → $\frac{3}{4}$hour

How many hours does the plane save?

Solution

Time by train

$$5 \text{ hours}$$

Time by plane

$$\frac{3}{4} \text{ hour}$$

Difference

$$5 - \frac{3}{4}$$

Convert 5 into fourths:

$$5 = \frac{20}{4}$$

Therefore,

$$\frac{20}{4} - \frac{3}{4} = \frac{17}{4} = 4\frac{1}{4}$$

Answer

$$\boxed{4\frac{1}{4}\text{ hours}}$$

The plane saves **4¼ hours**.

Question 20

Mariam's grandmother baked a cake.

Mariam and her cousins finished

$$\frac{2}{3}$$

of the cake.

The remaining cake was shared equally by Mariam's three friends.

How much cake did each friend get?

Solution

The remaining cake is

$$1-\frac{4}{5}=\frac{5-4}{5}=\frac{1}{5}$$

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So, $\frac{1}{5}$of the cake is shared equally by Mariam's three friends.

$$\therefore\ \text{Each of the friend got } \frac{1}{5}\div 3=\frac{1}{5}\times\frac{1}{3}=\frac{1}{15}$$

$$\therefore\ \text{Thus, each friend got } \frac{1}{15} \text{ of the cake.}$$

Question 9

Choose the option(s) describing the product of

$$\frac{5}{4} \times \frac{7}{6}$$

Options:

(a) $> \frac{5}{4}$

(b) $< \frac{5}{4}$

(c) $> \frac{7}{6}$

(d) $< \frac{7}{6}$

(e) > 1

(f) < 1

Solution

$$\frac{5}{4} \times \frac{7}{6} = \frac{35}{24}$$
$$= 1\frac{11}{24}$$

Since

$$\frac{35}{24} > \frac{5}{4}$$

Option (a) ✓

Since

$$\frac{35}{24} > \frac{7}{6}$$

Option (c) ✓

Since

$$\frac{35}{24} > 1$$

Option (e) ✓

Correct Options

$$\boxed{(a),\ (c),\ (e)}$$

Question 22

What fraction of the whole square is shaded?

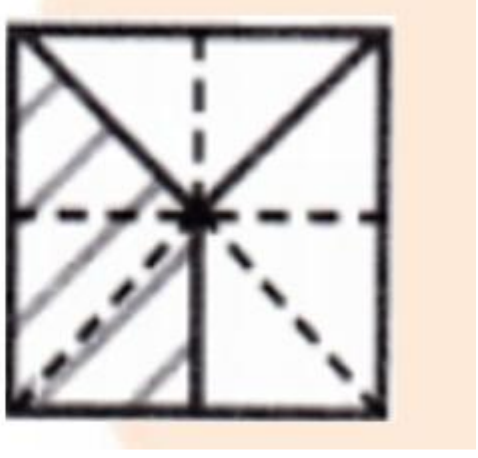
Diagram from the book (simplified)

The large square is divided into 4 equal smaller squares.

One small square is further divided into 8 equal triangles.

Out of those 8 triangles, 3 are shaded.

Solution



One small square occupies

$$\frac{1}{4}$$

of the large square.

Within that square,

$$\frac{3}{8}$$

is shaded.

Therefore,

$$\frac{1}{4} \times \frac{3}{8} = \frac{3}{32}$$

Answer

$$\boxed{\frac{3}{32}}$$

of the whole square is shaded.

Question 23

A colony of ants searches for food.

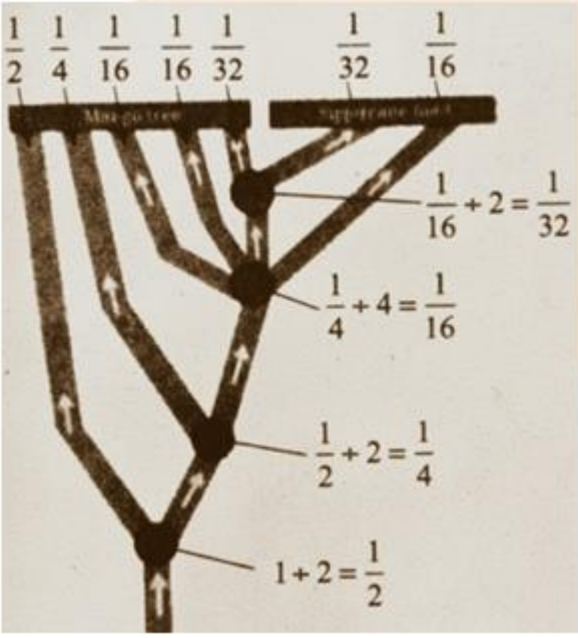
At each branching point, the ants split equally.

Two food sources are reached:

- Mango tree
- Sugarcane field

Find the fraction of the original group reaching each food source.

Solution



First split

$$1 \div 2 = \frac{1}{2}$$

goes each way.

Second split

$$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

Third split

Into four equal branches:

$$\frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$$

Fourth split

Into two equal branches:

$$\frac{1}{16} \times \frac{1}{2} = \frac{1}{32}$$

Following the route shown in the textbook,

Mango tree

$$\boxed{\frac{1}{2}}$$

of the ants reach the mango tree.

Sugarcane field

$$\boxed{\frac{1}{32}}$$

of the ants reach the sugarcane field.

(These values follow the branching pattern shown in the figure.)

Question 24

Find

$$1 - \frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} \times \frac{4}{5} \times \cdots \times \frac{99}{100}$$

Make a general statement and explain.

Solution

Observe the pattern:

$$\frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} \times \frac{4}{5} \times \cdots \times \frac{99}{100}$$

Every denominator cancels the next numerator.

1/2 × 2/3 × 3/4 × 4/5 × ... × 99/100
↑ ↑ ↑ ↑
cancel cancel cancel cancel

Only the first numerator and the last denominator remain.

$$= \frac{1}{100}$$

Therefore,

$$1 - \frac{1}{100} = \frac{99}{100}$$

Answer

$$\boxed{\frac{99}{100}}$$

General Statement

For

$$\frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} \times \cdots \times \frac{n-1}{n}$$

all middle terms cancel.

Result:

$$\boxed{\frac{1}{n}}$$

This is called a **telescoping product**.

Practice Time 8.1

1.

$$\frac{2}{5} \times 25 = \frac{2 \times 25}{5} = 10$$

Answer: 10

2.

$$18 \times \frac{2}{9} = \frac{18}{9} \times 2 = 2 \times 2 = 4$$

Answer: 4

3.

$$\frac{7}{8} \times \frac{12}{21} = \frac{1}{2}$$

Answer: $\frac{1}{2}$

4.

$$\frac{5}{6} \times \frac{9}{10} = \frac{45}{60} = \frac{3}{4}$$

Answer: $\frac{3}{4}$

5.

$$2\frac{1}{3} \times \frac{3}{14} = \frac{7}{3} \times \frac{3}{14} = \frac{7}{14} = \frac{1}{2}$$

Answer: $\frac{1}{2}$

6.

$$\frac{4}{7} \times \frac{21}{16} = \frac{3}{4}$$

Answer: $\frac{3}{4}$

7.

$$\left(\frac{5}{12} \times \frac{18}{20}\right) \times \frac{10}{3}$$
$$= \frac{3}{8} \times \frac{10}{3} = \frac{30}{24} = \frac{5}{4}$$

Answer: $\frac{5}{4}$

Practice Time 8.2

1.

$$\frac{3}{4} \div \frac{5}{6} = \frac{3}{4} \times \frac{6}{5} = \frac{9}{10}$$

Answer: $\frac{9}{10}$

2.

$$\frac{2}{7} \div \frac{14}{27} = \frac{2}{7} \times \frac{27}{14} = \frac{27}{49}$$

Answer: $\frac{27}{49}$

3.

$$5 \div \frac{2}{3} = 5 \times \frac{3}{2} = \frac{15}{2}$$

Answer: $7\frac{1}{2}$

4.

$$\frac{3}{5} \div 6 = \frac{3}{5} \times \frac{1}{6} = \frac{1}{10}$$

Answer: $\frac{1}{10}$

5.

$$2\frac{1}{2} \div \frac{5}{8} = \frac{5}{2} \times \frac{8}{5} = 4$$

Answer: 4

6.

Compare:

$$\frac{2}{3} \div \frac{3}{4} = \frac{8}{9}$$
$$\frac{2}{3} \div \frac{2}{3} = 1$$

Since

$$1 > \frac{8}{9}$$

Answer: $\frac{2}{3} \div \frac{2}{3}$is larger.

Practice Time 8.3

1.

Milk per cup

$$\frac{5}{6} \div 10 = \frac{5}{60} = \frac{1}{12} \text{ L}$$

Answer: $\frac{1}{12}$**L**

2.

Area of one tile

$$\frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$$

Number of tiles

$$\frac{7}{4} \div \frac{1}{9} = \frac{7}{4} \times 9 = \frac{63}{4} = 15\frac{3}{4}$$

Answer: $15\frac{3}{4}$**tiles**

3.

Tap A fills in 1 day.

Rate = 1tank/day

Tap B fills in $\frac{1}{4}$day.

Rate = 4tanks/day

Together:

$$1 + 4 = 5$$

Time

$$\frac{1}{5} \text{ day}$$

Answer: $\frac{1}{5}$**day**

4.

One small square

$$= \frac{1}{4}$$

Half of one small square

$$= \frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$$

Answer: $\frac{1}{8}$

5.

Center square area

$$= \frac{1}{9}$$

Shaded part

$$\frac{2}{3} \times \frac{1}{9} = \frac{2}{27}$$

Answer: $\frac{2}{27}$

6.

$$\frac{2}{3} \times \frac{3}{5} \times \frac{1}{4} = \frac{6}{60} = \frac{1}{10}$$

Answer: $\frac{1}{10}$**of the coin**

Exam Time MCQs

1.

$$\frac{2}{5} \times 3 = \frac{6}{5}$$

Answer: (d) $\frac{6}{5}$

2.

$$\frac{3}{4} \times \frac{2}{5} = \frac{6}{20} = \frac{3}{10}$$

Answer: (b) $\frac{3}{10}$

3.

$$3 \div \frac{1}{4} = 12$$

Answer: (b) 12

4.

$$\frac{2}{3} \div \frac{3}{5} = \frac{2}{3} \times \frac{5}{3} = \frac{10}{9}$$

Answer: (a) $\frac{10}{9}$

5.

If $0 < p < 1$and $0 < q < 1$,

their product is less than both.

Answer: (b) Less than both

Fill in the Blanks

1. $\frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}$
2. reciprocal
3. $\frac{3}{5}$of 60 = 36
4. $\frac{2}{3} \div 2 = \frac{1}{3}$
5. factors

True / False

1. True
2. True
3. True
4. True
5. False

Match the Columns

Column A	Column B
1. Multiply by reciprocal	c
2. Fraction × Fraction	d
3. Whole × Fraction	b
4. Unit square model	a
5. Product size prediction	e

Very Short Answer Questions

1.

Reciprocal of $\frac{7}{9}$

$$\frac{9}{7}$$

2.

For $\frac{3}{5} \times \frac{4}{7}$

Equal parts:

$$5 \times 7 = 35$$

Answer: 35

3.

Dividing by a fraction less than 1 makes the number larger.

4.

Multiply numerators and multiply denominators.

5.

$$1 = \frac{1}{1}$$

Short Answer Questions

1.

$$\frac{3}{4} \times 20 = 15$$

Since $15 < 20$, $\frac{3}{4} \times 20$is less than 20.

2.

$$\frac{6}{14} \times \frac{7}{9} = \frac{3}{7} \times \frac{7}{9} = \frac{1}{3}$$

3.

Because a whole number can be written as a fraction with denominator 1, then multiply normally.

4.

Compare the fraction with 1:

- Fraction < 1 ⇒ product becomes smaller.
- Fraction > 1 ⇒ product becomes larger.

5.

Area model:

$$\frac{2}{3} \times \frac{1}{4} = \frac{2}{12} = \frac{1}{6}$$

Long Answer Questions

1.

$$\frac{3}{5} \times \frac{4}{7} = \frac{12}{35}$$

2.

Example:

$$6 \div \frac{1}{4} = 24$$

Meaning: 24 quarter-units fit into 6 wholes.

3.

$$\frac{5}{6} \times \frac{18}{25} \times \frac{10}{3}$$

Cancel:

$$\frac{5}{6} \times \frac{18}{25} \times \frac{10}{3} = \frac{1 \times 3 \times 2}{1 \times 5 \times 1} = \frac{6}{5}$$

4.

Cyclist speed = 42 km/h

(a)

$$42 \times \frac{2}{3} = 28 \text{ km}$$

(b)

$$42 \times \frac{5}{7} = 30 \text{ km}$$

(c)

$$42 \times \frac{3}{2} = 63 \text{ km}$$

5.

$$\frac{3}{4} \times \frac{2}{5} = \frac{6}{20} = \frac{3}{10}$$

Answer: $\frac{3}{10}$

Competency-Based Questions

Assertion–Reason

1.

Assertion:

$$a \div \frac{1}{b} = ab$$

True.

Reason: Division by a fraction equals multiplication by its reciprocal.

True.

Reason correctly explains assertion.

Answer: (a)

2.

If $0 < p < 1$and $q > 1$,

$pq > q$is False.

Reason statement is True.

Answer: (d)

Case-Based Question

Machine A prints 360 pages/hour.

(a)

$$360 \times \frac{3}{4} = 270$$

Answer: 270 pages

(b) 108 pages

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(d) 360