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Based on the Syllabus prescribed by National Council of Educational Research and Training (NCERT)

NATIONAL EDUCATION POLICY NEP 2020

Maths

Teacher's Manual (Class 7)

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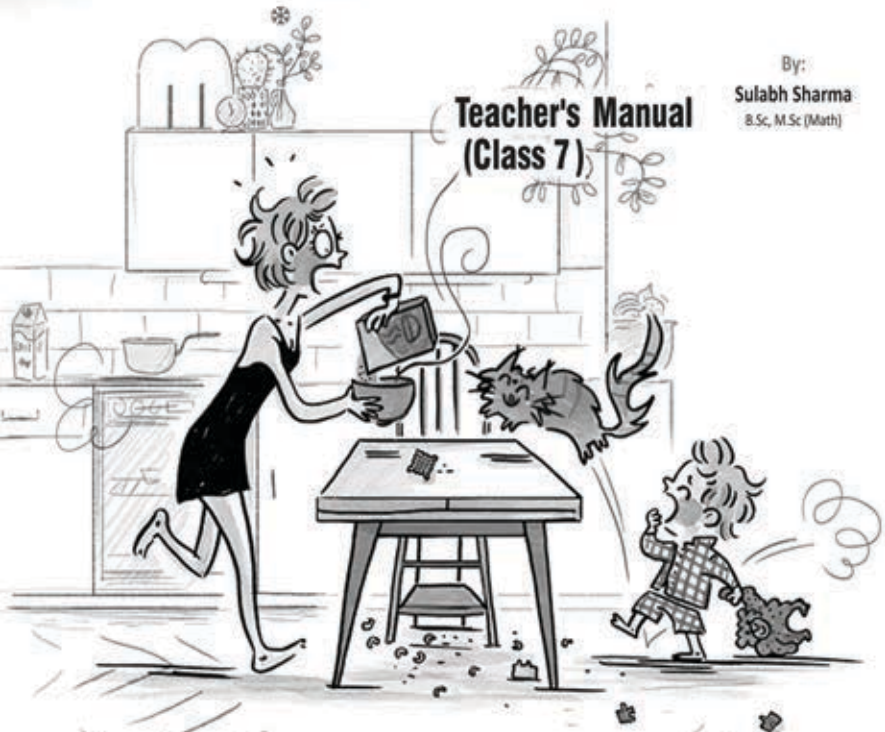


Chapter

1 Integers

Exercise 1.1

1. Find the sum of the following :

(a) $(-4)+(+3)+(-5)$
$=-4+3-5$
$=-9+3$
$=-6$

(b) $40+(-5)+(-20)$
$=40-5-20$
$=40-25$
$=15$

(c) $(-25)+50+20$
$=-25+70$
$=45$

(d) $(-4)+(15)+(+20)+(-12)$
$=-4+15+20-12$
$=35-16=19$

(e) $(16)+(-4)+(-7)$
$=16-4-7$
$=16-11$
$=5$

(f) $(5)+(+7)+(-2)+(-5)$
$=5+7-2-5$
$=5+7-7$
$=5$

2. Subtract the following.

(a) -68 from -30
$=-30-(-68)$
$=-30+68$
$=38$

(b) -42 from 8
$=8-(-42)$
$=8+42$
$=50$

(c) 591 from 1091
$=1091-591$
$=500$

(d) 5700 from -5700
$=-5700-5700$
$=-11400$

(e) -2009 from -1009
$=-1009-(-2009)$
$=-1009+2009=1000$

(f) 0 from -67
$=-67-0$
$=-67$

(g) -48 from 0
$=0-(-48)$
$=0+48=48$

(h) 17 from -38
$=-38-17$
$=-55$

(i) -17 from 57
$=57-(-17)$
$=57+17=74$

3. Find the additive inverse of the following numbers :

(a) Additive inverse of $90 = -90$

(b) Additive inverse of $-37 = +37$

(c) Additive inverse of $0 = 0$

(d) Additive inverse of $-1908 = +1908$

(e) Additive inverse of $11801 = -11801$

(f) Additive inverse of $-600100 = +600100$

4. Find the absolute value of the following :

(a) The absolute value of $-4 = |-4| = 4$

(b) The absolute value of $0 = |0| = 0$

(c) The absolute value of $+7 = |+7| = 7$

(a) The absolute value of $-8 = |-8| = 8$

5. Find the product of each of the following :

(a) $(-9) \times 4$
$= -36$

(b) $0 \times (-52)$
$= 0$

(c) $7 \times (-35)$
$= -245$

(d) $(-17) \times (-2)$
$= +(17 \times 2) = +34$

(e) $(-7) \times (-49)$
$= +(7 \times 49)$
$= +343$

(f) $(-18) \times (-13)$
$= +(18 \times 13)$
$= +234$

(g) $(-1) \times (-3) \times (6)$
$= +(1 \times 3 \times 6)$
$= +18$

(h) $(-5) \times (-5) \times (-5)$
$= -(5 \times 5 \times 5)$
$= -125$

(i) $(-10) \times 0 \times (-18)$
$= 0 \times (-18)$
$= 0$

(j) $10 \times (-9) \times (-9)$
$= (-90) \times (-9)$
$= +810$

(k) $2 \times (-3) \times 4 \times (-5)$
$= (-6) \times 4 \times (-5)$
$= (-24) \times (-5) = +120$

(l) $(-3) \times (-3) \times 0 \times (-6)$
$= 9 \times 0 \times (-6)$
$= 0 \times (-6) = 0$

6. Speed $= 6$ m/min

total distance $= 10 - (-350)$ m
$= 10 + 350$ m $= 360$ m

$$\text{Time} = \frac{\text{distance}}{\text{speed}} = \frac{360}{6} = 60 \text{ min or } 1 \text{ hr}$$

7. No, collection of integers is not associative under subtraction.

8. No, collection of integers is not associative under division.

e.g., $24 \div (12 \div 2) \neq (24 \div 12) \div 2$

$24 \div 6 \neq 2 \div 2$

$4 \neq 1$

9. Verify and name the property used :

(a) $(-202) \times (-142) = (-142) \times (-202)$

$+28684 = +28684$

LHS = RHS

(commotative property over multiplication)

(b) $-1210 + 265 = 265 + (-1210)$

$-945 = -945$

L.H.S. = R.H.S

(commotative property over addition)

(c) $[-15 + 135] + (-250) = -15 + [135 + (-250)]$

$[+120] - (250) = -15 + [135 - 250]$

$120 - 250 = -15 + (-115)$

$-130 = -15 - 115$

$-130 = -130$

(Associative property over addition)

L.H.S. = R.H.S

(d) $(-20 \times 5) \times (-356) = -20 \times [5 \times (-356)$

$(-100) \times (-356) = -20 \times [5 \times (-356)]$

$(-100) \times (-356) = (-20) \times (-1780)$

$+35600 = +35600$

L.H.S. = R.H.S.

(Associative property over addition)

10. Fill in the blanks

(a) $-19 \div \boxed{-1} = 19$ (b) $(23) \div \boxed{-23} = -1$

(c) $(-602) \div \boxed{1} = -602$ (d) $\boxed{-93} \div 1 = -93$

(e) $\boxed{-1} \div 1 = -1$ (f) $121 \div \boxed{-11} = -11$

(g) $\boxed{-35} \div (7) = -5$

11. $a \div 5 = -b$

Such pairs are = $(-10, -2)$ $(-15, -3)$ $(-20, -4)$ $(-25, -5)$, $(-30, -6)$, $(-35, -7)$ etc.

12. (a) Let Ankit attempts x questions incorrect

Marks scored by Ankit $= 80$

$$20\times(+5)+x\times(-2)=80$$
$$100-2x=80$$
$$2x=100-80$$
$$2x=20$$
$$x=\frac{20}{2}$$
$$x=10$$

So, Ankit attempted 10 questions incorrect.

(b) Let Bhavna attempted x questions incorrect.

Marks scored by Bhavna $= 0$

$$10\times(+5)+x\times(-2)=0$$
$$50-2x=0$$
$$2x=50$$
$$x=\frac{50}{2}$$
$$x=25$$

So, Bhavna attempted 25 questions incorrect.

(c) Let Chavi attempted x questions correct and $(13-x)$ questions incorrect

So, marks scored by Chavi $=-5$

$$x\times(+5)+(13-x)\times(-2)=-5$$
$$5x-26+2x=-5$$
$$7x=-5+26$$
$$7x=21$$
$$x=\frac{21}{7}$$
$$x=3$$

So, Chavi attempted 3 questions correct and $(13-3)=10$ questions incorrect.

13. Product of two number $=-153$

one no. $=9$

othe no. $=-153\div 9$

$$=\frac{-153}{9}=-17$$

14. For each of the following statements, write true or false :

(a) False (b) True (c) False

(d) True (e) False (f) False

Exercise 1.2

1. Express the following statements in mathematical terms making use of brackets :

(a) $(-15)\times[12+(-35)]$ (b) $-21\div 7+7$

(c) $36\div(8-2)$ (d) $21+15\div 3$

(e) $5\times[(32-7)-1]$ (f) $(8\times 5)-[(-6)\times(-10)]$

2. Find the value of :

(a) $120-45\div 15$
$=120-3$
$=117$

(b) $28\div\overline{10-9}$
$=28\div 1$
$=28$

(c) $5-(5+3-2)$
$=5-(8-2)$
$=5-(6)=-1$

(d) $28+8\div 4$
$=28+2$
$=30$

(e) $(-21)+8\div[6-(4)]$
$=-21+8\div 2$
$=-21+4=-17$

(f) $15-(3\times 2)-4$
$=15-6-4$
$=9-4=5$

(g) $15+(-4)\times(-5)-8$
$=15+20-8$
$=35-8$
$=27$

(h) $(-4)-(-30)\div(-12-3)\times 5$
$=(-4)-(-30)\div(-15)\times 5$
$=-4-(2)\times 5$
$=-4-10=-14$

3. Simplify :

(a) $15+3\times 3-[14-2-\{9-(7-\overline{9-4})\}]$
$=15+3\times 3-[14-2-\{9-(7-5)\}]$
$=15+9-[14-2-\{9-2\}]$
$=15+9-[14-2-7]$
$=15+9-[14-9]$
$=24-5=19$

(b) $-25+12\div(9-3)$
$=-25+12\div 6$
$=-25+2=-23$

(c) $-30+\{\overline{(-1)-(-2)}\times 3\div \overline{6-3}\}$

$=-30+\{1\times 3\div 3\}$

$=-30+\{3\div 3\}$

$=-30+1=-29$

(d) $75-\{35\times 2-(14\times 4+6)\}$

$=75-\{35\times 2-(56+6)\}$

$=75-\{70-62\}$

$=75-\{8\}=67$

(e) $12+5-[9-\{6\div 2-(6-12\div 3)\div 2\}]-5$

$=12+5-[9-\{6\div 2-(6-4)\div 2\}]-5$

$=12+5-[9-\{6\div 2-2\div 2\}]-5$

$=12+5-[9-\{3-1\}]-5$

$=12+5-[9-2]-5$

$=12+5-7-5$

$=17-12=5$

(f) $29-[38-\{40\div 2-(6-9\div 3)\div 3\}]$

$=29-[38-\{40\div 2-(6-3)\div 3\}]$

$=29-[38-\{40\div 2-3\div 3\}]$

$=29-[38-\{40\div 2-1\}]$

$=29-[38-\{20-1\}]$

$=29-[38-19]=29-19=10$

(g) $14+\frac{1}{5}[\{-10\times(25-\overline{13-3})\}\div(-5)]$

$=14+\frac{1}{5}[\{-10\times(25-10)\}\div(-5)]$

$=14+\frac{1}{5}[\{-10\times 15\}\div(-5)]$

$=14+\frac{1}{5}[\{-150\}\div(-5)]$

$=14+\frac{1}{5}[30]$

$=14+\frac{1}{5}\times 30$

$=14+6=20$

(h) $12-[7-\{16-(18-\overline{6+3-1})\}]$

$=12-[7-\{16-(18-8)\}]$

$=12-[7-\{16-10\}]$

$=12-[7-6]$

$=12-1=11$

(i) $(21-4)\times[20+\{18+\overline{10-5}\}]$

$=17\times[20+\{18+5\}]$

$=17\times[20+23]$

$=17\times 43=731$

(j) $14-\frac{1}{2}\{13+2-(7+5-\overline{2+3})\}$

$=14-\frac{1}{2}\{13+2-(7+5-5)\}$

$=14-\frac{1}{2}\{13+2-7\}$

$=14-\frac{1}{2}\{15-7\}$

$=14-\frac{1}{2}\times 8=14-4=10$

(k) $100-[18-\{16\div 2-(16-12\div 3)\div 3\}]$

$=100-[18-\{16\div 2-(16-4)\div 3\}]$

$=100-[18-\{16\div 2-12\div 3\}]$

$=100-[18-\{8-4\}]$

$=100-[18-4]$

$=100-14=86$

(l) $(-4)\times(-5)[3\times(-6)+3\times(\overline{2\times 6}-4-4)]$

$=(-4)\times(-5)\times[3\times(-6)+3\times(12-4-4)]$

$=(-4)\times(-5)\times[3\times(-6)+3\times 4]$

$=(-4)\times(-5)\times(-18+12)$

$=20\times(-6)=-120$

Multiple Choice Questions

Tick (✓) the correct option :

1. (c) **2.** (a) **3.** (b) **4.** (c) **5.** (c) **6.** (a) **7.** (a) **8.** (c) **9.** (a) **10.** (b)

Chapter

2 Exponents

Exercise 2.1

1. Write the base and exponent in each of the following :

(a) $(3)^7 \Rightarrow$ Base = 3, exponent = 7

(b) $(-4)^2 \Rightarrow$ Base = – 4, exponent = 2

(c) $(10)^5 \Rightarrow$ Base = 10, exponent = 5

(d) $\left(\frac{2}{3}\right)^7 \Rightarrow$ Base = $\frac{2}{3}$, exponent = 7

(e) $(-4)^6 \Rightarrow$ Base = – 4, exponent = 6

(f) $\left(\frac{-3}{7}\right)^5 \Rightarrow$ Base = $\frac{-3}{7}$, exponent = 5

(g) $(7)^7 \Rightarrow$ Base = 7, exponent = 7

(h) $(-7)^5 \Rightarrow$ Base = –7, exponent = 5

2. Express the following in exponential form :

(a) $7 \times 7 \times 7 = 7^3$

(b) $(-2) \times (-2) \times (-2) \times (a) \times (a) \times b = (-2)^3 \times a^2 \times b$

(c) $(-3) \times (-3) \times (b) \times (b) \times (b) = (-3)^2 \times b^3$

(d) $(a) \times (a) \times (a) \times (b) \times (b) \times (c) \times (c) \times (d) = a^3 \times b^2 \times c^2 \times d$

(e) $(2) \times (2) \times (2) \times (b) \times (c) \times (c) \times (b) = 2^3 \times b^2 \times c^2$

(f) $(-3) \times (-3) \times (-3) \times (p) \times (p) \times q = (-3)^3 \times p^2 \times q$

(g) $(-x) \times (-x) \times (-x) \times (y) \times (y) \times (z) = (-x)^3 \times y^2 \times z$

3. Find the value of each of the following numbers using exponential notation :

(a) $(-7)^3 = (-7) \times (-7) \times (-7) = -343$

(b) $(-4)^2 = (-4) \times (-4) = 16$

(c) $\left(\frac{-1}{2}\right)^6 = \frac{-1}{2}\times\frac{-1}{2}\times\frac{-1}{2}\times\frac{-1}{2}\times\frac{-1}{2}\times\frac{-1}{2} = \frac{1}{64}$

(d) $-\left(\frac{1}{10}\right)^4 = \frac{-1}{10}\times\frac{-1}{10}\times\frac{-1}{10}\times\frac{-1}{10} = \frac{1}{10000}$

4. Write the exponential notation :

(a) $10000 = 10\times 10\times 10\times 10 = (10)^4$

(b) $125 = 5\times 5\times 5 = (5)^3$

(c) $\frac{-32}{243} = \frac{-2\times-2\times-2\times-2\times-2}{3\times3\times3\times3\times3} = \frac{(-2)^5}{(3)^5} = \left(\frac{-2}{3}\right)^5$

(d) $\frac{8}{729} = \frac{2\times2\times2}{9\times9\times9} = \left(\frac{2}{9}\right)^3$

(e) $\frac{-2187}{128} = \frac{-3\times-3\times-3\times-3\times-3\times-3\times-3}{2\times2\times2\times2\times2\times2\times2} = \left(\frac{-3}{2}\right)^7$

(f) $\frac{81}{2401} = \frac{3\times3\times3\times3}{7\times7\times7\times7} = \left(\frac{3}{7}\right)^4$

(g) $\frac{243}{1024} = \frac{3\times3\times3\times3\times3}{4\times4\times4\times4\times4} = \left(\frac{3}{4}\right)^5$

(h) $\frac{343}{729} = \frac{7\times7\times7}{9\times9\times9} = \left(\frac{7}{9}\right)^3$

5. Expand and write as a rational number :

(a) $(-5)^3 = -5\times-5\times-5 = -125$

(b) $\left(\frac{-1}{3}\right)^4 = \frac{-1}{3}\times\frac{-1}{3}\times\frac{-1}{3}\times\frac{-1}{3} = \frac{1}{81}$

(c) $\left(\frac{-2}{7}\right)^3 = \frac{-2}{7}\times\frac{-2}{7}\times\frac{-2}{7} = \frac{-8}{343}$

(d) $\left(\frac{3}{4}\right)^2 = \frac{3}{4}\times\frac{3}{4} = \frac{9}{16}$

6. Write the reciprocal of the following :

(a) $(-3)^5 \Rightarrow$ reciprocal of $(-3)^5 = \left(\frac{1}{-3}\right)^5$

(b) $\left(\frac{2}{5}\right)^4 \Rightarrow$ reciprocal of $\left(\frac{2}{5}\right)^4 = \left(\frac{5}{2}\right)^4$

(c) $\left(\frac{-5}{11}\right)^2 \Rightarrow$ reciprocal of $\left(\frac{-5}{11}\right)^2 = \left(\frac{-11}{5}\right)^2$

(d) $(-8)^5 \Rightarrow$ reciprocal of $(-8)^5 = \left(\frac{1}{-8}\right)^5$

7. Which is greater?

(a) 3^2 or 2^3

$3^2 = 9$

$2^3 = 8$

$9 > 8$

or 3^2 is greater than 2^3

(b) 5^3 or 3^5

$5^3 = 125$

$3^5 = 243$

$125 < 243$

3^5 is greater than 5^3

(c) 2^8 or 8^2

$2^8 = 256$

$8^2 = 64$

$256 > 64$

2^8 is greater than 8^2

(d) 4.2×10^8 or 2.4×10^9

$4.2 \times 10^8 = 4.2 \times 100000000 = 4200000000$

$2.4 \times 10^9 = 2.4 \times 1000000000$

$4200000000 < 2400000000$

2.4×10^9 is greater than 4.2×10^8

(e) 5×10^{12} or 4×10^{13}

$5 \times 10^{12} = 5 \times 1000000000000 = 5000000000000$

$4 \times 10^{13} = 4 \times 10000000000000 = 40000000000000$

$500000000000 < 4000000000000$

4×10^{13} is greater than 5×10^{12}

8. Evaluate.

(a) $30 - 3^3 = 30 - 27 = 3$

(b) $51 + 2^3 = 51 + 8 = 59$

(c) $3^4 + 2 \times (-17) = 81 + (-34) = 81 - 34 = 47$

(d) $2^5 - (5).(5) = 32 - 5 \times 5 = 32 - 25 = 7$

(e) $(-4)^2 + (-1)^3 = 16 + (-1) = 16 - 1 = 15$

(f) $(3)^4 + (4)^3 = 81 + 64 = 145$

9. Find the number which makes the given expressions true.

(a) $2^x = 32$

$2^x = (2)^5$

$x = 5$

(b) $(-4)^x = -64$

$(-4)^x = (-4)^3$

$x = 3$

(c) $(0.5)^y = 0.25$

$(0.5)^y = (0.5)^2$

$y = 2$

(d) $10^y = 10000$

$10^y = (10)^4$

$y = 4$

(e) $1^3 + 2^3 + 3^3 + 4^3 = 10^x$

$1 + 8 + 27 + 64 = 10^x$

$100 = 10^x$

$10^2 = 10^x$

$x = 2$

Exercise 2.2

1. Expand :

(a) $(3a)^5 = 3^5 \times a^5$

(b) $(4 \times 3)^6 = 4^6 \times 3^6$

(c) $(2 \times b)^4 = 2^4 \times b^4$

(d) $(7 \times 3)^{10} = 7^{10} \times 3^{10}$

(e) $(-6a)^3 = (-6)^3 \times a^3$

(f) $(a \times b)^{10} = a^{10} \times b^{10}$

(g) $(8 \times -b)^{11} = 8^{11} \times -b^{11}$

(h) $(-8 \times x)^{15} = -8^{15} \times x^{15}$

2. Using the laws of exponents. Simplify in the exponential form :

(a) $3^9 \times 3^2 = (3)^{9+2} = 3^{11}$

(b) $6^3 \times 6^4 \times 6^2 = (6)^{3+4+2} = 6^9$

(c) $m \times m^2 \times m^3 = (m)^{1+2+3} = m^6$

(d) $\left(\frac{1}{4}\right)^6 \times \left(\frac{1}{4}\right)^2 = \left(\frac{1}{4}\right)^{6+2} = \left(\frac{1}{4}\right)^8$

(e) $\left(-\frac{3}{5}\right)^6 \times \left(-\frac{3}{5}\right)^3 \times \left(-\frac{3}{5}\right)^5 = \left(\frac{-3}{5}\right)^{6+3+5} = \left(\frac{-3}{5}\right)^{14}$

(f) $\left(-\frac{2}{3}\right) \times \left(-\frac{2}{3}\right)^4 \times \left(-\frac{2}{3}\right)^6 = \left(\frac{-2}{3}\right)^{1+4+6} = \left(\frac{-2}{3}\right)^{11}$

(g) $(-4)^2 \times (-4)^3 \times (-4)^6 = (-4)^{2+3+6} = (-4)^{11}$

(h) $n^6 \times n^2 \times n^{10} = (n)^{6+2+10} = n^{18}$

(i) $(-7) \times (-7)^3 \times (-7)^4 = (-7)^{1+3+4} = (-7)^8$

3. Write the following in exponential form assuming the denominators not equal to zero :

$(x^a \div x^b = x^{a-b})$

(a) $\frac{4^6}{4^3} = 4^6 \div 4^3 = 4^{6-3} = 4^3$

(b) $\frac{10^{12}}{10^5} = 10^{12} \div 10^5 = 10^{12-5} = 10^7$

(c) $\frac{(-2)^8}{(-2)^6} = (-2)^8 \div (-2)^6 = (-2)^{8-6} = (-2)^2$

(d) $\frac{(-5)^{10}}{(-5)^4} = (-5)^{10} \div (-5)^4 = (-5)^{10-4} = (-5)^6$

(e) $\left(-\frac{1}{2}\right)^{11} \div \left(-\frac{1}{2}\right)^6 = \left(\frac{-1}{2}\right)^{11-6} = \left(\frac{-1}{2}\right)^5$

(f) $(0.5)^7 \div (0.5)^3 = (0.5)^{7-3} = (0.5)^4$

(g) $(6.8)^{10} \div (6.8)^4 = (6.8)^{10-4} = (6.8)^6$

(h) $\left(\frac{x}{y}\right)^6 \div \left(\frac{x}{y}\right)^4 = \left(\frac{x}{y}\right)^{6-4} = \left(\frac{x}{y}\right)^2$

4. Express the following with a single power :

$(x^{ab} = x^{a \times b}; x^a \times x^b = x^{a+b})$

(a) $(3^3)^5 \times (3^4)^2 = (3)^{3\times5} \times (3)^{4\times2} = (3)^{15} \times (3)^8$

$= (3)^{15+8} = (3)^{23}$

(b) $(7^2)^5 \times (7^3)^6 = (7)^{2\times5} \times (7)^{3\times6} = (7)^{10} \times (7)^{18}$

$= (7)^{10+18} = (7)^{28}$

(c) $(5^3)^6 \times (5^2)^4 = (5)^{3\times6} \times (5)^{2\times4} = (5)^{18} \times (5)^8$

$= (5)^{18+8} = (5)^{26}$

(d) $(2^{10})^3 \times (2^5)^4 = (2)^{10\times3} \times (2)^{5\times4}$

$= (2)^{30} \times (2)^{20} = (2)^{30+20} = (2)^{50}$

(e) $(9^2)^3 \times (9^3)^4 = (9)^{2\times3} \times (9)^{3\times4} = (9)^6 \times (9)^{12}$

$= (9)^{6+12} = (9)^{18}$

(f) $(10^3)^4 \times (10^5)^3 = (10)^{3\times4} \times (10)^{5\times3}$

$= (10)^{12} \times (10)^{15} = (10)^{12+15} = (10)^{27}$

(g) $(2)^{4\times3} \times (2)^{3\times2} \times (2)^{2\times4} = (2)^{12} \times (2)^6 \times (2)^8$

$= (2)^{12+6+8} = (2)^{26}$

(h) $(3^2)^3 \times (3^3)^2 \times (3^4)^3 = (3)^{2\times3} \times (3)^{3\times2} \times (3)^{4\times3}$

$= (3)^6 \times (3)^6 \times (3)^{12}$

$= (3)^{6+6+12} = 3^{24}$

5. Which one is greater?

(a) $(3^2)^4$ or $(3^2) \times 4$

$(3^2)^4 = 3^{2\times4} = 3^8 = 6561$

$3^2 \times 4 = 9 \times 4 = 36$

$6561 > 36$

$(3^2)^4$ is greater

(b) $(4^3)^5$ or $(4^3) \times 5$

$(4^3)^5 = 4^{3\times5} = 4^{15}$

$4^3 \times 5 = 64 \times 5 = 320$

$4^{15} > 320$

$(4^3)^5$ is greater

6. Simplify and answer in the exponential :

(a) $(2^3 \times 2)^2 = (2^{3+1})^2 = (2^4)^2 = 2^{4\times2} = 2^8$

(b) $\left(\frac{4^6 \times a^8 b^5}{4^3 \times a^5 b^2}\right) = \frac{4^6}{4^3} \times \frac{a^8 b^5}{a^5 b^2} = (4)^{6-3} \times (a)^{8-5} \times (b)^{5-2}$

$= 4^3 \times a^3 \times b^3 = (4ab)^3$

(c) $\frac{2^8 \times a^5}{4^3 \times a^3} = \frac{2^8 \times a^5}{2^6 \times a^3} = (2)^{8-6} \times (a)^{5-3} = (2)^2 (a)^2 = (2a)^2$

(d) $2^3 \times 2^2 \times 5^5 = (2)^{3+2} \times (5)^5 = (2)^5 \times (5)^5 = (2 \times 5)^5 = 10^5$

(e) $\left[\left(\frac{1}{4}\right)^3\right]^2 \times \left(\frac{1}{4}\right)^5 = \left(\frac{1}{4}\right)^6 \times \left(\frac{1}{4}\right)^5 = \left(\frac{1}{4}\right)^{6+5} = \left(\frac{1}{4}\right)^{11}$

(f) $[-6^3]^2 \div [(-6)^2]^3 = (-6)^6 \div (-6)^6$

$= (-6)^{6-6} = (-6)^0 = 1$

(g) $\left(\frac{-2}{43}\right)^4 \times \left(\frac{-2}{43}\right)^2 \times \left(\frac{-2}{43}\right)^3 = \left(\frac{-2}{43}\right)^{4+2+3} = \left(\frac{-2}{43}\right)^9$

(h) $\left[\left(\frac{-2}{5}\right)^6 \times \left(\frac{-2}{5}\right)^3\right] \div \left(\frac{-2}{5}\right)^8 = \left(\frac{-2}{5}\right)^{6+3} \div \left(\frac{-2}{5}\right)^8$

$= \left(\frac{-2}{5}\right)^9 \div \left(\frac{-2}{5}\right)^8 = \left(\frac{-2}{5}\right)^{9-8} = \left(\frac{-2}{5}\right)^1$

7. Find the value of x is :

(a) $\left(\frac{7}{4}\right)^3 \times \left(\frac{7}{4}\right)^5 = \left(\frac{7}{4}\right)^{x+1}$

$\Rightarrow \quad \left(\frac{7}{4}\right)^{3+5} = \left(\frac{7}{4}\right)^{x+1} \quad \Rightarrow \quad \left(\frac{7}{4}\right)^8 = \left(\frac{7}{4}\right)^{x+1}$

$\Rightarrow \quad 8 = x + 1 \quad \Rightarrow \quad x = 7$

(b) $\left(\frac{-2}{7}\right)^5 \times \left(\frac{3}{5}\right)^5 = \left(\frac{-6}{35}\right)^x$

$\Rightarrow \quad \left[\frac{-2}{7} \times \frac{3}{5}\right]^5 = \left(\frac{-6}{35}\right)^x \quad \Rightarrow \quad \left(\frac{-6}{35}\right)^5 = \left(\frac{-6}{35}\right)^x$

$\Rightarrow \quad x = 5$

Multiple Choice Questions

Tick (✓) the correct answer :

1. (a) **2.** (b) **3.** (b) **4.** (a) **5.** (d) **6.** (d) **7.** (c) **8.** (c).

BRAIN BOOSTER

1. Value of $4^3 = 4 \times 4 \times 4 = 64$

Value of $`3^4 = 3 \times 3 \times 3 \times 3 = 81$

Difference $= 3^4 - 4^3 = 81 - 64 = 17$

2. Value of $5^4 = 5 \times 5 \times 5 \times 5 = 625$

Value of $4^5 = 4 \times 4 \times 4 \times 4 \times 4 = 1024$

Difference $= 1024 - 625 = 399$

3. (b) $x^{2a} \times x^b = x^{2a+b}$

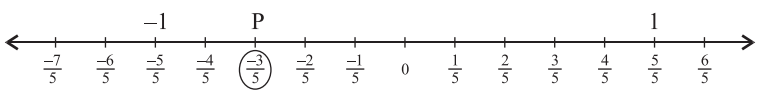
Chapter

3 Rational Numbers

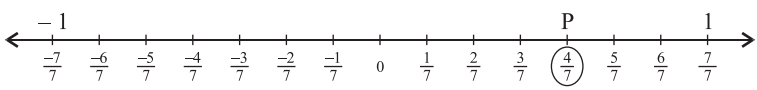
Exercise 3.1

1. Draw number lines and mark the following :

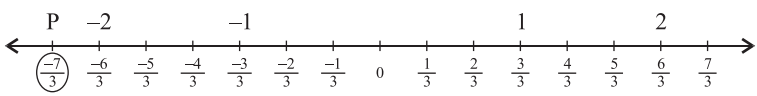
(a)



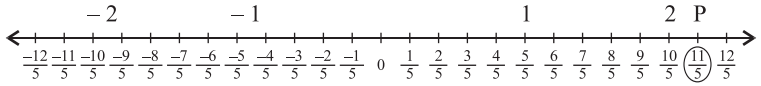
(b)



(c)



(d)



2. State, wheather true (T) or false (F) :

(a) T (b) F (c) F (d) T (e) T

3. Write the numerator and the denominator of each of the following rational numbers :

(a) $\frac{5}{-6}$, Numerator = 5, Denominator = – 6

(b) $\frac{-12}{8}$, Numerator = – 12, Denominator = 8

(c) $\frac{-13}{1}$, Numerator = – 13, Denominator = 1

(d) $\frac{-6}{-7}$, Numerator = – 6, Denominator = – 7

(e) $\frac{18}{25}$, Numerator = 18, Denominator = 25

(f) $\frac{-17}{20}$, Numerator = – 17, Denominator = 20

4. Express the following as rational numbers in the form of $\frac{p}{q}$.

(a) $-9 = \frac{-9}{1}$

(b) $0 = \frac{0}{1}$

(c) $1.8 = \frac{18}{10}$ or $\frac{9}{5}$

(d) $-0.7 = \frac{-7}{10}$

5. Find four rational numbers equivalent to :

(a) $\frac{3}{7} = \frac{3\times2}{7\times2} = \frac{6}{14}; \frac{3\times-2}{7\times-2} = \frac{-6}{-14}; \frac{3}{7} = \frac{3\times3}{7\times3} = \frac{9}{21}; \frac{3}{7}\times\frac{-3}{-3} = \frac{-9}{-21}$

$\frac{6}{14}, \frac{-6}{-14}, \frac{9}{21}, \frac{-9}{21}$ are equavalent rational number of $\frac{3}{7}$.

(b) $\frac{-4}{9} = \frac{-4\times-2}{9\times-2} = \frac{8}{-18}; \frac{-4\times3}{9\times3} = \frac{-12}{27}; \frac{-4\times4}{9\times4} = \frac{-16}{36};$

$\frac{-4\times-5}{9\times-5} = \frac{20}{-45}$

$\frac{8}{-18}, \frac{-12}{27}, \frac{-16}{36}$ and $\frac{20}{-45}$ are equalvalent rational number of $\frac{-4}{9}$.

(c) $\frac{-5}{11}=\frac{-5\times-2}{11\times-2}=\frac{10}{-22}$; $\frac{-5\times-3}{11\times-3}=\frac{15}{-33}$; $\frac{-5\times-4}{11\times-4}=\frac{20}{-44}$;

$\frac{-5\times-5}{11\times-5}=\frac{25}{-55}$

$\frac{10}{-22}$; $\frac{15}{-33}$; $\frac{20}{-44}$ and $\frac{25}{-55}$ are equalaned fractional number $\frac{5}{4}$.

6. Write each of the following with a positive denominator.

(a) $\frac{4}{-13}=\frac{4\times-1}{-13\times-1}=\frac{-4}{13}$

(b) $\frac{-3}{-5}=\frac{-3\times-1}{-5\times-1}=\frac{3}{5}$

(c) $\frac{1}{-9}=\frac{1\times-1}{-9\times-1}=\frac{-1}{9}$

(d) $\frac{-7}{-15}=\frac{-7\times-1}{-15\times-1}=\frac{7}{15}$

7. Check if the following pairs of rational numbers are equivalent :

(a) $\frac{2}{3}$ and $\frac{8}{9}\Rightarrow\frac{2}{3}=\frac{2\times3}{3\times3}=\frac{6}{9}$

$\Rightarrow$ $\frac{6}{9}\neq\frac{8}{9}$ No, pair is not equivalent

(b) $\frac{-5}{6}=\frac{-5\times5}{6\times5}=\frac{-25}{30}$

$\frac{25}{-30}=\frac{25\times-1}{-30\times-1}=\frac{-25}{30}$

$\frac{-25}{30}=\frac{-25}{30}$ Yes, Pair is equivalent.

(c) $\frac{-1}{-3}$ and $\frac{5}{15}$

$\frac{-1}{3}=\frac{-1\times-5}{-3\times-5}=\frac{5}{15}$

$\frac{5}{15}=\frac{5}{15}$ Yes, pair is equivalent

(d) $\frac{-4}{11}$ and $\frac{-12}{22}$

$\frac{-4\times2}{11\times2}=\frac{-8}{22}$; $\frac{-12}{22}$; $\frac{-8}{22}\neq\frac{-12}{22}$ No, pair is not equalvalent.

8. Express the following rational numbers in their standard form.

(a) $\frac{-12}{16} = \frac{-12 \div 4}{16 \div 4} = \frac{-3}{4}$ (H.C.F. of 12 and 16 is 4)

(b) $\frac{-84}{-120} = \frac{-84 \div -12}{-120 \div 12} = \frac{7}{10}$ (H.C.F. of – 84 and – 120 is –12)

(c) $\frac{39}{-49} = \frac{39 \times -1}{-49 \times -1} = \frac{-39}{49}$

(d) $\frac{-32}{-96} = \frac{-32 \times -1}{-96 \times -1} = \frac{32}{96} = \frac{32 \div 32}{96 \div 32} = \frac{1}{3}$

9. Express $\frac{6}{-15}$ as a rational numbers with :

(a) numerator = 48

$\frac{6 \times 8}{-15 \times 8} = \frac{48}{-120}$

(b) numerator = – 84

$\frac{6 \times -14}{-15 \times -14} = \frac{-84}{210}$

(c) denominator = – 75

$\frac{6 \times 5}{-15 \times 5} = \frac{30}{-75}$

(d) denominator = 30

$\frac{6 \times -2}{-15 \times -2} = \frac{-12}{30}$

10. Arrange the following in ascending order.

(a) $\frac{4}{-9}, \frac{-5}{6}, \frac{-2}{3}, \frac{11}{18}$

First, on changing the denominator of $\frac{4}{-9}$ into positive number,

we have $\frac{4}{-9} = \frac{-4}{9}$

Now, compare $\frac{-4}{9}, \frac{-5}{6}, \frac{-2}{3}, \frac{11}{18}$ by converting them into equivalent rational number.

$\frac{11}{18}$ is positive rational number which is largest.

(LCM of 9, 6, 3 is 18)

$\frac{-4}{9} = \frac{-4 \times 2}{9 \times 2} = \frac{-8}{18}; \frac{-5}{6} = \frac{-5 \times 3}{6 \times 3} = \frac{-15}{18}; \frac{-2}{3} = \frac{-2 \times 6}{3 \times 6} = \frac{-12}{18}$

Now, $\frac{-8}{18}, \frac{-15}{18}, \frac{-12}{18}$

Since $-8 > -12 > -15$

or Ascending order $\frac{-15}{18} < \frac{-12}{18} < \frac{-8}{18}$

or $\frac{-5}{6} < \frac{-2}{3} < \frac{-4}{9} < \frac{11}{18}$

(b) $\frac{-7}{5}, \frac{-19}{-30}, \frac{3}{10}, \frac{8}{-15}$

First, on changing the denominator of $\frac{-19}{-30}$ and $\frac{8}{-15}$ into positive number, we have $\frac{-19}{-30} = \frac{19}{30}; \frac{8}{-15} = \frac{-8}{15}$

Now, we have $\frac{19}{30}$ and $\frac{3}{10}$ are positive rational number.

We campare $\frac{19}{30}$ and $\frac{3}{10}$

$19 \times 10 = 190 > 3 \times 30$

$\frac{19}{30} \times \frac{3}{10}$ (By cross multiplication)

$\frac{19}{30}$ is greater than $\frac{3}{10}$.

Now, compare $\frac{-7}{5}$ and $\frac{-8}{15}$

$\frac{-7}{5} \times \frac{-8}{15}$ (By cross multiplication)

$-7 \times 15 < -8 \times 5 = -105 < -40$

or $\frac{-7}{5} < \frac{-8}{15}$

Now, Ascending order

$\frac{-7}{5} < \frac{-8}{15} < \frac{3}{10} < \frac{19}{30}$

or $\frac{-7}{5} < \frac{8}{-15} < \frac{3}{10} < \frac{-19}{-30}$

11. Find two rational numbers between :

(a) $\frac{1}{2}$ and $\frac{3}{4}$

Reduce both of them of equivalent national numbers having denominator equal to the LCM of 2 and 4 multiplied by 20. *i.e.*, 80

$\frac{1}{2}=\frac{1\times 40}{2\times 40}=\frac{40}{80}$ and $\frac{3}{4}=\frac{3\times 20}{4\times 20}=\frac{60}{80}$

Now, we say that $\frac{41}{80},\frac{42}{80},\frac{42}{80},\frac{44}{80},\frac{45}{80}$..... all these rational number between $\frac{1}{2}$ and $\frac{3}{4}$

So, $\frac{41}{80},\frac{42}{80}$ are two rational number between $\frac{1}{2}$ and $\frac{3}{4}$.

(b) $\frac{-1}{2}$ and $\frac{1}{2}$

First rational no. $=\frac{1}{2}\left[\frac{-1}{2}+\frac{1}{2}\right]=\frac{1}{2}\times 0=0$

Now, second rational number between 0 and $-\frac{1}{2}$

$$=\frac{1}{2}\left[0-\frac{1}{2}\right]=\frac{1}{2}\times\frac{-1}{2}=\frac{-1}{4}$$

So, Two rational number between $\frac{-1}{2}$ and $\frac{1}{2}$ are $=0$ and $\frac{-1}{4}$

12. Find four rational numbers between :

(a) $\frac{-3}{5}$ and -2

Reduce both of them of equivalent rational number having denominator equal to the LCM of 5 and 1 that is 5.

$$\frac{-3}{5}=\frac{-3\times 1}{5\times 1}=\frac{-3}{5}$$

$$\frac{-2}{1}=\frac{-2\times 5}{1\times 5}=\frac{-10}{5}$$

Thus, rational numbers between $\frac{-3}{5}$ and $\frac{-10}{5}$ are

$\frac{-4}{5}, \frac{-6}{5}, \frac{-7}{5}, \frac{-8}{5}, \frac{-9}{5}, \frac{-10}{5}$

(choice any four rational number)

Rational numbers are $\frac{-4}{5}, \frac{-6}{5}, \frac{-7}{5}, \frac{-8}{5}$

(b) -2 and -1

-2 and -1 may be shown as rational numbers with a common denominator 10. Let us say

$\frac{-2}{1} \times \frac{10}{10} = \frac{-20}{10}$; $\frac{-1}{1} \times \frac{10}{10} = \frac{-10}{10}$

Thus, rational no. between $\frac{-20}{10}$ and $\frac{-10}{10}$ are

$\frac{-19}{10}, \frac{-18}{10}, \frac{-17}{10}, \frac{-16}{10}, \frac{-15}{10} \ldots \frac{-11}{10}$ (choice any four)

Rational numbers are $\frac{-19}{10}, \frac{-18}{10}, \frac{-17}{10}, \frac{-16}{10}$

(c) $\frac{-4}{5}$ and $\frac{-3}{4}$

$\frac{-4}{5}$ and $\frac{-3}{4}$ may be shown as equalivent rational number having denominator equal to the LCM of 5 and 4 multipled by 10 ; 200

$\frac{-4}{5} \times \frac{40}{40} = \frac{-160}{200}$; $\frac{-3}{4} \times \frac{50}{50} = \frac{-150}{200}$

Thus rational numbers between $\frac{-150}{200}$ and $\frac{-160}{200}$ are

$\frac{-159}{200}, \frac{-158}{200}, \frac{-157}{200}, \frac{-156}{200} \ldots \frac{-151}{200}$ (choice any four)

Rational numbers are $\frac{-159}{200}, \frac{-158}{200}, \frac{-157}{200}, \frac{-156}{200}$.

(d) $\frac{1}{4}$ and $\frac{6}{7}$

$\frac{1}{4}$ and $\frac{6}{7}$ may be shown as equalivent rational number having denominator equal to the LCM of 4 and 7 are 28.

$\frac{1\times 7}{4\times 7}=\frac{7}{28}$; $\frac{6\times 4}{7\times 4}=\frac{24}{28}$

Thus, rational numbers between $\frac{7}{28}$ and $\frac{24}{28}$ are

$\frac{7}{28},\frac{8}{28},\frac{9}{28},\frac{10}{28}\ldots\frac{12}{28},\frac{14}{28}\ldots\frac{20}{28},$ (choice any four)

Rational numbers are $\frac{10}{28},\frac{12}{28},\frac{14}{28},\frac{20}{28}$

13. Fill in the blanks :

(a) $\frac{2}{3}=\frac{\mathbf{24}}{36}$ (b) $\frac{7}{11}=\frac{70}{\mathbf{110}}$ (c) $\frac{-8}{13}=\frac{16}{\mathbf{-26}}$ (d) $\frac{9}{18}=\frac{\mathbf{-9}}{-18}$

Exercise 3.2

1. Fill in the blanks so as to make the given statements true :

(a) $\frac{3}{11}+\frac{-2}{11}=+\frac{\mathbf{1}}{\mathbf{11}}$ (b) $\frac{2}{3}+\mathbf{1}=\frac{5}{3}$ (c) $\frac{5}{9}+\frac{\mathbf{-5}}{\mathbf{9}}=0$

(d) $\frac{\mathbf{13}}{\mathbf{14}}-\frac{5}{7}=\frac{3}{14}$ (e) $\frac{\mathbf{-13}}{\mathbf{17}}-\frac{-13}{17}=0$ (f) $0+\frac{\mathbf{4}}{\mathbf{7}}=\frac{4}{7}$

2. Write the additive inverse of :

(a) The additive inverse of $\frac{2}{9}=\frac{-2}{9}$

(b) The additive inverse of $\frac{-5}{11}=\frac{+5}{11}$

(c) The additive inverse of $\frac{8}{-9}=\frac{8}{9}$

(d) The additive inverse of $\frac{-11}{-61}=\frac{-11}{61}$

3. Add the following :

(a) $\frac{-4}{5}$ and $\frac{-1}{5} = \frac{-4}{5} + \left(\frac{-1}{5}\right) = \frac{-4-1}{5} = \frac{-5}{5} = -1$

(b) $\frac{-5}{7}$ and $\frac{-6}{-7}$

$$\frac{-6}{-7} = \frac{-6\times(-1)}{-7\times(-1)} = \frac{6}{7}$$

Now, $\frac{-5}{7} + \frac{6}{7} = \frac{-5+6}{7} = \frac{1}{7}$

(c) $\frac{3}{9}$ and $\frac{1}{-9}$

$$\frac{1}{-9} = \frac{1\times(-1)}{-9\times(-1)} = \frac{-1}{9}$$

Now, $\frac{3}{9} + \left(\frac{-1}{9}\right) = \frac{3-1}{9} = \frac{2}{9}$

(d) $\frac{-3}{8}$ and $\frac{-5}{8}$

$$\frac{-3}{8} + \left(\frac{-5}{8}\right) = \frac{-3-5}{8} = \frac{-8}{8} = -1$$

4. Add and express the sum in the lowest terms.

(a) $\frac{7}{25} + \frac{3}{5} = \frac{7+(3\times5)}{25} = \frac{7+15}{25} = \frac{22}{25}$

(b) $\frac{-5}{12} + \frac{-1}{4} = \frac{-5}{12} - \frac{1}{4} = \frac{-5-(1\times3)}{12} = \frac{-5-3}{12} = \frac{-8}{12}$ or $= \frac{-2}{3}$

(c) $\frac{-3}{10} + \frac{9}{5} = \frac{-3+(9\times2)}{10} = \frac{-3+18}{10} = \frac{15}{10}$ or $\frac{3}{2}$ or $1\frac{1}{2}$

(d) $\frac{11}{12} + \frac{-1}{4} = \frac{11}{12} - \frac{1}{4} = \frac{11-3}{12} = \frac{8}{12}$ or $\frac{2}{3}$

5. Evaluate the following :

(a) $\frac{7}{12} - \frac{1}{12} = \frac{7-1}{12} = \frac{6}{12}$ or $\frac{1}{2}$ (b) $\frac{-3}{7} - \frac{5}{7} = \frac{-3-5}{7} = \frac{-8}{7}$

(c) $\frac{1}{3}-\left(\frac{-5}{3}\right)=\frac{1-(-5)}{3}=\frac{1+5}{3}=\frac{6}{3}$ or 2

(d) $\frac{-5}{21}-\left(\frac{-3}{21}\right)=\frac{-5+3}{21}=\frac{-2}{21}$

6. Simplify :

(a) $\frac{16}{9}+\frac{5}{-12}+\frac{-7}{18}$

Writing $\frac{5}{-12}$ as a rational number with a positive denominator

$$\frac{5}{-12}\times\frac{-1}{-1}=\frac{-5}{12}$$

$$\frac{16}{9}+\left(\frac{-5}{12}\right)+\left(\frac{-7}{18}\right)=\frac{16}{9}-\frac{5}{12}-\frac{7}{18}$$

$$=\frac{(16\times4)-(5\times3)-(7\times2)}{36}$$

(LCM of 9, 12, 18 = 36)

$$=\frac{64-15-14}{36}=\frac{64-29}{36}=\frac{35}{36}$$

(b) $\frac{-11}{3}+\frac{-3}{4}+\frac{-11}{6}+\frac{3}{8}$ (LCM of 3, 4, 6 and 8 = 24)

$$=\frac{(-11\times8)-(3\times6)-(11\times4)+(3\times3)}{24}$$

$$=\frac{-88-18-44+9}{24}=\frac{-150+9}{24}$$

$$=\frac{-141}{24}\text{ or }\frac{-47}{8}$$

(c) $\frac{5}{7}+\frac{-11}{14}+\frac{16}{21}$

$$=\frac{5\times6+(-11\times3)+(16\times2)}{42}$$ (LCM of 7, 14 and 21 = 42)

$$=\frac{30+(-33)+32}{42}=\frac{62-33}{42}=\frac{29}{42}$$

(d) $\frac{-8}{7}+\frac{-4}{9}+\frac{-11}{7}+\frac{5}{6}$

$=\frac{(-8\times 18)+(-4\times 14)+(-11\times 18)+(5\times 21)}{126}$

(LCM of 7, 9, 7 and 6 = 126)

$=\frac{-144+(-56)+(-198)+105}{126}$

$=\frac{-144-56-198+105}{126}=\frac{-398+105}{126}=\frac{-293}{126}$

7. Sum of $\frac{-5}{7}$ and $\frac{15}{14}$

$\frac{-5}{7}+\frac{15}{14}=\frac{-5\times 2+15}{14}=\frac{-10+15}{14}=\frac{5}{14}$

Subtract $\frac{5}{14}$ from $\frac{9}{28}$

$\frac{9}{28}-\left(\frac{5}{14}\right)=\frac{9-5\times 2}{28}=\frac{9-10}{28}=\frac{-1}{28}$

8. The difference of two rational numbers is $\frac{-6}{25}$.

The greatest number $=\frac{-4}{6}$

So, the smallest number $=\frac{-6}{25}-\left(\frac{-4}{6}\right)$

$=\frac{-36+100}{150}=\frac{64}{150}$ or $\frac{32}{75}$

Thus, the smallest number is $\frac{32}{75}$.

9. Quantity of apples $=\frac{1}{3}$

Quantity of oranges $=\frac{1}{4}$

Quantity of bananas $=\frac{1}{5}$

Let total quantity of fruits in basket $=1$

Quantity of mangoes $=1-\left(\frac{1}{3}+\frac{1}{4}+\frac{1}{5}\right)$

$$=1-\left(\frac{(1\times 20)+(1\times 15)+(1\times 12)}{60}\right)$$

$$=1-\left(\frac{20+15+12}{60}\right)=1-\frac{47}{60}=\frac{60-47}{60}=\frac{13}{60}$$

Total number of fruits $=240$

Number of apples $=240\times\frac{1}{3}=80$

Number of oranges $=240\times\frac{1}{4}=60$

Number of bananas $=240\times\frac{1}{5}=48$

Number of mangoes $=240\times\frac{13}{60}=52$

Thus, $\frac{13}{60}$ mangoes put in baskets and 80 apples, 60 oranges, 49 bananas, 52 mangoes in a basket.

10. Sum of two rational number $=-4$

one rational number $=\frac{-11}{5}$

other number $=-4-\left(\frac{-11}{5}\right)$

$$=\frac{-4\times 5+11}{5}=\frac{-20+11}{5}=\frac{-9}{5}$$

11. One rational number $\frac{-3}{11}$

According to questions $\frac{-3}{11}$ more than $\frac{4}{7}$

$$=\frac{-3}{11}+\frac{4}{7}=\frac{(-3\times 7)+(4\times 11)}{77}=\frac{-21+44}{77}=\frac{23}{77}$$

Thus, required number $= \frac{23}{77}$.

12. Let required number $= x$

According to question;

$$x + \frac{-5}{7} = \frac{13}{21}$$

$$x = \frac{13}{21} - \left(\frac{-5}{7}\right)$$

$$= \frac{13}{21} + \frac{5}{7} = \frac{13 + 5 \times 3}{21}$$

$$= \frac{13 + 15}{21} = \frac{28}{21} = \frac{4}{3}$$

Thus, if $\frac{4}{3}$ added to $\frac{-5}{7}$ to get $\frac{13}{21}$

Exercise 3.3

1. Find the reciprocal of :

(a) Reciporal of $\frac{-6}{11} = \frac{11}{-6}$

(b) Reciporal of $\frac{9}{-5} = \frac{-5}{9}$

(c) Reciporal of $\frac{-1}{10} = -10$

(d) Reciporal of $-5 = \frac{1}{-5}$

2. Write in the standard form :

(a) $\left(\frac{1}{3}\right)^{-1} = (3)^1 = 3$

(b) $(-1)^{-1} = \frac{1}{-1} = -1$

(c) $\left(\frac{5}{-8}\right)^{-1} = \left(\frac{-8}{5}\right)$

(d) $\left[\frac{5}{2} \times \frac{-2}{5}\right]^{-1} = (-1)^{-1} = \frac{1}{-1} = -1$

3. Find the product of the following :

(a) $\frac{-5}{3} \times \frac{-7}{15} \quad \Rightarrow \quad \frac{-5}{3} \times \frac{-7}{15} = \frac{7}{9}$

(b) $\frac{2}{-3} \times \frac{4}{5} \Rightarrow \frac{2\times 4}{-3\times 5} = \frac{8}{-15}$

(c) $\frac{15}{2} \times \frac{17}{-5} \Rightarrow \frac{15}{2} \times \frac{17}{-5} = \frac{51}{-2}$

(d) $\frac{10}{-19} \times 57 \Rightarrow \frac{10}{-19} \times 57 = \frac{570}{-19} = -30$

4. Divide :

(a) $\frac{-2}{9} \div \frac{1}{9} = \frac{-2}{9} \times \frac{9}{1} = -2$

(b) $\frac{-3}{13} \div \frac{-5}{39} = \frac{-3}{13} \times \frac{39}{-5} = \frac{-3\times 3}{-5} = \frac{9}{5}$

(c) $\frac{56}{7} \div \frac{-8}{14} = \frac{56}{7} \times \frac{14}{-8} = \frac{7\times 2}{-1} = -14$

(d) $\frac{-105}{11} \div \frac{-15}{121} = \frac{-105}{11} \times \frac{121}{-15} = 7\times 11 = 77$

5. Simplify :

(a) $\left(\frac{1}{2} \times \frac{1}{4}\right) + \left(\frac{1}{2} \times 6\right) = \left(\frac{1}{8} + 1\times 3\right) = \frac{1}{8} + 3 = \frac{1+3\times 8}{8} = \frac{1+24}{8} = \frac{25}{8}$

(b) $\left(-5\times \frac{2}{15}\right) - \left(-6\times \frac{2}{9}\right) = \left(\frac{-1\times 2}{3}\right) - \left(-2\times \frac{2}{3}\right)$

$= \frac{-2}{3} - \left(\frac{-4}{3}\right) = \frac{-2+4}{3} = \frac{2}{3}$

(c) $\left(\frac{-5}{18} \times \frac{15}{-7}\right) - \left(1\times \frac{1}{4}\right) + \left(\frac{1}{2} \times \frac{1}{4}\right) = \left(\frac{-5}{6} \times \frac{5}{-7}\right) - \frac{1}{4} + \frac{1}{8}$

$= \frac{25}{42} - \frac{1}{4} + \frac{1}{8} = \frac{25}{42} + \frac{1}{8} - \frac{1}{4}$

$= \frac{(25\times 4) + 21 - 42}{168}$

$= \frac{100 + 21 - 42}{168} = \frac{79}{168}$

(d) $\left(\frac{2}{13} \div \frac{1}{7}\right) \times \frac{26}{14} = \left(\frac{2}{13} \times 7\right) \times \frac{26}{14} = \frac{14}{13} \times \frac{26}{14} = 2$

6. Product $= \frac{7}{2}$

Let required number x

$$\frac{-5}{4} \times x = \frac{7}{2}$$

$$x = \frac{7}{2} \div \frac{-5}{4} = \frac{7}{2} \times \frac{4}{-5}$$

$$= \frac{7 \times 2}{-5} = \frac{14}{-5} \text{ or } \frac{-14}{5}$$

Thus, required number $-\frac{14}{5}$.

7. Sum of $\frac{1}{3}$ and $\frac{2}{5}$

$$= \frac{1}{3} + \frac{2}{5} = \frac{5 + 2 \times 3}{15} = \frac{5 + 6}{15} = \frac{11}{15}$$

Divide $\frac{11}{15}$ by $\frac{3}{5}$

$$= \frac{11}{15} \div \frac{3}{5} = \frac{11}{15} \times \frac{5}{3} = \frac{11}{9}$$

8. Length of rope $= 20\,\text{m}$

Size of each piece $= \frac{5}{4}\,\text{m}$

Number of pieces cut $= 20 \div \frac{5}{4} = 20 \times \frac{1}{5} = 16$

Thus, 16 pieces are cut off and no rope is left..

9. Let the required number be 'x'.

$\therefore$ $\quad x \times \frac{-2}{3} = \frac{-14}{27}$

$\Rightarrow$ $\quad x = \frac{-\cancel{14}^{7} \times \cancel{3}^{1}}{9\cancel{27} \times \cancel{2}_{1}} = \frac{7}{9}$

So, the required number is $\frac{7}{9}$.

10. Let the required number be 'x'.

$$\therefore \quad x \times \frac{-8}{13} = 24$$

$$\Rightarrow \quad x = \frac{^{3}\cancel{24} \times 13}{-\cancel{8}_{1}}$$

$$x = -3 \times 13 = -39$$

So, the required number is –39.

Exercise 3.4

1. Without performing actual division, state which of the following have a terminating decimals or non-terminating decimals :

(a) $\frac{19}{29}$

Here denominator = 29, which cannot be expressed as a factor of 2 or 5 or both.

Hence, it is non-terminating.

(b) $-\frac{8}{10}$

Here denominator $10 = 2 \times 5$, since the prime factors are 2 and 5.

$\therefore \ \frac{-8}{10}$ is terminating decimal.

(c) $\frac{17}{90}$

Here denominator = 90

Prime factors of $90 = 2 \times 3 \times 3 \times 5$

Here the prime factors are other than 2 and 5.

So, $\frac{17}{90}$ is a non-terminating repeating decimal.

(d) $-\frac{33}{20}$

Here denominator = 20

Prime factors of $20 = 2 \times 2 \times 5$

Here, the prime factors are 2 and 5.

So, $\frac{-33}{20}$ is terminating decimal

(e) $-\frac{13}{27}$

Here, denominator = 27

Prime factors of $27 = 3 \times 3 \times 3$

Since, prime factors are other than 2 or 5

So, $\frac{-13}{27}$ is terminating repeating decimal.

(f) $\frac{438}{900}$

Here, denominator = 900

Prime factors of $900 = 2 \times 2 \times 5 \times 3 \times 3 \times 5$

Here, prime factors are other than 2 or 5.

So, $\frac{438}{900}$ is non-terminating decimal.

(g) $\frac{71}{75}$

Here, denominator 75

Prime factors of $75 = 3 \times 5 \times 5$

Here, prime factors are other than 2 or 5.

So, $\frac{71}{75}$ is non-terminating decimal.

(h) $\frac{19}{45}$

Here, denominator = 45

Prime factors of $45 = 3 \times 3 \times 5$

Here, prime factors are other than 2 or 5

So, $\frac{19}{43}$ is non-terminating decimal.

2. Convert the following rational numbers into decimal numbers :

(a) $\frac{26}{25} = 26 \div 25$

$25\overline{)26(}\ 1.04$

$\underline{-25}$

100

(b) $\frac{85}{12} = 85 \div 2$

$12\overline{)85(}\ 7.08333$

$\underline{-84}$

100

$$\begin{array}{r} -100 \\ \hline 0 \end{array}$$

$\therefore \quad \frac{26}{25} = 1.04$

$$\begin{array}{r} -96 \\ \hline 40 \\ -36 \\ \hline 40 \\ -36 \\ \hline 40 \\ -36 \\ \hline 4 \end{array}$$

$\therefore \quad \frac{85}{12} = 7.08333$

(c) $\frac{2}{11} = 2 \div 11$

$11\overline{)20(}\ 0.181818$

$$\begin{array}{r} -11 \\ \hline 90 \\ -88 \\ \hline 20 \\ -11 \\ \hline 90 \\ -88 \\ \hline 20 \\ -11 \\ \hline 90 \\ -88 \\ \hline 2 \end{array}$$

$\frac{2}{11} = 0.181818$

(d) $\frac{16}{32} = 16 \div 32$

$32\overline{)160(}\ 0.5$

$$\begin{array}{r} -160 \\ \hline 0 \end{array}$$

$\therefore \quad 16 \div 32 = 0.5$

(e) $\frac{49}{15} = 49 \div 15$

$15\overline{)49(}\ 3.2666$

$$\begin{array}{r} -45 \\ \hline 40 \\ -30 \\ \hline 100 \end{array}$$

(f) $\frac{11}{8}$

$8\overline{)11(}\ 1.375$

$$\begin{array}{r} -8 \\ \hline 30 \\ -24 \\ \hline 60 \end{array}$$

$$\begin{array}{r} -90 \\ \hline 100 \\ -90 \\ \hline 100 \\ -90 \\ \hline 10 \end{array}$$

$\therefore \quad \frac{49}{15} = 3.2666$

(g) $\frac{26}{500}$

$$500\overline{)2600(}\ 0.052$$

$$\begin{array}{r} -2500 \\ \hline 1000 \\ -1000 \\ \hline 0 \end{array}$$

$\therefore \quad \frac{26}{500} = 0.052$

$$\begin{array}{r} -56 \\ \hline 40 \\ -40 \\ \hline 0 \end{array}$$

$\therefore \quad \frac{11}{8} = 1.375$

(h) $\frac{303}{125}$

$$125\overline{)303(}\ 2.424$$

$$\begin{array}{r} -250 \\ \hline 530 \\ -500 \\ \hline 300 \\ -250 \\ \hline 500 \\ -500 \\ \hline 0 \end{array}$$

$\therefore \quad \frac{303}{125} = 2.424$

3. Express each of the following decimals in rational form :

(a) Let $x = 0.1\overline{3}$

Here, we have two digits in the decimal part out of which one digit is repeated.

First, we multiply it by 10. So that only repeating decimal is left on the right side the decimal point

$$10x = 1.\overline{3} \qquad \ldots(i)$$

Now, only one digit is repeating, so again we multiply it by 10.

$$100x = 13.\overline{3} \qquad \ldots(ii)$$

Subtracting equation (ii) from (i)

$$100x - 10x = 13.\overline{3} - 1.\overline{3}$$

$$90x = 12$$

$$x = \frac{12}{90} \text{ or } \frac{2}{15}$$

(b) Let $x = 0.8\overline{3}$

Here, we have two digits in the decimal part out of which one digit is repeated.

First, we multiply it by 10. So that only repeating decimal is left on the right side the decimal point

$$10x = 8.\overline{3} \quad \ldots(i)$$

Now, only one digit is repeating, so again we multiply it by 10.

$$100x = 83.\overline{3} \quad \ldots(ii)$$

Subtracting equation (ii) from (i)

$$100x - 10x = 83.\overline{3} - 8.\overline{3}$$

$$90x = 75$$

$$x = \frac{75}{90} \text{ or } \frac{25}{30} \text{ or } \frac{5}{6}$$

(c) Let $x = 2.\overline{3} \quad \ldots(i)$

Here, only one digit in decimal part is repeating, so we multiply it by 10

$$10x = 23.\overline{3} \quad \ldots(ii)$$

Subtracting (i) from (ii)

$$10x - x = 23.\overline{3} - 2.\overline{3}$$

$$9x = 21$$

$$x = \frac{21}{3} \text{ or } \frac{7}{3} \text{ or } 2\frac{1}{3}$$

(d) $12.68 = \frac{1268}{100} = \frac{317}{25}$ or $12\frac{17}{25}$

(e) $3.125 = \frac{3.125}{1000} = \frac{25}{8}$ or $3\frac{1}{8}$

(f) $5.005 = \frac{5005}{1000} = \frac{1001}{200}$ or $5\frac{1}{200}$

(g) Let $x = 1.4\overline{3}$

Here, we have two digits in the decimal part of which one digit is repeated

First, we multiply it by 10. So that only repeating decimal is left on right side that decimal part.

$$10x = 14.\overline{3} \quad \ldots(i)$$

Now only one digit is repeating so again we multiply it by 10.

$$100x = 143.\overline{3} \quad \ldots(ii)$$

Subtracting (ii) form (i)

$$100x - 10x = 143.\overline{3} - 14.\overline{3}$$

$$90x = 129x = \frac{129}{90} \text{ or } \frac{43}{30} 1\frac{13}{30}$$

(h) Let $x = 3.\overline{185} \quad \ldots(i)$

Here we have three digits in the decimal part is repeating, so we multiply is by 1000

$$1000x = 3185.\overline{185} \quad \ldots(ii)$$

Subtracting eq. (ii) form (i)

$$1000x - x = 3185.\overline{185} - 3.\overline{185}$$

$$999x = 3182$$

$$= \frac{3182}{999} \text{ or } 3\frac{185}{999}$$

4. Which of the following decimals can be expressed as rational numbers?

Ans. As only those number can be expressed as national numbers whose decimals recurr in a definite pattern.

As only (a) and (b) full fills this condition thus, only 0.66666… and 0.217217217… can be expressed as rational number.

5. Find the value of the following as a rational number :

(a) $0.\overline{2} + 0.1\overline{3}$

First convert each of the decimals into rational numbers. Then, add them

Let

$$a = 0.\overline{2} \quad \ldots(i)$$

$$10a = 2.\overline{2} \quad \text{(multiply by 10)} \quad \ldots(ii)$$

Now, on subtracting (ii) from (i) we get

$$10a = 2.\overline{2}$$

$$-a = 0.2$$

$$9a = 2 \quad \Rightarrow \quad a = \frac{2}{9}$$

And, Let $b = 0.1\overline{3}$

$10b = 1.\overline{3}$ (multiply by 10) …(iii)

$100b = 13.\overline{3}$ (multiply by 100) …(iv)

Now, subtracting (iv) from (iii) we get

$$\begin{array}{r} 100b = 13.\overline{3} \\ -10b = \ 1.\overline{3} \\ \hline 90b = \ \ 12 \end{array}$$

$\Rightarrow \quad b = \frac{12}{90}$ or $\frac{2}{15} \qquad b = \frac{2}{15}$

Here, $0.\overline{2} + 0.1\overline{3} = \frac{2}{9} + \frac{2}{15}$

$$= \frac{2\times 5 + 2\times 3}{45} = \frac{10+6}{45} = \frac{16}{45}$$

So, $0.\overline{2} + 0.1\overline{3} = \frac{16}{45}$

(b) $0.\overline{2} + 0.\overline{3} + 0.\overline{4}$

First convert each of the decimals into rational number. Then, add them

Let $a = 0.\overline{2}$ …(i)

$10a = 2.\overline{2}$ (multiply by 10) …(ii)

Now, on subtracting (ii) from (i) we get

$$\begin{array}{r} 10a = 2.\overline{2} \\ -a = 0.2 \\ \hline 9a = 2 \end{array} \qquad \Rightarrow \qquad a = \frac{2}{9}$$

And, let $b = 0.\overline{3}$ …(iii)

$10b = 3.\overline{3}$ …(iv)

subtracting eq. (iii) from (iv)

$$\begin{array}{r} 10b = 3.\overline{3} \\ -b = 0.\overline{3} \\ \hline 9b = 3 \end{array}$$

$b = \frac{3}{9} = \frac{1}{3} \quad \Rightarrow \qquad b = \frac{1}{3}$

Again, let $c = 0.\overline{4}$ …(v)

$$10c = 4.\overline{4} \qquad \ldots(vi)$$

subtracting eq. (v) from (vi)

$$\begin{array}{r} 10c = 4.\overline{4} \\ -c = 0.\overline{4} \\ \hline 9c = 4 \end{array} \quad \Rightarrow \quad c = \frac{4}{9}$$

$$c = \frac{4}{9}$$

Here, $0.\overline{2} + 0.\overline{3} + 0.\overline{4}$

$\frac{2}{9} + \frac{1}{3} + \frac{4}{9}$

$$\frac{2+3+4}{9} = \frac{9}{9} \text{ or } 1$$

so, $0.\overline{2} + 0.\overline{3} + 0.\overline{4} = 1$

(c) $5.\overline{1} - 4.\overline{7}$

First, convert each of the decimals into rational numbers. Then subtract them

Let $x = 5.\overline{1} \qquad \ldots(i)$

$10x = 51.\overline{1}$ (multiply by 10) $\qquad \ldots(ii)$

Subtracting eq. (i) from (ii)

$$\begin{array}{r} 10x = 51.\overline{1} \\ -x = 5.\overline{1} \\ \hline 9x = 46 \end{array} \quad \Rightarrow \quad x = \frac{46}{9}$$

$$x = \frac{46}{9}$$

And, let $y = 4.\overline{7} \qquad \ldots(iii)$

$10y = 47.\overline{7} \qquad \ldots(iv)$

Subtracting eq. (iii) from (iv)

$$10y - y = 47.\overline{7} - 4.\overline{7}$$

$$9y = 43$$

$$y = \frac{43}{9}$$

Here, $5.\overline{1} - 4.\overline{7} = \frac{46}{9} - \frac{43}{9} = \frac{46-43}{9} = \frac{3}{9}$ or $\frac{1}{3}$

$\therefore \quad 5.\overline{1} - 4.\overline{7} = \frac{1}{3}$

Multiple Choice Questions

Tick (✓) the correct answer :

1. (d) **2.** (c) **3.** (b) **4.** (c) **5.** (b) **6.** (c) **7.** (a) **8.** (c)

BRAIN BOOSTER

1. Multiplicative inverse of $\frac{-7}{5} = \frac{5}{-7}$ or $= \frac{-5}{7}$

Multiplicative inverse of $-2 = \frac{1}{-2}$ or $\frac{-1}{2}$

LCM of 7 and $2 = 14$

$$\frac{-5}{7} = \frac{-5 \times 2}{7 \times 2} = \frac{-10}{14}$$

$$\frac{-1}{2} = \frac{-1 \times 7}{2 \times 7} = \frac{-7}{14}$$

$$\frac{-10}{14} < \frac{-9}{14} < \frac{-8}{14} < \frac{-7}{14}$$

Here we find only two rational numbers we have to find 4 rational numbers.

So, $$\frac{-5}{7} = \frac{-5 \times 4}{7 \times 4} = \frac{-20}{28}$$

$$\frac{-1}{2} = \frac{-1 \times 14}{2 \times 14} = \frac{-14}{28}$$

Here $$= \frac{-20}{28} < \frac{-19}{28} < \frac{-18}{28} < \frac{-17}{28} < \frac{-16}{28} < \frac{-15}{28} < \frac{-14}{28}$$

(choice any four)

$\therefore$ four rational numbers are $\frac{-19}{28} < \frac{-18}{28} < \frac{-17}{28} < \frac{-16}{28}$

2. Find the following :

(a) $\frac{1}{5}+\frac{1}{5}+\frac{1}{5}+\ldots\ldots+50 \text{ times} \quad \Rightarrow \quad \frac{1}{5}\times 50=10$

(b) $\left(-2\frac{1}{4}\right)+\left(-2\frac{1}{4}\right)+\ldots\ldots+100 \text{ times} \quad \Rightarrow \quad -2\frac{1}{4}\times 100$

$$=\frac{-9}{4}\times 100=-9\times 25=-225$$

Chapter

4 Fractions

Exercise 4.1

1. Write four equivalent fractions for the following :

(a) $\frac{2}{3}=\frac{2\times 2}{3\times 2}=\frac{4}{6};\frac{2\times 3}{3\times 3}=\frac{6}{9};\frac{2\times 4}{3\times 4}=\frac{8}{12};\frac{2\times 5}{3\times 5}=\frac{10}{15}$

$\frac{4}{6},\frac{6}{9},\frac{8}{12}$ and $\frac{10}{15}$ are the equivalent fractions of $\frac{2}{3}$.

(b) $\frac{2}{7}=\frac{2\times 2}{7\times 2}=\frac{4}{14};\frac{2\times 3}{7\times 3}=\frac{6}{21};\frac{2\times 4}{7\times 4}=\frac{8}{28};\frac{2\times 5}{7\times 5}=\frac{10}{35}$

$\frac{4}{14};\frac{6}{21};\frac{8}{28}$ and $\frac{10}{35}$ are the equivalent fractions of $\frac{2}{7}$.

(c) $\frac{1}{5}=\frac{1\times 2}{5\times 2}=\frac{2}{10};\frac{1\times 3}{5\times 3}=\frac{3}{15};\frac{1\times 4}{5\times 4}=\frac{4}{20};\frac{1\times 5}{5\times 5}=\frac{5}{25}$

$\frac{2}{10};\frac{3}{15};\frac{4}{20};\frac{5}{25}$ are the equivalent fractions of $\frac{1}{5}$.

2. Compare the following fractions :

(a) $\frac{6}{7}$ and $\frac{7}{6}$

$\frac{6}{7}\times\frac{7}{6}$

$6\times 6<7\times 7$

(b) $\frac{7}{15}$ and $\frac{9}{20}$

$\frac{7}{15}\times\frac{9}{20}$

$20\times 7>15\times 9$

$36 < 49$ $\qquad\qquad$ $140 > 135$

$\therefore \quad \frac{6}{7} < \frac{7}{6}$ $\qquad\qquad$ $\frac{7}{15} > \frac{9}{20}$

3. Arrange the following in descending order :

(a) $\frac{1}{2}, \frac{1}{4}, \frac{3}{7}, \frac{2}{7}$

(LCM of 2, 4, 7 and 7 = 28)

$\frac{1}{2} \times \frac{14}{14} = \frac{14}{28}$; $\frac{1}{4} \times \frac{7}{7} = \frac{7}{28}$; $\frac{3}{7} \times \frac{4}{4} = \frac{12}{28}$; $\frac{2}{7} \times \frac{4}{4} = \frac{8}{28}$

$\because \quad 14 > 12 > 8 > 7$

So, $\frac{14}{28} > \frac{12}{28} > \frac{8}{28} > \frac{7}{28}$

So, Descending order $= \frac{1}{2} > \frac{3}{7} > \frac{2}{7} > \frac{1}{4}$

(b) $\frac{1}{4}, \frac{1}{9}, \frac{1}{7}, \frac{1}{3}, \frac{1}{11}$

(LCM of 4, 9, 7, 3 and 11 = 2772)

$\frac{1}{4} \times \frac{693}{693} = \frac{693}{2772}$; $\frac{1}{9} \times \frac{308}{308} = \frac{308}{2772}$;

$\frac{1}{7} \times \frac{396}{396} = \frac{396}{2772}$; $\frac{1}{3} \times \frac{924}{924} = \frac{924}{2772}$; $\frac{1}{11} \times \frac{252}{252} = \frac{252}{2772}$

$\because \quad 924 > 693 > 396 > 308 > 252$

So, $\frac{924}{2772} > \frac{693}{2772} > \frac{396}{2772} > \frac{308}{2772} > \frac{252}{2772}$

So, Descending order $\frac{1}{3} > \frac{1}{4} > \frac{1}{7} > \frac{1}{9} > \frac{1}{11}$

4. Simplify :

(a) $7\frac{1}{2} + 3\frac{1}{3}$

$= \frac{15}{2} + \frac{10}{3}$

$= \frac{15 \times 3 + 10 \times 2}{6}$

$= \frac{45 + 20}{6}$

(b) $4\frac{1}{5} - 2\frac{1}{3}$

$= \frac{21}{5} - \frac{7}{3}$

$= \frac{21 \times 3 - 7 \times 5}{15}$

$= \frac{63 - 35}{15}$

(c) $2\frac{1}{4} - 1\frac{1}{2} + 4$

$= \frac{9}{4} - \frac{3}{2} + 4$

$= \frac{9 - 3 \times 2 + 4 \times 4}{4}$

$= \frac{9 - 6 + 16}{4}$

$= \frac{65}{6}$ or $10\frac{5}{6}$ $= \frac{28}{15}$ or $1\frac{13}{15}$ $= \frac{9+16-6}{4}$

$= \frac{25-6}{4}$

$= \frac{19}{4}$ or $4\frac{3}{4}$

(d) $4\frac{1}{2} - 1\frac{1}{5} + \frac{2}{5}$

$\frac{9}{2} - \frac{6}{5} + \frac{2}{5}$

$\frac{9\times5-6\times2+2\times2}{10} = \frac{9\times5-6\times2+2\times2}{10} = \frac{45-12+4}{10}$

$= \frac{45+4-12}{10} = \frac{49-12}{10} = \frac{37}{10}$ or $3\frac{7}{10}$

5. Number of parts of pizza with Sunny $= \frac{8}{8}$

He gave to Vikas $= \frac{2}{8}$

He gave to Khalid $= \frac{3}{8}$

He gave to Wasim $= \frac{1}{8}$

He has pizza left $= \frac{8}{8} - \left[\frac{2}{8} + \frac{3}{8} + \frac{1}{8}\right] = \frac{8}{8} - \frac{6}{8} = \frac{8-6}{8} = \frac{2}{8}$

Difference of Khalid and Sunny pizza $= \frac{3}{8} - \frac{2}{8} = \frac{1}{8}$

So, Khalid got $\frac{1}{8}$ pizza more than Sunny.

6. Manu finish work in one hour $= \frac{2}{3}$

Priti finished work in one hour $= \frac{3}{4}$

We compare $\frac{2}{3}$ and $\frac{3}{4}$ (LCM of 3 and $4 = 12$)

$$\frac{2\times4}{3\times4}=\frac{8}{12};\ \frac{3\times3}{4\times3}=\frac{9}{12}$$

$$\frac{8}{12}<\frac{9}{12}$$

$\therefore$ Priti finished the work earlier.

7. (a) Fraction of money spend on bag and books and total money $=\frac{500}{1000}=\frac{1}{2}$

(b) Fraction of money give to her brother and total money $=\frac{250}{1000}=\frac{1}{4}$

(c) Money left with Ruchi $=₹\ 1000-(500+100+250)$

$=₹\ 1000-850$

$=150$

Fraction of money left with her and total money $=\frac{150}{1000}=\frac{3}{20}$

Exercise 4.2

1. Find the product and express as a mixed fraction :

(a) $3\frac{1}{7}\times2$

$=\frac{22}{7}\times2=\frac{44}{7}$ or $6\frac{2}{7}$

(b) $\frac{3}{4}$ of $5\frac{1}{7}$

$=\frac{3}{4}\times\frac{36}{7}=\frac{108}{28}$

$=\frac{27}{7}$ or $3\frac{6}{7}$

(c) $2\times3\frac{1}{3}$

$=2\times\frac{10}{3}=\frac{20}{3}$ or $6\frac{2}{3}$

(d) $\frac{4}{7}$ of $2\frac{3}{4}$

$=\frac{4}{7}\times\frac{11}{4}=\frac{11}{7}$ or $1\frac{4}{7}$

(e) $7\frac{1}{5}\times5$

$=\frac{36}{5}\times5=36$

(f) $\frac{5}{\cancel{8}_{2}}\times\cancel{108}^{27}$

$=\frac{5\times27}{2}=\frac{135}{2}=67\frac{1}{2}$

(g) $3\frac{1}{4} \times 6$

$\frac{13}{4} \times 6 = \frac{39}{2} = 19\frac{1}{2}$

(h) $3 \times 5\frac{1}{5}$

$= 3 \times \frac{26}{5} = \frac{78}{5} = 15\frac{3}{5}$

2. Find the value of :

(a) $\frac{1}{4}$ of 200

$= \frac{1}{4} \times 200 = 50$

(b) $\frac{2}{7}$ of 63

$= \frac{2}{7} \times 63 = 2 \times 9 = 18$

(c) $\frac{3}{4}$ of 62

$= \frac{3}{4} \times 62 = \frac{3}{2} \times 31$

$= \frac{93}{2}$ or $46\frac{1}{2}$

(d) $\frac{1}{6}$ of $2\frac{3}{4}$

$= \frac{1}{6} \times \frac{11}{4} = \frac{11}{24}$

(e) $\frac{3}{5}$ of $\frac{7}{5}$

$= \frac{3}{5} \times \frac{7}{5} = \frac{21}{25}$

(f) $\frac{2}{5}$ of ₹ 500

$= \frac{2}{5} \times$ ₹ 500 = ₹ 200

(g) $\frac{9}{9}$ of 18 kg

$= \frac{7}{\cancel{9}} \times \cancel{18}^{2}$ kg = 14 kg

(h) $\frac{4}{5}$ of a kilogram

$= \frac{4}{\cancel{5}} \times \cancel{1000}^{200}$ g = 800 g

3. Evaluate :

(a) $\left(\frac{3}{11} + \frac{5}{22}\right) \times \left(\frac{14}{9} + \frac{5}{6}\right) = \left(\frac{3 \times 2 + 5}{22}\right) \times \left(\frac{14 \times 2 + 5 \times 3}{18}\right)$

$= \left(\frac{6+5}{22}\right) \times \left(\frac{28+15}{18}\right) = \left(\frac{11}{22}\right) \times \left(\frac{43}{18}\right)$

$= \frac{11}{22} \times \frac{43}{18} = \frac{43}{36}$ or $1\frac{7}{36}$

(b) $\left[\frac{6}{25} \times \frac{50}{24}\right] - \left[\frac{5}{9} \times \frac{1}{25}\right] = \frac{1}{2} - \frac{1}{9 \times 5}$

$\frac{1}{2} - \frac{1}{45} = \frac{45-2}{90} = \frac{43}{90}$

(c) $\left(3\frac{1}{4}\times 3\frac{1}{5}\right)-\left(\frac{2}{3}-\frac{3}{7}\right)=\left(\frac{13}{4}\times\frac{16}{5}\right)-\left(\frac{2\times 7-3\times 3}{21}\right)$

$=\left(\frac{13\times 4}{5}\right)-\left(\frac{14-9}{21}\right)$

$=\frac{52}{5}-\frac{5}{21}=\frac{52\times 21-5\times 5}{105}$

$=\frac{1092-25}{105}=\frac{1067}{105}=10\frac{17}{105}$

(d) $\left[4\frac{1}{2}\times 2\frac{1}{5}\times 2\frac{2}{3}\right]-\left[\frac{3}{5}\times 2\frac{2}{3}\times 3\frac{3}{4}\right]$

$=\left[\frac{9}{2}\times\frac{11}{5}\times\frac{8}{3}\right]-\left[\frac{3}{5}\times\frac{8}{3}\times\frac{15}{4}\right]$

$=\frac{3\times 11\times 4}{5}-1\times 2\times 3$

$=\frac{132}{5}-6=\frac{132-6\times 5}{5}$

$=\frac{132-30}{5}=\frac{102}{5}$ or $20\frac{2}{5}$

4. Distance covered by using 1 litre $=26$ km

Distance covered by using $5\frac{3}{4}$ litre or $\frac{23}{4}$ L $=\frac{23}{4}\times 26=\frac{23\times 13}{2}$

$=\frac{299}{2}=149\frac{1}{2}$ km

Thus, bus wil cover $149\frac{1}{2}$ km distance with $5\frac{3}{4}$ litres of diesel.

5. Total number of marbles in bag $=240$

(a) Number of white marbles $=\frac{1}{4}\times 240=60$

Number of black marbles $=\frac{1}{3}\times 240=80$

Number of red marbles $=\frac{1}{5}\times 240=48$

(b) Number of blue marbles $= 240 - (60 + 80 + 48)$

$240 - 188 = 52$

Fraction of blue marbles $= \frac{52}{240}$ or $\frac{13}{60}$

6. One third of $\frac{33}{4} = \frac{33}{4} \times \frac{1}{3} = \frac{11}{4}$

half of $\frac{11}{2} = \frac{11}{2} \times \frac{1}{2} = \frac{11}{4}$

$\frac{11}{4} = \frac{11}{4}$

Yes, these are equal.

Exercise 4.3

1. Find the reciprocal of the following :

(a) reciprocal of $1 = 1$

(b) reciprocal of $\frac{7}{3} = \frac{3}{7}$

(c) reciprocal of $8 = \frac{1}{8}$

(d) reciprocal of $\frac{21}{4} = \frac{4}{21}$

2. Find the following :

(a) $\frac{6}{11} \div 15 = \frac{6}{11} \times \frac{1}{15} = \frac{2}{11 \times 5} = \frac{2}{55}$

(b) $5 \div \frac{2}{11} = 5 \times \frac{11}{2} = \frac{55}{2}$ or $27\frac{1}{2}$

(c) $36\frac{1}{4} \div 8\frac{2}{4} = \frac{145}{4} \div \frac{34}{4} = \frac{145}{4} \times \frac{4}{34} = \frac{145}{34}$ or $4\frac{9}{34}$

(d) $\frac{343}{64} \div \frac{7}{8} = \frac{343}{64} \times \frac{8}{7} = \frac{49}{8}$ or $6\frac{1}{8}$

3. Simplify :

(a) $\left[\frac{4}{15} \times \frac{6}{28}\right] \times \frac{9}{2} = \left[\frac{4}{15} \times \frac{6}{28}\right] \times \frac{9}{2} = \frac{2}{5 \times 7} \times \frac{9}{2} = \frac{9}{35}$

(b) $\left(24 \div 2\frac{2}{3}\right) \div 3\frac{1}{9} = \left(24 \div \frac{8}{3}\right) \div \frac{28}{9} = \left(24 \times \frac{3}{8}\right) \div \frac{28}{9}$

$= 9 \div \frac{28}{9} = \frac{9 \times 9}{28} = \frac{81}{28} = 2\frac{25}{28}$

(c) $\left(2\frac{1}{7}\times 2\frac{4}{5}\right)\div\frac{1}{10}=\left(\frac{15}{7}\times\frac{14}{5}\right)\div\frac{1}{10}=6\times 10=60$

(d) $\left[7\div 2\frac{2}{5}\right]\times\left[\frac{5}{9}\div 9\frac{4}{9}\right]=\left[7\div\frac{12}{5}\right]\times\left[\frac{5}{9}\div\frac{85}{9}\right]$

$=\left[7\times\frac{5}{12}\right]\times\left[\frac{5}{9}\times\frac{9}{85}\right]=\frac{35}{12}\times\frac{1}{17}=\frac{35}{204}$

Exercise 4.4

1. Total No. of eggs $=30\times 12=360$

Number of broken eggs $=\frac{2}{\cancel{5}_1}\times\cancel{360}^{72}=2\times 72=144$

$\therefore$ Number of good eggs $=360-144=216$

So, the number of good eggs are 216.

2. Rocky has toffees $=30\frac{3}{8}\text{ kg}=\frac{243}{8}\text{ kg}$

Quantity of each packet $=2\frac{1}{40}\text{ kg}=\frac{81}{40}\text{ kg}$

Number of packet filled by Rocky $=\frac{243}{8}\div\frac{81}{40}$

$=\frac{243}{8}\times\frac{40}{81}=15$

$\therefore$ Rocky made 15 packets.

3. Distance covered by bus in an hour $=60\frac{3}{4}\text{ km}=\frac{243}{4}\text{ km}$

$\therefore$ Distance covered in $2\frac{2}{3}$ hours $=2\frac{2}{3}\times\frac{243}{4}\text{ km}$

$=\frac{\cancel{8}^{2}}{\cancel{3}_1}\times\frac{\cancel{243}^{81}}{\cancel{4}_1}$

$=2\times 81\text{ km}=162\text{ km}$

So, the distance covered by bus in $2\frac{2}{3}$ hour is 162 km.

4. Side of square $=16\frac{3}{4}\text{ m}=\frac{67}{4}\text{ m}$

Perimeter of a square $= 4 \times \text{side} = 4 \times \frac{67}{4} = 67\,\text{m}$

Area of a square $= \frac{67}{4} \times \frac{67}{4}\,\text{m}^2$

$= \frac{4489}{16} = 280\frac{9}{16}\,\text{m}^2.$

5. Total number of sweets packets $= 200$

$\therefore$ $\frac{1}{4}$ of 200 packets $= \frac{1}{\cancel{4}} \times \cancel{200}^{50}$ packets $= 50$ packets

$\therefore$ Required number of packets left with Nitin $= 200 - 50$

$= 150$ packets

So, the number of packets left with Nitin are 150.

6. Distance covered in 1 hour $= 5\frac{1}{3}$ km or $\frac{16}{3}$ km

Distance covered in $2\frac{1}{4}$ or $\frac{9}{4}$ hours $= \frac{16}{3} \times \frac{9}{4} = 12\,\text{km}$

Thus, Amar can walk 12 km in $2\frac{1}{4}$ hours

7. Total length of the track $= 630\,\text{m}$

$\therefore$ Length covered by sweeti by walking $= \frac{2}{\cancel{7}} \times \cancel{630}^{90}$ m

$= 2 \times 90\,\text{m} = 180\,\text{m}$

So, the length covered by sweeti by running $= 630 - 180 = 450\,\text{m}$

Hence, the length covered by running is 450 m.

8. Weight of one cement bag $= 15\frac{2}{3}\,\text{kg} = \frac{47}{3}\,\text{kg}$

Number of bags $= 22\frac{4}{7} = \frac{158}{7}$

Weight of $\frac{158}{7}$ bags $= \frac{47}{3} \times \frac{158}{7}$

$= \frac{47 \times 158}{3 \times 7} = \frac{7426}{21} = 353\frac{13}{21}\,\text{kg}$

Thus, the weight of $22\frac{4}{7}$ bags is $353\frac{13}{21}$ kg.

9. Product of two numbers $= 15\frac{5}{6} = \frac{95}{6}$

One number $= 6\frac{1}{3} = \frac{19}{3}$

Other number $= \frac{95}{6} \div \frac{19}{3}$

$= \frac{95}{6} \times \frac{3}{19} = \frac{5}{2}$ or $2\frac{1}{2}$

10. Total length of a rope $= 58\frac{13}{20}$ m $= \frac{1173}{20}$ m

Number of pieces $= 17$

Length of each piece $= \frac{1173}{20} \div 17$

$= \frac{1173}{20} \times \frac{1}{17} = \frac{69}{20} = 3\frac{9}{20}$

Thus, length of each piece is $3\frac{9}{20}$ m.

11. Let total number of students $= x$

Number of boys $= \frac{x \times 4}{7} = \frac{4x}{7}$

Number of girls $= x - \frac{4x}{7} = \frac{3x}{7}$

According to questions;

Number of girls $= \frac{3x}{7} = 210$

$x = \frac{210 \times 7}{3} = 490$

Number of boys in the school $= 490 \times \frac{4}{7} = 280$

Thus, 280 boys in the school.

12. The duration of one period $= \frac{2}{3}$ hour

The duration of 9 periods $= \frac{2}{3} \times 9$ hour $= 6$ hours

Multiple Choice Questions

Tick (✓) the correct answer :

1. (c) **2.** (c) **3.** (d) **4.** (c)

BRAIN BOOSTER

1. The largest fraction $= \frac{10}{11}$

The smallest fraction $= \frac{3}{11}$

$$\text{Product} = \frac{10}{11} \times \frac{3}{11} = \frac{30}{121}$$

2. Let one rational be x and second number be $(10.5 - x)$

Let greater number be x and smaller number well be $(10.5 - x)$

According to the question,

$$\frac{(10.5-x)}{x} \times \frac{2}{3}$$

$$31.5 - 3x = 2x$$

$$31.5 = 2x + 3x$$

$$31.5 = 5x$$

$$x = \frac{31.5}{5} = 6.3$$

$$6.3 = \frac{63}{10}$$

Now, $$10.5 - \frac{63}{10} = \frac{10.5 \times 10 - 63}{10}$$

$$= \frac{105-63}{10}$$

$$= \frac{42}{10} = \frac{21}{5}$$

$$\frac{21}{5} \div \frac{63}{10} \quad \Rightarrow \quad \frac{21}{5} \times \frac{10}{63} = \frac{2}{3}$$

So, fractions are $\frac{21}{5}$ and $\frac{63}{10}$.

Chapter

5 Decimals

Exercise 5.1

1. Write the product in the blank space :

(a) $40.04 \times 10 = \mathbf{400.4}$

(b) $2389.05 \times 1000 = \mathbf{2389050}$

(c) $2.103 \times 100 = \mathbf{210.3}$

(d) $8.6 \times 100 = \mathbf{860}$

(e) $609.75 \times 1000 = \mathbf{609750}$

(f) $3.756 \times 10 = \mathbf{37.56}$

2. Find the product :

(a) 1.9×5

Number of decimal places $= 1$

So; $1.9 \times 5 = 9.5$

(b) 0.9×0.09

Number of decimal places $= 1 + 2 = 3$

So, $0.9 \times 0.09 = 0.081$

(c) 0.111×0.003

Number of decimal places $= 3 + 3 = 6$

So, $0.111 \times 0.003 = 0.000333$

(d) 1.1×1.01

Number of decimal paces $= 1 + 2 = 3$

So, $1.1 \times 1.01 = 1.111$

(e) 0.8×0.7

Number of decimal places $= 1 + 1 = 2$

So, $0.8 \times 0.7 = 0.56$

(f) 2.01×0.4

Number of decimal places $= 2 + 1 = 3$

So, $2.01 \times 0.4 = 0.804$

3. If $1257 \times 5 = 6285$, then find the product :

(a) $1.257 \times 5 = \mathbf{6.285}$

(b) $12.57 \times 0.5 = \mathbf{6.285}$

(c) $125.7 \times 0.05 = \mathbf{6.285}$

4. Multiply :

(a) 26.42 by 3.2

$$\begin{array}{r} 2642 \\ \times\ 32 \\ \hline 5284 \\ 79260 \\ \hline 84544 \end{array}$$

Number of decimal-places $= 2+1=3$

$\therefore\ 26.42 \times 3.2 = 84.544$

(b) 94.13 by 2.5

$$\begin{array}{r} 9413 \\ \times\ 25 \\ \hline 47065 \\ 188260 \\ \hline 235325 \end{array}$$

Number of decimals-places $= 2+1=3$

$\therefore\ 94.13 \times 2.5 = 235.325$

(c) 895.17 by 1.01

$$\begin{array}{r} 89517 \\ \times\ 101 \\ \hline 89517 \\ 000000 \\ 8951700 \\ \hline 9041217 \end{array}$$

Number of decimal-places $= 2+2=4$

$\therefore\ 895.17 \times 1.01 = 904.1217$

(d) 183.8 by 31.12

$$\begin{array}{r} 1838 \\ \times\ 3112 \\ \hline 3676 \\ 18380 \\ 183800 \\ 5514000 \\ \hline 5719856 \end{array}$$

Number of decimal-places $= 1+2=3$

$\therefore\ 183.8 \times 31.12 = 5719.856$

(e) 501.03 by 3.3

$$\begin{array}{r} 50103 \\ \times\ 33 \\ \hline 150309 \\ 1503090 \\ \hline 1653399 \end{array}$$

Number of decimal-places $= 2+1=3$

$\therefore\ 501.03 \times 3.3 = 1653.399$

(f) 307.12 by 12.6

$$\begin{array}{r} 30712 \\ \times\ 126 \\ \hline 184272 \\ 614240 \\ 3071200 \\ \hline 3869712 \end{array}$$

Number of decimal $= 2+1=3$

$\therefore\ 307.12 \times 12.6 = 3869.712$

5. Cost of 1 kg wheat $= ₹\ 24.25$

Cost of 15.1 kg wheat $= ₹\ 24.25 \times 15.1$

$= ₹\ 366.175$

$$\begin{array}{r} 24.25 \\ \times\ 15.1 \\ \hline 2425 \\ 121250 \\ 242500 \\ \hline 366.175 \end{array}$$

Thus cost of 15 kg wheat is ₹ 366.175.

6. Distance covered in 1 litre of petrol = 16.5 km

Distance covered in 5.5 litre of petrol = (16.5 × 5.5) km = 90.75 km

$$\begin{array}{r} 16.5 \\ \times\ 5.5 \\ \hline 825 \\ 8250 \\ \hline 90.75 \end{array}$$

So, taxi covered 90.75 km distance in 5.5 liters.

7. Side of squares = 6.25 m

Area of squares = $(\text{side})^2$

$= 6.25 \times 6.25\ \text{m}^2$

$= 39.0625\ \text{m}^2$

Thus, area of squares is 39.0625 m^2

$$\begin{array}{r} 6.25 \\ \times 6.25 \\ \hline 3125 \\ 12500 \\ 375000 \\ \hline 39.0625 \end{array}$$

Exercise 5.2

1. Write the quotient :

(a) 15.5 ÷ 10 = 1.55 (b) 430.75 ÷ 100 = 4.3075

(c) 122.5 ÷ 1000 = 0.1225 (d) 323.8 ÷ 1000 = 0.3238

(e) 84.84 ÷ 10 = 8.484 (f) 0.5 ÷ 100 = 0.005

2. Divide :

(a) Divide : 3.204 by 36

3.204 ÷ 36

$$\begin{array}{r} 0.089 \\ 36\overline{)3.204} \\ -288 \\ \hline 324 \\ -324 \\ \hline 0 \end{array}$$

Quotient = 0.089

(b) Divide 0.192 by 12

0.192 ÷ 12

$$\begin{array}{r} 0.016 \\ 12\overline{)0.192} \\ -12 \\ \hline 72 \\ -72 \\ \hline 0 \end{array}$$

Quotient = 0.016

(c) Divide = 125.086 by 26

$125.086 \div 26$

$26\overline{)125.086}(4.811$

-104

210

-208

28

-26

26

-26

0

Quotient = 4.811

(d) Divide 4.23 by 15

$4.23 \div 15$

$15\overline{)4.23}(0.282$

-30

123

-120

30

-30

0

Quotient = 0.282

3. Find the quotient :

(a) $8.88 \div 22$

$22\overline{)8.88}(0.404$

-88

88

-88

0

Quotient = 0.404

(b) $37.986 \div 39$

$39\overline{)37.986}(0.974$

$-35\,1$

$2\,88$

$-2\,73$

156

-156

0

Quotient = 0.974

(c) $0.077 \div 7$

$7\overline{)0.077}(0.011$

-7

07

-7

0

Quotient = 0.011

(d) $125.375 \div 25$

$25\overline{)125.375}(5.015$

-125

$0\,37$

-25

125

-125

0

Quotient = 5.015

(e) $12.675 \div 3$

$3\overline{)12.675(}\ 4.225$

12

06

-6

07

-6

15

-15

0

Quotient $= 4.225$

(f) $3.12 \div 8$

$8\overline{)3.12(}\ 0.39$

24

72

72

0

Quotient $= 0.39$

4. Find :

(a) $1.296 \div 0.108$

$= 1.296 \times 1000 \div 0.108 \times 1000$

$= 1296 \div 108 = 12$

$108\overline{)1296(}\ 12$

-108

216

-216

0

(b) $0.216 \div 0.6 = 0.216 \times 10 \div 0.6 \times 10$

$= 2.16 \div 6$

$= 0.36$

$6\overline{)2.16(}\ 0.36$

-18

36

-36

0

(c) $0.0102 \div 0.17 = 0.0102 \times 100 \div 0.17 \times 100$

$= 1.02 \div 17$

$= 0.06$

$17\overline{)1.02(}\ 0.06$

-102

0

(d) $3.48 \div 0.003 = 3.48 \times 1000 \div 0.003 \times 1000$

$= 3480 \div 3$

$= 1160$

$3\overline{)3480(}\ 1160$

-3

04

-3

18

-18

0

(e) $0.4288 \div 0.134$

$= 0.4288 \times 1000 \div 0.134 \times 1000$

$= 428.8 \div 134$

$= 3.2$

$$\begin{array}{r} 34\overline{)428.8(}\ 3.2 \\ -414 \\ \hline 148 \\ -148 \\ \hline 0 \end{array}$$

(f) $99.36 \div 2.3 = 99.36 \times 10 \div 2.3 \times 10$

$= 993.6 \div 23$

$= 43.2$

$$\begin{array}{r} 23\overline{)993.6(}\ 43.2 \\ -92 \\ \hline 73 \\ -69 \\ \hline 46 \\ -46 \\ \hline 0 \end{array}$$

5. Divide :

(a) Divide 8.64 by 0.24

$8.64 \div 0.24 = 8.64 \times 100 \div 0.24 \times 100$

$= 864 \div 24 = 36$

(b) Divide 337.5 by 1.125

$337.5 \div 1.125 = 337.5 \times 1000 \div 1.125 \times 1000$

$= 337500 \div 1125 = 300$

(c) Divide 0.75 by 0.025

$0.75 \div 0.025 = 0.75 \times 1000 \div 0.025 \times 1000$

$= 750 \div 25 = 30$

(d) Divide 1.28 by 0.8

$1.28 \div 0.8 = 1.28 \times 10 \div 0.8 \times 10$

$= 12.8 \div 8 = 1.6$

(e) Divide 0.027 by 0.03

$0.027 \div 0.03 = 0.027 \times 100 \div 0.03 \times 100$

$= 2.7 \div 3 = 0.9$

(f) Divide 0.993 by 0.331

$0.993 \div 0.331 = 0.993 \times 1000 \div 0.331 \times 1000$

$= 993 \div 331 = 3$

6. Divide :

(a) Divide 18 by 1.2 $= 18 \times 10 \div 1.2 \times 10 = 180 \div 12 = 15$

(b) Divide 26 by 3.25 $= 26 \times 100 \div 3.25 \times 100 = 2600 \div 325 = 8$

(c) Divide 21 by $0.42 = 21 \times 100 \div 0.42 \times 100 = 2100 \div 42 = 50$

(d) Divide 9 by $0.15 = 9 \times 100 \div 0.15 \times 100 = 900 \div 15 = 60$

(e) Divide by 99 by $0.09 = 99 \times 100 \div 0.09 \times 100 = 9900 \div 9 = 1100$

(f) Divide 76 by $0.019 = 76 \times 1000 \div 0.019 \times 1000 = 76000 \div 19 = 4000$

7. Find :

(a) $1 \div 0.005 = 1 \times 1000 \div 0.005 \times 1000 = 1000 \div 5 = 200$

(b) $8 \div 0.04 = 8 \times 100 \div 0.04 \times 100 = 800 \div 4 = 200$

(c) $72 \div 0.144 = 72 \times 1000 \div 0.144 \times 1000$

$= 72000 \div 144 = 500$

(d) $5 \div 0.125 = 5 \times 1000 \div 0.125 \times 1000 = 5000 \div 125 = 40$

(e) $822 \div 16.44 = 822 \times 100 \div 16.44 \times 100 = 82200 \div 1644 = 50$

(f) $365 \div 9.125 = 365 \times 1000 \div 9.125 \times 1000 = 365000 \div 9125 = 40$

8. If $3250 \div 26 = 125$, find the quotient orally :

(a) $32.50 \div 26 = 1.25$ (b) $3.250 \div 26 = 0.125$

(c) $325.0 \div 26 = 12.5$

Exercise 5.3

Solve the following word problems :

1. Quantity of vegetables bought in 7 days = 21.7 kg

Quantity of vegetables bought in 1 day $= 21.7 \div 7 = 3.1$ kg

$$7\overline{)21.7(}\ 3.1$$
$$\underline{-21}$$
$$07$$
$$\underline{-7}$$
$$0$$

Thus, Aurna brought 3.1 kg vegetables in each day.

2. Quantity of ink in a one bottle = 0.375 lit

Quantity of total ink = 13.5 litres

Number of bottle required $= 13.5 \div 0.375$

$$= \frac{13.5 \times 1000}{0.375 \times 1000}$$

$$= \frac{13500}{375} = 36$$

$$375\overline{)13500(}\ 36$$
$$\underline{-1125}$$
$$2250$$
$$\underline{-2250}$$
$$0$$

So, 36 bottles are required.

3. Cost of 1 metre of cloth $= ₹\ 67.25$

Cost of 18 metres of cloth $= ₹\ 67.25 \times 18$

$= ₹\ 1210.50$

Thus, cost of 18 metres cloth is ₹ 1210.50.

$$\begin{array}{r} 67.25 \\ \times\ 18 \\ \hline 53800 \\ 67250 \\ \hline 1210.50 \end{array}$$

4. Cost of 8.75 m cloth $= ₹\ 420$

$$\text{Cost of 1 m cloth} = ₹\ \frac{420}{8.75} = ₹\ 48$$

$$\text{Cost of 3.5 m cloth} = ₹\ \frac{420}{8.75} \times 3.5$$

$$= ₹\ \frac{1470}{8.75}$$

$$= \frac{1470 \times 100}{8.75 \times 100} = \frac{147000}{875}$$

$$\begin{array}{r} 875\overline{)147000(}\ 168 \\ -875 \\ \hline 5950 \\ -5250 \\ \hline 700 \end{array}$$

Thus, the cost of 3.5 m cloth is ₹ 168.

5. Weight of 13 slabs $= 6.682$ kg

Weight of 1 slab $= \frac{6.682}{13}$ kg

Weight of 8 slabs $= 0.514 \times 8 = 4.112$ kg.

$$\begin{array}{r} 0.514 \\ \times\ 8 \\ \hline 4.112 \end{array}$$

$$\begin{array}{r} 13\overline{)6.682(}\ 0.514 \\ -65 \\ \hline 18 \\ -13 \\ \hline 52 \\ -52 \\ \hline 0 \end{array}$$

Thus, weight of 8 slabs is 4.112 kg

6. The weight of 25 packets of butter = 6.25 kg

$\therefore$ The weight of one packet of butter $= 6.25 \div 25 = 0.25$ kg

So, The weight of one packet of butter is 0.25 kg or 250 gram.

7. Cloth required for making a shirt $= 1.85$ m

Total cloth $= 22.2$ m

Number of shirts can be made $= 22.2 \div 1.85$

$$= \frac{22.2 \times 100}{1.85 \times 100}$$

$$= \frac{2220}{185} = 12$$

$$\begin{array}{r} 185\overline{)2220(}\ 12 \\ -185 \\ \hline 370 \\ -370 \\ \hline 0 \end{array}$$

Thus, 12 shirts can be made from 22.2 m cloth.

8. Cost of one kg mangoes $= ₹\ 28.70$

Cost of 3.5 kg mangoes $= ₹\ 28.70 \times 3.5$

$= ₹\ 100.45$

Thus, cost of 3.5 kg mangoes is ₹ 100.45.

$$\begin{array}{r} 28.70 \\ \times 3.\ \ 5 \\ \hline 14350 \\ 186100 \\ \hline 100.450 \end{array}$$

9. Let the other number be 'x'.

$\therefore \quad x \times 0.54 = 1.8576$

$$\Rightarrow \quad x = \frac{1.8576}{0.54} = \frac{185.76}{54} = 3.44$$

So, the other number is 3.44.

10. The distance covers by a car in 4.4 hours = 198.2 km.

$\therefore$ The distance covered by this car in an hour

$= 198.2 \div 4.4$

$= 1982 \div 44 = 45.05$ km

So, the distance covered by car in an hour is 45.05 km.

11. Weight of 1 gold chain $= 22.725$ g

Number of chains $= 5$

Total weight of 5 chains $= 22.725 \times 5$g

$= 113.625$ g

Thus, weight of 5 gold chains is 113.625 g.

$$\begin{array}{r} 22.725\text{g} \\ \times 5 \\ \hline 113.625\text{g} \end{array}$$

12. Cost of 1 litre milk $= ₹\ 15.50$

Cost of 5 litres milk $= ₹\ 15.50 \times 5$

$= ₹\ 77.50$

Thus, my mother spent ₹ 77.50 for bought 5 litres of milk.

$$\begin{array}{r} ₹\ 15.50 \\ \times 5 \\ \hline ₹\ 77.50 \end{array}$$

13. Number of vessels $= 81$

Quantity of water $= 283.5$ litres

Capacity of each vessel $= 283.5$ L $\div 81$

$= 3.5$ L

$$\begin{array}{r} 3.5 \\ 81\overline{)283.5} \\ -243 \\ \hline 405 \\ -405 \\ \hline 0 \end{array}$$

The capacity of each vessel is 3.5 L.

14. Total length of ribbon = 18.24 m
and number of friends = 6
∴ Length of ribbon to get each friend = 18.24 ÷ 6 = 3.04 m
Hence, the required length of ribbon is 3.04 m

Exercise 5.4

Simplify :

1. $14 + 2 \div 4 - 0.5 \times 3 = 14 + 0.5 - 1.5 = 14.5 - 1.5 = 13$

2. $13 \div 5.2 + 0.024$ of $8 + 0.3$
$= 13 \div 5.2 + 0.024 \times 8 + 0.3$
$= 2.5 + 0.192 + 0.3 = 2.992$

3. $1.4 \times 3.2 + 2 \times 2.1 - 0.8 = 4.48 + 4.2 - 0.8 = 8.68 - 0.8 = 7.88$

4. $9 + 2.5 \div 0.5 - 1 = 9 + 5 - 1 = 14 - 1 = 13$

5. $8.5 \div 1.7 + 1.2 - 0.9$ of 1.2
$= 8.5 \div 1.7 + 1.2 - 0.9 \times 1.2$
$= 5 + 1.2 - 0.9 \times 1.2$
$= 5 + 1.2 - 1.08 = 6.2 - 1.08 = 5.12$

6. $4 \div 3.2 + 37.8 - 6.5$ of 3
$= 4 \div 3.2 + 37.8 - 6.5 \times 3$
$= 1.25 + 37.8 - 6.5 \times 3$
$= 1.25 + 37.8 - 19.5 = 19.55$

7. $2.5 \div 0.5 + 4 \times 2.5 = 5 + 4 \times 2.5 = 5 + 10 = 15$

8. $1.1 \times 0.1 + 3.01 - 0.01 = 0.11 + 3.01 - 0.01 = 3.12 - 0.01 = 3.11$

9. $2.5 \times 4 - 25.5 \div 2.5$ of 2
$= 2.5 \times 4 - 25.5 \div 2.5 \times 2$
$= 2.5 \times 4 - 25.5 \div 5$
$= 2.5 \times 4 - 5.1 = 10 - 5.1 = 4.9$

10. $12 \div \frac{1}{2} + 0.5 \times \frac{5}{2} - 2 = 12 \times 2 + 0.5 \times 2.5 - 2$
$= 24 + 1.25 - 2$
$= 25.25 - 2$
$= 23.25$

Multiple Choice Questions

Tick (✓) the correct answer :

1. (a) **2.** (b) **3.** (c) **4.** (d) **5.** (b) **6.** (c) **7.** (a) **8.** (c) **9.** (a) **10.** (c)

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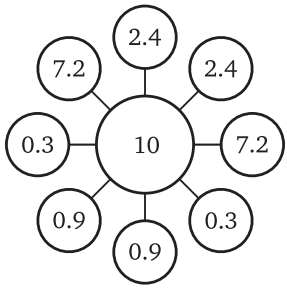
$(7.2 \times 10 \times 0.3 = 21.6;\ 2.4 \times 10 \times 0.9 = 21.6)$



Chapter

6 Comparing Quantities

Exercise 6.1

1. Fill in the following blanks making them equivalent ratios :

(a) $\frac{15}{75} = \frac{\mathbf{60}}{300} = \frac{75}{\mathbf{375}} = \frac{\mathbf{1}}{5}$ (b) $\frac{32}{\mathbf{48}} = \frac{4}{6} = \frac{\mathbf{2}}{3} = \frac{48}{\mathbf{72}}$

2. Total number of animals $= 95$

Number of horses $= 5$

Number of rabbits $= 20$

Number of hens $= 95 - (5 + 20)$

$= 95 - 25 = 70$

(a) Ratio of horses and total number of animals $= 5 : 95$ or $1 : 19$

(b) Ratio of rabbits to number of houres $= 20 : 5 = 4 : 1$

(c) Ratio of hens to number of hourses $= 70 : 5 = 14 : 1$

(d) Ratio of hens to the number of rabbits $= 70 : 20 = 7 : 2$

3. Find the ratio of the following :

(a) 60 minutes to 3 hours

1 hours $= 60$ min

3 hrs $= 180$ min

Ratio of 60 min to 180 min $= 60 : 180 = 1 : 3$

(b) 32 cm to 4 m

1 m $= 100$ cm

4 m $= 400$ cm

Ratio of 32 cm to 400 cm $= 32 : 400 = 2 : 25$

(c) 800 ml to 4.8 litres

1 L $= 1000$ mL

4.8 L $= 4.8 \times 1000 = 4800$

Ratio of 800 mL to 4800 mL $= 800 : 4800 = 1 : 6$

4. Compare ratio $= 3 : 4$ or $2 : 3$

$3 : 4 = \frac{3}{4}$; $\quad 2 : 3 = \frac{2}{3}$

$\frac{3 \times 3}{4 \times 3} = \frac{9}{12}$ $\quad$ or $\quad \frac{2 \times 4}{3 \times 4}$ $\quad$ or $\quad \frac{8}{12}$

Clearly, $\quad \frac{9}{12} > \frac{8}{12}$

So, $\quad \frac{3}{4} > \frac{2}{3}$ $\quad$ or $\quad 3 : 4 > 2 : 3$

5. Total amount $=$ ₹ 324

Ratio of A, B and C $= 3 : 4 : 5$

Sum of ratio $= 3 + 4 + 5 = 12$

$\therefore$ Share of $A = ₹\ 324 \times \frac{3}{12} = ₹\ 27 \times 3 = ₹\ 81$

$\therefore$ Share of $B = ₹\ 324 \times \frac{4}{12} = ₹\ 27 \times 4 = ₹\ 108$

$\therefore$ Share of $C = ₹\ 324 \times \frac{5}{12} = ₹\ 27 \times 5 = ₹\ 135$

6. $x : y = 1 : 2$ $\quad \frac{x}{y} = \frac{1}{2}$ $\quad y = 2x$

Consider, $\frac{2x+y}{y-x}=\frac{2x+2x}{2x-x}$

$$=\frac{4x}{x}=4$$

7. Number of books in a library $=90$

Number of Social Science books $=10$

Number of Hindi books $=18$

Number of English books $=27$

Number of Science $=90-(10+18+27)$

$=90-55=35$

(a) Ratio of Social Science books to science books $=10:35$ or $2:7$

(b) Ratio of Hindi books to English books $=18:27=2:3$

(c) Ratio of social science books to total books

$=10:90$ or $1:9$

8. $\frac{5m+n}{n-m}=\frac{9}{7}$.

$(5m+n)7 = 9(n-m)$

$35m+7n = 9n-9m$

$35m+9m = 9n-7n$

$44m = 2n$

$\frac{m}{n} = \frac{2}{44}$ or $\frac{1}{22}$

$\therefore \quad m:n=1:22$

9. Total Amount $=₹\ 900$

The two parts are 5 and 4

The sum of $5+4=9$

Therefore A's share $=₹\ 900\times\frac{5}{9}=₹\ 500$

B's share $=₹\ 900\times\frac{4}{9}=₹\ 400$

10. A : B = 2 : 3 … (i) $\times 4 = 8:12$

B : C = 4 : 5 … (ii) $\times 3 = 12:15$

So, A : B : C = 8 : 12 : 15

(a) A : C = 8 : 15 ; (b) A : B : C = 8 : 12 : 15

11. $a : b = 4 : 5$,

$$\frac{a}{b} = \frac{4}{5} \qquad \Rightarrow \qquad a = \frac{4b}{5}$$

consider, $$\frac{5a+b}{5a-b} = \frac{5\times\frac{4b}{5}+b}{5\times\frac{4b}{5}-b} = \frac{4b+b}{4b-b} = \frac{5b}{3b} = \frac{5}{3}$$

$\therefore$ $$\frac{5a+b}{5a-b} = \frac{5}{3}$$

12. Ratio of two number $= 4 : 7$

Let one number $= 4x$

Then, second number $= 7x$

According to questions

$$\frac{4x+3}{7x+3} \times \frac{5}{8}$$

$$(4x+3)\,8 = (7x+3)\,5 \text{ (cross multiplication)}$$

$$32x + 24 = 35x + 15$$

$$24 - 15 = 35x - 32x$$

$$9 = 3x$$

or $$x = \frac{9}{3} = 3$$

$$x = 3$$

Thus one number is $= 4 \times 3 = 12$ and

second number is $= 7 \times 3 = 21$

13. Perimeter of triangle $= 54$ cm

Ratio of sides $= 2 : 3 : 4$

Sum of ratio $= 2 + 3 + 4 = 9$

One side of triangle $= 54 \times \frac{2}{9} = 6 \times 2 = 12$ cm

Second side of triangle $= 54 \times \frac{3}{9} = 6 \times 3 = 18$ cm

Third side of triangle $= 54 \times \frac{4}{9} = 6 \times 4 = 24$ cm

Thus, side are 12 cm, 18 cm, 24 cm of triangle.

14. $\frac{2x+3y}{x-8y}=\frac{1}{2}$

$$(2x+3y)2=(x-8y) \qquad \text{(cross multiplication)}$$
$$4x+6y=x-8y$$
$$4x-x=-8y-6y$$
$$3x=-14y$$
$$\frac{x}{y}=\frac{-14}{3}$$

Exercise 6.2

1. Are the following in proportion?

(a) 30, 35, 40, 45

Product of extremes = Product of means

$$30\times 45 = 35\times 40$$
$$1350 \neq 1400$$

Thus, it is not in proportion.

(b) 2, 4, 3, 6

Product of extremes = Product of means

$$2\times 6 = 4\times 3$$
$$12 = 12$$

Thus, It is in proportion.

(c) 14, 18, 21, 27

Product of extremes = Product of means

$$14\times 27 = 18\times 21$$
$$378 = 378$$

Thus, It is in proportion.

2. Are the following in continued proportion?

(a) 4, 6, 9

$$\Rightarrow \quad b^2 = ac$$
$$(6)^2 = 4\times 9$$
$$36 = 36$$

They are in continued proportion.

(b) 2, 4, 6

$$\Rightarrow \quad b^2 = ac$$
$$(4)^2 = 2 \times 6$$
$$16 \neq 12$$

They are not in continued proportion.

(c) 4, 12, 36

$$\Rightarrow \quad b^2 = ac$$
$$(12)^2 = 4 \times 36$$
$$144 = 144$$

They are in continued proportion.

(d) 3, 9, 27

$$\Rightarrow \quad b^2 = ac$$
$$(9)^2 = 3 \times 27$$
$$81 = 81$$

They are in continued proportion.

3. Find the fourth proportion to :

(a) 8, 12, 16

Let the fourth proportion to 8, 12 and 16 be x.

$$8 : 12 :: 16 : x$$
$$8x = 12 \times 16$$

(Product of extremes = Product of mean)

$$x = \frac{12 \times 16}{8} = 24$$

Thus, $x = 24$ is fourth proportion to 8, 12 and 16

(b) 4, 7, 8

Let the fourth proportion to 4, 7 and 8 be x

$$4 : 7 :: 8 : x$$
$$4x = 7 \times 8$$

(Product of extremes = Product of means)

$$x = \frac{56}{4} = 14$$

Thus, $x = 14$ is fourth proportion to 4, 7 and 8

(c) 1, 6, 10

Let the fourth proportion 1, 6 and 10 be x

$$1 : 6 : : 10 : x$$

$$1 \times x = 6 \times 10$$

(Product of extreme = Product of mean)

Thus, $x = 60$ is fourth proportion to 1, 6 and 10.

(d) 30,40, 45

Let the fourth proportion 30, 40 and 45 be x

$$30 : 40 : : 45 : x$$

$$30 \times x = 40 \times 45$$

(Product of extremes = Product of mean)

$$x = \frac{40 \times 45}{30} = 60$$

Thus, $x = 60$ is fourth proportion to 30, 40 and 45.

4. Find the value of x :

(a) $21 : 28 :: x : 52$

Product of extremes = Product of means.

$$21 \times 52 = 28 \times x$$

$$x = \frac{21 \times 52}{28} = 39$$

(b) $11 : x :: 12 : 72$

Product of extremes = Product of means

$$11 \times 72 = x \times 12$$

$$x = \frac{11 \times 12}{12} = 66$$

(c) $x : 45 :: 24 : 60$

Product of extremes = Product of means

$$x \times 60 = 45 \times 24$$

$$x = \frac{45 \times 24}{60} = 18$$

5. Find the third proportion to :

(a) 9 and 4 $\Rightarrow$ Let third proportion be x

In continued proportion

$$x^2 = a \times c$$

$$x^2 = 9 \times 4$$
$$x = \sqrt{36} = 6$$

Thus, third proportion is 6.

(b) 2 and 8 $\Rightarrow$ Let third proportion be x

In continued proportion

$$x^2 = a \times c$$
$$x^2 = 2 \times 8$$
$$x = \sqrt{16} = 4$$

Thus, third proportion is 4.

(c) 25 and 4 $\Rightarrow$ Let third proportion be x

In continued proportion

$$b^2 = a \times c$$
$$x^2 = 25 \times 4$$
$$x = \sqrt{100} = 10$$

Thus, third proportion is 10.

(d) 9 and 16 $\Rightarrow$ Let third proportion be x

In continued proportion

$$b^2 = a \times c$$
$$x^2 = 9 \times 16$$
$$x = \sqrt{144} = 12$$

Thus, third proportion is 12.

6. Let actual distance will be x

than, 1 : 50,00,000 : : 2 : x

or $$\frac{1}{50,00,000} = \frac{2}{x}$$

$$x = 1,00,00,000 \text{ cm}$$

or $$x = 100 \text{ km}$$

7. Ratio of present ages of two girls = 3 : 5

Let, Present age of first girl = $3x$

Present age of second girl = $5x$

5 years ago :

Age of first girl = $3x - 5$

Age of second girl $= 5x - 5$

Ratio $= (3x-5) : (5x-5)$

According to question

5 years ago their ratio $= 1 : 2$

$$\frac{3x-5}{5x-5} \times \frac{1}{2} \qquad \text{(cross multiplication)}$$

$$(3x-5)2 = 5x-5$$

$$6x-10 = 5x-5$$

$$6x-5x = -5+10$$

$$x = 5$$

$\therefore$ First girl present age is $3 \times 5 = 15$ years.

$\therefore$ Second girl present age is $5 \times 5 = 25$ years.

8. Distance covered by train $= 180$ km

Time taken $= 3$ hrs

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{180}{3} = 60 \text{ hrs/km}$$

If distance covered $= 240$ km

$$\text{Time taken} = \frac{\text{Distance}}{\text{Speed}} = \frac{240}{60} = 4 \text{ hrs.}$$

9. Number of bulbs $= 12$

Number of defective $= 3$

Ratio $= 12 : 3$

If number of bulbs $= 100$

Let assumed defective bulbs $= x$

Ratio $= 100 : x$

$12 : 3 : : 100 : x$

$12 \times x = 3 \times 100$

$$x = \frac{3 \times 100}{12} = 25$$

Thus, 25 defective bulbs will be there in 100 bulbs.

10. Let x should be added to numbers 1, 3, 10 and 18

Than numbers $= (1+x), (3+x), (10+x)$ and $(18+x)$

Now, they are in proportion :

So, product of extremes = product of mean

$$(1+x) : (3+x) :: (10+x) : (18+x)$$

$$(1+x)(18+x) = (3+x)(10+x)$$
$$18+x+18x+x^2 = 30+3x+10x+x^2$$
$$18+19x+x^2 = 30+13x+x^2$$
$$19x-13x = 30-18$$
$$6x = 12$$
$$x = \frac{12}{6}$$
$$x = 2$$

Thus, required number is 2.

Exercise 6.3

1. Cost of 30 metre of cloth $= ₹\ 1800$

Cost of 1 metre of cloth $= ₹\ \frac{1800}{30}$

Cost of 35 metre of cloth $= ₹\ \frac{1800}{30} \times 35 = ₹\ 2100$

Thus, cost of 35 m cloth is ₹ 2100.

2. Number of books purchased in ₹ 606 $= 12$

Number of books purchase $₹1 = \frac{12}{606}$

Number of books purchase ₹ 1010 $= \frac{12}{606} \times 1010 = 20$

Thus, 20 books are purchased in ₹ 1010.

3. 4 month's income $= ₹\ 24000$

1 month's income $= ₹\ \frac{24000}{4}$

Thus, annual income $= ₹\ \frac{24000}{4} \times 12 = ₹\ 72000$

4. Cost of 5 litre milk $= ₹\ 112.50$

Cost of 1 litre milk $= ₹\ \frac{112.50}{5}$

Cost of 2 litre milk $= ₹\ \frac{112.50}{5} \times 2 = ₹\ 45$

Thus, the cost of 2 litre milk is ₹ 45.

5. Cost of a doll $= ₹\ 625$

Tax on doll $= ₹\ 62.50$

$\therefore$ Tax on ₹ 625 $= ₹\ 62.50$

Tax on ₹ 1 $= ₹\ \dfrac{62.50}{625}$

Tax on ₹ 300 $= ₹\ \dfrac{62.50}{625} \times 300 = ₹\ 30$

6. Distance covered by plane in 8 hrs $= 4800\,\text{km}$

Distance covered by plane in 1 hrs $= \dfrac{4800}{8} = 600\,\text{km}$

Time taken to cover 600 km $= 1\,\text{hr}$

Time taken to cover 1 km $= \dfrac{1}{600}\,\text{hrs}$

Time taken to cover 1800 km $= \dfrac{1}{600} \times 1800 = 3\,\text{hrs}$

Thus, 3 hrs will be taken to cover 1800 km.

7. Number of boxes required for 900 chocolates $= 15$

Number of boxes required for 1 chocolates $= \dfrac{15}{900}$

Number of boxes required for 1500 chocolates $= \dfrac{15}{900} \times 1500 = 25$

Thus, 25 boxes are required to pack 1500 chocolate.

8. Number of tank required for 1.2 kL or 1200 L $= 1$

Number of tank required for 1 L $= \dfrac{1}{1200}$

Number of tank required for 180000 L $= \dfrac{1}{1200} \times 180000 = 150$

Thus, 150 tank required for 180000 L.

Exercise 6.4

1. Express the following fractions as percentages :

(a) $\dfrac{3}{4} = \left(\dfrac{3}{4} \times 100\right)\% = 75\%$ (b) $\dfrac{5}{8} = \left(\dfrac{5}{8} \times 100\right)\% = 62\dfrac{1}{2}\%$

(c) $1\frac{7}{8} = \left(\frac{15}{8} \times 100\right)\% = 187\frac{1}{2}\%$ (d) $\frac{11}{20} = \left(\frac{11}{20} \times 100\right)\% = 55\%$

2. Express the following ratios as per cent :

(a) $1 : 2 = \left(\frac{1}{2} \times 100\right)\% = 50\%$

(b) $3 : 4 = \left(\frac{3}{4} \times 100\right)\% = 75\%$

(c) $5 : 12 = \left(\frac{5}{12} \times 100\right)\% = 41\frac{2}{3}\%$

(d) $27 : 50 = \left(\frac{27}{50} \times 100\right)\% = 54\%$

3. Express the following decimals as per cent :

(a) $0.02 = (0.02 \times 100)\% = 2\%$

(b) $1.05 = (1.05 \times 100)\% = 105\%$

(c) $0.250 = (0.250 \times 100)\% = 25\%$

(d) $12.25 = (12.25 \times 100)\% = 1225\%$

4. Express the following per cents as ratios in simplest form :

(a) $1.2\% = \frac{12}{1000} = \frac{3}{500} = 3 : 500$

(b) $20\% = \frac{20}{100} = 1 : 5$

(c) $15\frac{1}{2}\% = \frac{31}{200} = 31 : 200$

(d) $72\% = \frac{72}{100} = 18 : 25$

5. Express the following per cents as fractions :

(a) $26\% = \frac{26}{100} = \frac{13}{50}$ (b) $3\frac{1}{4}\% = \frac{13}{4} \times \frac{1}{100} = \frac{13}{400}$

(c) $35\frac{1}{2}\% = \frac{71}{2} \times \frac{1}{100} = \frac{71}{200}$ (d) $105\% = \frac{105}{100} = \frac{21}{20}$

6. Express the following per cents as decimals :

(a) $3\% = \frac{3}{100} = 0.03$ (b) $29\% = \frac{29}{100} = 0.29$

(c) $25.6\% = \frac{25.6}{100} = 0.256$ (d) $212\% = \frac{212}{100} = 2.12$

7. Find the number whose :

(a) 12% is 60

Let 12% of $x = 60 \quad \Rightarrow \quad x \times \frac{12}{100} = 60$

$$x = \frac{60 \times 100}{12} = 500$$

(b) 25% is 70

Let 25% of $x = 70$

$$x \times \frac{25}{100} = 70$$

$$x = \frac{70 \times 100}{25} = 280$$

(c) 65% is 221

Let 65% of $x = 221$

$$x \times \frac{65}{100} = 221$$

$$x = \frac{221 \times 100}{65} = 340$$

(d) 12.5% is 1000

Let 12.5% of $x = 1000$

$$x \times \frac{12.5}{100} = 1000$$

$$x = \frac{1000 \times 100}{12.5} = 8000$$

8. Calculate the following :

(a) $15\% \text{ of } 200 \text{ m} = 200 \times \frac{15}{100} = 30 \text{ m}$

(b) $24\% \text{ of } 500 \text{ kg} = 500 \times \frac{24}{100} = 120 \text{ kg}$

(c) $5\frac{1}{2}\% \text{ of } ₹\ 1200 = ₹\ 1200 \times \frac{11}{2 \times 100} = ₹\ 66$

(d) $30\% \text{ of } 1.5 \text{ litres} = 1.5 \times \frac{30}{100} = 0.45 \text{ L or } 450 \text{ ml}$

9. What per cent of :

(a) 60 is 600? $= \left(\frac{^{1}60}{600} \times 100\right)\% = 1000\%$

(b) ₹ 50 is ₹ 250? $= \left(\frac{250}{50} \times 100\right)\% = 500\%$

(c) 8 hrs is 2 days? $= \left(\frac{2 \times 24}{8} \times 100\right)\% = 600\%$

(d) 125 g is 2.5 kg? $= \left(\frac{2500}{125} \times 100\right)\% = 2000\%$

10. Let original price of saree $= ₹\, x$

$$\text{increase price} = ₹\, x \times 15\% = ₹\, \frac{15x}{100}$$

$$\text{Total price of saree} = ₹\left(x + \frac{15x}{100}\right) = ₹\, \frac{115x}{100}$$

According to question;
Price of saree

$$\frac{115x}{100} = 115$$

$$x = \frac{100 \times 115}{115} = ₹\, 100$$

So, original price of saree $= ₹\, 100$

11. Cost of a railway ticket $= ₹\, 720$
Percentage of tax $= 2\%$

$$\text{Tax} = ₹\, 720 \times \frac{2}{100} = ₹\, 14.4$$

Total cost of ticket ₹ 720 + 14.4 = ₹ 734.4

12. Percentage of passed $= 90\%$
Percentage of fail candidates $= 100\% - 90\% = 10\%$
Let Number of candidates $= x$

$$10\% \text{ of } x = 80$$

$$\frac{10 \times x}{100} = 80$$

$$x = \frac{80 \times 100}{10} = 800$$

Thus, number of candidates is 800.

13. Percentage of Tanu $= \frac{630}{900} \times 100 = 70\%$

Percentage of Anu $= \frac{650}{1000} \times 100 = 65\%$

Thus, Tanu's performance is better.

14. Distance covered by bus $= 50\,\text{km}$

Distance covered by train $= 200\,\text{km}$

Total distance covered $= 200 + 50\,\text{km} = 250\,\text{km}$

Distance percentage by bus $= \frac{50}{250} \times 100 = 20\%$

Distance Percentage by train $= \frac{200}{250} \times 100 = 80\%$

Multiple Choice Questions

Tick (✓) the correct answer :

1. (a) **2.** (b) **3.** (b) **4.** (b) **5.** (d) **6.** (d) **7.** (a)

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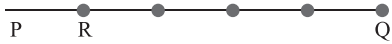
- What fraction of PQ is RQ ?

(a) 

$= \frac{5}{8}$

(b) 

$= \frac{4}{5}$

- Jenny has more sweets because $\frac{3}{2} > \frac{2}{3}$.
- Let x should be added to numbers
  14, 22, 32 and 49
  Than numbers
  $(14+x), (22+x), (32+x), (49+x)$
  Now they are in proportion
  So, product of extremes = product of means
  $(14+x) : (22+x) :: (32+x)(49+x)$

$$
\begin{aligned}
(14+x)(49+x) &= (22+x)(32+x) \\
14(49+x)+x(49+x) &= 22(32+x)+x(32+x) \\
686+14x+49x+x^2 &= 704+22x+32x+x^2 \\
686+63x+x^2 &= 704+54x+x^2 \\
63x-54x &= 704-686 \\
9x &= 18 \\
x &= 2
\end{aligned}
$$

So, 2 should be added to 14, 22, 32 and 49

Chapter

7 Introduction to Algebra

Exercise 7.1

1. Classify the following expressions as monomials, binomials and trinomials :

(a) $x^2 + y^2 + z^2 =$ trinomial (b) $14xyz =$ monomial

(c) $-10 =$ monomial (d) $y + 2z =$ binomial

(e) $pq + qr - 4 =$ trinomial (f) $15z^2 - 2 =$ binomial

2. Write the co-efficient of y^2 in the following :

(a) Co-efficient of y^2 in $10y^2z = 10z$

(b) Co-efficient of y^2 in $-14xy^3z = -14yzx$

(c) Co-efficient of y^2 in $8y^2 = 8$

(d) Co-efficient of y^2 in $\frac{5}{6}y^2x^2z = \frac{5}{6}x^2z$

(e) Co-efficient of y^2 in $11x^2y^2z^2 = 11x^2z^2$

(f) Co-efficient of y^2 in $32x^2y^4z = 32x^2y^2z$

3. Write an algebraic expression for the following :

(a) $2y - 3x$ (b) z^2 (c) $\frac{1}{2}(x+y)$

(d) $\frac{pq}{4}$ (e) $x^2 + y^2$ (f) $3mn + 5$

4. Write the numerical co-efficient of each of the following expressions:

(a) The numerical co-efficient $= \frac{-15}{2}, -30, 6, 4$

(b) The numerical co-efficient $= 9, -10, -11, -1$

(c) The numerical co-efficient $= 7, -2, -16, 18$

(d) The numerical co-efficient $= \frac{-3}{5}, 9, -18$

5. Write the co-efficient of :

(a) Co-efficient of y in $-5y = -5$

(b) Co-efficient of a in $2ab = 2b$

(c) Co-efficient of y in $-7xy = -7x$

(d) Co-efficient of p in $-3pq = -3q$

(e) Co-efficient of y^2 in $9xy^2 = 9x$

(f) Co-efficient of x^3 in $x^3 + 1 = 1$

(g) Co-efficient of x^2 in $-x^2 = -1$

(h) Co-efficient of x^2 in $\frac{-5}{7}x^2 y = \frac{-5}{7}y$

6. Identify the like terms from each of the following expressions :

(Like terms : All the terms containing the same literal numbers (or variables) with the same degrees are called like terms.)

Thus, the like terms are :

(a) $9a^2, -4a^2; 3b^2, 2b^2$ (b) $2yz, -4yz, 9yz, -\frac{19}{2}yz$

(c) $a^2b^2c, -9a^2cb^2$ (d) $pqr, -32pqr$

(e) $x^2y, yx^2, 4x^2y$ (f) $-xy^2, 2xy^2$

7. What's the degree of each term of the following expressions. Hence, state the degree of the expression.

(a) $4 + y^2$

Degree of $4 = 0$

Degree of $y^2 = 2$

Highest degree is 2

The degree of $4 + y^2 = 2$

(b) $4 - y^3$

Degree of $4 = 0$

Degree of $y^3 = 3$

Highest degree is 3

The degree of $4 - y^3 = 3$

(c) $1 - 2t + t^2 - 3t^3$

Degree of $1 = 0$

Degree of $-2t = 1$

Degree of $t^2 = 2$

Degree of $-3t^3 = 3$

Highest degree is 3

Degree of $1 - 2t + t^2 - 3t^3 = 3$

(d) $x^2 + xy$

Degree of $x^2 = 2$

Degree of $xy = 2$

Highest degree is 2

Degree of $x^2 + xy = 2$

(e) $4x^3 - 3x^2 + 5x - 6$

Degree of $4x^3 = 3$

Degree of $-3x^2 = 2$

Degree of $5x = 1$

Degree of $6 = 0$

Highest degree $= 3$

Degree of $4x^3 - 3x^2 + 5x - 6 = 3$

(f) $x^2 y - xy^2 + 7xy - 3$

Degree of $x^2 y = 3$

Degree of $-xy^2 = 3$

Degree of $7xy = 2$

Degree of $-3 = 0$

Highest degree is $= 3$

Degree of $x^2y - xy^2 + 7xy - 3 = 3$

8. Write the factors of each term of the following :

(a) $-16xyz + 4yz$

We write all the values separately to know all the factors. Thus, factors are

$-16xyz = -16, x, y, z$ and $+4yz = 4, y, z$

(b) $32y^2z - 8xy - 4$

We write all the values separately to know all the factors. Thus, factors are

$32y^2z = 32, y, y, z$; $-8xy = -8, x, y$; $-4 = -4$

(c) $a^2b^2c - ab + 9$

We write all the values separately to know all the factors. Thus, factors are

$a^2b^2c = a \times a \times b \times b \times c$; $-ab = -a, b$; $9 = 9$

(d) $x^2y - y^2z$

We write all the values separately to know all the factors Thus, factors are $x^2y = x \times x \times y$; $-y^2z = -y \times y \times z$

9. Write down the degree of each term and degree of the algebraic expressions given in Q. 8.

(a) $-16xyz + 4yz$

Degree of $-16xyz = 3$

Degree of $+4yz = 2$

Highest degree is $= 3$

$\therefore$ The degree of $-16xyz + 4yz = 3$

(b) $32y^2z - 8xy - 4$

Degree of $32y^2z = 3$

Degree of $-8xy = 2$

Degree of $-4 = 0$

Highest degree is $= 3$

$\therefore$ The degree of $3y^2z - 8xy - 4 = 3$

(c) $a^2b^2c - ab + 9$

Degree of $a^2b^2c = 5$

Degree of $-ab = 2$

Degree of $9 = 0$

Highest of degree is $= 5$

$\therefore$ The degree of $a^2b^2c - ab + 9 = 5$

(d) $x^2y - y^2z$

Degree of $x^2y = 3$

Degree of $y^2z = 3$

Highest of degree is $= 3$

$\therefore$ The degrees of $x^2y - y^2z = 3$

Exercise 7.2

1. Add the following :

(a) Add :

$3x^2, -10x^2, 4x^2 = 3x^2 + (-10x^2) + 4x^2$

$= 3x^2 - 10x^2 + 4x^2$

$= 7x^2 - 10x^2 = -3x^2$

(b) Add :

$5y^3, 26y^3, 10y^3, -3y^3 = 5y^3 + 26y^3 + 10y^3 + (-3y^3)$

$= 5y^3 + 26y^3 + 10y^3 - 3y^3$

$= 41y^3 - 3y^3 = 38y^3$

(c) Add :

$8x^2y, -11x^2y, -8x^2y = 8x^2y + (-11x^2y) + (-8x^2y)$

$= 8x^2y - 11x^2y - 8x^2y$

$= 8x^2y - 19x^2y$

$= -11x^2y$

(d) Add :

$24xy, 19xy, -4xy = 24xy + 19xy + (-4xy)$

$= 24xy + 19xy - 4xy$

$= 43xy - 4xy = 39xy$

(e) Add :

$4x^2y, -3xy^2, -5xy^2, 5x^2y$

$= 4x^2y + (-3xy^2) + (-5xy^2) + 5x^2y$

$= 4x^2y + 5x^2y - 3xy^2 - 5xy^2$

$= 9x^2y - 8xy^2$

(f) Add :

$-10ab^2c, -ab^2c, 15ab^2c, ab^2c$

$= -10ab^2c + (-ab^2c) + 15ab^2c + ab^2c$

$= -10ab^2c - ab^2c + 15ab^2c + ab^2c$

$= -11ab^2c + 16ab^2c$

$= 16ab^2c - 11ab^2c$

$= 5ab^2c$

2. Add the following expressions :

(a) Add : $x^2y + xy^2$, $-11x^2y + 10xy^2$, $-10x^2y - 11xy^2$

$$\begin{array}{r} x^2y + xy^2 \\ -11x^2y + 10xy^2 \\ (+)\underline{-10x^2y - 11xy^2} \\ \underline{-20x^2y} \end{array}$$

(b) Add : $2x^2 + 4y^2 + 5$, $-x^2 + 3y^2 + 10$, $-2x^2 - 4y^2 - 10$

$$\begin{array}{r} 2x^2 + 4y^2 + 5 \\ -x^2 + 3y^2 + 10 \\ (+)\ \underline{-2x^2 - 4y^2 - 10} \\ \underline{-x^2 + 3y^2 + 5} \end{array}$$

(c) Add : $4abc + 6a^2 + 7b$, $10a^2 + 14b$, $-2abc - 3a^2$

$$\begin{array}{r} 4abc + 6a^2 + 7b \\ +10a^2 + 14b \\ (+)\underline{-2abc - 3a^2} \\ \underline{2abc + 13a^2 + 21b} \end{array}$$

(d) Add : $x^2 + y^2 + 2xy,\ 3x^2 + y^2 - 4xy, x^2 + y^2$

$$\begin{array}{r} x^2 + y^2 + 2xy \\ 3x^2 + y^2 - 4xy \\ (+)\quad x^2 + y^2 \\ \hline 5x^2 + 3y^2 - 2xy \end{array}$$

3. Subtract :

(a) Subtract : $-5x^3 y$ from $-10x^3 y$

$$= -10x^3 y - (-5x^3 y)$$
$$= -10x^3 y + 5x^3 y = -5x^3 y$$

(b) Subtract : $14x^2$ from $3x^2$

$$= 3x^2 - 14x^2 = -11x^2$$

(c) Subtract : $18ab$ from $-6ab$

$$= -6ab - 18ab = -24ab$$

(d) Subtract : $-a^2 b$ from $9a^2 b$

$$= 9a^2 b - (-a^2 b)$$
$$= 9a^2 b + a^2 b = 10a^2 b$$

(e) Subtract : $19pq$ from $6pq$

$$= 6pq - 19pq = -13pq$$

(f) Subtract : $10xy$ from $-14xy$

$$= -14xy - 10xy = -24xy$$

4. Subtract the first expression from the second :

(a) $x^2 - xy + y^2, -x^2 - 2xy + y^2$

$$\begin{array}{r} -x^2 - 2xy + y^2 \\ x^2 - xy + y^2 \\ \underline{(-)\quad (+)\quad (-)} \\ -2x^2 - xy \end{array}$$

(b) $5a^2 - 7ab + 5b^2, 3ab - 2a^2 - 2b^2$

$$\begin{array}{r} 3ab - 2a^2 - 2b^2 \\ -7ab + 5a^2 + 5b^2 \\ \underline{(+)\quad (-)\quad (-)} \\ 10ab - 7a^2 - 7b^2 \end{array}$$

(c) $ab^2 + b^2 - a^2b, -2ab^2 + 3b^2$

$$\begin{array}{r} -2ab^2 + 3b^2 \\ ab^2 + b^2 - a^2b \\ \hline (-) \quad (-) \quad (+) \\ \hline -3ab^2 + 2b^2 + a^2b \end{array}$$

(d) $5a - 3b + 15, 6a - 8b - 10$

$$\begin{array}{r} 6a - 8b - 10 \\ (-) \quad 5a - 3b + 15 \\ \hline (-)\ (+)\ (-) \\ \hline 1a - 5b - 25 \end{array}$$

(e) $7 - 2x - x^2, 3x^2 - 4x + 2$

$$\begin{array}{r} 3x^2 - 4x + 2 \\ (-) \quad -x^2 - 2x + 7 \\ \hline (+)\ (+)\ (-) \\ \hline 4x^2 - 2x - 5 \end{array}$$

(f) $4p^3 + 3p^2 - 2p, 6p^3 - 4p$

$$\begin{array}{r} 6p^3 - 4p \\ 4p^3 - 2p + 3p^2 \\ \hline (-) \quad (+) \quad (-) \\ \hline 2p^3 - 2p - 3p^2 \end{array}$$

(g) $8y - 6x^2 + 9, 2x^2$

$$\begin{array}{r} 2x^2 \\ -6x^2 + 8y + 9 \\ \hline (+) \quad (-) \quad (-) \\ \hline 8x^2 - 8y - 9 \end{array}$$

(h) $3x^2 - 5y + 7, 10y + 14$

$$\begin{array}{r} 10y + 14 \\ 3x^2 - 5y + 7 \\ \hline (-) \quad (+) \quad (-) \\ \hline -3x^2 + 15y + 7 \end{array}$$

5. Subtract $10a^2b + 4ab^2$ from the sum of $-7a^2b + 9$ and $-3ab^2 + 2$.

Sum of $-7a^2b + 9$ and $-3ab^2 + 2$

Add : $-7a^2b + 9$

$+ 2 - 3ab^2$

$-7a^2b + 11 - 3ab^2$

Subtract $10a^2b + 4ab^2$ from $-7a^2b + 11 - 3ab^2$

Subtract : $-7a^2b + 11 - 3ab^2$

$10a^2b + 4ab^2$

$(-) \quad (-) \quad (-)$

$-17a^2b + 11 - 7ab^2$

6. What should be added to $5x^3 - 11x^2 - 4$ to get $10x^3 - 4x^2 + 6$?

$10x^3 - 4x^2 + 6$

$5x^3 - 11x^2 - 4$

$(-) \quad (+) \quad (+)$

$5x^3 + 7x^2 + 10$

Thus, $5x^3 + 7x^2 + 10$ should be added to $5x^3 - 11x^2 - 4$ to get $10x^3 - 4x^2 + 6$.

7. Add $15xy + x^2 + 2$ to the sum of $11xy - x^2 - 4$ and $-14xy + 5x^2$.

Add : $11xy - x^2 - 4$ and $-14xy + 5x^2$

Add : $11xy - x^2 - 4$

$-14xy + 5x^2$

$-3xy + 4x^2 - 4$

Add : $15xy + x^2 + 2$ and $-3xy + 4x^2 - 4$

Add : $15xy + x^2 + 2$

$-3xy + 4x^2 - 4$

$12xy + 5x^2 - 2$

8. The sum of two expression is $x^2 - y^2 + 3y - 5$, if one of them is $2y^2 + 2x - y - 10$, find the other.

Sum of the two expressions $= x^2 - y^2 + 3y - 5$

One expression $= 2y^2 + 2x - y - 10$

Other expression

$$x^2 - y^2 + 3y - 5$$
$$2y^2 - y + 2x - 10$$
$$(-)\ \ (+)\ \ (-)\ \ (+)$$
$$+x^2 - 3y^2 + 4y - 2x + 5$$

9. What should be subtracted from $14xyz + 6xy$ to get $-xyz + 7xy$?

$$14xyz + 6xy$$
$$-xyz + 7xy$$
$$-(+)\ \ (-)$$
$$15xyz - xy$$

Thus, $15xyz - xy$ should be subtract to get $-xyz + 7xy$.

10. How much is $x^3 - 2x^2 + x + 4$ greater than $2x^3 - 7x^2 - 5x + 6$?

$$x^3 - 2x^2 + x + 4$$
$$2x^3 - 7x^2 - 5x + 6$$
$$(-)\ \ (+)\ \ (+)\ \ (-)$$
$$-x^3 + 5x^2 + 6x - 2$$

Thus, $x^3 - 2x^2 + x + 4$ is $-x^3 + 5x^2 + 6x - 2$ greater than $2x^3 - 7x^2 - 5x + 6$.

11. From the sum of $pq + p^2 - q^2$ and $2p^2 + 4q^2$ subtract $2pq - p^2$.

Add : $pq + p^2 - q^2$ and $2p^2 + 4q^2$

Add :
$$pq + p^2 - q^2$$
$$+\ 2p^2 + 4q^2$$
$$pq + 3p^2 + 3q^2$$

Subtract $2pq - p^2$ from $pq + 3p^2 - 3q^2$

Subtract :
$$pq + 3p^2 + 3q^2$$
$$+\ 2pq - p^2$$
$$(-)\ \ (+)\ \ (+)$$
$$-pq + 4p^2 + 3q^2$$

12. If P = $2x^2 + 3xy - 5y^2$, Q = $-5x^2 + 2xy + 3y^2$, and R = $-3x^2 + 5xy - 2y^2$, show that P + Q – R = 0.

P = $2x^2 + 3xy - 5y^2$, Q = $-5x^2 + 2xy + 3y^2$,

$$\begin{aligned} P+Q &= 2x^2 + 3xy - 5y^2 \\ &\quad -5x^2 + 2xy + 3y^2 \\ &\quad \overline{-3x^2 + 5xy - 2y^2} \end{aligned}$$

$$\begin{aligned} P+Q-R &= -3x^2 + 5xy - 2y^2 \\ &\quad -3x^2 + 5xy - 2y^2 \\ &\quad \overline{(+)\quad (-)\quad (+)} \\ &\quad \overline{0} \end{aligned}$$

$P + Q - R = 0$

Hence proved.

Exercise 7.3

1. Find the value of the expressions, if $a = 2$, $b = -2$, $c = 1$:

(a) $a^2b + ab^2 = (2)^2 \times -2 + 2 \times (-2)^2$

$= 4 \times -2 + 2 \times 4 = -8 + 8 = 0$

(b) $a^3 + b^3 + c^3 = (2)^3 + (-2)^3 + (1)^3 = 8 - 8 + 1 = 1$

(c) $2abc + 1 = 2 \times 2 \times -2 \times 1 + 1 = -8 + 1 = -7$

(d) $ab + bc + ac = (2 \times -2) + (-2 \times 1) + (2 \times 1)$

$= -4 + (-2) + 2 = -4 - 2 + 2$

$= -6 + 2 = -4$

(e) $a^3 + b^3 + c^3 - 3abc = (2)^3 + (-2)^3 + (1)^3 - 3 \times 2 \times (-2) \times 1$

$= 8 - 8 + 1 - (-12) = 0 + 1 + 12 \quad = 13$

(f) $-a^2b - a^2c - 2a^2 = -(2)^2 \times -2 - (2)^2 \times 1 - 2(2)^2$

$= -4 \times -2 - 4 \times 1 - 2 \times 4$

$= +8 - 4 - 8 = -4$

(g) $-ab^2c + a^2bc - abc^2$

$= -2 \times (-2)^2 \times 1 + (2)^2 \times -2 \times 1 - (2 \times -2 \times (1)^2)$

$= -2 \times 4 \times 1 + 4 \times -2 \times 1 - (-4)$

$= -8 - 8 + 4 = -12$

(h) $a^2 - b^2 - c^2 - 2ab - 2bc - 2ac$

$= (2)^2 - (-2)^2 - (1)^2 - (2\times 2\times -2) - (2\times -2\times 1) - (2\times 2\times 1)$

$= 4 - 4 - 1 - (-8) - (-4) - 4$

$= 4 - 4 - 1 + 8 + 4 - 4 = 7$

2. If $x = 2, y = 1$, find the value of each of the following expressions :

(a) $2x + 3 = 2\times 2 + 3 = 4 + 3 = 7$

(b) $4y - 6 = 4\times 1 - 6 = 4 - 6 = -2$

(c) $4x^2 - 5 = 4(2)^2 - 5 = 4\times 4 - 5 = 16 - 5 = 11$

(d) $y^2 - 2y = (1)^2 - 2\times 1 = 1 - 2 = -1$

(e) $x^2 + y^2 - xy = (2)^2 + (1)^2 - 2\times 1 = 5 - 2 = 3$

(f) $x^2 - y^2 = (2)^2 - (1)^2 = 4 - 1 = 3$

3. Simplify the expressions and find their values, if $x = 2$:

(a) $x + 7 + 4(x - 5) = x + 7 + 4x - 20 = 5x + 7 - 20 = 5x - 13$

Putting $x = 2$ we get

$5\times 2 - 13 = 10 - 13 = -3$

(b) $3(x + 2) + 5x - 7 = 3x + 6 + 5x - 7 = 3x + 5x + 6 - 7 = 8x - 1$

Putting $x = 2$ we get

$8\times 2 - 1 = 16 - 1 = 15$

(c) $4(2x - 1) + 3x + 11 = 8x - 4 + 3x + 11 = 8x + 3x - 4 + 11$

$= 11x + 7$

Putting $x = 2$ we get

$11\times 2 + 7 = 22 + 7 = 29$

4. (a) Find the value of $x^3 - 3(x - 10)$, if $x = 10$.

Putting $x = 10$ expression we get

$x^3 - 3(x - 10) = (10)^3 - 3(10 - 10) = 1000 - 3\times 0 \quad = 1000$

(b) Find the value of $y^2 - 2y - 100$, if $y = -10$

Putting $y = -10$ in expression we get

$y^2 - 2y - 100 = (-10)^2 - 2\times(-10) - 100 = 100 + 20 - 100 = 20$

5. Simplify the expressions and find their values if $p = -1, q = 1, r = 2$:

(a) $4p + q - 6p + q = 4\times(-1) + 1 - 6(-1) + 1$

$= -4 + 1 + 6 + 1 = -4 + 8 = 4$

(b) $7p^2 + q^2 - 8p^2 - q^2 = 7(-1)^2 + (1)^2 - 8(-1)^2 - (1)^2$

$= 7 + 1 - 8 - 1 = 8 - 8 - 1 = -1$

(c) $10pq - 2qr - 6pr + 4pq$

$= 10(-1 \times 1) - 2(1 \times 2) - 6(-1 \times 2) + 4(-1 \times 1)$

$= -10 - 4 + 12 - 4$

$= -18 + 12 = -6$

(d) $pqr - 6pqr + 7q^2 - 4p^2$

$= (-1 \times 1 \times 2) - 6(-1 \times 1 \times 2) + 7(1)^2 - 4(-1)^2$

$= -2 - 6(-2) + 7 - 4$

$= -2 + 12 + 7 - 4$

$= 12 + 7 - 4 - 2$

$= 19 - 6 = 13$

(e) $5p^2 - 6q^2 - 7r^2 + 6p^2 - 5q^2 + 2r^2$

$= 5(-1)^2 - 6(1)^2 - 7(2)^2 + 6(-1)^2 - 5(1)^2 + 2(2)^2$

$= 5 - 6 - 7 \times 4 + 6 - 5 + 2 \times 4$

$= 5 - 6 - 28 + 6 - 5 + 8 = 5 + 6 + 8 - 6 - 28 - 5 = 19 - 39 = -20$

(f) $5(p + q) - 3p - 2q = 5(-1 + 1) - 3 \times (-1) - 2 \times 1$

$= 5 \times 0 + 3 - 2$

$= 0 + 3 - 2 = +1$

Multiple Choice Questions

Tick (✓) the correct answer :

1. (b) **2.** (c) **3.** (b) **4.** (c) **5.** (d) **6.** (a) **7.** (c) **8.** (b) **9.** (a) **10.** (d)

BRAIN BOOSTER

1. Addition of $3x^2y$, $6xy^2$ and $9x^2y^2$

$3x^2y + 6xy^2 + 9x^2y^2 = 3x^2y + 6xy^2 + 9x^2y^2$

Thus, Tom is wrong. This is so because he added the unlike terms as like terms.

2. Khalid added $= a^2 + 2b^2 + 3c^2$ and $3a^2 + 2b^2 + c^2$

$$\begin{array}{rr} & a^2 + 2b^2 + 3c^2 \\ & 3a^2 + 2b^2 + c^2 \\ \hline \textbf{Add :} & 4a^2 + 4b^2 + 4c^2 \\ \hline \end{array}$$

Vikky subtracts : $a^2 + 2b^2 + 3c^2$ from $3a^2 + 2b^2 + c^2$

$$\begin{array}{r} 3a^2 + 2b^2 + c^2 \\ a^2 + 2b^2 + 3c^2 \\ \hline (-)\quad (-)\quad (-) \\ \hline 2a^2 \qquad\quad -2c^2 \end{array}$$

$(3a^2 + 2b^2 + c^2 - a^2 - 2b^2 - 3c^2) = 2a^2 - 2c^2$

Difference $= 4a^2 + 4b^2 + 4c^2 - (2a^2 - 2c^2)$

Subtract

$$\begin{array}{r} 4a^2 + 4b^2 + 4c^2 \\ 2a^2 \quad -3c^2 \\ \hline (-)\quad (+) \\ \hline 2a^2 + 4b^2 + 6c^2 \end{array}$$

Chapter

8 Simple Equation

Exercise 8.1

1. Write equations for the following statements :

(a) $\frac{P}{4} + 4 = 40$ (b) $n + 10 = 25$ (c) $\frac{t}{7} + 13 = 20$

(d) $5b - 3 = 12$ (e) $\frac{c}{6} - 2 = 8$ (f) $7m = 84$

(g) $5x + 3 = 18$ (h) $\frac{y}{2} = 33$ (i) $d - 11 = 40$

(j) $8y - 8 = 80$

2. Write the following equations in statement forms :

(a) Sum of x and 3 is 14

(b) 6 times x added to 11 gives 35

(c) Negative quotient of p and 7 is 7

(d) Difference between 5 and y is -3

(e) 3 less than quotient of b and 7 is 8

(f) 7 subtracted from one-fifth of y is 8

(g) Quotient of q and 9 is 9

(h) Three-fourth of a number p is 15

(i) 16 times m is 96

(j) 14 less than 3 times x results is 4

3. Form an equation for the following cases :

(a) $2x + 6 = 24$. (where Isha's age is x years)

(b) $3x = 195$ (where x is the number of runs scored by Gautam)

(c) $\frac{2x}{5} + x = 35$ (where x is the number of boys in class)

(d) $2(l + b) = 240$, where $l = 2b - 6$

(e) $3x + 4 = 43$ (where x is Monu's age)

(f) $x + \frac{x}{2} = 33$

(g) $\angle A + \frac{\angle A}{3} + \frac{\angle A}{3} = 180°$ $\left(\angle B = \angle C = \frac{\angle A}{3} \rightarrow \text{given} \right)$

(h) $2x \pm 1 = 51 [x + (x + 1) \text{ or } (x - 1) + x]$

Exercise 8.2

1. Solve the following equation and check your result :

(a) $$\frac{x}{13} + 6 = 5$$

$$\frac{x}{13} = 5 - 6$$

$$\frac{x}{13} = -1$$

$$x = -13$$

Check : $\frac{x}{13} + 6 = \frac{-13}{13} + 6 = -1 + 6 = 5$

L.H.S = R.H.S

(b) $$12t + 1 = 37$$

$$12t = 37 - 1$$

$$12t = 36$$

$$t = \frac{36}{12} = 3$$

$$t = 3$$

Check : $12t + 1 = 12 \times 3 + 1 = 36 + 1 = 37$

$$\text{L.H.S} = \text{R.H.S}$$

(c)
$$8z + 20 = 52$$
$$8z = 52 - 20$$
$$z = \frac{32}{8} = 4$$
$$z = 4$$

Check : $8z + 20 = 8 \times 4 + 20 = 32 + 20 = 52$

$$\text{L.H.S} = \text{R.H.S}$$

(d)
$$\frac{5}{2} y = 60$$
$$\frac{5y}{2} = 60$$
$$5y = 60 \times 2$$
$$y = \frac{120}{5} = 24$$
$$y = 24$$

Check :
$$\frac{5y}{2} = 60$$
$$\frac{5 \times 24}{2} = 60$$
$$60 = 60$$
$$\text{L.H.S} = \text{R.H.S}$$

(e)
$$-2(y + 3) = 7$$
$$-2y + 3 \times (-2) = 7$$
$$-2y - 6 = 7$$
$$-2y = 7 + 6$$
$$y = \frac{-13}{2}$$

Check :
$$-2(y + 3) = -2\left(\frac{-13}{2} + 3\right)$$
$$= -2\left(\frac{-13 + 6}{2}\right)$$

$$= -2 \times \frac{-7}{2}$$

$$= -1 \times -7 = 7$$

L.H.S = R.H.S

(f) $\frac{x}{4} + 9 = 7$

$$\frac{x + 9 \times 4}{4} = 7$$

$$x + 36 = 7 \times 4$$

$$x + 36 = 28$$

$$x = 28 - 36 = -8$$

$$x = -8$$

Check : $\frac{x}{4} + 9 = 7$

$$\frac{-8}{4} + 9$$

$$-2 + 9 = 7$$

L.H.S = R.H.S

(g) $5(n-3) = -45$

$$5n - 15 = -45$$

$$5n = -45 + 15$$

$$5n = -30$$

$$n = \frac{-30}{5} = -6$$

$$n = -6$$

Check : $5(n-3) = 5(-6-3) = 5 \times -9 = -45$

L.H.S = R.H.S

(h) $34 - 5(n-1) = 4$

$$34 - (5n - 5) = 4$$

$$34 - 5n + 5 = 4$$

$$39 - 5n = 4$$

$$-5n = -39 + 4$$

$$n = \frac{-35}{-5} = 7$$

$$n = 7$$

Check : $34-5(7-1)=34-5\times 6=34-30=4$

$$\text{L.H.S} = \text{R.H.S}$$

(i) $$4(5x-4)+3(2x-1)=7$$
$$20x-16+6x-3=7$$
$$26x-19=7$$
$$26x=7+19$$
$$x=\frac{26}{26}=1$$
$$x=1$$

Check : $$4(5x-4)+3(2x-1) = 4(5\times 1-4)+3(2\times 1-1)$$
$$= 4(5-4)+3(2-1)$$
$$= 4\times 1+3\times 1=4+3=7$$
$$\text{L.H.S} = \text{R.H.S}$$

2. Solve the following equations by transposition method :

(a) $2m+\frac{5}{2}=\frac{37}{2}$

$2m=\frac{37}{2}-\frac{5}{2} \quad \Rightarrow \quad 2m=\frac{37-5}{2}$

$2m=\frac{32}{2}=16 \quad \Rightarrow \quad m=16\div 2=8 \quad \Rightarrow \quad m=8$

(b) $$7x+2(x+2)=20-(2x-5)$$
$$7x+2x+4=20-2x+5$$
$$9x+4=25-2x$$
$$9x+2x=25-4$$
$$11x=21$$
$$x=\frac{21}{11}$$
$$x=\frac{21}{11}$$

(c) $-3(4-x)=2x+5$

$-12+3x=2x+5 \quad \Rightarrow \quad 3x-2x=5+12 \quad \Rightarrow \quad x=17$

(d) $0=18+9(m-2)$

$0=18+9m-18 \quad \Rightarrow \quad 0=9m$

$m=\frac{0}{9}=0 \quad \Rightarrow \quad m=0$

(e) $\frac{x}{4} = \frac{x}{5} + 1$

$\frac{x}{4} - \frac{x}{5} = 1 \quad \Rightarrow \quad \frac{5x - 4x}{20} = 1 \quad \Rightarrow \quad \frac{x}{20} = 1$

$x = 20 \quad \Rightarrow \quad x = 20$

(f) $\frac{y}{5} - \frac{y}{6} = \frac{1}{30}$

$\frac{6y - 5y}{30} = \frac{1}{30} \quad \Rightarrow \quad \frac{y}{30} = \frac{1}{30} \quad \Rightarrow \quad 30y = 30$

$\Rightarrow \quad y = \frac{30}{30} \quad \Rightarrow \quad y = 1$

(g) $4x - \frac{1}{3} = \frac{1}{5} + 3x$

$4x - 3x = \frac{1}{5} + \frac{1}{3} \quad \Rightarrow \quad x = \frac{3+5}{15}$

$x = \frac{8}{15} \quad \Rightarrow \quad x = \frac{8}{15}$

(h) $3p - 2(2p - 5) = 2(p + 3) - 8$

$3p - 4p + 10 = 2p + 6 - 8$

$-1p + 10 = 2p - 2$

$-1p - 2p = -2 - 10$

$-3p = -12$

$p = \frac{-12}{-3} = 4$

$p = 4$

(i) $23 - 4x = -25 + 4x$

$23 + 25 = 4x + 4x \quad \Rightarrow \quad 48 = 8x$

$x = \frac{48}{8} = 6 \quad \Rightarrow \quad x = 6$

3. Check whether or not the value given in the bracket is a solution to the given equation :

(a) $\frac{a}{20} = 4 \quad (a = 60)$

Putting the value of 'a' in the equation

$$\frac{60}{20} = 3$$

$$3 \neq 4$$

So, the given value is not a solution the to equation.

(b) $8 - 7n = -20$ $(n = 2)$

putting the value of n in eq.

$$8 - 7 \times 2 = 8 - 14 = -7$$

$$-7 \neq -20$$

So, the given value is not a solution to the given equation.

(c) $13b = 169 \quad (b = 13)$

Putting the value of 'b' in the equation

$$13 \times 13 = 169$$

$$169 = 169$$

So, the given value is a solution to the equation.

(d) $2b + 5 = 17 \quad (b = 6)$

Putting the value of 'b' in the equal to $2 \times 6 + 5 = 12 + 5 = 17$

$$17 = 17$$

So, the given value is a solution to the equation.

(e) $4s = 80 \quad (s = 76)$

Putting the value of s the equation

$$7 \times 76 = 304$$

$$304 \neq 80$$

So, the given value is not a solution to the given equation.

(f) $9q - 3 = 15$ $(q = 2)$

Putting the value of 'q' in the equation

$$9 \times 2 - 3 = 18 - 3 = 15$$

$$15 = 15$$

So, the given value is a solution to the equation.

(g) $2x + 1 = x + 3$ $(x = 1)$

Putting the value of 'x' in the equation

$$2 \times 1 + 1 = 2 + 1 = 3$$

$$1 + 3 = 4$$

$$3 \neq 4$$

So, the given value is not a solution to the equation.

(h) $\frac{y}{2} - 4 = 0 \; (y = 8)$

Putting the value of 'y' in the equation

$$\frac{8}{2} - 4 = 4 - 4 = 0$$

$$0 = 0$$

So, the given value is a solution to the equation.

(i) $-12 + 23x = 11 \;\; (x = 1)$

Putting the value of 'x' in the equation

$$-12 + 23 \times 1 = -12 + 23$$

$$11 = 11$$

So, the given value is a solution to the equation.

Exercise 8.3

1. Let one of the numbers be x.

The second number will be $x + 1$

Then,
$$x + (x + 1) = 203$$
$$2x + 1 = 203$$
$$2x = 203 - 1$$
$$x = \frac{202}{2} = 101$$
$$x + 1 = 101 + 1 = 102$$

Then, the numbers are 101, 102.

2. Let first angle of triangle $= x$

Second angle of triangle $= 2x$

Third angle of triangle $= 3x$

Sum of three and of triangle $= 180°$

$$x + 2x + 3x = 180°$$
$$6x = 180°$$
$$x = 180 \div 6 = 30°$$

$x = 30°$; $2x = 60°$; $3x = 90°$

Angles of triangles is 30°, 60° and 90°.

3. Let one of the even number be x.

Then next consecutive even number $= x + 2$

Sum of 2 connective even number $= 502$

$$x+(x+2)=502$$
$$2x+2=502$$
$$2x=502-2$$
$$2x=500$$
$$x=500\div 2=250$$

Hence, one even number $=250$ and

Then, second even number $=250+2=252$

4. Let Sahil's age $=x$ years

His mother's age $=5x$

Sum of their ages $=x+5x=48$

$$6x=48$$
$$x=\frac{48}{6}=8$$

Thus Sahil's age $=8$ years

his mother age $=8\times 5=40$ years.

5. Let one number be x

Three-fourth of number $=x\times\frac{3}{4}=\frac{3x}{4}$

Sum of number and three-fourth number is 91.

$$x+\frac{3x}{4}=91$$
$$\frac{4x+3x}{4}=91$$
$$\frac{7x}{4}=91$$
$$x=\frac{91\times 4}{7}=52$$

Hence, one number is 52 and other number is $39=\left(52\times\frac{3}{4}\right)$.

6. Let one number $=x$

Second number $=\frac{x}{2}$

According to question; $x+\frac{x}{2}=45$

$$\frac{2x+x}{2} = 45$$

$$\frac{3x}{2} = 45$$

$$3x = 45 \times 2$$

$$x = 90 \div 3 = 30$$

Thus,one number is 30, second number is $15 = \left(30 \times \frac{1}{2}\right)$

7. Let one of number be $= x$

It is multiplied by $\frac{5}{6}$ gives 60 $\Rightarrow$ $x \times \frac{5}{6} = 60$

$$\frac{5x}{6} = 60$$

$$x = \frac{60 \times 6}{5} = 72$$

Thus, required number is 72.

8. Let one of the number be x

Let second number will be $(x+1)$

Let third number will be$(x+2)$

Then $x + (x+1) + (x+2) = 24$

$$3x + 3 = 24$$

$$3x = 24 - 3$$

$$x = \frac{21}{3}$$

$$x = 7$$

Hence, one of the number is 7, second number $= 8\,(7+1)$, and third number $= 9\,(7+2)$.

9. Let one number be $= x$

Then, the next consecutive odd number $= x + 2$

Sum of 2 consecutive odd number $= 136$

$$x + (x+2) = 136$$

$$2x + 2 = 136$$

$$2x = 136 - 2$$

$$x = \frac{134}{2} = 67$$

Hence, one odd number = 67, second odd number= $67 + 2 = 69$.

10. Let the required number be x, 5 times the number $= 5x$
Subtracting 3 from it, to get $5x-3$,
So, the following equation is obtained

$$5x-3=42$$
$$5x=42+3$$
$$x=\frac{45}{5}=9$$
$$x=9$$

Required number is 9.

11. Let one of the number be $=x$
35 added it then we get $=x+35$
According to questions, $x+35=217$

$$x=217-35=182.$$

Thus, required number is 182.

12. Let required number $=x$
Two third of number $=x\times\frac{2}{3}=\frac{2x}{3}$
One-third of number $=\frac{x}{3}$
According to question $\frac{2x}{3}>\frac{x}{3}$

$$\text{If added 3 in } \frac{x}{3}=\frac{2x}{3}$$
$$3+\frac{x}{3}=\frac{2x}{3}$$
$$\frac{x+9}{3}=\frac{2x}{3}$$
$$3x+27=6x$$
$$27=6x-3x$$
$$27=3x$$
$$x=\frac{27}{3}=9$$

Thus, required number is 9.

13. Let required number $=x$; twice a number $=2x$
If 7 added to $2x$ gives 59

$$2x+7=59$$
$$2x=59-7$$
$$x=52\div 2$$
$$x=26$$

Thus, required number is 26.

14. Let Mayank's present age $=x$ years

According to the question

$$x+15=4x$$
$$15=4x-x$$
$$15=3x$$
$$x=\frac{15}{3}=5$$

Mayank's present age $=5$ years.

15. Let the runs second by 'B' $=x$

$\therefore$ run scored by 'A' $=2x$

According to the question;

$$(2x+x)=200-5$$
$$3x=195$$
$$x=\frac{195}{3}=65$$

Thus, Runs scored by 'A' $=2\times 65=130$

Run scored by 'B' $=65$

16. Number of 2-rupee coins $=x$

Number of 1-rupee coins $=3x$

Value of 2 rupees coin $=2\times x=$ ₹ $2x$

Value of 1 rupee coin $=1\times 3x=$ ₹ $3x$

Total value 2 rupees and 1-rupees coin

$$=₹\ 50$$
$$\grave{}\ (2x+3x)=50$$
$$5x=50$$
$$x=\frac{50}{5}=10$$
$$x=10$$

Thus, Number of 2 rupees coins $=10$

Number of 1 rupees coins $=3\times 10=30$

17. Let of the breath of rectangle $= x$ m

Length of rectangle $= (4x-3)$ m

Perimeter $= 2(l+b)$

According to question; $94 = 2(x+(4x-3))$ m

$$94 = 2(x+4x-3)\text{ m}$$
$$94 = 2(5x-3)$$
$$94 = 10x-6$$
$$10x = 94+6$$
$$10x = 100$$
$$x = 10$$
$$\text{Breath} = 10\text{ m}$$

$\therefore$ $\text{Length} = (4\times 10-3)$ m

$= (40-3)$ m $= 37$ m

18. Let Isha's present age $= x$ year

Then brother's present age $= (x+5)$ year

After 4 year

Isha's age $= (x+4)$ year

Her brother's age $= (x+5)+4$ year

$= x+9$ year

According to questions

Their age Ratio $= 2:3$

$$\frac{x+4}{x+9} = \frac{2}{3} \text{ (cross multiply)}$$
$$3(x+4) = 2(x+9)$$
$$3x+12 = 2x+18$$
$$3x-2x = 18-12$$
$$x = 6$$

Thus, Isha's present age is 6 year and her brother's age $6+5=11$ years.

19. Let Sony's present age $= x$ years

Sony's mother age $= 3\times x = 3$ years

Sum of both ages $= x+3x$

According to question

$$\text{Sum of ages} = 72$$
$$x+3x = 72$$

$$4x = 72$$
$$x = \frac{72}{4} 18\,;\, x = 18$$

Thus, Sony's age = 18 years;
and her mother's age = $18 \times 3 = 54$ years

20. In isosceles triangle two angle are equal
Let one angle of triangle = x
other angle are also = x
According to question, third angle of triangle = $3x$
We know that the sum of three angles of triangle is 180°

$$x + x + 3x = 180°$$
$$5x = 180°$$
$$x = \frac{180°}{5} = 36°$$

One angle of triangle is 36°
Other angle of triangle is 36°
and third angle of the triangle = $3 \times 36° = 108°$
Value of angles are 36°, 36°, 108°.

21. Let Tobu's age be 'x' years.
$\therefore$ Subbu's age = $(18 - x)$ years
According to question,

$$(18 - x) - x = 4$$
$$\Rightarrow \quad 18 - x - x = 4$$
$$\Rightarrow \quad -2x = 4 - 18$$
$$\Rightarrow \quad -2x = -14$$
$$\Rightarrow \quad x = 7$$

$\therefore$ Tobu's age = 7 years
and Subbu's age = $18 - 7 = 11$ years
Hence, the required ages are 11 years and 7 years.

22. Let the breadth of rectangle be 'x' cm
$\therefore$ Length of rectangle = $(x + 6)$ cm
So, the perimeter of rectangle = $2(L + B)$

$$\Rightarrow \quad 2[x + (x + 6)] = 60\,\text{cm}$$
$$\Rightarrow \quad 2[x + x + 6] = 60\,\text{cm}$$
$$\Rightarrow \quad 2(2x + 6) = 60\,\text{cm}$$

$\Rightarrow \quad 2x + 6 = 30\,\text{cm}$

$\Rightarrow \quad 2x = (30 - 6)\,\text{cm}$

$\Rightarrow \quad 2x = 24\,\text{cm}$

$\Rightarrow \quad x = 12\,\text{cm}$

$\therefore$ Length of rectangle $= 12 + 6 = 18\,\text{cm}$

and Breadth of rectangle $= 12\,\text{cm}$

Now,

Area of rectangle $= L \times B$

$= 18 \times 12\,\text{cm}^2 = 216\,\text{cm}^2$

23. Let the 50 p coins and ₹ ` coins are equal in number be 'x'.

$$50\text{ p} = ₹\,\frac{50}{100} = ₹\,0.50$$

According to question,

$0.50x + 1x = 300$

$\Rightarrow \quad 1.50x = 300$

$\Rightarrow \quad x = \dfrac{300}{1.50} = \dfrac{\cancel{30000}^{200}}{\cancel{150}_{1}}$

$\Rightarrow \quad x = 200$

Hence, the required number of coins each type are 200.

24. Let the number of present days be 'x'

$\therefore$ Number of absent days $= (30 - x)$

According to question

$120x - 20(30 - x) = 2760$

$\Rightarrow \quad 120x - 600 + 20x = 2760$

$\Rightarrow \quad 140x - 600 = 2760$

$\Rightarrow \quad 140x = 2760 + 600$

$\Rightarrow \quad 140x = 3360$

$\Rightarrow \quad x = \dfrac{3360}{140}$

$\Rightarrow \quad x = \dfrac{\cancel{336}^{24}}{\cancel{14}_{1}} = 24$

Hence, Typist was present 24 days in the office.

Multiple Choice Questions

Tick (✓) the correct answer :

1. (b) **2.** (a) **3.** (d) **4.** (a) **5.** (d) **6.** (c)

Chapter

9 Lines and Angles

Exercise 9.1

1. Write the complementary angles of the following :

(Complementary angle : Two angles whose sum is 90° are called complementary angle)

(a) Complementary angle of $42° = 90° - 42° = 48°$

(b) Complementary angle of $65° = 90° - 65° = 25°$

(c) Complementary angle of $39° = 90° - 39° = 51°$

(d) Complementary angle of $51° = 90° - 51° = 39°$

2. Write the supplementary angles of the following :

(Supplementary angle : Two angles whose sum is 180° is called supplementary angle)

(a) Supplementary angle of $105° = 180° - 105° = 75°$

(b) Supplementary angle of $87° = 180° - 87° = 93°$

(c) Supplementary angle of $135° = 180° - 135° = 45°$

(d) Supplementary angle of $154° = 180° - 154° = 26°$

3. Classify the following pairs of angles as complementary or supplementary angles.

Complementary angles : (b), (d), (g) and (h);

Supplementary angles : (a), (c), (e), (f), (i) and (j)

4. Ratio of angles $= 7 : 8$

Sum of two complementary angles $= 90°$

Let one angle $= 7x$

second angle $= 8x$

$$7x + 8x = 90$$

$$15x = 90$$

$$x = \frac{90}{15} = 6$$

$$x = 6$$

Value of one angle $= 7 \times 6 = 42°$

Value of second angle $= 8 \times 6 = 48°$

5. Ratio of angle $= 7 : 11$

Sum of supplementary angles $= 180°$

Let one angle $= 7x$

Second angle $= 11x$

Sum $= 7x + 11x = 180°$

$18x = 180°$

$$x = \frac{180}{18} = 10$$

Value of one angle $= 7 \times 10 = 70°$

Value second angle $= 11 \times 10 = 110°$

6. Given ; one angle $= (3x + 15)°$

Second angle $= (2x + 5)°$

We know that,

Sum of supplementary angle $= 180°$

$(3x + 15)° + (2x + 5)° = 180°$

$3x + 15 + 2x + 5 = 180°$

$5x + 20 = 180°$

$5x = 180° - 20°$

$$x = \frac{160°}{5} = 32°$$

Thus, value of x is $= 32°$

7. Given : One angle $= (2x - 7)°$

Second angle $= (x + 4)°$

We know that

Sum of complementary angle $= 90$

$(2x - 7)° + (x + 4)° = 90°$

$2x - 7 + x + 4 = 90°$

$3x - 3 = 90°$

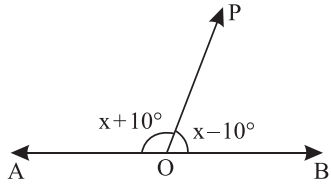
$3x = 90° + 3$

$$x = \frac{93}{3} = 31°$$

Thus, value of x is 31°

- For questions 7 to 10 refer to the given diagram in which ABC is a straight line.

8. From the adjoining figure, find x; if AOB is a straight line. Hence complete the following :



(a) We know that,

sum of the angles at a point on a straight line $= 180°$

$$(x+10)° + (x-10)° = 180°$$
$$2x + 10 - 10 = 180°$$
$$2x = 180°$$
$$x = \frac{180°}{2} = 90°$$

$$\angle AOP = (x+10)°$$
$$= 90° + 10°$$
$$= 100°$$

(b) $\angle BOP = (x-10)° = 90 - 10 = 80°$

(c) $\angle BOP$ is acute angle.

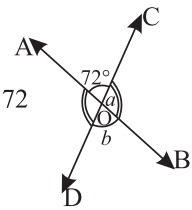
(d) $\angle AOP$ is obtuse angle.

9. In the figure given along side, the lines AB and CD intersect at O.

(a) AB is straight line

Sum of the angles on a straight line $= 180°$

$$72° + \angle a = 180°$$
$$\angle a = 180° - 72$$
$$\angle a = 108°$$



(b) The adjacent angle = $\angle AOD$ and $\angle DOB$;
$\angle BOC$ and $\angle COA$; $\angle COA$ and $\angle AOD$;
$\angle DOB$ and $\angle BOC$

(c) The vertically opposite angles $\angle AOD$ and $\angle BOC$; $\angle AOC$ and $\angle BOD$

(d) Yes; figure shows clearly that the vertically opposite angles are equal.

10. Given; $x = 45°$

$$\text{straight line angle} = 180°$$
$$45 + y° = 180°$$
$$y° = 180° - 45° = 135°$$

11. Given, Value of $y = 2x$

$$\text{straight line angle} = 180°$$
$$x + y = 180°$$
$$x + 2x = 180°$$
$$3x = 180°$$
$$x = \frac{180}{3} = 60°$$

Thus, value of $x = 60°$

Value of $y = 60° \times 2 = 120°$

12. Given, $x = \frac{1}{2} y$

$$\text{straight line angle} = 180°$$
$$x + y = 180°$$
$$y + \frac{1}{2} y = 180°$$
$$\frac{2y + 1y}{2} = 180°$$
$$\frac{3y}{2} = 180°$$
$$y = \frac{180° \times 2}{3}$$
$$= \frac{360°}{3}$$
$$y = 120°$$

Thus, Value of $y = 120°$

13. If $y = 1\frac{1}{2}$ right angle, find x

$$y = \frac{3}{2} \times 90° = 135°$$

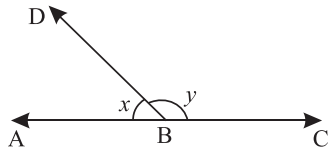
straight line. angle $= 180°$

$$x + 135° = 180°$$

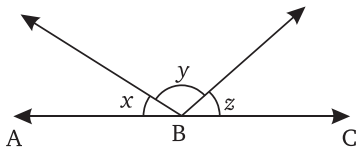
$$x = 180° - 135°$$

$$= 45°$$

Value of $x = 45°$



14. In the given figure, state ABC is a straight line or not, if :



Sum of straight line angle $= 180°$

(a) $x = y = 80°; z = 30°$

Sum of angle x, y, z

$$80° + 80° + 30° = 190°$$

No, it is not straight line.

(b) $x = y = z = \frac{2}{3}$ right angle.

right angle $= 90°$

$$z = \frac{2}{3} \times 90 = 60°$$

sum of angle x, y and z

$$60° + 60° + 60° = 180°$$

So, it is straight line.

(c) $x = \frac{2}{3}$ right angle, $y = 1$ right angle, $z = \frac{1}{2}$ right angle.

$x = \frac{2}{3}$ right angle $= \frac{2}{3} \times 90° = 60°$

$y = 1$ right angle $= 90°$

$z = \frac{1}{2}$ right angle $= \frac{1}{2} \times 90° = 45°$

sum of angle x, y and z

$$60° + 90° + 45° = 195°$$

So, it is not straight line.

(d) $z = 1\frac{1}{2}$ right angle, $x = y = 30°$.

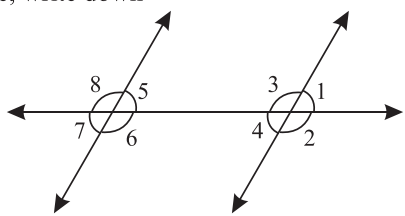
$z = \frac{3}{2}$ right angle $= \frac{3}{2} \times 90° = 135°$

Sum of x, y and z

$$30° + 30° + 135° = 195°$$

No, it is not straight line.

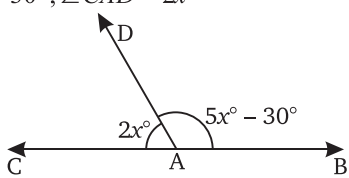
15. In the figure, write down



(a) Linear pair $= \angle 1, \angle 2; \angle 2, \angle 4; \angle 3, \angle 1; \angle 3, \angle 4; \angle 5, \angle 6; \angle 6, \angle 7; \angle 7, \angle 8, \angle 8, \angle 5$

(b) Vertically opposite angle $\angle 1, \angle 4; \angle 2, \angle 3; \angle 5, \angle 7; \angle 8, \angle 6;$

16. $\angle BAD = 5x° - 30°, \angle CAD = 2x°$



Sum of straight line angle $= 180°$

$$5x° - 30° + 2x° = 180°$$
$$7x - 30° = 180°$$
$$7x° = 180° + 30°$$
$$x = \frac{210}{7} = 30°$$

value of $x = 30°$.

17. State whether the following statements are true or false.

(a) F (b) T (c) F (d) F

18. Fill in the blanks :

(a) If two angles are supplementary, then sum of their measures is **180°**.

(b) If sum of two angles is one right angle, they are **complementary**.

(c) Two angles forming a linear pair are **supplementary**.

(d) If two lines intersect, then vertically opposite angles are **equal**.

(e) If two adjacent angles are supplementary, then they form a **linear** pair.

(f) A line segment has **two** end points.

(g) A ray can be extended in **one** direction only.

(h) An **angle** is formed when two rays meet.

(i) An angle equal to its complement is **45°**.

(j) An angle equal to its supplement is **90°**.

Exercise 9.2

1. Fill in the blanks :

(a) A pair of vertically opposite angles is always **equal** in measure.

(b) If the sum of the measures of two angles is 180°, they are called **supplementary angles**.

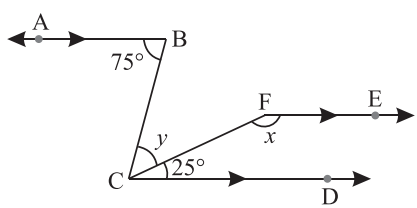
(c) A pair of **adjacent** angles always have a common vertex.

(d) A line which intersects two or more lines at different points is called a **transversal**.

(e) The distance between two parallel lines is the **same** everywhere.

2. $\angle FCD + \angle CFE = 180°$ (consecutive interior angles)

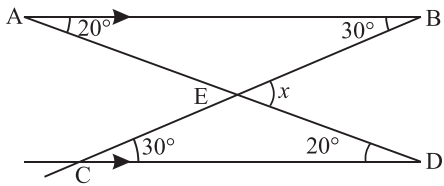
$25° + x = 180°$



$$x = 180° - 25°$$
$$x = 155°$$
$$x = 155°$$
$$\angle ABC = \angle BCD$$
$$= \text{(corresponding angle)}$$
$$75° = y + 25°$$
$$y = 75° - 25° \qquad y = 50°$$

3. $AB \,||\, CD$

Extending A and B, we get two triangles.



ΔAEB and ΔCED

$$\angle B = \angle C = 30° \qquad \text{(alternate angle)}$$
$$\angle D = 20° \text{ (given)}$$

In ΔEDC; $\angle D = 20°$, $\angle C = 30° = \angle E = ?$

Sum of angle of triangle $= 180°$

$$\angle D + \angle C + \angle E = 180°$$
$$20° + 30° + \angle E = 180°$$
$$\angle E = 180° - 50° = 130°$$

Now, $\angle AEB = \angle CED$ (Vertically opposite sides)

AED is straight line

Sum of straight line is 180°

$$x = 180° - 130° = 50°$$

Then; $x = 50°$

4. In the given figure, find x, y, z and w. Give reasons.

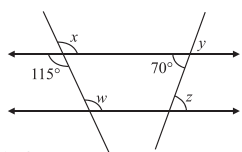
$\angle x = 115°$ (vertically opposite angles)

$\angle y = 70°$ (vertically opposite angles)

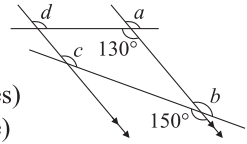
$\angle x = \angle w = 15°$ (corresponding angles)

$\angle y = \angle z = 70°$ (corresponding angles)

$\angle x = 115°, \angle y = 70°, \angle z = 70°; \angle w = 115°.$



5. $\angle E = 130°$ (given)



$\angle F = 150°$ (given)

$\angle b = 150°$ (vertically opposite angles)

$\angle a = 130°$ (vertically opposite angle)

$\angle b = \angle c = 150°$ (corresponding angle)

$\angle a = \angle d = 130°$ (corresponding angle)

$\angle a = 130°, \angle b = 150°, \angle c = 150°, \angle d = 130°.$

6. $\angle A = \angle C = 125°$ (corresponding angle)

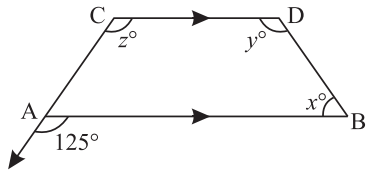
$z° = 125°$

$\angle D = \angle C$

$= 125°$

(corresponding angle)

$z° = y° = 125°$



BD is straight angle,

Sum of angle of straight line $= 180°$

$x° + y° = 180°$

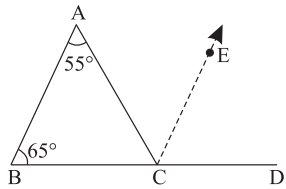
$x + 125° = 180°$

$x = 180° - 125°$

$= 55°$

Thus, $x° = 55°$, $y° = 125°$, $z = 125°$.

7. $AB \,||\, CE$



$\angle ABC = 65°$

$\angle BAC = 55°$

$\angle ABC = \angle DCE$

$= 65°$

(corresponding angle)

In *ABC*, Triangle

$\angle BAC + \angle ABC + \angle ACB = 180°$

$55° + 65° + \angle ACB = 180°$

$120° + \angle ACB = 180°$

$120° + \angle ACB = 180°$

$\angle ACB = 180° - 120° = 60°$

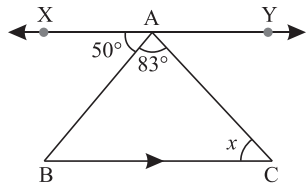
BCD is straight line

Sum of straight angle $= 180°$

$$\angle ACB + \angle ACE + \angle ECD = 180°$$
$$60° + \angle ACE + 65° = 180°$$
$$\angle ACE + 125° = 180°$$
$$\angle ACE = 180° - 125° = 55°$$
$$\angle ACD = \angle ACE + \angle ECD$$
$$= 55° + 65° = 120°$$

$\angle ACE = 55°$; $\angle ECD = 65°$; $\angle ACD = 120°$.

8. In the given figure, $XY \| BC$. Find the value of x.



XAY is straight line

Sum of angles of straight line $= 180°$

$$\angle XAB + \angle BAC + \angle YAC = 180°$$
$$50° + 83° + \angle YAC = 180°$$
$$133° + \angle YAC = 180°$$
$$\angle YAC = 180° - 133°$$
$$\angle YAC = 47°$$
$$\angle YAC = \angle ACB = x \text{ (alternate angles)}$$
$$47° = 47° = x$$

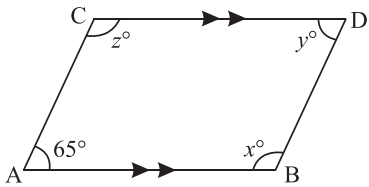
Value of x is 47°.

9. (a) $AB \| CD$, $AC \| BD$

$\angle A = \angle D$ (opposite angle of □ gm)

$\angle D = y° = 65°$

AB straight line,



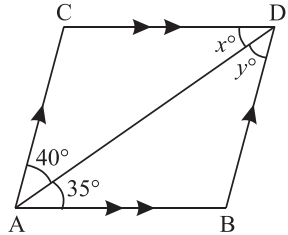
Sum of angle of straight line $= 180°$

$\angle B = 180° - 65° = 115°$

$\angle B = \angle C = z° = x°$ (oppoosite angles of $\square$ gm)

$z° = 115°$

$x° = 115°,\ y° = 65°,\ z° = 115°.$

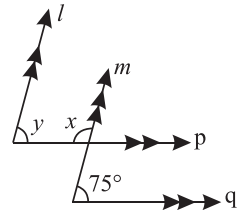


(b) $x° = 40°,\ y° = 35°$

(corresponding angles are equal)

$x = 40°,\ y = 35°$

10. Given $l \,||\, m$ and $p \,||\, q$. Find x and y.



$\angle y = 75°$

(corresponding angles are equal)

$\angle x$ and $\angle y$ in a straight line

so, sum of these angle $= 180°$

$\angle x + \angle y = 180°$

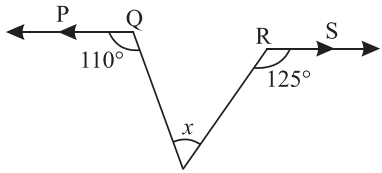
$\angle x + 75° = 180°$

$\angle x = 180° - 75° = 105°$

11. $PQ \,||\, RS$

Extending the lines PQ and RS

we get, $180° - 110° = 70°$ and $180 - 125° = 55°$



$PQ \,||\, RS$

$\angle Q = \angle y = 70°$ (corresponding angle)

Here, ARY is triangle.

Sum of angle of triangle $= 180°$

$70° + 55° + x = 180°$

$125° + x = 180°$

$x = 180° - 125° = 55°$

Value of $x = 55°$.

Multiple Choice Questions

Tick (✓) the correct option :

1. (a) **2.** (c) **3.** (b) **4.** (b) **5.** (b)

BRAIN BOOSTER

$$\text{Sum of supplementary angle} = 180°$$

$$\text{Let value of } x = A$$

$$\text{Value of } y = (180 - A)°$$

putting the value of x and y

$$(A + 25)°;\ (180° - A + 15°) = (195° - A)° \text{ (given)}$$

Vertically opposite angle is equal

$$(A + 25)° = (195 - A)°$$

$$A + A = 195° - 25°$$

$$2A = 170°$$

$$A = \frac{170}{2} = 85°$$

$$\text{Angles} = (85° + 25°) = 110°$$

$$= (180° - 85° + 15°)$$

$$= (195 - 85)° = 110°$$

Chapter

10 Properties of Triangles

Exercise 10.1

1. State in which cases the angles can possibly be those of a triangle :
(We know that; Sum of three angles of triangle is 180°)

(a) Sum of angles $= 70° + 60° + 70° = 200°$
Triangle is not possible.

(b) Sum of angles $= 90° + 30° + 60° = 180°$
Yes, triangle is possible.

(c) Sum of angles $= 50° + 45° + 85° = 180°$
Yes, triangle is possible.

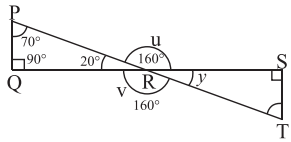
(d) Sum of angles $= 45° + 90° + 45° = 180°$
Yes, triangle is possible.

(e) Sum of angles $= 60° + 30° + 100° = 190°$
Triangle is not possible

(f) Sum of angles $= 105° + 30° + 35° = 170°$
Triangle is not possible

2. Find the unknown angles in the following figures :

(a) In ΔPQR,



$$\begin{aligned}
\angle P + \angle Q + \angle R &= 180° \\
x + 90° + 20° &= 180° \\
x + 110° &= 180° \\
x &= 180° - 110° = 70° \\
\angle P &= 70° \\
20° &= y \quad \text{(vertical opposite angles)}
\end{aligned}$$

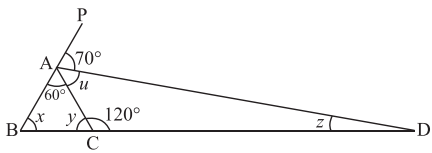
In ΔTSR; $\angle R + \angle S + \angle T = 180°$

$$\begin{aligned}
20 + 90° + \angle T &= 180° \\
\angle T &= 180° - 110° = 70° \\
\angle T &= 70°
\end{aligned}$$

PRT straight line

$$\begin{aligned}
v + 20° &= 180° \\
v &= 180° - 20° \\
&= 160° \\
v &= 160° \\
u = v &= 160° \text{ (vertical opposite angles)}
\end{aligned}$$

(b) ABP is straight line



$$\begin{aligned}
60° + u + 70° &= 180° \\
130° + u &= 180° \\
u &= 180° - 130°
\end{aligned}$$

$$u = 50°$$
$$u = 50°$$

In ACD

$$\angle DAC + \angle ACD + \angle CDA = 180°$$
$$50° + 120° + \angle CDA = 180°$$
$$z = 180° - 170°$$
$$z = 10°$$
$$z = 10°$$

BCD is straight line

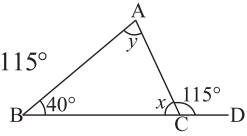
$$\angle ACD + \angle ACB = 180°$$
$$120° + y = 180°$$
$$y = 180° - 120° = 60°$$
$$y = 60°$$

ΔABC ;

$$\angle BAC + \angle ABC + \angle BCA = 180°$$
$$60° + x + y = 180°$$
$$60° + x + 60° = 180°$$
$$x + 120° = 180°$$
$$x = 180° - 120°$$
$$x = 60°$$

(c) BCD is straight line

$$\angle ACB + \angle ACD = 180°$$
$$x + 115° = 180°$$
$$x = 180° - 115°$$
$$x = 65°$$



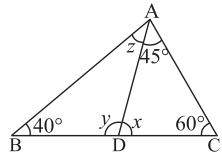
ΔABC,

$$\angle ABC + \angle BAC + \angle BCA = 180°$$
$$40° + y + x = 180°$$
$$40° + y + 65° = 180°$$
$$y + 105° = 180°$$
$$y = 180° - 105°$$
$$y = 75°$$

(d) In ΔADC ;

$$\angle DAC + \angle ADC + \angle DCA = 180°$$
$$45° + x + 60° = 180°$$

$$x + 105° = 180°$$
$$x = 180° - 105° = 75°$$
$$x = 75°$$



BDC straight line

$$\angle BDC + \angle ADB = 180°$$
$$x + y = 180°$$
$$75° + y = 180°$$
$$y = 180° - 75° = 105°$$
$$y = 105°$$

In ΔADB

$$\angle BAD + \angle DBA + \angle BDA = 180°$$
$$40° + z + y = 180°$$
$$40° + z + 105° = 180°$$
$$z + 145° = 180°$$
$$z = 180° - 145°$$
$$z = 35°$$

3. Number of angle in quadrilateral $= 4$

Value of each angle $= 90°$

Sum of all angles of a quadrilateral $= 90° \times 4 = 360°$.

4. Number of angle in pentagon value of each angle $= 108°$

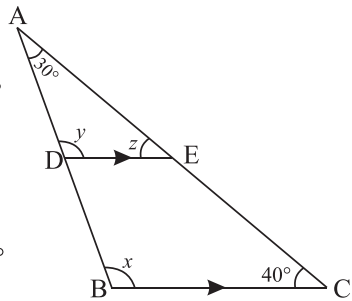
Sum of angles of a pentagon $= 108° \times 5 = 540°$.

5. $DE \parallel BC$

$$\angle C = \angle E$$

(corresponding angle)

$$\angle C = \angle E = 40°$$



ΔADE,

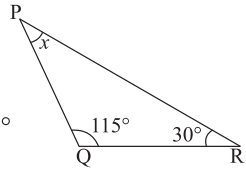
$$\angle A + \angle D + \angle E = 180°$$
$$30° + y + 40° = 180°$$
$$y = 180°$$
$$y = 180° - 70°$$
$$y = 110°$$
$$\angle D = \angle B \text{ (corresponding angle)}$$
$$\angle D = \angle B = 110°$$

Thus, $x = 110°$, $y = 110°$, $z = 40°$.

6. Find the value of the unknown angles in the following figures :

(a) In sum of three angles of a triangle $= 180°$

ΔPQR



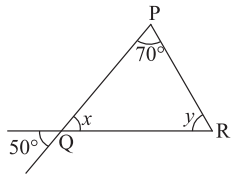
$$\angle P + \angle R + \angle Q = 180°$$
$$x + 30° + 115° = 180°$$
$$x + 145 = 180°$$
$$x = 180° - 145°$$
$$= 35°$$

(b) $\angle x = 50°$ (vertical opposite angles)

In $x = 50°$

$$\angle P + \angle Q + \angle R = 180°$$

(sum of three angle of a triangle $= 180°$)

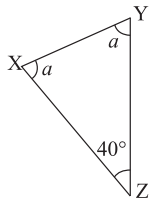


$$70° + 50° + y° = 180°$$
$$120° + y° = 180°$$
$$y = 180° - 120°$$
$$= 60°.$$

(c) Sum of three angle of a triangle

$$= 180°$$

In ΔXYZ

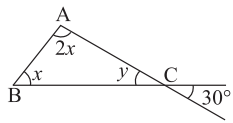


$$\angle X + \angle Y + \angle Z = 180°$$
$$a + a + 40° = 180°$$
$$2a + 40° = 180°$$
$$2a = 180° - 40°$$
$$2a = 140°$$
$$a = 70°$$

$\angle x = 70°$; $\angle y = 70°$.

(d) $\angle y = 30°$ (vertical opposite angles)

In $\Delta ABC, \angle A + \angle B + \angle C = 180°$



$$2x + x + 30° = 180°$$
$$3x = 180° - 30°$$
$$3x = 150°$$
$$x = 50°$$
$$\angle A = 2x = 50 \times 2 = 100°$$
$$\angle B = x = 50°.$$

7. One angle of the triangle $= 75°$

Sum of angles in triangle $= 180°$

$\therefore$ Sum of other two angles $= 180° - 75° = 105°$.

8. (a) Yes, sum of three angles of a triangle is 180°, if one of the angle is obtuse then the other two are less than 90°

(b) No, obtuse angle > 90° and sum of three angles is equal to 180°. Therefore, two angles can never be $\geq 90°$

(c) No, same as above

(d) No, as sum of three angles = 180° and sum of angle > 60° is greater than 180°. Therefore, it is not possible to have all angles > 60°

(e) No, if all angles < 60°, their sum will be < 180°

(f) Yes

9. Sum of angle of triangle is 180°

Let, Value of first angle $= x$

Value of second angle $= 2x$

Value of third angle $= 3x$

$$x + 2x + 3x = 180°$$

$$6x = 180°$$

$$x = \frac{180°}{6} = 30°$$

Value of first angle $= 30°$

Value second angle $= 2 \times 30° = 60°$

Value third angle $= 3 \times 30° = 90°$

Angle of triangle is 30°, 60° and 90°.

10. In right angled triangle one angle is 90°.

Ratio of other angle in triangle 2 : 3

Let, Value of second angle $= 2x$

third angle $= 3x$

Sum of angle of triangle is 180°

$$90° + 2x + 3x = 180°$$

$$5x = 180° - 90°$$

$$x = 90° \div 5$$

$$x = 18$$

Value of second angle $= 2 \times 18° = 36°$

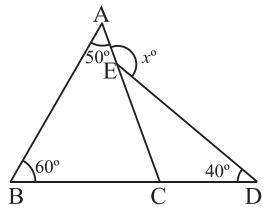
Value of third angle $= 3 \times 18° = 54°$

Exercise 10.2

1. Find angle x in the following figures :

(a) Since, the sum of interior opposite angles = exterior angle

$$\angle B + \angle B = \angle C$$
$$50° + 60° = 110°$$
$$\angle C = 110°$$

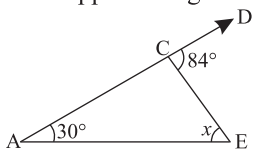


In ΔECD;

Sum of triangle's angle $= 180°$

$$\angle E + \angle C + \angle D = 180°$$
$$\angle E + 110° + 40° = 180°$$
$$\angle E = 180° - 150° = 30°$$
$$\angle AED + \angle AEC = 180° \text{ (linear pair)}$$
$$x + 30° = 180°$$
$$x = 180° - 30° = 150°$$
$$x = 150°$$

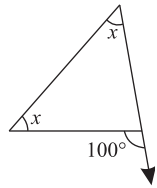
(b) Sum of interior opposite angles = exterior angles



$$30° + x° = 84°$$
$$x = 84° - 30°$$
$$x = 54°$$

(c) Sum interior opposite angle = exterior angle

$$x + x = 100°$$
$$2x = 100°$$
$$x = \frac{100}{2} = 50°$$
$$x = 50°$$



2. (a) Yes, external angle = Sum of the interior remote angles

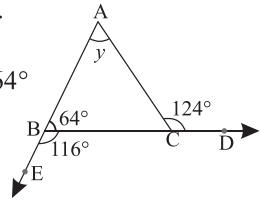
(b) Yes, same as above

(c) No, external angles ≠ Sum of interior angles

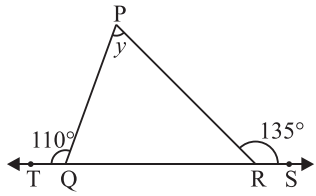
(d) Yes

3. Find the value of y in the following figure.

(a)
$$\angle DBE + \angle CBA = 180°$$
$$\angle CBA = 180° - 116° = 64°$$
$$\angle B + \angle A = \angle C$$
Exterior angle property
$$64° + y = 124°$$
$$y = 124° - 64° = 60°$$

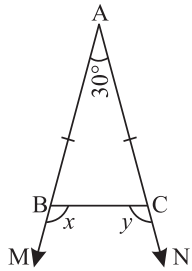


(b)
$$\angle TQP + \angle RQP = 180°$$
(linear pair)
$$\angle RQP = 180° - 110°$$
$$= 70°$$
$$\angle Q + \angle P = \angle R$$
(Exterior angle property)
$$70° + y° = 135°$$
$$y° = 135° - 70 = 65°$$

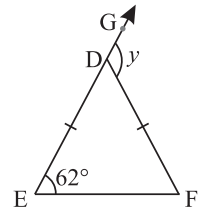


4. Here,
$$AB = AC$$
$$\angle B = \angle C$$
(Angles opposite to equal side of a triangle are equal)

Let
$$\angle B = \angle C = P$$
$$\angle B + \angle C + \angle A = 180°$$
$$P + P + 30° = 180°$$
(Sum of angles of a triangle)
$$2P = 180° - 30°$$
$$P = \frac{150°}{2} = 75°$$
$$\angle BAC + \angle BCA = \angle CBM$$
(Sum of interior opposite angles = exterior angle)
$$30° + 75° = x$$
$$105° = x$$
$$x = 105°$$
$$\angle BAC + \angle ABC = \angle BCN$$
(Sum of interior opposite angles = exterior angle)
$$30° + 75° = 105° = y$$
$$y = 105°$$



5. Find the unknown angle in the following figure.



(a) Given $\angle DEF = \angle EFD$

$\because \quad \angle DEF = 62°$

$\therefore \quad \angle EFD = 62°$

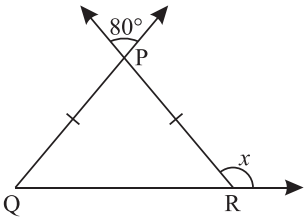
$\angle DEF + \angle FED = \angle GDF$

$62° + 62° = \angle GDF$

$124° = \angle GDF$

$\therefore \quad y = 124°$ (Exterior angle property)

(b) $\angle P = 80°$



$PQ = PR = \angle Q = \angle R$

(Angles opposite to equal sides of a triangle are equal)

Let $\angle Q = \angle R = A$

(Angle sum of triangle property)

$A + A + 80° = 180°$

$2A = 180° - 80°$

$A = 100° \div 2 = 50°$

$\angle P + \angle Q = \angle R$ (Exterior angle property)

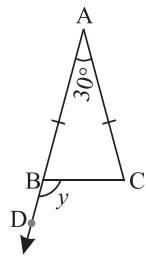
$80° + 50° = 130°$

$\angle R = 130°$

$x = 130°$

(c) $\angle A = 30°$

$AB = BC; \angle B = \angle C$



Let $\angle B = \angle C = A$

$\angle B + \angle C + \angle A = 180°$

(Angle sum of Triangle property)

$30° + A + A = 180°$

$$A = \frac{180° - 30°}{2}$$

$$= \frac{150°}{2} = 75°$$

$\angle B = \angle C = 75$

$\angle A + \angle C = \angle CBD$ (Exterior angle property)

$30° + 75 = y$

$y = 105°$

(d) $\angle R = 98°$ (vertical opposite angles)

$PR = QR$

(Angles opposite to equal sides of a triangle are equal)

$\angle Q = \angle P$

Let $\angle Q = \angle P = A$

$A + A + 98° = 180°$

(sum of angle triangle property)

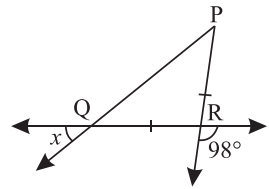
$2A + 98 = 180°$

$A = \dfrac{180 - 98}{2}$

$A = 41$

$\angle Q = 41$

$\angle x = 41$ (vertically opposite angle)



(e) QRS in straight angle

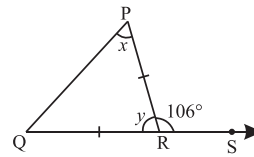
$\angle QRP + \angle SRP = 180°$

$\angle QRP + 106° = 180°$

$\angle QRP = 180° - 106°$

$= 74°$

$\angle R = y° = 74°$



ΔPQR ; $PR = QR$

$\angle P = \angle Q$

(Angles opposite to equal sides of a triangle are equal.)

Let $\angle P = \angle Q = x$

$x + x + 74 = 180°$

$2x = 180° - 74°$

$x = \dfrac{180° - 74°}{2} = 53°$

So, $\angle P = x$ then $x = 53°$ and $y = 74°$

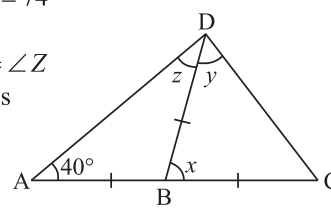
(f) Here, $AB = BD$

$\angle A = \angle D = \angle Z$

(Angles opposite to equal sides of a triangle are equal)

so $\angle z = 40°$

In ΔABD



$\angle BAD + \angle ABD + \angle ADB = 180°$ (sum of angle of triangle)

$$40° + 40° + \angle ABD = 180°$$
$$\angle ABD = 180° - 80° = 100°$$

ABC is straight line

$$\angle ABD + \angle CBD = 180°$$
$$\angle CBD = 180° - 100° = 80°$$
$$x = 80°$$

And $BC = BD$

$$\angle D = \angle C$$

Let $\angle D$ is y

In ΔDBC, $\angle BDC + \angle DBC + \angle BCD = 180°$

$$y + y + 180° = 180°$$
$$2y + 80 = 180°$$
$$2y = 180° - 80°$$
$$y = \frac{100°}{2} = 50$$
$$y° = 50°$$

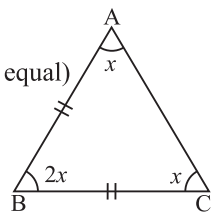
So, $x = 80°$, $y = 50°$, $z` = 40°$

6. $AB = BC$

Let $\angle A = x$

then $\angle C = x$

(Angles opposite to equal side of a triangle are equal)



$$\angle B = 2x$$
$$\angle A + \angle B + \angle C = 180°$$
$$x + 2x + x = 180°$$
$$4x = 180°$$
$$x = \frac{180°}{4} = 45°$$

$\angle A = 45°$; $\angle C = 45°$ And $\angle B = 45° \times 2 = 90°$

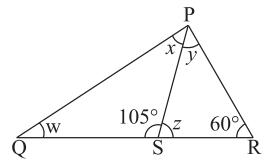
7. QSR is a straight line

So, $\angle z + 105° = 180°$ (Linear pair)

$$\angle z = 180° - 105°$$
$$\angle z = 75°$$

Now in ΔPSR, $\angle P + \angle S + \angle R = 180°$

$$y + 75° + 60° = 180°$$
$$y + 135° = 180°$$
$$y = 45°$$



Now ΔQPR

RS in the bisector of $\angle QPR$

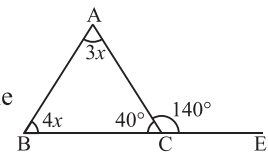
So, $\angle x = \angle y° = 45°$

In ΔPQS

$$\begin{aligned} \angle P + \angle Q + \angle S &= 180° \\ x + w + 105° &= 180° \\ 45° + w + 105° &= 180° \\ w + 150° &= 180° \\ w &= 180° - 150° \\ &= 30° \end{aligned}$$

So, $x = 45°$, $y = 45°$, $z° = 75°$ and $w = 30°$.

8. Let ΔABC; $\angle A = 3x$; $\angle B = 4x$



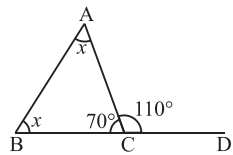
$$\begin{aligned} \angle ACE &= 140° \\ \text{Sum of interior opposite angles} &= \text{exterior angle} \\ 3x + 4x &= 140 \\ 7x &= 140° \\ x &= \frac{140°}{7} = 20° \end{aligned}$$

$$\begin{aligned} \text{Value of angle } A &= 3x = 3 \times 20° = 60° \\ \text{Value of angle } B &= 4 \times x = 4 \times 20° = 80° \\ \angle ACE + \angle ACB &= 180° \text{ (linear pair)} \\ 140° + \angle ACB &= 180° \\ \angle ACB &= 180° - 140° \\ &= 40° \end{aligned}$$

$\angle A = 60°, \angle B = 80°, \angle C = 40°$

9. Let interior opposite angle $= x$

Sum of interior opposite angles = Exterior angle



$$\begin{aligned} x + x &= 110° \\ 2x &= 110° \\ x &= 110° \div 2 = 55° \\ \angle BCA + \angle ACD &= 180° \\ \angle BCA + 110° &= 180° \\ \angle BCA &= 180° - 110° = 70° \end{aligned}$$

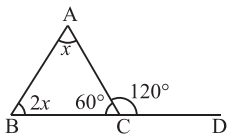
$\angle A = 55°,\ \angle B = 55°,\ \angle C = 70°$

10. Let ABC is triangle

$\angle A = x, \angle B = 2x$

Sum of interior opposite angles $=$ Exteriors angle

$$x + 2x = 120°$$
$$3x = 120°$$
$$x = 120° \div 3$$
$$x = 40°$$
$$\angle BCA + \angle ACB = 180°$$
$$120° + \angle ACB = 180°$$
$$\angle ACB = 180° - 120°$$
$$= 60°$$
$$\angle A = 40°,$$
$$\angle B = 40 \times 2 = 80°$$
$$\angle C = 60°$$



Exercise 10.3

1. Which of the following can be the sides of a right triangle?

(a) 8 cm, 15 cm, 17 cm

In this Hypotenuse is 17 cm

$$(17)^2 = (8)^2 + (15)^2$$
$$289 = 64 + 225$$
$$289 = 289$$

So, with these dimesions, right triangle is possible.

(b) 3 cm, 3 cm, 9 cm

In this Hypotenuse is 9 cm^2

$$(9)^2 \neq (3)^2 + (3)^2$$
$$81 \neq 9 + 9$$
$$81 \neq 18$$

So, with these dimensions, right triangle is not possible.

(c) 2.5 cm, 6.5 cm, 6 cm

In this Hypotenuse is 6.5 cm

$$(6.5)^2 = (2.5)^2 + (6)^3$$
$$42.25 = 6.25 + 36$$
$$42.25 = 42.25$$

So, with these dimensions, right triangle is possible.

(d) 16 cm, 30 cm, 34 cm

In this Hypotenuse is 34 cm

$$(34)^2 = (16)^2 + (30)^2$$
$$1156 = 256 + 900$$
$$1156 = 1156$$

So, these dimensions, right triangle is possible.

2. Verify that the following numbers represent Pythagorean triplet :

(a) 12, 35, 37

$\therefore \quad 12^2 = 144 \qquad 35^2 = 1225 \qquad$ and $\qquad 37^2 = 1369$

$\Rightarrow \qquad 37^2 = 12^2 + 35^2$

So, (12, 35, 37) is a pythagorean triplet.

(b) 7, 24, 25

$\therefore \quad 7^2 = 49 \qquad 24^2 = 576 \qquad$ and $\qquad 25^2 = 625$

$\Rightarrow \qquad 25^2 = 7^2 + 24^2$

So, (7, 24, 25) is a pythagorean triplet.

(c) 6, 8, 10

$\therefore \quad 6^2 = 36 \qquad 8^2 = 64 \qquad$ and $\qquad 10^2 = 100$

$\Rightarrow \qquad 10^2 = 8^2 + 6^2$

So, (6, 8, 10) is a pythagorean triplet.

(d) 2, 1.5, 2.5

$\therefore \quad 2^2 = 4 \qquad 1.5^2 = 2.25 \qquad$ and $\qquad 2.5^2 = 6.25$

$\Rightarrow \qquad 2.5^2 = 2^2 + 1.5^2$

So, (2, 1.5, 2.5) is a pythagorean triplet.

(e) 3, 4, 5

$\therefore \quad 3^2 = 9 \qquad 4^2 = 16 \qquad$ and $\qquad 5^2 = 25$

$\Rightarrow \qquad 5^2 = 3^2 + 4^2$

So, (3, 4, 5) is a pythagorean triplet.

(f) 6, 2.5, 6.5

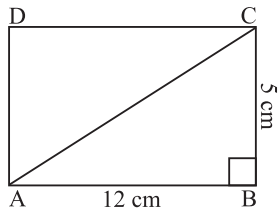
$\therefore \quad 6^2 = 36 \qquad 2.5^2 = 6.25 \qquad$ and $\qquad 6.5^2 = 42.25$

$\Rightarrow \qquad 6.5^2 = 6^2 + 2.5^2$

So, (6, 2.5, 6.5) is a pythagorean triplet.

3. Length of rectangle = 12 cm

Breadth of rectangle = 5 cm



Now, in ΔABC,

$$AC^2 = AB^2 + BC^2$$

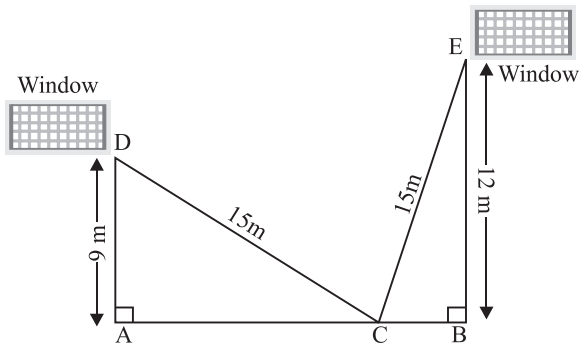
$$= 12^2 + 5^2$$

$$= 144 + 25 = 169$$

$$\therefore \quad AC = \sqrt{169} = 13$$

So, the length of diagonals is 13 cm.

4. Let AB be the street and C be the foot of the ladder. D and E be the windows at the height of 9 m and 12 m respectively from the ground.



In right angled ΔDAC,

$$DC^2 = AD^2 + AC^2 \qquad \text{(By Pythogoras theorem)}$$

$$(15)^2 = (9)^2 + AC^2$$

$$\Rightarrow \quad AC^2 = 225 - 81$$

$$\Rightarrow \quad AC^2 = 144$$

$$\Rightarrow \quad AC = \sqrt{144}$$

$$\Rightarrow \quad AC = 12 \text{ m}.$$

Similarly, in right-angled ΔCBE,

$$CE^2 = CB^2 + BE^2$$

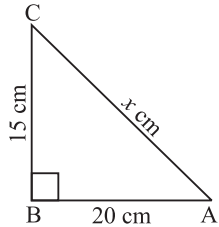
$$CB^2 = CE^2 - BE^2$$
$$CB^2 = (15)^2 - (12)^2$$
$$CB^2 = 225 - 144$$
$$CB^2 = 81$$
$$CB = \sqrt{81} = 9\text{ m}$$

Hence, width of the street $= AC + CB$
$= 12 + 9 = 21\text{ m}$

So, the width of the street is 21 m.

5. Let the required distance be 'x' cm.

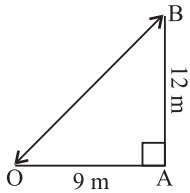
In ΔABC,



$$x^2 = 20^2 + 15^2$$
$$x^2 = 400 + 225$$
$$x^2 = 625$$
$$x = \sqrt{625}$$
$$x = 25\text{ cm}$$

6. Let O be the initial position of Kajal

$OA = 9\text{ m}$, $AB = 12\text{ m}$, $OB = ?$



$$OB^2 = OA^2 + AB^2$$

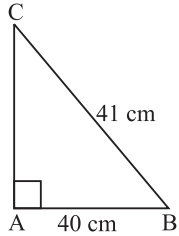
(phythagorast theorem)

$$OB^2 = (9)^2 + (12)^2$$
$$= 81 + 144 = 225$$
$$OB = \sqrt{225} = 15$$

Hence, Kajal is at distance of 15 m from her initial position.

7. In right-angled triangle,

hypotenuse $= 41\text{ cm}$; one side $= 40\text{ cm}$



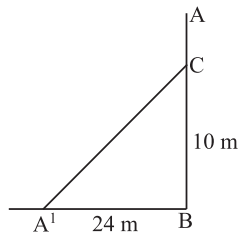
$$CB^2 = AB^2 + AC^2$$
$$CA^2 = CB^2 - AB^2$$
$$= 41^2 - 40^2$$
$$= 1681 - 1600 = 81$$
$$CA = \sqrt{81} = 9\text{ cm}$$

Other side of triangle is 9 cm.

8. Let AB be the height of the tree before it broken. Let C be point from where it broke and the broken tree touches the ground at point A'.

Then, BCA' is a right angle triangle

$$\begin{aligned} A'C^2 &= BC^2 + (BA^1)^2 \\ &= (10)^2 + (24)^2 \\ &= 100 + 576 = 676 \\ A'C &= 26 \end{aligned}$$



So, height of the tree

$$\begin{aligned} AB &= AC + BC \\ &= A'C + BC \\ &= 26 + 10 = 36\,\text{m} \end{aligned}$$

9. $ABCD$ is a rhombus AC and BD are its diagonal CA rhombus has all sides equal and its diagonals bisect each other at right angle.

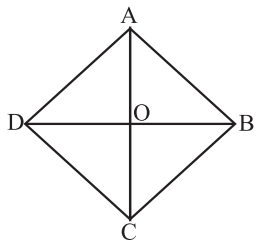
So, AOB is right angle triangle

$$AO = \frac{1}{2} AC$$

$$AO = \frac{1}{2} \times 24 = 12\,\text{cm}$$

$$BO = \frac{1}{2} \times 10$$

$$BO = 5\,\text{cm}$$



Thus using pythagoras property we have

$$\begin{aligned} AB^2 &= AO^2 + OB^2 \\ &= (12)^2 + (5)^2 \\ &= 144 + 25 = 169 \\ AB &= \sqrt{169} = 13\,\text{cm} \\ AB &= BC = CD = DC = 13\,\text{cm} \end{aligned}$$

Perimeter of rhombus $= 4 \times \text{side} = 4 \times 13\,\text{cm} = 52\,\text{cm}$

Hence, perimeter of rhombus is 52 cm.

10. The height of two poles are 30 m and 15 m

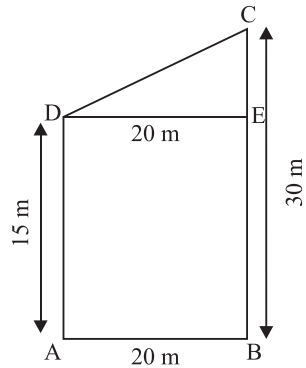
$\therefore$ $AD = 15\,\text{m}$, $BC = 30\,\text{cm}$

$$\begin{aligned} AB &= DE \\ &= 20\,\text{m} \\ CE &= BC - BE \end{aligned}$$

$= BC - AD$

$= 30 - 15$

$= 15m \ [BE = AD]$



In right ΔDCE,

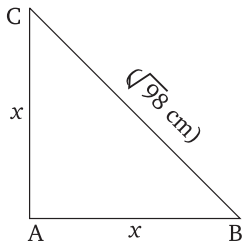
$$CD^2 = CE^2 + DE^2$$
$$= (15)^2 + (20)^2$$
$$= 225 + 400$$
$$= 625$$
$$CD = \sqrt{625}$$
$$= 25$$

Hence, distance between their top most points is 25 m.

11. In anclsoscies right triangle two sides are equal.

equal side $= x$ cm

By pythogorean theorem



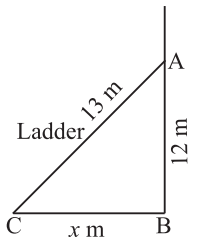
$$(AB)^2 + (CA)^2 = (CB)^2$$
$$(x)^2 + (x)^2 = \sqrt{98}$$
$$x^2 + x^2 = 98$$
$$2x^2 = 98$$
$$x^2 = 49$$
$$x = \sqrt{49} = 7 \text{ cm}$$

Length of side $= 7$ cm

So, length of each side $= 7$ cm, 7 cm and 9.89 cm.

12. In ΔABC,

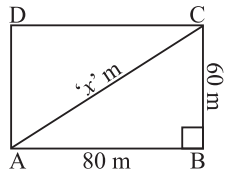
$$AC^2 = AB^2 + CB^2$$
$$CB^2 = AC^2 - AB^2$$
$$= (13)^2 - (12)^2$$
$$= 169 - 144$$
$$= 25$$
$$CB = \sqrt{25} = 5$$



Thus, Distance of the foot of ladder from the wall is 5 m.

13. Let the required shorter length be 'x' m.

Now, In ΔABC,



$$AC^2 = AB^2 + BC^2$$

$$x^2 = 80^2 + 60^2$$

$$= 6400 + 3600$$

$$= 10000$$

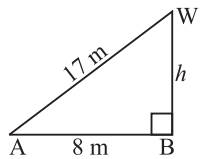
$$\Rightarrow \quad x = \sqrt{10000}$$

$$= 100\,\text{m}$$

Hence, the required shorter length is 100 m.

14. Let the required height of the window be 'h' m.

Now, In ΔABC,



$$AW^2 = AB^2 + BW^2$$

$$\Rightarrow \quad BW^2 = AW^2 - AB^2$$

$$\Rightarrow \quad h^2 = 17^2 - 8^2$$

$$\Rightarrow \quad h^2 = 289 - 64$$

$$\Rightarrow \quad h^2 = 225$$

$$\Rightarrow \quad h = \sqrt{225} = 15\,\text{m}$$

Hence, the height of the window is 15 m.

Exercise 10.4

1. Fill in the blanks :

(a) The altitude of a triangle is the **perpendicular** from vertex to the **opposite** side.

(b) Median of a triangle is a line segment that joins a **vertex** to the **middle point** of the opposite side.

(c) If ΔABC is right angled at C, then ***BC*** and ***AC*** are two of the altitudes of the triangle.

(d) In ΔDEF, P is the mid-point of EF

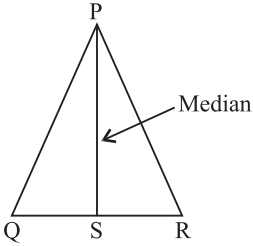
DP is **Median**;

DQ is **Altitude** ;

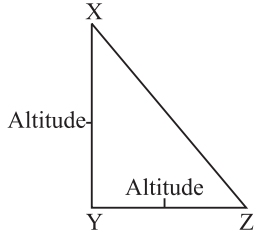
EP is $\frac{1}{2}$ ***EF*** .

2. Draw diagrams which represent the following :

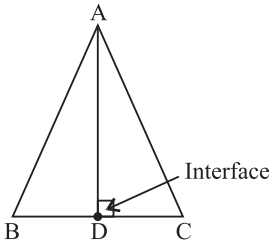
(a)



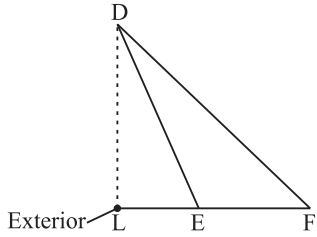
(b)



(c)



(d)



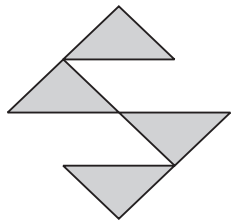
Multiple Choice Questions

Tick (✓) the correct option :

1. (d) **2.** (a) **3.** (b) **4.** (d) **5.** (a) **6.** (c) **7.** (c) **8.** (a)

BRAIN BOOSTER

1.



2. Let ΔABC is triangle,

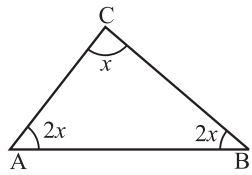
Let angle of $A = 2x$

$B = 2x$

and $C = x$

Sum of angle $= 180°$

$x + 2x + 2x = 180°$



$$5x = 180°$$
$$x = \frac{180°}{5}$$
$$= 36°$$

Then, $\angle A = 72°$, $\angle B = 72°$, $\angle C = 36°$.

Chapter

11 Congruence of Triangles

Exercise 11.1

1. Fill in the blanks :

(a) If two figures have the same **shape** and **dimension**, they are congruent.

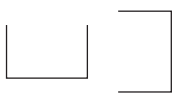
(b) Two rectangles will be **congruent**, if their respective lengths and breadths are equal.

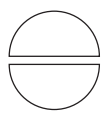
(c) Two circles are congruent, if they have the same **radius**.

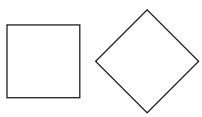
(d) If ΔABC is superimposed over ΔDEF and ΔDEF is covered completely, then the two triangles are **congruent**.

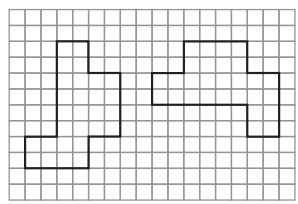
(e) Two angles are congruent, if they are equal in **degree** measure.

2. Which of the following pair of figures are congruent? If you are not sure, trace one figure and see if the tracing will fit over the other figure.

(a) 

(d) 

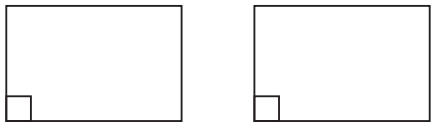
(e) 

(f) 

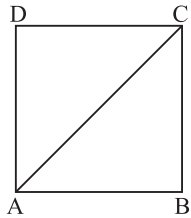
3.

$$\overline{XY} = 4.2 \text{ cm}$$
$$MN \cong XY$$
$$MN = 4.2 \text{ cm}$$
$$\text{Length is of } \overline{MN} = 4.2 \text{ cm}$$

4. Yes, the two angles of a rectangle congruent.
Rectangle both of 90°.



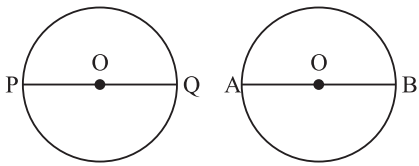
5. Square $ABCD$



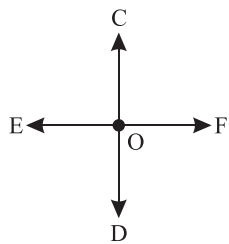
$$\Delta ABC \cong ACD$$
$$AB = DC = AD = BC$$

AC is diagonal

6. The diameter divide the circle in two congruent parts. Each part is called semi circle.



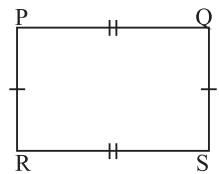
7.



$$\angle COF = \angle DOF ;$$
$$\angle COE = \angle DOE$$

All angles are equal.

8. Let $PQSR$ is a ||gm.



Then, $PQ = RS$

and $PR = QS$

So, $\overline{PQ} \cong \overline{RS}$ (given)

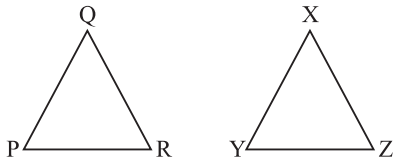
($\because$ opposite sides of ||gm are equal in length.)

$\Rightarrow$ $\overline{PR} \cong \overline{QS}$

Hence Proved

9. They are congruent triangle

Yes, $\overline{PQ} = \overline{XY}$



10. $\overline{PQ}$

$\overline{PR} = \overline{RQ}$

Yes, $\overline{PR}$ will be congruent to $\overline{RQ}$.

Exercise 11.2

1. (a) $\Delta ABC \cong \Delta PQR$, SAS congruence.

(b) $\Delta ABC \cong \Delta DEF$, ASA congruence.

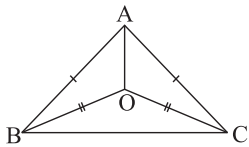
(c) ΔPQR and ΔLMN are not congruent.

2. In ΔABO and ΔACO

$AB = CA$ (given)

$BO = OC$ (given)

$OA = OA$ (common line)



So, $\Delta ABO \cong \Delta ACO$

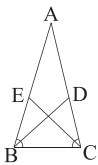
So, $\angle ABO = \angle ACO$

3. $\Delta BDC = \Delta CEB$

$BC = BC$ (Base)

$\angle DBC = \angle ECB$; $\angle DBE = \angle ECD$

(Bisect angle are equal)



$BE = DC$

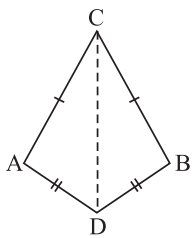
$\Delta BDC \cong \Delta CEB$

4. $\Delta ACD = \Delta BCD$

$AD = DB$ (given)

$AC = CB$ (given)

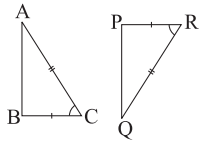
$DC = DC$ (common)



$A \leftrightarrow C, D \leftrightarrow D, B \leftrightarrow B$

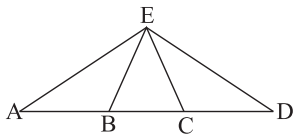
$\Delta ACD \cong BCD$

5. In $\Delta ABC \cong \Delta QPR$



$$AC = RQ \text{ (given)}$$
$$BC = PR \text{ (given)}$$
$$\angle BCA = \angle PRQ \text{ (given)}$$
$$\therefore \quad \Delta ABC \cong \Delta PQR$$

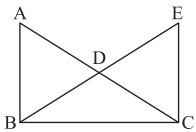
6.



$$AB = CD$$
$$AE = ED$$
$$BE = CE$$

EBC is also an isosceles triangle.

7. (a) ΔADB and ΔCDE



$$AD = DC \text{ (Given)}$$
$$BD = DE \text{ (given)}$$
$$\angle ADB = \angle CDE$$
(vertical opposite angle)

So, $\Delta ADB \cong \Delta CDE$

(b) $AB = EC$

$\Delta ABC \cong \Delta ECB$

$$BC = BC \text{ (common line)}$$
$$AB = CE \text{ (proved above)}$$
$$AC = BE \text{ (given)}$$

$\Delta ABC \cong \Delta ECB$

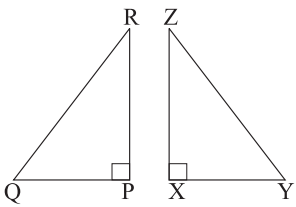
(c) We have proed that,

$\Delta ABC \cong \Delta ECD$

So, $\angle CBA = \angle BCE$

So, $\angle ECB = 90°$ (given)

8.



$$QP = XY$$
$$\angle P = \angle X = 90°$$

Either $PQ = XY$ or $PR = XZ$

Multiple Choice Questions

Tick (✓) the correct option :

1. (d) **2.** (a) **3.** (d) **4.** (b) **5.** (c)

BRAIN BOOSTER

1. ΔABC and ΔDEF are congruent triangles.

$$AC = DF$$
$$BC = EF$$
$$AB = BE$$
$$\angle B = \angle E$$
$$\angle E = 45°$$
$$45° = (x - 5)$$
$$x = 45 + 5 = 50°$$
$$\angle C = \angle F$$
$$27° = (y + 5)°$$
$$y = (27 - 5)° = 22°$$

Value of $x = 50°$

and $y° = 22°$

Chapter

12 Constructions

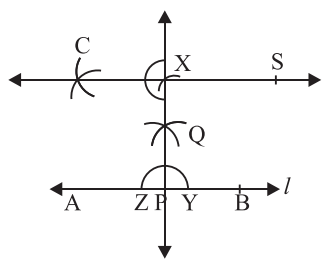
Exercise 12.1

1. Steps :

(i) Draw $\overleftrightarrow{AB}$ of any measure name it as l.

(ii) Take any point P on l.

(iii) With P as centre and any sufficient measure draw a semicircle. Let this semicircle cut the line AB on l at Z and Y.



(iv) With Z and Y as centre and radius more than half of semicircle drawn in previous step, put two arcs intersecting each other at Q. as shown above.

(v) Join PQ

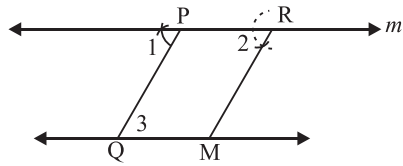
(vi) With P as centre and radius equal to 3 cm cut an arc on the line PQ. Let X be a point on PQ such that $PX = 3$ cm.

(vii) Now to draw a line m parallel to l through X we will repeat the steps (iii) to (v) with X.

Here, XS is the line drawn parallel to l through the point X which is at a distance of 3 cm from the line l.

2. Steps :

(i) Let l be any line and P be any point not lying on l.



(ii) Draw a line m parallel to l as explained in steps (iii) to (v) of the previous solution.

(iii) Now, take a point R on m.

Then with P as centre draw an arc of some sufficient measure. With the same radius draw arc from the point R then make equal arc such that.

$\angle 1 = \angle 2$ (as $PQ \,||\, RM$)

Also $\angle 1 = \angle 3$ (as $m \,||\, l$)

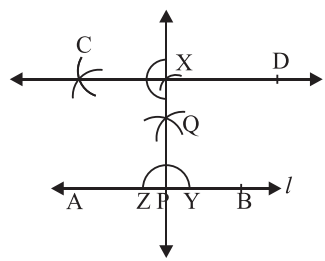
Thus, the figure obtained is the required figure.

3. Steps :

(i) Draw $\overleftrightarrow{AB}$

(ii) Take any point P on AB.

(iii) With P as centre and any sufficient measure draw semicircle. Let this semicircle cut the line AB at Z and Y.



(iv) With Z and Y as centre and radius more than half of semicircle drawn in previous step, put two arcs intersecting each other at Q. as shown above.

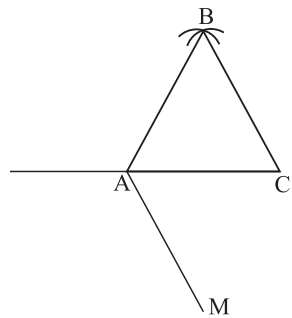
(v) Join PQ

(vi) With P as centre and radius equal to 4 cm cut an arc on the line PQ. Let X be a point on PQ such that $PX = 4$ cm.

(vii) Now to draw a line CD parallel to AB through X we will repeat the steps (iii) to (v) with X.

Here, CD is the line drawn parallel to AB through the point X which is at a distance of 4 cm from the line AB.

4. $\Delta ABC, AB = CB, BC = AM$



Step :

(i) Draw a line AC.

(ii) Cut an arc from A and C.

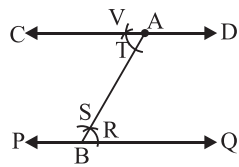
(iii) Join both the points at B. Thus gives us ΔABC.

(iv) Cut an arc from A and C, down wards it m.

(v) Join M to A. It is parallel to BC. $AB = BC$

5. Step :

(a)



(i) Draw a line PQ using a ruler and mark a point A outside PQ.

(ii) Take any point B on PQ. Join AB.

(iii) With B as centre and a suitable radius draw an arc using compass to cut PQ at R and AB at S.

(iv) With A as centre and the same radius draw an arc, cutting AB.

(v) Now place the pointed tip of the compass at R and adjust the opening so that the pencil tip is at S.

(vi) With T as centre and the same radius RS, draw an arc cutting the previous arc at V.

(vii) Join AV and produce it on both sides to get the required line parallel to PQ.

(b) only one
(c) only one

Exercise 12.2

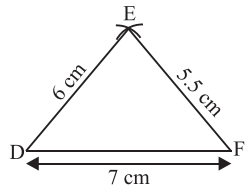
1. Step :

(i) Draw a line segment DF of length 7 cm.

(ii) With D as centre and radius 6 cm, draw an arc using compass.

(iii) With F as centre and radius 5.5 cm draw an another arc, cutting the preview arc at E.

(iv) Join DE 6 cm and FE.



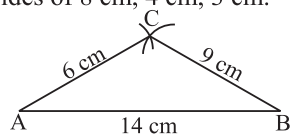
Then, ΔDEF is the required triangle.

2. Which of the following triangles can be constructed?

(a) We can not construct triangle for sides of 8 cm, 4 cm, 3 cm.

(b) We can not construct triangle for side of 7 cm, 15 cm, 5 cm.

(c) We can make construe triangle as follow the step.



(i) Draw a line segment AB 14 cm

(ii) With A as centre and radius 6 cm, draw an arc using a compass.

(iii) With B as centre and radius 9 cm draw another arc cutting previous and at C.
Join CA and CD

(d) We can not construct triangle for sides OP 10 cm, 10 cm and 20 cm.
Then, ΔABC are required triangle.

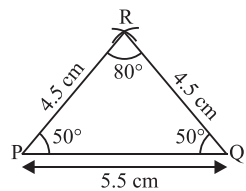
3. Step :

(i) Draw a line segment PQ length 5.5 cm.

(ii) With P as centre and radius 4.5 cm, draw an arc using compass.

(iii) With Q as centre and radius 4.5 cm draw an another arc, cutting the previous arc at R.

(iv) Join PR and QR.



Then, ΔPQR is the required triangle.
$\angle P = 50°$, $\angle Q = 50°$ and $\angle R = 80°$.

4. Step :

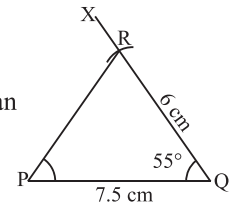
(i) Draw a line segment $PQ = 7.5$ cm.

(ii) At Q constract $\angle XQP = 55°$.

(iii) With Q as centre and radius 6 cm, draw an arc cutting QX at R.

(iv) Join PR.

Then, ΔPRQ is the required triangle.



5. (a) **Step :**

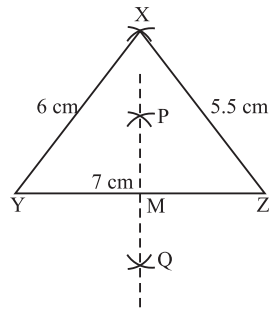
(i) Draw a line segment $YZ = 7$ cm

(ii) With Y as centre and radius 6 cm, draw an arc a compass.

(iii) With z as centre and radius 5.5 cm draw an arc crossing a compass. Cutting previous are at$X$.

(iv) Join XY and XZ. Then, ΔXYZ is the triangle.

(v) With Y as centre and radius more than $\frac{1}{2}$ of YZ drawn arcs both side of YZ.



(vi) With z as centre and radius more than $\frac{1}{2}$ of YZ. Draw arcs cutting the previously drawn arcs at P and Q respectively.

(vi) Join PQ meeting at M. Then PM is particular bisector YZ. Ray PQ bisects YZ.

(b) **Step**

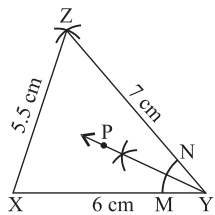
(i) Draw a line segment $XY = 6$ cm.

(ii) With X as centre and radius 5.5 cm draw angle crossing a compass.

(iii) With Z as centre and radius 7 cm drawn arc cutting previous at at Z.

(iv) Join XZ and YZ.

(v) With Y as a centre and taking any suitable radius, draw an arc which cut XY and YZ at M and N respectively.



(vi) With centre M and radius more than half at MN draw an arc.

(v) With centre N and some radius more than half at MN draw an arc cutting at $\angle$.

(vi) Join $\angle Y$ and produce it any point X.

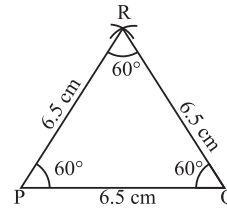
Then, ray PY bisects $\angle XYZ$.

6. Step :

(i) Draw a line segment length 6.5 cm.

(ii) With P as centre and radius 6.5 cm, draw an arc using compass.

(iii) With Q as centre and radius 6.5 cm draw an another arc, cutting the previous arc at R.



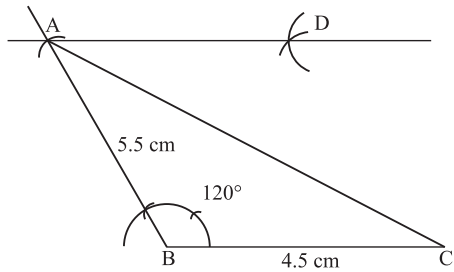
(iv) Join PR and QR

Then, ΔPQR is the required triangle

We conclose that, $\angle P = 60°$, $\angle Q = 60°$, $\angle R = 60°$.

7. Step :

(i) Draw a line segment BC of measurement 4.5 cm.



(ii) Make an angle of 120° at B.

(iii) Taking B as centre make an arc at A of length 5.5 cm. Join A with B.

(iv) Join A to C.

(v) Taking C as centre, mark an arc parallel to A of 5.5 cm.

(vi) Make another arc from A of the same radius.

(vii) Join A to D. AD is parallel to BC.

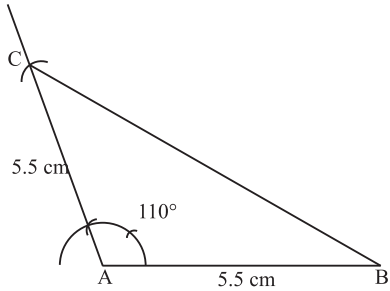
8. Step :

(i) Draw a line segment $AB = 5.5$ cm.

(ii) At A construct $\angle XAB$ 110°.

(iii) With A as center and radius 5.5 cm draw an arc cutting AX at C Join CB.

(iv) Then, ABC is a required triangle.



9. Step :

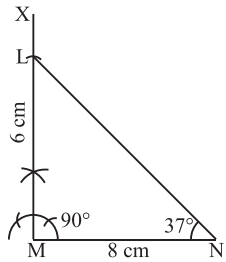
(i) Draw a line segment $MN = 8$ cm.

(ii) At M construct $\angle XMN$ 90°.

(iii) With M as centre and radius 6 cm draw an arc cutting MX at L.

(iv) Join NL.

Then, ΔMNL is the required triangle.



Exercise 12.3

1. Given : $QR = 5.5$ cm

$\angle P = 45°, \angle Q = 30°$

You know that $\angle P + \angle Q + \angle R = 180°$

(angle sun property of triangle)

$$45° + 30° + \angle R = 180°$$
$$75° + \angle R = 180°$$
$$\angle R = 180° - 75°$$
$$= 105°$$

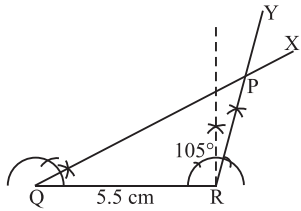
Step :

(i) Draw line segment $QR = 5.5$ cm.

(ii) At Q constant $\angle XQR = 30°$ cut at R construct $\angle YRQ = 105°$.

(iii) QX and RY at the dot of P.

(iv) ΔQRP is triangle.



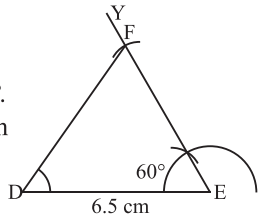
2. Step :

(i) Draw DE length 6.5 cm.

(ii) At point of E construct $= \angle YED = 60°$.

(iii) With E as a center and radius 4.5 cm cutting EY in 4.5 cm at F join FD.

Now, ΔDEF is required triangle.



3. Step :

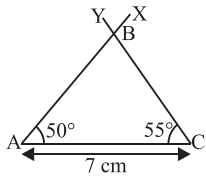
(i) Draw AC of length 7 cm.

(ii) At A construct $\angle XAB = 50°$.

(iii) At Q construct $\angle YCA = 55°$.

(iv) Let AX and CY intersect at B.

Then, ΔABC is the required triangle.



4. Step :

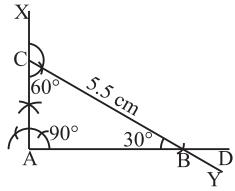
(i) Draw AD.

(ii) AtA construct $\angle XAB = 90°$.

(iii) At point of C construct $\angle YCA = 60°$.

(iv) With C as a center and radius 5.5 cm. cutting previous like CY at the point of B.

(v) Now, ΔABC is required right angled triangle.



5. Step :

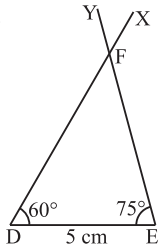
(i) Draw DE of length 5 cm.

(ii) At D construct $\angle XDE = 60°$.

(iii) At E construct $\angle YED = 75°$

(iv) Let DX and EY intersect at F.

Then, ΔDEF is the required triangle.



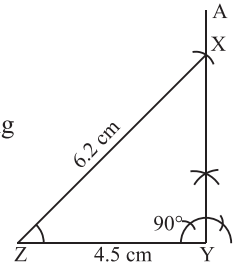
6. Step :

(i) Draw YZ length 4.5 cm.

(ii) At Y construct $\angle AYZ = 90°$.

(iii) With Z as center and radius 6.2 cm cutting pervious line AZ.

Now, ΔXYZ is required triangle.



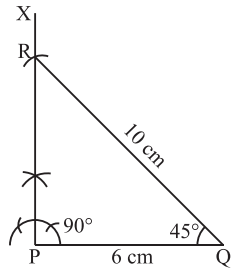
7. Step

(i) Draw PQ of length 6 cm.

(ii) At P construct $\angle XPQ = 90°$.

(iii) With Q as a center and radius 10 cm cutting PX in 10 cm.

Then, ΔPQR is required.



8. Step :

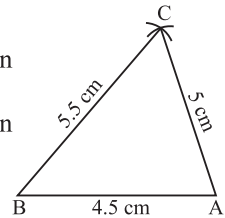
(i) Draw AB length of 4.5 cm.

(ii) With A as center and radius 5 cm cut an arc.

(iii) With B as center and radius 5.5 cm cut an arc with previous arc at C.

(iv) Join AC and BC

Then, ΔABC is required triangle.



9. Step :

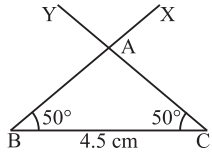
(i) Draw BC of length 4.5 cm.

(ii) At B construct $\angle XBC = 50°$.

(iii) At C construct $\angle YCB = 50°$

(iv) Let BX and CY intersect at A.

Then, ΔABC is the required triangle.



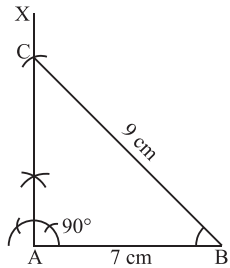
10. Step :

(i) Draw AB length of 7 cm.

(ii) At A construct $\angle XAB = 90°$.

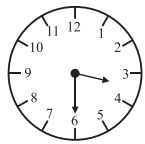
(iii) With B as a center and radius 9 cm cutting previous line AY as C point.

(iv) Then, ΔABC is required right angled triangle.



BRAIN BOOSTER

Required angle is 75°



Chapter

13 Mensuration

Exercise 13.1

1. Find the area of a square whose side is given below. Also find its perimeter :

(a) side 4.8 cm

$$\text{Perimeter of square} = 4 \times \text{side}$$
$$= 4 \times 4.8 \text{ cm} = 19.2 \text{ cm}$$
$$\text{Area} = (\text{side})^2$$
$$= 4.8 \times 4.8 \text{ cm}^2 = 23.04 \text{ cm}^2$$

(b) side 35 m

$$\text{Perimeter of square} = 4 \times \text{side}$$
$$= 4 \times 35 \text{ m} = 140 \text{ m}$$
$$\text{Area} = (\text{side})^2$$
$$= 35 \times 35 \text{ m}^2 = 1225 \text{ m}^2$$

(c) 44 mm

$$\text{Perimeter of square} = 4 \times \text{side}$$
$$= 4 \times 44 \text{ mm} = 176 \text{ mm or } 17.6 \text{ cm}$$
$$\text{Area} = (\text{side})^2 = (44)^2$$
$$= 1936 \text{ mm}^2 \text{ or } 19.36 \text{ cm}^2$$

(d) 2 m 50 cm.

$$\text{Perimeter of square} = 4 \times \text{side}$$
$$= 4 \times 2.5 \text{ m} = 10 \text{ m}$$
$$\text{Area} = (\text{side})^2$$
$$= 2.5 \text{ m}^2 = 6.25 \text{ m}^2$$

2. Find the missing values :

S. No.	Base	Height	Area of triangle
(a)	40 cm	**27 cm**	540 cm^2
(b)	**60.24 cm**	30 cm	903.6 cm^2
(c)	8.4 cm	**23.2 cm**	97.44 cm^2
(d)	7.8 cm	**8.4 cm**	32.76 cm^2

3. Find the missing values :

S. No.	Base	Height	Area of parallelogram
(a)	15 cm	**30 cm**	450 cm^2
(b)	**80 cm**	31.4 cm	2512 cm^2
(c)	22 cm	**7.75 cm**	170.5 cm^2
(d)	20 cm	**20 cm**	400 cm^2

4. Length of a room $= 5.6$ m or 560 cm

Wide of a room $= 3.6$ m or 360 cm

Area of a room $= 560\,\text{cm} \times 360\,\text{cm} = 201600\,\text{cm}^2$

Length of square marble $= 10\,\text{cm}$

Weight of square marble $= 10\,\text{cm}$

Area of square marble $= 10 \times 10\,\text{cm}^2 = 100\,\text{cm}^2$

$$\text{Required marble} = \frac{201600}{100} = 2016$$

$$\text{Cost of 2 tiles} = ₹\ 5$$

$$\text{Cost of 1 tile} = ₹\ \frac{5}{2}$$

$$\text{Cost of 2016 tiles} = ₹\ \frac{5}{2} \times 2016 = ₹\ 5040$$

Thus, cost of required titles is ₹ 5040.

5. Area of rectangle $= 24\,\text{cm}^2$

$$\text{breadth} = 6\,\text{cm}$$

$$\text{length} = \frac{24}{6} = 4\ \text{m}$$

6. length of a room $= 9.5$ m

breadth of a room $= 7.5$ m

height of a room $= 2.5$ m

Area of a room $= 2 \times (l + b) \times h$

$= 2 \times (9.5 + 7.5) \times 2.5\ \text{m}^2$

$= 2 \times 17 \times 2.5\ m^2 = 85\,\text{m}^2$

Area of a door $= 2 \times 3\,\text{m}^2 = 6\,\text{m}^2$

Area of two window $= 3.5 \times 2 \times 2 = 14\ m^2$

Area of wall $= 85 - (6 + 14)\ m^2$

$= (85 - 20)\ m^2 = 65\ m^2$

Cost of paining your wall $= 65 \times 5.60 = ₹\ 364$

7. Size of greeting card $= 10\ cm \times 6\ cm$

Area of greeting card $= 10 \times 6 = 60\ cm^2$

Size of paper $= 1\ m \times 0.96\ m$

$= 100\ cm \times 96\ cm$

Area of paper $= 9600\ cm^2$

Number of greeting card made by paper

$$= \frac{9600\ cm^2}{60\ cm^2} = 160$$

8. Length of a door $= 2.6\ m$

breadth of a door $= 1.1\ m$

Area of door $= 2.6 \times 1.1\ m^2 = 2.86\ m^2$

Paining shall be done both sides

So , Area to be painted $= 2.86 \times 2 = 5.72\ m^2$

cost of painting per square metre $= ₹\ 20$

cost of painting $5.72\ m^2 = ₹\ 20 \times 5.72 = ₹\ 114.40$

9. Area of square $= 18050\ m^2$

length of diagonal $= \sqrt{2 \times Area}$

$= \sqrt{2 \times 18050}$

$= \sqrt{36100}$

$= \sqrt{190 \times 190} = 190$

Thus, length of diagonal is 190 m.

10. Area of a square plot $= 400 \times 400\ m^2 = 160000\ m^2$

Area of 9 hectares $= 90000\ m^2$

Remaining plot $= 160000 - 90000 = 70000$

Cost of plot $= ₹\ 900$ per metre square

$= ₹\ 70000 \times 900 = ₹\ 63000000$

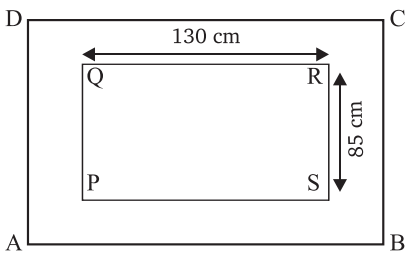
So, he will get 6 corre 30 lakh rupees.

11. Let breadth of room $= x$ m
Then, length of room $= 3 \times x = 3x$ m
Height of room $= 3$ m
Area of 4 walls of room $= 2(l + b) \times h$
$= 2(x + 3x) \times 3\,\text{m}^2$
$= 2 \times 4x \times 3\,\text{m}^2$
$= 8x \times 3\,\text{m}^2 = 24x\,\text{m}^2$
According to question; $144\,\text{m}^2 = 24x\,\text{m}^2$
$$x = \frac{144}{24} = 6$$
$l = 3 \times 6 = 18$ m, $b = 6$ m
Area of flour $= l \times b$
$= 18 \times 6 = 108\,\text{m}^2$

12. Original length $= l$
Original breadth $= b$
Area $= l \times b$
New length $= 2l$
New breadth $= 2b$
Area $= 2l \times 2b = 4(l \times b)$
The area has quadrupled (increased 4 time).

Exercise 13.2

1. Area of $PQRS = 130 \times 85\,\text{m}^2 = 11050\,\text{m}^2$



Area of $ABCD$
Length of $AB = 130 + 4 \times 2 = 138$ cm
Length of $AD = 85 + 4 \times 2 = 93$ cm

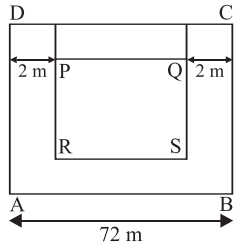
Area of $ABCD = 138 \times 93\,m^2 = 12834\,m^2$

Area of path $= 12834 - 11050\,m^2$

$= 1784\,m^2$

2. Area of $ABCD = 72 \times 72\,m^2$

$= 5184\,m^2$



Area of $PQRS = (72 - 2 \times 2) \times (72 - 2 \times 2)$

$= 68 \times 68\,m^2$

$= 4624\,m^2$

Area of path = Area of $ABCD$ – Area of $PQRS$

$= 5184 - 4624\,m^2 = 560\,m^2$

3. Calculate the area of the shaded region in each of the following figures.

(a) Area of $ABCD = 60 \times 50\,m^2 = 3000\,m^2$

Area of (i) square $= 8 \times 8\,m^2 = 64\,m^2$

Area of (ii) square $= 64\,m^2$

Area of (iii) square $= 64\,m^2$

Area of (iv) square $= 64\,m^2$

Area of shaded part $= 3000 - (64 + 64 + 64 + 64)$

$= 3000 - 256\,m^2 = 2744\,m^2$

(b) In this figure have two recentangle,

Area of $ABCD = 7 \times 2\,m^2 = 14\,m^2$

Area of $DEFG = 6 \times 2\,m^2 = 12\,m^2$

Total Area $= (14 + 12)\,m^2 = 26\,m^2$

4. $ABCD$ represents the park and $EFGH$ and $IJLK$ represent the two cross roads.

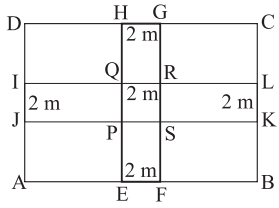
Area of road $EFGH = 2 \times 30\,cm^2$

$= 60\,cm$

Area of $IJKL = 2 \times 58\,cm^2$

$= 116\,cm^2$

Area of $PQRS = 2 \times 2 = 4\,cm^2$



$$\text{Area of road} = \text{Area of } EFGH + IJKL - PQRS$$
$$= 60 + 116 - 4$$
$$= 176 - 4 = 172\,\text{cm}^2$$

5. Length of a rectangular park $= 100\,\text{m}$

Breadth of a rectangular park $= 65\,\text{m}$

Area of park $= 100 \times 65\,\text{m}^2 = 6500\,\text{m}^2$

Length of one flower bed $= 20\,\text{m}$

Breadth one flower bed $= 10\,\text{m}$

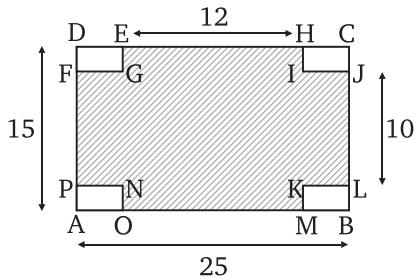
Area of one flower bed $= 20 \times 10\,\text{m}^2 = 200\,\text{m}^2$

Area of 6 flower bed $= 200 \times 6 = 1200\,\text{m}^2$

The remaining portion of park $= 6500 - 1200\,\text{m}^2$
$= 5300\,\text{m}^2$

Cost of laying the paths $= ₹\ 5300 \times 20$
$= ₹\ 10600$

6. (a) Area of $ABCD = 15 \times 25\ \text{m}^2 = 375\,\text{m}^2$



All the unshaded parts are equal

Length of one unshaded part $= (25 - 12) \div 2 = 6.5$ m

breadth of unshaded part $= (15 - 10) \div 2 = 2.5$ m

Area of $DEFG = 6.5 \times 2.5 = 16.25\ \text{m}^2$

Area of $HCIJ = 16.25\ \text{m}^2$

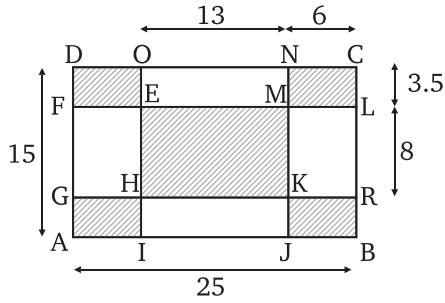
Area of $PNAO = 16.25\ \text{m}^2$

Area of $BLMK = 16.25\ \text{m}^2$

Total Area of un shaded parts $= 16.25 \times 4 = 65\,\text{m}^2$

Area of shaded part $= 375 - 65\,\text{m}^2 = 310\,\text{m}^2$

(b)



$$\text{Length of } AB = 25$$
$$\text{Length of } AD = 15$$
$$\text{Area of } ABCD = 25 \times 15\,\text{m}^2 = 375\,\text{m}^2$$
$$\text{Area of } ONEM = \text{Area of } HKIJ$$
$$\text{Length} = 13\,\text{m}$$
$$\text{breadth} = 3.5\ \text{m}$$
$$\text{Area} = 13 \times 3.5 = 45.5\ \text{m}^2$$
$$\text{Area of two rectangle} = 45.5 \times 2 = 91\,\text{m}^2$$
$$\text{Area of } GHEF = \text{Area of } LRKM$$
$$\text{Length} = 8\,\text{m}$$
$$\text{breadth} = 6\,\text{cm}$$
$$\text{Area} = 8 \times 6\,\text{m}^2 = 48\,\text{m}^2$$
$$\text{Area of two rectangle} = 48 \times 2 = 96\,\text{m}^2$$
$$\text{Total Area of unshaded part} = 91 + 96\,\text{m}^2 = 187\,\text{m}^2$$
$$\text{Area of shaded part} = 375 - 187\,\text{m}^2 = 188\,\text{m}^2$$

7. Length of cardboard $= 12\,\text{cm}$
breadth of cardboard $= 10\,\text{cm}$
Area of cardboard $= 12 \times 10\,\text{cm}^2 = 120\,\text{cm}^2$
Length of photo $= 8\,\text{cm}$
breadth of photo $= 6\,\text{cm}$
Area of photo $= 8 \times 6\,\text{cm}^2 = 48\,\text{cm}^2$
Area of cardboard that is visible outside the photo $= 120 - 48\,\text{cm}^2$
$= 72\,\text{cm}^2$

Exercise 13.3

1. Calculate the area of each :

(a) Area of triangle $= \frac{1}{2} BC \times AD$

$= \frac{1}{2} \times 2.2 \times 4.9 \text{ cm}^2$

$= 1.1 \times 4.9 \text{ cm}^2$

$= 5.39 \text{ cm}^2$

(b) Area of triangle $= \frac{1}{2} PQ \times QR$

$= \frac{1}{2} \times 2.7 \times 5.8 \text{ cm}^2 = 7.83 \text{ cm}^2$

2. Calculate the base of the triangle whose :

(a) Area $= 4.83 \text{ cm}^2$ and altitude = 2.3 cm.

$$\text{Area} = \frac{1}{2} \times \text{base} \times \text{altitude}$$

$$4.83 = \frac{1}{2} \times \text{base} \times 2.3 \text{ cm}$$

$$\text{base} = \frac{4.83 \times 2}{2.3} \text{ cm} = 4.2 \text{ cm}$$

(b) Area = 9.38 m^2 and altitude = 2.8 m.

$$\text{Area} = \frac{1}{2} \times \text{base} \times \text{altitude}$$

$$9.38 = \frac{1}{2} \times \text{base} \times 2.8$$

$$\text{base} = \frac{9.38 \times 2}{2.8} = 6.7 \text{ cm}$$

(c) Area = 11.4 cm^2 and altitude = 4 cm.

$$\text{Area} = \frac{1}{2} \times \text{base} \times \text{Altitude}$$

$$11.4 = \frac{1}{2} \times \text{base} \times 4$$

$$\text{base} = \frac{11.4 \times 2}{4} = 5.7 \text{ cm}$$

3. Area of rectangle $= L \times b$

$= 100 \times 60\,\text{m}^2$

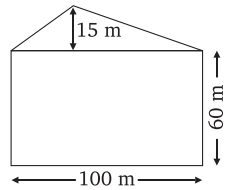
$= 6000\,\text{m}^2$

Area of triangle $= \frac{1}{2} \text{ base} \times \text{altitude}$

$= \frac{1}{2} \times 100 \times 15$

$= 750\,\text{m}^2$

Area of figures $= (6000 + 750)\,\text{m}^2 = 6750\,\text{m}^2$



4. Length of right triangle $= 90\,\text{m}$

Breadth of right triangle $= 120\,\text{m}$

Area of right triangle $= \frac{1}{2} \times 90\,\text{cm} \times 120\,\text{cm}$

$= 5400\,\text{m}^2$

Cost of levelling $= ₹\ 5400 \times 12$

$= ₹\ 64800.$

5. Area of an equilateral triangle $= 9\sqrt{3}\,\text{cm}^2$

Length of each side $= 6\,\text{cm}$

$\because$ Area of triangle $= \frac{1}{2} \times \text{base} \times \text{height}$

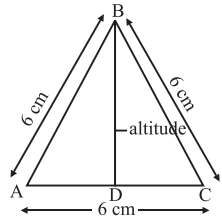
$9\sqrt{3}\,\text{cm}^2 = \frac{1}{2} \times AC \times BD$

$9\sqrt{3}\,\text{cm}^2 = \frac{1}{2} \times 6\,\text{cm} \times BD$

$\frac{9\sqrt{3}}{3}\,\text{cm} = BD$

$3\sqrt{3}\,\text{cm} = BD$

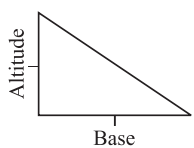
$BD = 3\sqrt{3}\,\text{cm}$



6. Area of a right triangle $= 6\,\text{cm}^2$

Base $= 3\,\text{cm}$

Area $= \frac{1}{2} \times \text{Base} \times \text{Altitude}$



$$6 = \frac{1}{2} \times 3 \times \text{Altitude}$$

$$\text{Altitude} = \frac{6 \times 2}{3} = 4 \text{ cm}$$

By Pythogoras;

$$(\text{Hypotenuse})^2 = (\text{Base})^2 + (\text{Altitude})^2$$

$$= (3\,\text{cm})^2 + (4\,\text{cm})^2$$

$$= (9+16)\,\text{cm}^2$$

$$= 25\,\text{cm}^2$$

$$\text{Hypotenuse} = \sqrt{25} = 5\,\text{cm}$$

So, one side is 4 cm and other is 5 cm.

7. Ratio of a triangle side $= 3 : 4 : 5$

Sides are $3x$, $4x$, $5x$

Perimeter = 24 cm (sum of sides)

$$(3x + 4x + 5x) = 24$$

$$12x = 24$$

$$x = 24 \div 12 = 2$$

$$\text{one side} = 3 \times 2 = 6 \text{ cm;}$$

$$\text{second side} = 4 \times 2 = 8\,\text{cm}$$

$$\text{Third side} = 5 \times 2 = 10\,\text{cm}$$

$$S = \frac{a+b+c}{2}$$

$$= \frac{6+8+10}{2}$$

$$= \frac{24}{2} = 12\,\text{cm}$$

$$\text{Area of triangle} = \sqrt{S\,(S-a)(S-b)(S-c)}$$

$$= \sqrt{12(12-6)(12-8)(12-10)}$$

$$= \sqrt{12 \times 6 \times 4 \times 2}$$

$$= \sqrt{576} = 24$$

Area of triangle 24 cm^2.

8. Side of triangle = 17 cm, 10 cm, 9 cm

$a = 17$ cm, $b = 10$ cm, $c = 9$ cm

$$S = \frac{a+b+c}{2}$$

$$S = \frac{17+10+9}{2}$$

$$= \frac{36}{2} = 18$$

$$\text{Area of triangle} = \sqrt{S(S-a)(S-b)(S-c)}$$

$$= \sqrt{18(18-17)(18-10)(18-9)}\ \text{cm}^2$$

$$= \sqrt{18 \times 1 \times 8 \times 9}\ \text{cm}^2$$

$$= \sqrt{1296}\ \text{cm}^2$$

$$= 36\ \text{cm}^2$$

Area of triangle is 36 cm^2

9. Sides of triangle = 40 m, 37 m, 13 m

$a = 40$ m, $b = 37$ m, $c = 13$ m

$$S = \frac{a+b+c}{2} = \frac{40+37+13}{2} = \frac{90}{2} = 45$$

$$\text{Area or triangle} = \sqrt{S(S-a)(S-b)(S-c)}$$

$$= \sqrt{45(45-40)(45-37)(45-13)}\ \text{m}^2$$

$$= \sqrt{45 \times 5 \times 8 \times 32}\ \text{m}^2$$

$$= \sqrt{57600}\ \text{m}^2 = 240\ \text{m}^2$$

Area of plot is 240 m^2.

10. Let $PQRS$ be the given quadrilateral. PR is the given diagonal $SM \perp PR$ and $QN \perp PR$.

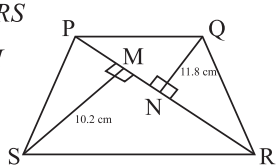
$\therefore$ $PR = 28$ cm, $SM = 10.2$ cm and $QN = 11.8$ cm

Area of quadrilateral $PQRS$

$$= \text{area of } \Delta PQR + \text{area of } \Delta PRS$$

$$= \frac{1}{2} \times PR \times NQ + \frac{1}{2} \times PR \times SM$$

$$= \frac{1}{2} \times PR \times (SM + QN)$$



$$= \frac{1}{2} \times 28 \times [10.2 + 11.8]$$

$$= \frac{1}{2} \times 28 \times 22\,\text{cm}^2$$

$$= 14 \times 22\ \text{cm}^2 = 308\,\text{cm}^2$$

Hence, the area of the quadrilateral is $308\ \text{cm}^2$.

Exercise 13.4

1. Find the area of each of the following parallelograms :

(a) Base $(PQ) = 2$ cm

Altitude $= 4.5$ cm

Area of parallelogram $=$ Base $\times$ Altitude

$= 2 \times 4.5 = 9\,\text{cm}^2$

(b) Base $= 5.8$ cm

Altitude $= 6.5$ cm

Area of parallelogram $=$ Base $\times$ Altitude

$= 5.8 \times 6.5\ \text{cm}^2$

$= 37.7\ \text{cm}^2$

(c) Base $= 5.2$ cm

Altitude $= 3$ cm

Area of parallelogram $=$ Base $\times$ Altitude

$= 5.2 \times 3\ \text{cm}^2 = 15.6\ \text{cm}^2$

2. Find the area of the parallelogram whose :

(a) Base $= 5.6$ cm and height $= 4.2$ cm.

Area $= 5.6 \times 4.2 = 23.52\ \text{cm}^2$

(b) Base $= 6.4$ cm and height $= 3.6$ cm.

Area $= 6.4 \times 3.6\ \text{cm}^2 = 23.04\ \text{cm}^2$

3. Side of a parallelogram $= 8.2$ cm

corresponding altitude $= 6.2$ cm

Area of the parallelogram $=$ base $\times$ altitude

$= 8.2 \times 6.2\ \text{cm}^2 = 50.84\ \text{cm}^2$

Divided into 3 parts

Area of each parallelogram $= 50.84 \div 3 = 16.95\ \text{cm}^2$.

4. Area of a parallelogram $= 6.25 \text{ m}^2$

Altitude $= 5.0 \text{ m}$

$$\text{Corresponding} = \frac{\text{Area}}{\text{Altitude}}$$

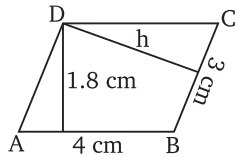
$$= \frac{6.25}{5.0} = 1.25 \text{ m}$$

Corresponding base is 1.25 m.

5. Area of parallelelogram $=$ base $\times$ altitude

$= 1.8 \times 4$

$= 7.2 \text{ cm}^2$



Area of parallelelogram $=$ base $\times$ altitude

$7.2 = 3 \times h$

$$h = \frac{7.2}{3} = 2.4$$

height $= 2.4$ cm.

6. Area of a rhombus $= 202.4 \text{ cm}^2$

One diagonals $= 18.4$ cm

Let other diagonals $= x$

$$\text{Area of rhombus} = \frac{1}{2} \times \text{product of diagonals}$$

$$202.4 = \frac{1}{2} \times 18.4 \times x$$

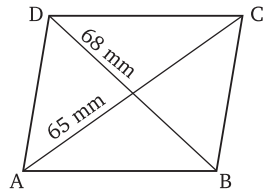
$$x = \frac{202.4 \times 2}{18.4} = 22 \text{ cm}$$

Other side of rhombus is 22 cm.

7. Diagonals $= 8$ cm 8 mm

$= 88$ mm

$= 6$ cm 5 mm or 65 mm



$$\text{Area of rhombus} = \frac{1}{2} (\text{product of diagonals})$$

$$= \frac{1}{2} \times 88 \times 65 \text{ mm}^2$$

$$= 44 \times 65 \text{ mm}^2 = 2860 \text{ mm}^2.$$

Exercise 13.5

1. Find the circumference of a circle whose diameter is :

$$\textbf{circumference} = \mathbf{2\pi r}$$

or $\pi \times d$ (Where d = diameter)

(a) Diameter $= 2.8$ m

$$\text{circumference} = \pi \times d$$

$$= \frac{22}{7} \times 2.8 \text{ m} = 8.8 \text{ m}$$

(b) Diameter $= 35$ cm

$$c = \pi \times d$$

$$c = \frac{22}{7} \times 35 = 110 \text{ cm}$$

(c) Diameter $= 4.2$ cm

$$c = \pi \times d$$

$$= \frac{22}{7} \times 4.2 \text{ cm} = 13.2 \text{ cm}$$

2. Circumference of one circle $= 121$ cm

$$2\pi r = 121$$

$$\Rightarrow \quad 2 \times \frac{22}{7} \times r = 121$$

$$r = \frac{121 \times 7}{2 \times 22} = 19.25 \text{ cm}$$

Circumference of second circle $= 154$ cm

$$2\pi r = 154$$

$$\Rightarrow \quad 2 \times \frac{22}{7} \times r = 154$$

$$r = \frac{154 \times 7}{2 \times 22} = 24.5 \text{ cm}$$

$$\text{Difference} = 24.5 \text{ cm} - 19.25 \text{ cm}$$

$$= 5.25 \text{ cm}$$

3. Length of rectangle $= 35$ cm

Breadth of rectangle $= 20$ cm

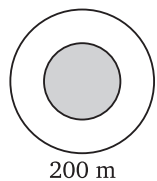
$$\text{Perimeter of rectangle} = 2(l + b)$$

$$= 2(35 + 20) = 2 \times 55 = 110 \text{ cm}$$

$$\text{Circumference of circle} = \text{perimeter of rectangle}$$
$$\text{Circumference of circle} = 2\pi r$$
$$110\,\text{cm} = \frac{2\times 22}{7}\times r$$
$$r = \frac{7\times 110}{2\times 22} = 17.5\ \text{cm}$$
$$\text{Diameter} = 2r$$
$$= 2\times 17.5 = 35\,\text{cm}.$$

4.
$$\text{Circumference} = 26.4\ \text{m}$$
$$\text{Circumference} = 2\pi r$$
$$26.4\ \text{m} = 2\times\frac{22}{7}\times r$$
$$r = \frac{26.4\times 7}{2\times 22} = 4.2$$
$$\text{Radius} = 4.2\ \text{cm}$$
$$\text{Diameter} = 4.2\times 2 = 8.4\ \text{cm}$$

5. Circumference of inner track $= 200$ m



$$2\pi r = 200\,\text{m}$$
$$2\times\frac{22}{7}\times r = 200\,\text{m}$$
$$r = \frac{200\times 7}{22\times 2}$$
$$= 31.82\ \text{m}$$
$$\text{circumference of outer track} = 220\,\text{m}$$
$$2\pi r = 220\,\text{m}$$
$$2\times\frac{22}{7}\times r = 220\,\text{m}$$
$$r = \frac{220\times 7}{2\times 22} = 35\,\text{m}$$
$$\text{width of track} = (35-31.82)\ \text{m} = 3.18\ \text{m}$$

6.
$$\text{Diameter of circle} = 5.6\ \text{m}$$
$$\text{Radius} = \frac{5.6}{2} = 2.8\ \text{cm}$$
$$\text{Circumference} = 2\pi r = 2\times\frac{22}{7}\times 2.8 = 17.6\ \text{m}$$

7. Diameter of the park $= 700\,\text{m}$

Circumference $= \pi \times d$

$= \frac{22}{7} \times 700\,\text{m} = 2200\,\text{m}$

Distance cover in 1 times daily $= 2200\,\text{m}$

distance cover in 5 times $= 2200 \times 5$

$= 11000\,\text{m}$ or 11 km.

8. Ratio of two radii $= 8 : 10$

Length of one radius $= 8x$

Length of second radius $= 10x$

For one circle :

circumference $= 2\pi r$

circumference $= 2 \times \pi \times 8x = 16x\pi$

For second circle :

circumference $= 2\pi \times 10x = 20x\pi$

Ratio of circumference $= 16x\pi : 20x\pi$

$= 4 : 5$

9. Length of radius of one circle $= 84\,\text{cm}$

circumference $= 2\pi r$

$= 2 \times \frac{22}{7} \times 84$

$= 528\,\text{cm}$

Length of radius of second circle $= 98\,\text{cm}$

circumference $= 2 \times \frac{22}{7} \times 98 = 616\,\text{cm}$

Difference $= 616 - 528 = 88\,\text{cm}$

So, second circle has more circumference by 88 cm.

10. Diameter of the wheel truck $= 98\,\text{cm}$

circumference $= \pi \times d$

$= 98 \times \frac{22}{7}\,\text{cm}$

$= 308\,\text{cm}$

Distance covered by wheel in 25 revolutions

$= 25 \times 308\,\text{cm}$

$= 7700\,\text{cm}$ or 77 m.

Exercise 13.6

1. Find the radius of a circle whose area is :

(a) $\text{Area} = 616\ \text{m}^2$

$\text{Area} = \pi r^2$

$616\ \text{m}^2 = \frac{22}{7} \times r^2$

$r^2 = \frac{616 \times 7}{22}\ \text{m}^2 = 196\ \text{m}^2$

$r = \sqrt{196}\ \text{m} = 14\ \text{m}$

(b) $\text{Area} = 2\pi\ \text{cm}^2$

$\text{Area} = \pi r^2$

$2\pi\ \text{cm}^2 = \pi r^2$

$r^2 = \frac{2\pi}{\pi}\ \text{cm}^2$

$r = \sqrt{2}\ \text{cm}$

2. Find the diameter of a circle whose area is :

(a) $\text{Area} = 50.24\ \text{m}^2$

$\text{Area m}^2 = \pi r^2$

$50.24\ \text{m}^2 = 3.14 \times r^2$

$r^2 = \frac{50.24}{3.14}\ \text{m}^2$

$r^2 = 16\ \text{m}^2$

$= 4\ \text{m}$

$d = 2r = 4 \times 2 = 8\ \text{m}$

(b) $\text{Area} = 314\ \text{m}^2$

$\text{Area} = \pi r^2$

$314 = 3.14 \times r^2$

$r^2 = \frac{314}{3.14}\ \text{m}^2$

$r^2 = 100\ \text{m}^2$

$r = 10\ \text{m}$

$d = 2r = 2 \times 10 = 20\ \text{m}$

3.

$\text{Area of circle} = 6.16\ \text{cm}^2$

$\pi r^2 = 6.16\ \text{cm}^2$

$r^2 = \frac{6.16 \times 7}{22} = 1.96\ \text{cm}^2$

$r = \sqrt{1.96}\ \text{cm} = 1.4\ \text{cm}$

$\text{Circumference of circle} = 2\pi r$

$= \frac{2 \times 22}{7} \times 1.4 = 8.8\ \text{cm}$

4.

$\text{Radius of outer circle} = 11\ \text{m}$

$\text{Radius of inner circle} = 4\ \text{m}$

$\text{Area of outer circle} = \pi r^2$

$= \frac{22}{7} \times 11 \times 11\ m^2$

$\text{Area of inner cirlce} = \pi r^2$

$$= \frac{22}{7} \times 4 \times 4 \text{ m}^2$$

Area of the ring $= \text{outer circle} - \text{inner circle}$

$$= \frac{22}{7} \times 11 \times 11 - \frac{22}{7} \times 4 \times 4$$

$$= \frac{22}{7}(121 - 16)\text{ m}^2$$

$$= \frac{22}{7} \times 105\text{ m}^2 = 330\text{ m}^2$$

So, Area of ring $= 330\text{ m}^2$

Cost of painting per $\text{m}^2 = ₹\ 21$

cost of painting of ring $= ₹\ 330 \times 21 = ₹\ 6930.$

5. Let radius $= r$ cm

Thus, circumference $= 2\pi r$ cm

Circumference $-$ radius $= 37$ cm

$$2\pi r - r = 37$$

$$2 \times \frac{22}{7} \times r - r = 37$$

$$\frac{44r - 7r}{7} = 37$$

$$\frac{37r}{7} = 37$$

$$r = \frac{37 \times 7}{37} = 7$$

$$r = 7 \text{ cm}$$

Thus, Area of circle $= \pi \times r^2$

$$= 7 \times 7 \times \frac{22}{7} = 154 \text{ cm}^2.$$

6. Area of rectangle $ABCD = AB \times BC$

$$= 60 \text{ cm} \times 28 \text{ cm}$$

$$= 1680 \text{ cm}^2$$

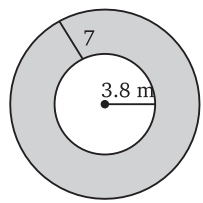
Diameter of cemicircle $= CB = 28$ cm

Radius $= 14$ cm $(28 \div 2 = 14$ cm$)$

$$\text{Area of circle} = \pi r^2$$
$$= \frac{22}{7} \times 14 \times 14 \text{ cm}^2$$
$$= 616 \text{ cm}^2$$
$$\text{Area of semi circle} = \frac{1}{2} \times \text{Area of circle}$$
$$= \frac{1}{2} \times 616$$
$$= 308 \text{ cm}^2$$
$$\text{Area of plot with out grass} = \text{Area of } ABCD - \text{Area of semi circle}$$
$$= 1680 - 308$$
$$= 1372 \text{ cm}^2.$$

7. Inner circumference = 242 m

$$2\pi r = 242 \text{ m}$$
$$2 \times \frac{22 \times r}{7} = 242$$
$$r = \frac{242 \times 7}{22 \times 2}$$
$$= 38.5 \text{ m}$$



$$\text{Outer radius} = 38.5 + 7 \text{ m} = 45.5 \text{ m}$$
$$\text{Area of inner circle} = \pi r^2$$
$$= \frac{22}{7} \times 38.5 \times 38.5 = 4658.5 \text{ m}^2$$
$$\text{Area of outer circle} = \pi r^2$$
$$= \frac{22}{7} \times 45.5 \times 45.5 = 6506.5 \text{ m}^2$$
$$\text{Area of track} = \text{Outer area of track} - \text{inner area of track}$$
$$\text{Area of track} = 6506.5 \text{ m}^2 - 4658.5 \text{ m}^2 = 1848 \text{ m}^2.$$

8. Area of outer part = 1886.5 cm^2

Area of inner part = 1386 cm^2

Let raidus of outer part = r_1

and radius of inner part = r_2

than, $\pi r_1^2 = 1886.5\,\text{cm}$

$$\frac{22}{7} \times r_1^2 = 1886.5$$

$$r_1^2 = \frac{1886.5 \times 7}{22}$$

$$r_1^2 = 600.25$$

$$r_1 = \sqrt{600.25}$$

$$r_1 = 24.5\,\text{cm}$$

$$\pi r_2^2 = 1368\,\text{cm}$$

$$\frac{22}{7} \times r_2^2 = 1386$$

$$r_2^2 = \frac{1386 \times 7}{22}$$

$$r_2^2 = \frac{1386 \times 7}{22}$$

$$r_2 = \sqrt{441}$$

$$r_2 = 21\,\text{cm}$$

So, width of the ring $= r_1 - r_2$

$= 24.5\,\text{cm} - 21\,\text{cm}$

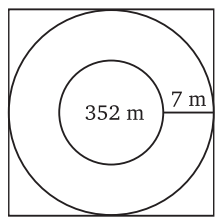
$= 3.5\ \text{cm}$

9. Circumference of circular park $= 352$ m

$$2\pi r_1 = 352\,\text{m}$$

$$2 \times \frac{22}{7} \times r_1 = 352\,\text{m}$$

$$r_1 = \frac{352 \times 7}{2 \times 22} = 56\,\text{m}$$



Area of outer ring $= \pi r_2^{\,2}$

outer radius $= 56 + 7 = 63\,\text{m}$

Area of outer ring $= \frac{22}{7} \times 63 \times 63 = 12474\,\text{m}^2$

Area of inner ring $= \pi r_1^{\,2}$

$$\frac{22}{7} \times 56 \times 56 = 9856\,\text{m}^2$$

$$\text{Area of road} = 12474\,\text{m}^2 - 9856\,\text{m}^2 = 2618\,\text{m}^2.$$

10.
$$\text{Perimeter of square} = 4 \text{ side}$$
$$132 = 4 \times \text{side}$$
$$\text{side} = \frac{132}{4} = 33$$
$$\text{Area of square} = (\text{side})^2 = 33 \times 33 = 1089\,\text{cm}^2$$
$$\text{Circumference of circle} = 132\,\text{cm} = 2\pi r$$
$$132\,\text{cm} = 2 \times \frac{22}{7} \times r$$
$$r = \frac{132 \times 7}{2 \times 22} = 21\,\text{cm}$$
$$\text{Area of circle} = \pi r^2$$
$$= \frac{22}{7} \times 21 \times 21 = 1386\,\text{cm}^2$$
$$\text{Difference} = 1386\,\text{cm}^2 - 1089\,\text{cm}^2 = 297\,\text{cm}^2$$

So, area of circle is greater by 297 cm^2.

11. Side of equilateral triangle $= 12\,\text{cm}$

$$\text{Area of equilateral triangle} = \frac{\sqrt{3}}{4} \times (\text{side})^2$$
$$= \frac{\sqrt{3}}{4} \times 12 \times 12$$
$$= \frac{1.732}{4} \times 12 \times 12 = 62.352\ \text{cm}^2$$
$$\text{Area of circle} = \pi r^2 = \frac{22}{7} \times 3.5 \times 3.5 = 38.5\ \text{cm}^2$$
$$\text{Area of shaded part} = 62.352\ \text{cm}^2 - 38.5\ \text{cm}^2$$
$$= 23.852\ \text{cm}.$$

12. Side of squares $= 21\,\text{cm}$

$$\text{Area of squares} = 21 \times 21 = 441\,\text{cm}^2$$
$$4 \times \frac{1}{4}\,\text{circle} = 1\,\text{circle}$$

$$\text{diameter} = 21\,\text{cm}$$
$$\text{radius} = 21 \div 2 = 10.5\ \text{cm}$$
$$\text{Area of circle} = 10.5 \times 10.5 \times \frac{22}{7} = 346.5\ \text{cm}^2$$
$$\text{Area of shaded part} = 441 - 346.5\ \text{cm}^2 = 94.5\ \text{cm}^2$$

Multiple Choice Questions

Tick (✓) the correct option :

1. (c) **2.** (b) **3.** (c) **4.** (b) **5.** (b)

BRAIN BOOSTER

1. Let side of square $= 7\,\text{cm}$

Perimeter of equre $= 4 \times 7\ \text{cm} = 28\,\text{cm}$

Radius of circle $= 7\,\text{cm}$

Perimeter of circle $= 2 \times \frac{22}{7} \times 7\,\text{cm} = 44\ \text{cm}$

Here, we see that the perimeter of circle is greater than sequare.

2. In first figure :

$$\text{side of square} = 16\,\text{cm}$$
$$\text{Area} = 16 \times 16\,\text{cm}^2 = 256\,\text{cm}^2$$
$$\text{Area of circle} = \pi r^2$$
$$r = 16 \div 2 = 8$$
$$= 3.14 \times 8 \times 8 = 200.96\ \text{cm}^2$$

Area of shaded part

$$(256 - 200.96)\ \text{cm}^2 = 55.04\ \text{cm}^2$$

In second figure :

$$\text{Radius of one circle} = \frac{1}{2} \times 4\ \text{cm} = 2\,\text{cm}$$
$$\text{Area} = \pi r^2 = \frac{22}{7} \times 2 \times 2\ \text{cm}$$
$$= 3.14 \times 2 \times 2 = 12.56\ \text{cm}^2$$
$$\text{Area of 16 circle} = 12.56 \times 16 = 200.96\ \text{cm}^2$$
$$\text{Area of square} = 16 \times 16 = 256\,\text{cm}^2$$
$$\text{Area of shaded part} = 256 - 200.96\ \text{cm}^2$$
$$= 55.04\ \text{cm}^2$$

Chapter

14 Data Handling

Exercise 14.1

1. The scores 13, 9, 10, 12, 1, 3, 4, 4

$$\text{Arithmetic mean} = \frac{\text{Sum of all observations}}{\text{Number of obscrvations}}$$

$$= \frac{13+9+10+12+1+3+4+4}{8} = \frac{56}{8} = 7$$

2.

$$\begin{aligned} \text{mean} &= 7 \\ \text{Mean} &= 9 \\ \text{number} &= 6 \\ \text{Mean} &= \frac{\text{Sum of number}}{\text{number}} \\ 9 &= \frac{5+7+a+8+10+11}{6} \\ 9\times 6 &= 41+a \\ 54 &= 41+a \\ -a &= 41-54 \\ -a &= -13 \\ a &= 13 \end{aligned}$$

3. Ten odd number $= 1, 3, 5, 7, 9, 11, 13, 15, 17, 19$

$$\text{mean} = \frac{\text{sum of odd number}}{\text{Number}}$$

$$\text{mean} = \frac{1+3+5+9+11+13+15+17+19}{10} = \frac{100}{10} = 10$$

$$\text{mean} = 10$$

4. Mean $= 75$, Number $= 35$

$$\begin{aligned} \text{Sum of Numbers} &= 75\times 35 = 2625 \\ \text{Every number multiplied by 4} &= 2625\times 4 = 10500 \\ \text{New mean} &= \frac{10500}{75} = 140 \\ \text{Mean} &= 140. \end{aligned}$$

5. First 11 prime number = 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31

$$\text{mean} = \frac{2+3+5+7+11+13+17+19+23+29+31}{11}$$

$$= \frac{160}{11} = 14.54$$

6. If mean = 27, number = 5

$$\text{Sum of number} = 27 \times 5 = 135$$

Let x be added,

$$\text{New sum} = 135 + x$$

$$\text{Mean} = 25$$

$$\text{Mean} = \frac{\text{Sum of mean}}{\text{Number}}$$

$$25 = \frac{135+x}{6}$$

$$25 \times 6 = 135 + x$$

$$150 = 135 + x$$

$$x = 150 - 135 = 15$$

Thus, 15 is added.

7.

$$\text{Mean} = 8$$

$$\text{Mean} = \frac{\text{Sum of number}}{\text{Number}}$$

$$8 = \frac{5+9+6+x+3}{5}$$

$$40 = 23 + x$$

$$-x = 23 - 40$$

$$-x = -17$$

$$x = 17$$

8. Frequency distribution table :

Members of families	Tally mark	Frequency
2	|	1
3	|	1
5	||||	4

6	𝍸 |	6
7	𝍸	5
8	|||	3
Total		20

(a) The smallest family size is 1.
2 families are of the smallest size.

(b) 6 is the most common family size.

9. Calculate the arithmetic of mean the following scores :

(a) Scores : 10, 32, 14, 42, 20, 22, 38, 34, 27, 16, 9, 18, 17, 25, 36

$$\text{Arithmetic mean} = \frac{\text{Sum of scores}}{\text{Number of scores}}$$

$$= \frac{10+32+14+42+20+22+38+34+27+16+9+18+17+25+36}{15}$$

$$= \frac{360}{15} = 24$$

(b) Scores : 3.8, 4.2, 3.3, 3.7, 4, 3.7, 4.6, 3.9, 4.4, 4.4

$$\text{Arithmetic mean} = \frac{\text{Sum of scores}}{\text{Number of scores}}$$

$$= \frac{3.8+4.2+3.3+3.7+4+3.7+4.6+3.9+4.4+4.4}{10}$$

$$= \frac{40}{10} = 4$$

10. Number of player = 11

scores of players = 18, 5, 20, 61, 35, 16, 50, 0, 3, 20, 14

$$\text{Average score} = \frac{\text{Sum of scores}}{\text{Number of players}}$$

$$= \frac{18+5+20+61+35+16+50+0+3+20+14}{11}$$

$$= \frac{242}{11} = 22$$

Thus, average score is 22.

11. Frequency distribution table.

Marks of students	Tally mark	Frequency
9	𝍸 |	6
12	||||	4
17	||||	4
18	||	2
19	||||	4
20	|||	3
25	||	2
	Total Students	25

(a) Range of marks $= 25 - 9 = 16$

(b) 25 is the highest mark. (c) 9 marks

12.

Weekly wages	Tally marks	Workers
150	|||	3
200	||||	5
250	||||	4
300	||	2
350	|	1
	Total workers	15

(a) Range $350 - 150 = 200$. (b) 1 worker is getting ₹ 350.

(c) 3 workers are getting the minimum wages.

Exercise 14.2

1. Ascending order of marks

5, 9, 10, 12, 15, 16, 19, 20, 20, 20, 20, 23, 24, 25, 26

$$n = 15$$

$$\text{Median} = \frac{n+1}{2}\text{th term} = \frac{15+1}{2}\text{th term}$$

$$= \frac{16}{2}\text{th term} = 8\text{ th term} = 20$$

$$\text{Median} = 20$$

$$\text{Mode} = 20$$

2. Ascending Order $= 12, 12, 13, 13, 14, 14, 14, 16, 19$

$$n = 9$$

$$\text{median} = \frac{n+1}{2}\text{th term}$$

$$= \frac{9+1}{2}\text{ th term} = \frac{10}{2}\text{th term} = 5\text{ th term}$$

$$\text{Median} = 14$$

$$\text{Mode} = 14.$$

3. Ascending Order

49, 60, 70, 75, 78, 78

$$n = 6$$

Now, the two middle items are 3th and 4th and their value are 70 and 75.

$$\text{Median} = \text{mean of 70 and 75} = \frac{70+75}{2} = 72.5$$

$$\text{Mode} = 78.$$

4. Number arrange in ascending order 1, 2, 3, 4, 5, 6, 6.

$$N = 7$$

$$\text{Median} = \frac{n+1}{2}\text{ th term}$$

$$\frac{7+1}{2}\text{ th term } \frac{8}{2}\text{ th term} = 4\text{ th term}$$

$$\text{Median} = 4$$

And, $\text{Mode} = 6$

5. (a) Mode = 8 (b) Mode = 6 and 3

Exercise 14.3

1. (a) Bar graph shows the number of vehicles passing through a particular crossing.

(b) The hourly traffic is maximum between 9-10 am. The maximum number of vehicles passed in this period is 400.

(c) The hourly traffic is minimum between 12 noon-1 pm.
The minimum number of vehicles passed in this period is 150.

(d) Total number of vehicle passing through is 2525.

2. (a) Bar graph shows the number of news paper published in 8 languages.

(b) Total number of newspapers published in English, Hindi, Bengali and Punjabi.

$4500+3000+3200+1000=11700.$

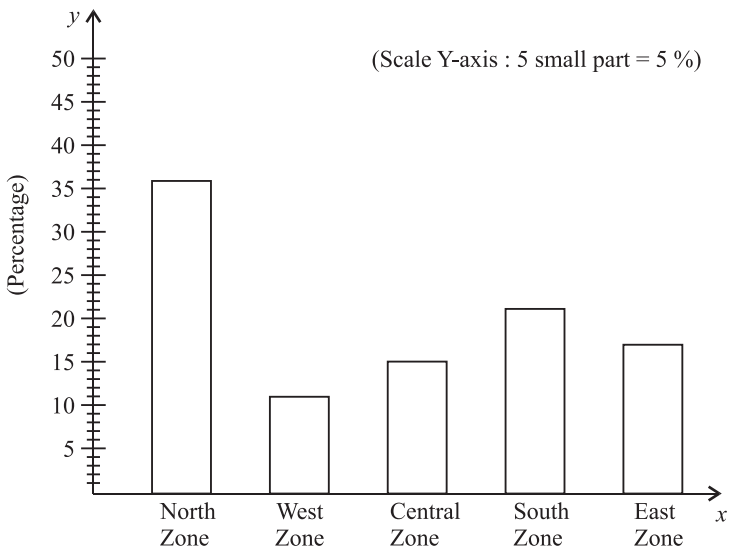
(c) The excess number of newspapers published in English over these published in Bengali $4500-3200=1300.$

(d) Percent is the number of newspapers published in English of the total number of newspaper.

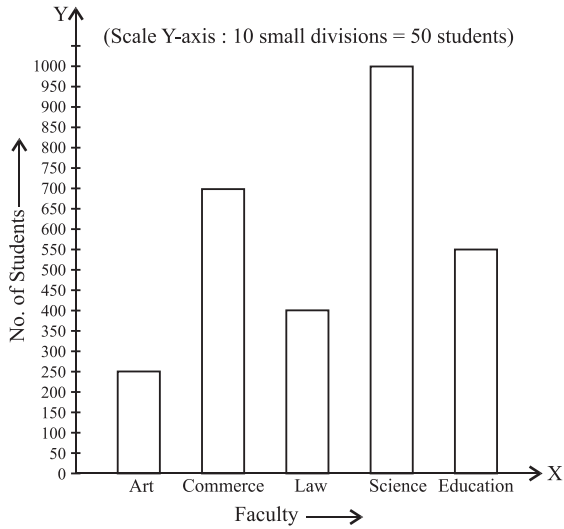
$$\frac{4500}{21500}\times 100=\frac{900}{43}$$

$$=20\frac{40}{43}\%$$

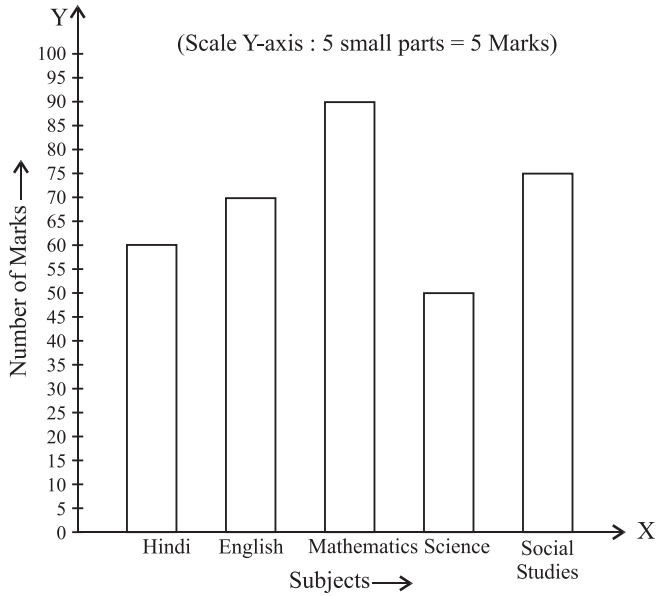
3.



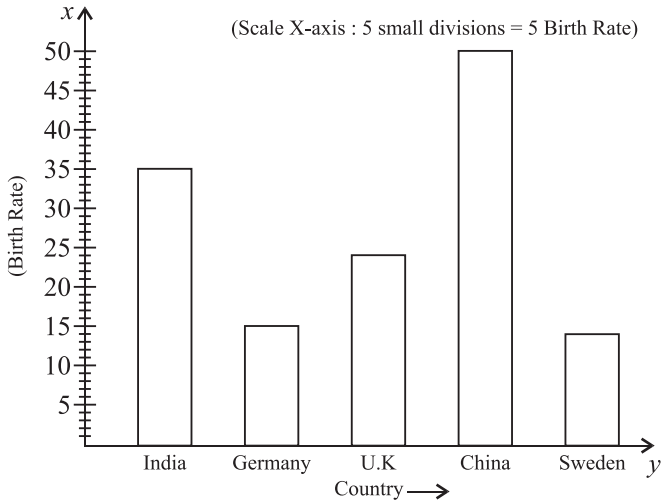
4.


Y
(Scale Y-axis : 10 small divisions = 50 students)
No. of Students
1000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
X
Art
Commerce
Law
Science
Education
Faculty

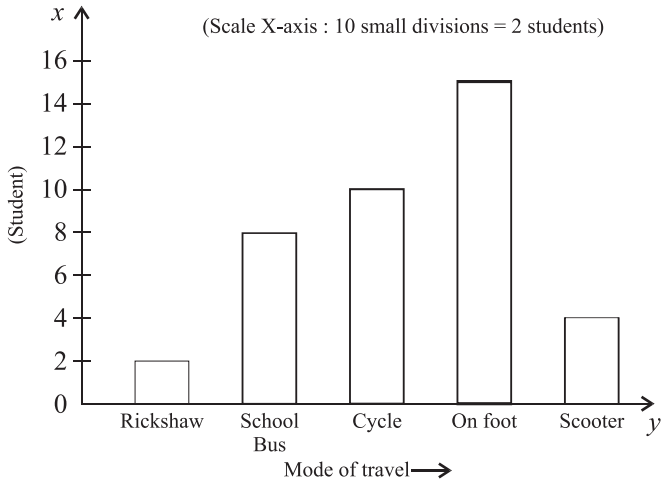
5.


Y
(Scale Y-axis : 5 small parts = 5 Marks)
Number of Marks
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
X
Hindi
English
Mathematics
Science
Social Studies
Subjects

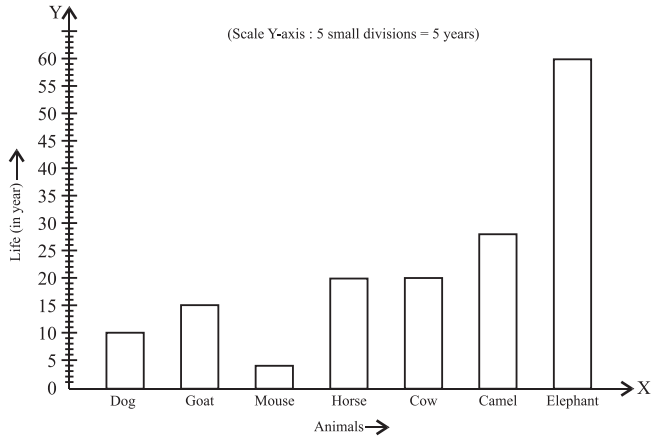
6.


x
(Scale X-axis : 5 small divisions = 5 Birth Rate)
50
45
40
35
30
25
20
15
10
5
(Birth Rate)
India
Germany
U.K
China
Sweden
y
Country

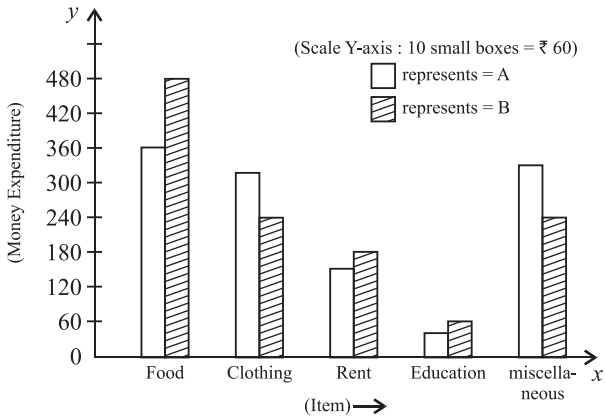
7.


x
(Scale X-axis : 10 small divisions = 2 students)
16
14
12
10
8
6
4
2
0
(Student)
Rickshaw
School Bus
Cycle
On foot
Scooter
y
Mode of travel

8.



BRAIN BOOSTER



Exercise 14.4

S. No.	Number of Total outcomes	Possible Outcomes	Probability of each outcome
1.	5	a, e, i, o, u	$\frac{1}{5}$
2.	6	1, 2, 3, 4, 5, 6	$\frac{1}{6}$

3.	5	M, A, R, C, H	$\frac{1}{5}$
4.	$2+2+3=7$	W, W, R, R, B, B, B	$\frac{1}{7}$
5.	4	K_1, K_2, K_3, K_4	$\frac{1}{4}$
6.	4	HH, H T, TH, TT	$\frac{1}{4}$

Exercise 14.5

1. Total balls $= 2+3+4+5=14$

Total outcomes $=14$

(a) Favourable outcomes $=2$

$$\text{Probability} = \frac{2}{14} = \frac{1}{7}$$

(b) Favourable outcome $=3$

$$\text{Probability} = \frac{3}{14}$$

(c) Favourable outcomes $=4$

$$\text{Probability} = \frac{4}{14} = \frac{2}{7}$$

(d) Favourable outcomes $=5$

$$\text{Probability} = \frac{5}{14}$$

2. The number of faces of the dice (Total outcome) $=6$

(a) an odd number $=1, 3, 5$

Fovourable out comes $=3$

$$\text{Probability} = \frac{\text{Favourable outcome}}{\text{Total outcome}}$$

$$= \frac{3}{6} = \frac{1}{2}$$

(b) an even number $=2, 4, 6$

Favourable outcomes $=3$

$$\text{Probability} = \frac{3}{6} = \frac{1}{2}$$

3. The number of face of dice (Total outcome) $= 6$

(a) Getting upper face $= 3$

Favourable out come $= 1$

$$\text{Probability} = \frac{1}{6}$$

(b) Less than 3 getting 1, 2

Favourable outcomes $= 2$

$$\text{Probability} = \frac{2}{6} = \frac{1}{3}$$

(c) More than 3 getting 4, 5, 6

Favourable out comes $= 3$

$$\text{Probability} = \frac{3}{6} = \frac{1}{2}$$

(d) 8 No possible $= 0$

4. Total balls $(2+3+4) = 9$ (Total out come)

(a) Favourable outcome

(red ball) $= 2$

$$\text{Probability} = \frac{2}{9}$$

(b) Favourable outcome

(black ball) $= 3$

$$\text{Probability} = \frac{3}{9} = \frac{1}{3}$$

(c) Favourable outcome

(blue ball) $= 4$

$$\text{Probability} = \frac{4}{9}$$

5. Total out comes $3+4+5+2=14$

(a) Masala chips $= 5$

Favourable outcomes $= 5$

$$\text{Probability} = \frac{5}{14}$$

(b) Pudina chips $= 2$

Favourable outcomes $= 2$

$$\text{Probability} = \frac{2}{14} = \frac{1}{7}$$

(c) Plain Salted chips $= 4$

Favourable outcomes $= 4$

$$\text{Probability} = \frac{4}{14} = \frac{2}{7}$$

(d) Cheese and onion chips $= 3$

$$\text{Probability} = \frac{3}{14}$$

6. Total out come $= (H, T) = 2$

Favourable out come $= 1$

$$\text{Probability} = \frac{1}{2}$$

7. Total out comes $= 300$ times

(a) Number of time head appeared $= 120$

$$\text{Probability} = \frac{\text{Favourable outcomes}}{\text{Total outcomes}} = \frac{120}{300} = \frac{2}{5}$$

(b) Number of time tail appeared $= 300 - 120 = 180$

$$\text{Probability} = \frac{180}{300} = \frac{3}{5}$$

8. The number of face of dice (Total outcome) $= 6$

(a) Getting upper face $= 2$

Favourable outcome $= 1$

$$\text{Probability} = \frac{1}{6}$$

(b) Getting upper face less than $4 = 1, 2, 3$

$$\text{Probability} = \frac{3}{6} = \frac{1}{2}$$

(c) Getting upper face $=$ an odd number $= 1, 3, 5$

$$\text{Probability} = \frac{3}{6} = \frac{1}{2}$$

9. Total outcome $= 2$

Favourable outcome $= 1$

$$\text{Probability} = \frac{1}{2}$$

Multiple Choice Questions

Tick (✓) the correct option :

1. (d) **2.** (b) **3.** (a) **4.** (b) **5.** (b) **6.** (d) **7.** (b) **8.** (a)

BRAIN BOOSTER

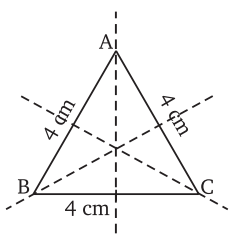
- Average of three numbers = 20
  Sum of number $= 20 \times 3 = 60$
  One number $= 14$
  Sum of remaining two numbers $= 46 = (60 - 14)$
  Average of two numbers $= \frac{46}{2} = \mathbf{23}$
- Do it yourself.
- Do it yourself.

Chapter

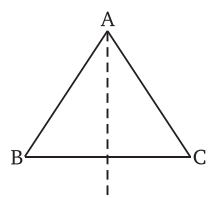
15 Symmetry

Exercise 15.1

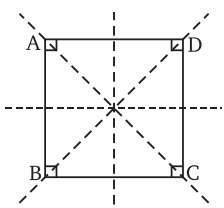
1. (a)



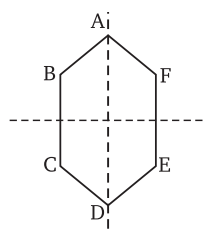
(b)



(c)



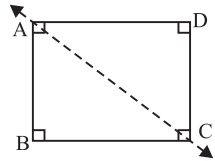
(d)



2. (a) corresponding sides = AB, CD; AD, BC

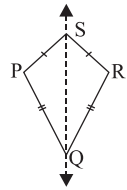
corresponding angles

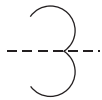
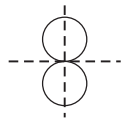
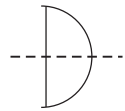
$= \angle A, \angle C$; $\angle B, \angle D$.

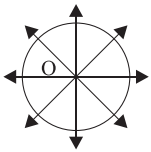


(b) corresponding sides = PS, SR; PQ, RQ

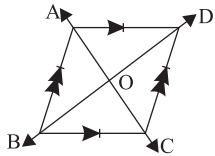
corresponding angles = $\angle R, \angle P$; $\angle S, \angle Q$



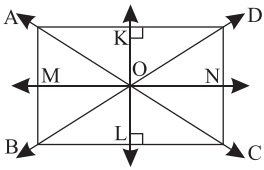
3. (a)  (b)  (c)  (d) 

4. (a) 

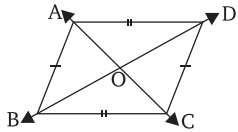
Number of lines of symmetry = infinite

(b) 

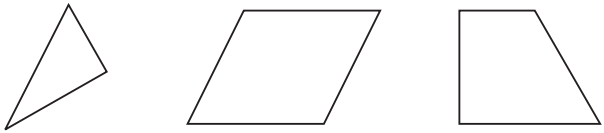
Number of lines of symmetry = 2

(c) 

Number of lines of symmetry = 2

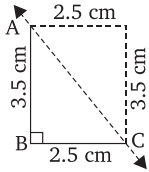
(d) 

Number of lines of symmetry = 0

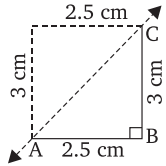
5. 

A scalene triangle, a parallelogram and a trapezium do not have any lines of symmetry.

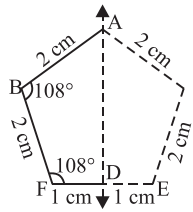
6. (a)



(b)

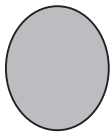


(c)

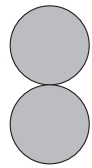


Exercise 15.2

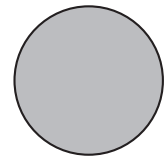
1. (b)



(e)



(f)

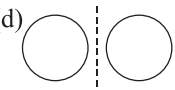


2. (a)

(b)

(c)

(d)



3. Parallelogram, no line of symmetry but has rotational symmetry of order 2.

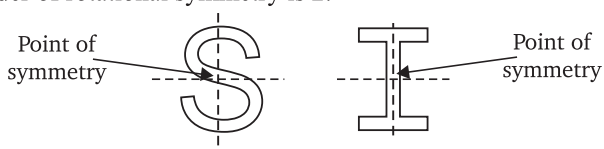
4. A, B, C are three letters which have line symmetry but have no rotational symmetry.

5. No, Trapezium has no rational symmetry.

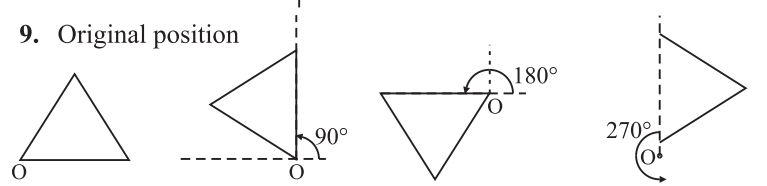
6. The pentagon shown above matches itself 5 times as it is rotated, it is said to have rotational symmetry of order 5.

7. H, I, O are three letters which have both line of symmetry and rotational symmetry.

8. Oder of rotational symmetry is 2.



9. Original position



Original position | Rotated at an angle 90° | Rotated at an angle 180° | Rotated at an angle 270°

Rotated at an angle 90°.

Rotated at an angle 180°.

Rotated at an angle 270°.

Multiple Choice Questions

Tick (✓) the correct option :

1. (c) **2.** (a) **3.** (a) **4.** (c) **5.** (a)

BRAIN BOOSTER

1. 3 o'clock, 6 o'clock, 9 o'clock.

2. The alphabet having both type of symmetries are *H*, *I*, *O* and *X*.

Chapter

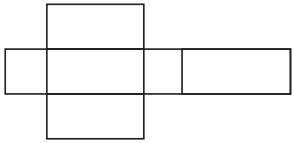
16 3D-Visualisation

Exercise 16.1

1. A dice is cube, each face marked with a number between 1 and 6. Number of faces of dice a different from each other. The sum of two number on the opposite is always 7. In this way we make a net of dice. On this basis we can say that the given figure is not a net of dice.

2. Identify the nets which can be used to form a cuboid?

(c)

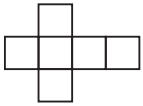


3. Identify the solids whose nets are given below :

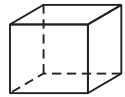
(a) Cylinder (b) Cone (c) Cube

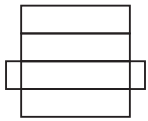
4.

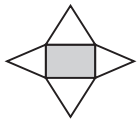
(a)

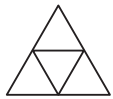


(iii)

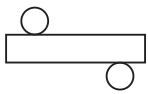


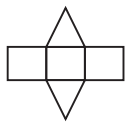
(b) 

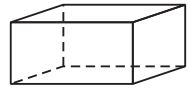
(c) 

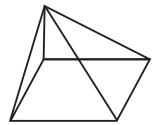
(d) 

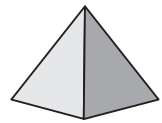
(e) 

(f) 

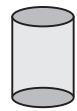
(g) 

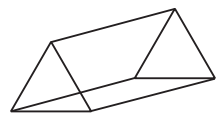
(iv) 

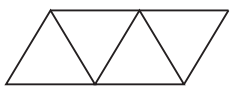
(i) 

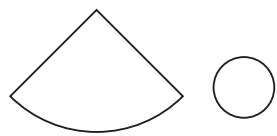
(ii) 

(vi) 

(vii) 

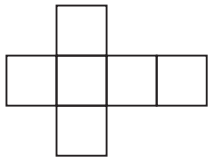
(v) 

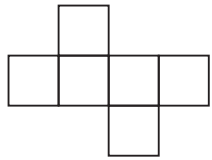
5. (a) 

(b) 

(c) 

(d) 

6. (c) 

(d) 

7. (a) Triangular prism
$V = 6, F = 5, E = 9$
$6 + 5 - 9 = 2$

(b) A cube
$V = 8, F = 6, E = 12$
$8 + 6 - 12 = 2$

(c) A hexagonal pyramid
$V = 7, F = 7, E = 12$
$7 + 7 - 12 = 2$

8. Volume of the cuboid $= 8 \times 5 \times 6\,\text{cm}$

$= 240\,\text{cm}^3$

Edge of the cube to be fit $= 1\,\text{cm}$

$\therefore$ Volume of the cube $= 1 \times 1 \times 1\,\text{cm}$

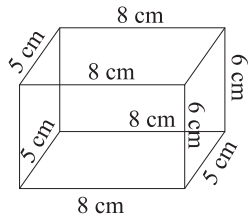
$= 1\,\text{cm}^3$

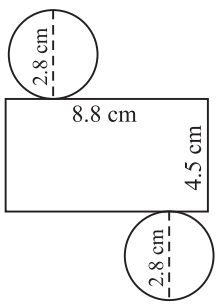
Number of cubes can be fit

$= 240\,\text{cm}^3 \div 1\,\text{cm}^3$

$= 240$

$\therefore$ 240 cubes can be fit in the cuboid.



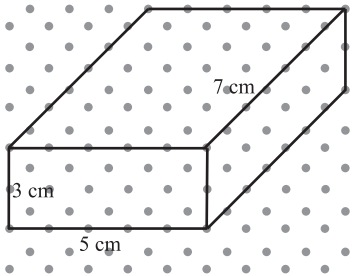
9. 

2 circular, 1 curved

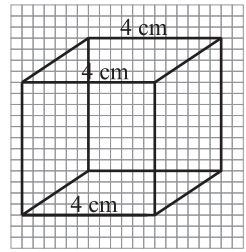
10. (a) Cone
(b) Cylinder
(c) Triangular Prism
(d) Square pyramid

Exercise 16.2

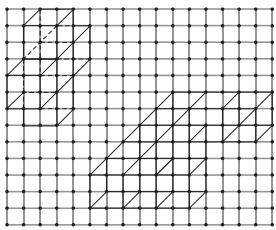
1.



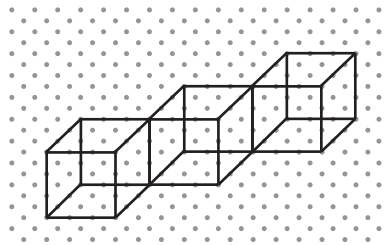
2.



3.

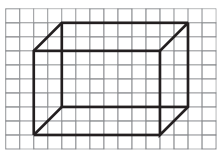


4.



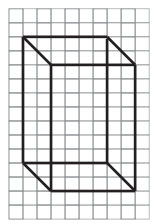
5. Do it yourself

6. (a)



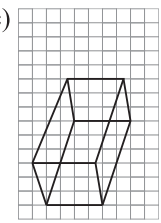
2 × 3 × 5 cm

(b)



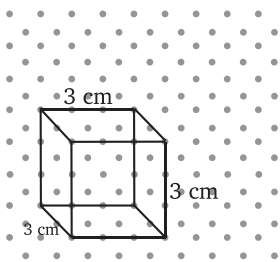
2 × 3 × 5 cm

(c)

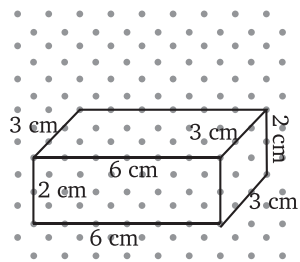


2 × 3 × 5 cm

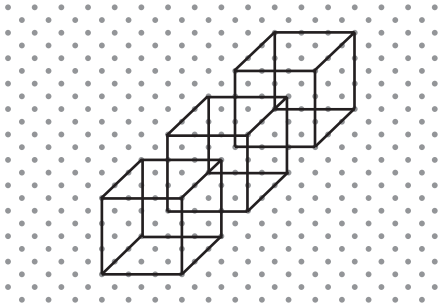
7. (a)



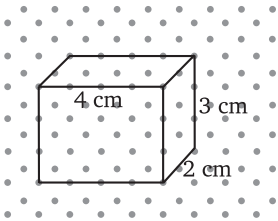
(b)



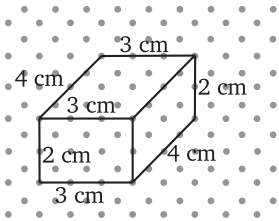
8.



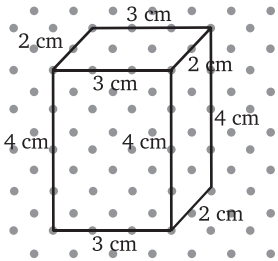
9. (a)



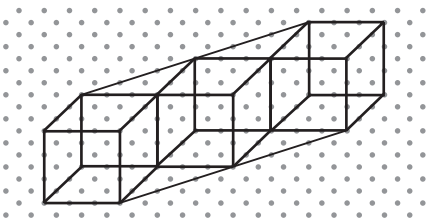
(b)



(c)



10.



Multiple Choice Questions

Tick (✓) the correct option :

1. (a) **2.** (a) **3.** (c) **4.** (a)