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NEP 2020

MATHEMATICS

Teacher's Manual (Class 8)

- Learning Tips
- Maths Lab Activity
- Model Test Paper
- MCQs

Chapter

1 Rotational Numbers

1. Fill in the blanks :

(a) $\frac{-14}{63} = \frac{\boxed{-2}}{9} = \frac{-18}{\boxed{81}}$ (b) $\frac{-5}{-12} = \frac{\boxed{25}}{60} = \frac{-35}{\boxed{-84}}$

2. Check, which of the following are equivalent :

(a) $\frac{-9}{11}, \frac{81}{-99}$ are same as $\frac{-9}{11}$ an $\frac{-81}{99}$

Now, $-9 \times 99 = -891$

and $11 \times (-81) = -891$

Thus, $\frac{-9}{11} = \frac{81}{-99}$

(b) $\frac{-12}{15}, \frac{36}{-60}$ are same as, $\frac{-12}{15}$ and $\frac{-36}{60}$

Now, $-12 \times 60 = -720$

and, $15 \times (-36) = -540$

Thus, $\frac{-12}{15} \neq \frac{36}{-60}$

(c) $\frac{-5}{11}, \frac{-15}{-33}$ are same as, $\frac{-5}{11}$ and $\frac{15}{33}$

Now, $-5 \times 33 = -165$

and, $11 \times 5 = 165$

Thus, $\frac{-5}{11} \neq \frac{-15}{-33}$

3. Arrange the following rational numbers in ascending order :

(a) First we write each rational number with a positive denominato, $\frac{-3}{10}, \frac{-7}{15}, \frac{-11}{20}, \frac{-17}{30}$

LCM of 10, 15, 20 and 30 is 60.

Now, $\frac{-3}{10} = \frac{-3 \times 6}{10 \times 6} = \frac{-18}{60}$

$$\frac{-7}{15}=\frac{-7\times 4}{15\times 4}=\frac{-28}{60}$$

$$\frac{-11}{20}=\frac{-11\times 3}{20\times 3}=\frac{-33}{60}$$

$$\frac{-17}{30}=\frac{-17\times 2}{30\times 2}=\frac{-34}{60}$$

So, $\frac{-17}{30}<\frac{-11}{20}<\frac{-7}{15}<\frac{-3}{10}$

$\Rightarrow$ $\frac{17}{-30}<\frac{-11}{20}<\frac{7}{-15}<\frac{-3}{10}$

(b) First we write each rational number with a positive denominator.

$$\frac{-2}{5},\frac{-3}{7},\frac{1}{9},\frac{7}{10}$$

LCM of 5, 7, 9 and 10 is 630

Now, $\frac{-2}{5}=\frac{-2\times 126}{5\times 126}=\frac{-252}{630}$

$$\frac{-3}{7}=\frac{-3\times 90}{7\times 90}=\frac{-270}{630}$$

$$\frac{1}{9}=\frac{1\times 70}{9\times 70}=\frac{70}{630}$$

$$\frac{7}{10}=\frac{7\times 63}{10\times 63}=\frac{441}{630}$$

So, $\frac{-3}{2}<\frac{-2}{5}<\frac{1}{9}<\frac{7}{10}$

$\Rightarrow$ $\frac{-3}{7},\frac{2}{-5}<\frac{1}{-9}<\frac{7}{10}$

(c) Given numbers are $\frac{-3}{5},\frac{7}{10}$ and $\frac{-5}{8}$.

First we wirte each rational number with positive denominator.

$$\frac{-3}{5}, \frac{-7}{10} \text{ and } \frac{-5}{8}$$

LCM of 5, 10 and $8 = 40$

Now, $\quad \frac{-3}{5} = \frac{-3 \times 8}{5 \times 8} = \frac{-24}{40}$

$$\frac{-7}{10} = \frac{-7 \times 4}{10 \times 4} = \frac{-28}{40}$$

$$\frac{-5}{8} = \frac{-5 \times 5}{8 \times 5} = \frac{-25}{40}$$

So, $\quad \frac{-7}{10} < \frac{-5}{8} < \frac{-3}{5}$

$\Rightarrow \quad \frac{7}{-10} < \frac{-5}{8} < \frac{-3}{5}$

4. Arrange the following rational numbers is descending order:

(a) Given number are,

$$\frac{4}{5}, \frac{-2}{3}, \frac{-1}{2}, \frac{-4}{7}$$

$\therefore$ LCM of 5, 3, 2, and $7 = 210$

Now, $\quad \frac{4}{5} = \frac{4 \times 42}{5 \times 42} = \frac{168}{210}$

$$\frac{-2}{3} = \frac{-2 \times 70}{3 \times 70} = \frac{-140}{210}$$

$$\frac{-1}{2} = \frac{-1 \times 105}{2 \times 105} = \frac{-105}{210}$$

$$\frac{-4}{7} = \frac{-4 \times 30}{7 \times 30} = \frac{-120}{210}$$

So, $\quad \frac{4}{5} > \frac{-1}{2} > \frac{-4}{7} > \frac{-2}{3}$

(b) Given numbers are,

$$\frac{-3}{4}, \frac{5}{-12}, \frac{-7}{16}, \frac{9}{-24}$$

$\Rightarrow \quad \frac{-3}{4}, \frac{-5}{12}, \frac{-7}{16}, \frac{-9}{24}$

$\therefore$ LCM of 4, 12, 16 and $24 = 48$

Now, $\frac{-3}{4} = \frac{-3 \times 12}{4 \times 12} = \frac{-36}{48}$

$\frac{-5}{12} = \frac{-5 \times 4}{12 \times 4} = \frac{-20}{48}$

$\frac{-7}{16} = \frac{-7 \times 3}{16 \times 3} = \frac{-21}{48}$

$\frac{-9}{24} = \frac{-9 \times 2}{24 \times 2} = \frac{-18}{48}$

Hence, $\frac{9}{-24} > \frac{5}{-12} > \frac{-7}{16} > \frac{-3}{4}$.

(c) Given number are,

$\frac{4}{-9}, \frac{-5}{12}, \frac{7}{-18}, \frac{-2}{3}$

$\Rightarrow \quad \frac{-4}{9}, \frac{-5}{12}, \frac{-7}{18}, \frac{-2}{3}$

$\therefore$ LCM of 9, 12, 18 and $3 = 36$.

Now, $\frac{-4}{9} = \frac{-4 \times 4}{9 \times 4} = \frac{-16}{36}$

$\frac{-5}{12} = \frac{-5 \times 3}{12 \times 3} = \frac{-15}{36}$

$\frac{-7}{18} = \frac{-7 \times 2}{18 \times 2} = \frac{-14}{36}$

$\frac{-2}{3} = \frac{-2 \times 12}{3 \times 12} = \frac{-24}{36}$

Hence, $\frac{7}{-18} > \frac{-5}{12} > \frac{4}{-9} > \frac{-2}{3}$

5. We have,

$x = \frac{3}{7}$ and $y = \frac{1}{-2}$

Now, $|x+y| = \left|\frac{3}{7} - \frac{1}{2}\right| = \left|\frac{6-7}{14}\right|$

$= \left|\frac{-1}{14}\right| = \frac{1}{14}$

and, $|x| + |y| = \left|\frac{3}{7}\right| + \left|-\frac{1}{2}\right| = \frac{3}{7} + \frac{1}{2} = \frac{6+7}{14} = \frac{13}{14}$

So, $|x+y| < |x| + |y|$ Hence proved.

6. We have

$x = \frac{-4}{5}$ and $y = \frac{3}{-7}$

Now, $|x \times y| = \left|\frac{-4}{5} \times \frac{3}{-7}\right| = \left|\frac{12}{35}\right| = \frac{12}{35}$

and, $|x| \times |y| = \left|\frac{-4}{5}\right| \times \left|\frac{3}{-7}\right| = \frac{4}{5} \times \frac{3}{7} = \frac{12}{35}$

So, $|x \times y| = |x| \times |y|$ Hence proved.

7. (a) $x = \frac{-5}{9}$

$\therefore \quad -(-x) = -\left(\frac{-5}{9}\right) = \frac{5}{9}$

and, $x = \frac{-5}{9}$

So, $-(-x) = x$ Hence verified.

(b) $x = \frac{-9}{-11}$

$\therefore \quad -(-x) = -\left(-\times \frac{+9}{+11}\right) = -\left(\frac{-9}{11}\right) = \frac{9}{11}$

and, $x = \frac{-9}{-11} = \frac{9}{11}$

So, $-(-x) = x$ Hence verified.

8. Say, True or False :

(a) False (b) True (c) False (d) False (e) True (f) False

Exercise 1.2

1. Write the additive inverse of each of the following :

(a) Additive inverse of $\frac{1}{7} = \frac{-1}{7}$

(b) Additive inverse of $\left(\frac{-7}{-5}\right) = -\left(\frac{+7}{+5}\right) = \frac{-7}{5}$

(c) Additive inverse of $\left(\frac{13}{11}\right) = \frac{-13}{11}$

(d) Additive inverse of $\left(\frac{-6}{13}\right) = -\left(\frac{-6}{13}\right) = \frac{6}{13}$

2. Find the multiplicative inverse of the following :

(a) Multiplicative inverse of $\left(\frac{-6}{7}\right) = \frac{7}{-6}$

(b) Multiplicative inverse of $\left(\frac{-7}{9}\right) = \frac{-9}{7}$

(c) $\frac{2}{15} \times \frac{3}{8} = \frac{\cancel{2}^{1} \times \cancel{3}^{1}}{\cancel{15}_{5} \times \cancel{8}_{4}} = \frac{1 \times 1}{5 \times 4} = \frac{1}{20}$

$\therefore$ Multiplicative inverse of $\left(\frac{1}{20}\right) = \frac{20}{1}$

(d) $-1 \times \frac{\cancel{-}12}{\cancel{-}17} = -1 \times \frac{12}{17} = \frac{-12}{17}$

$\therefore$ Multiplicative inverse of $\left(\frac{-12}{17}\right) = \frac{17}{-12}$

3. Solve the following using suitable rearrangement :

(a) $\frac{1}{7} \times \frac{-2}{9} \times \frac{14}{15} \times \frac{18}{12} = \frac{1 \times (-2) \times \cancel{14}^{2^{1}} \times \cancel{18}^{3^{1}}}{\cancel{7} \times 9 \times \cancel{15}_{5} \times \cancel{12}_{6_{1}}}$

$= \frac{1 \times (2)}{9 \times 5} = \frac{-2}{45}$

(b) $\frac{\cancel{9}^{1}}{\cancel{11}_{1}} \times \frac{\cancel{35}^{7}}{\cancel{6}_{1}} \times \frac{\cancel{12}^{1}}{\cancel{5}_{1}} \times \frac{\cancel{-55}^{-5}}{\cancel{18}_{9_{1}}} = \frac{1 \times 7 \times 1 \times (-5)}{1 \times 1 \times 1 \times 1}$

$= -35$

(c) $\frac{-\cancel{15}}{\cancel{13}} \times \frac{\cancel{17}}{\cancel{9}} \times \frac{-\cancel{26}}{\cancel{5}} \times \frac{-\cancel{27}}{\cancel{34}}$

$= \frac{(-3) \times 1 \times (-\cancel{2}^{-1}) \times (-3)}{1 \times 1 \times 1 \times \cancel{2}} = (-3) \times (-1) \times (-3) = -9$

4. Sum of the numbers $= \frac{-2}{15}$

One of the number $= \frac{2}{3} + \frac{3}{5} - \frac{1}{1}$

$= \frac{10 + 9 - 15}{15} = \frac{4}{15}$

$\therefore$ The other number = Sum − One number

$= \frac{-2}{15} - \frac{4}{15} = \frac{-6}{15} = \frac{-2}{5}$

Hence, the required other number is $\frac{-2}{5}$.

5. Simplify :

(a) $-\frac{2}{5} + \frac{-5}{10} - \frac{-4}{7} = \frac{-2}{5} - \frac{5}{10} + \frac{4}{7}$

$= \left(\frac{-4-5}{10}\right) + \frac{4}{7} = \frac{-9}{10} + \frac{4}{7} = \frac{-63 + 40}{70}$

$= \frac{-23}{70}$

(b) $\left(-\frac{13}{9} \div \frac{2}{15}\right) \times \left(\frac{7}{3} \div \frac{5}{8}\right) + \left(\frac{3}{5} \times \frac{1}{2}\right)$

$= \left(\frac{-13}{9} \times \frac{15}{2}\right) \times \left(\frac{7}{3} \times \frac{8}{5}\right) + \frac{3}{10}$

$= \frac{-13}{9} \times \frac{\cancel{15}^{\cancel{3}}}{\cancel{2}} \times \frac{7}{\cancel{3}} \times \frac{\cancel{8}^{4}}{\cancel{5}_{1}} + \frac{3}{10}$

$= \frac{-91 \times 4}{9} + \frac{3}{10} = \frac{-91 \times 4 \times 10 + 3 \times 9}{90}$

$= \frac{-3640 + 27}{90} = \frac{-3610}{90}$

(c) $-\left(\frac{\cancel{3}}{11}\times\frac{-5}{\cancel{6}_2}\right)-\left(\frac{9}{12}\div\frac{3}{4}\right)-\left(\frac{\cancel{3}}{13}\times\frac{-6}{\cancel{15}_3}\right)$

$=\frac{5}{22}-\left(\frac{\cancel{9}\cancel{3}^1}{\cancel{12}\cancel{3}}\times\frac{\cancel{4}}{\cancel{3}}\right)-\left(\frac{\cancel{-6}^2}{\cancel{39}_{13}}\right)$

$=\frac{5}{22}-\frac{1}{1}+\frac{2}{13}=\frac{65-286+44}{22\times13}=\frac{-177}{286}$

(d) $\left(\frac{1}{2}\times\frac{1}{4}\right)-\left(1\times\frac{1}{4}\right)+\left(\frac{-7}{18}\div\frac{7}{-15}\right)$

$=\frac{1}{8}-\frac{1}{4}+\left(\frac{\cancel{-7}}{18}\times\frac{-15}{7}\right)=\frac{1}{8}-\frac{1}{4}+\frac{\cancel{15}^5}{\cancel{18}_6}$

$=\frac{3-6+20}{24}=\frac{17}{24}$

6. We have,

$x=\frac{3}{13}$, $y=\frac{-2}{7}$ and $z=\frac{-1}{2}$

Now, $x\times(y+z)=\frac{3}{13}\times\left(\frac{-2}{7}+\frac{-1}{2}\right)$

$=\frac{3}{13}\times\left(\frac{-2}{7}-\frac{1}{2}\right)$

$=\frac{3}{13}\times\left(\frac{-4-7}{14}\right)$

$=\frac{3}{13}\times\frac{-11}{14}=\frac{-33}{182}$

$x\times y+x\times z=\frac{3}{13}\times\left(\frac{-2}{7}\right)+\frac{3}{13}\times\left(\frac{-1}{2}\right)$

$=\frac{-6}{91}-\frac{3}{26}=\frac{-12-21}{182}$

$=\frac{-33}{182}$

So, $x \times (y+z) = x \times y + x \times z = \frac{-33}{182}$ Hence verified.

7. We have,

(a) $x = \frac{3}{5}, y = \frac{-2}{5}, z = \frac{-7}{5}$

Now, $x \times (y+2) = \frac{3}{5} \times \left(\frac{-2}{5} + \frac{-7}{5}\right)$

$= \frac{3}{5} \times \frac{-9}{5} = \frac{-27}{25}$

$x \times y + x \times z = \frac{3}{5} \times \frac{-2}{5} + \frac{3}{5} \times \frac{-7}{5}$

$= \frac{-6}{25} - \frac{21}{25} = \frac{-27}{25}$ Hence verified.

(b) $x = \frac{-5}{12}, y = \frac{7}{8}, z = \frac{-12}{3}$

Now, $x \times (y+z) = \frac{-5}{12} \times \left(\frac{7}{8} - \frac{12^4}{3}\right)$

$= \frac{-5}{12} \times \left(\frac{7-32}{8}\right)$

$= \frac{-5}{12} \times \frac{-25}{8} = \frac{125}{96}$

$x \times y + x \times z = \frac{-5}{12} \times \frac{7}{8} + \frac{-5}{12} \times \frac{-12}{3}$

$= \frac{-35}{96} + \frac{5}{3} = \frac{-35+160}{96}$

$= \frac{125}{96}$

So, $x \times (y+z) = x \times y + x \times z = \frac{125}{96}$ Hence verified.

8. Fill in the blanks :

(a) For every rational number $\frac{a}{b}, \frac{a}{b} \times \frac{\boldsymbol{b}}{\boldsymbol{a}} = 1$.

(b) The additive inverse of any rational number $\frac{a}{b}$ is $\left(\frac{-a}{b}\right)$.

(c) The multiplicative inverse of any rational number $\frac{a}{b}$ is **0**.

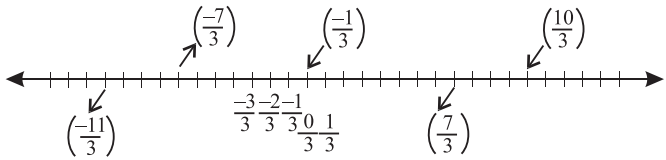
(d) The rational number **0** does not have a reciprocal.

(e) The rational number **1** is equal to its reciprocal.

(f) For every rational number $\frac{a}{b}, \frac{a}{b} \times \mathbf{0} = 0$.

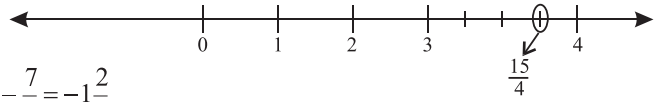
Exercise-1.3

1.

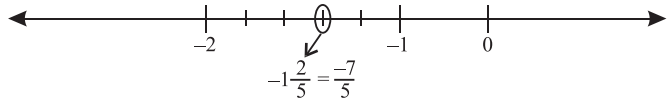


2. Represent the following rational numbers on number line :

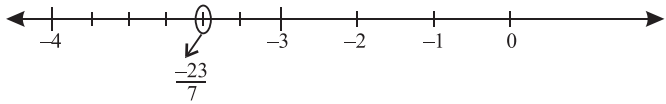
(a) $\frac{15}{4} = 3\frac{3}{4}$



(b) $-\frac{7}{5} = -1\frac{2}{5}$



(c) $-\frac{23}{7} = -3\frac{2}{7}$



3. Write two rational numbers between :

(a) We have

$\frac{1}{2} = \frac{4}{8} = \frac{8}{16}$ and $\frac{1}{4} = \frac{2}{8} = \frac{4}{16}$

$\therefore$ Required two rational no. between $\frac{1}{2}$ and $\frac{1}{4}$ are $\frac{7}{16}, \frac{6}{16}$.

(b) $\frac{-4}{5} = \frac{4 \times 7}{5 \times 7} = \frac{-28}{35}$

and, $\frac{-3}{7} = \frac{-3 \times 5}{7 \times 5} = \frac{-15}{35}$

$\therefore$ Two rational numbers between $\frac{-4}{5}$ and $\frac{-3}{7}$ are : $\frac{-27}{35}, \frac{-26}{35}$.

(c) $\frac{-2}{3} = \frac{-2 \times 3}{3 \times 5} = \frac{-10}{15}$

and, $\frac{-2}{5} \frac{-2 \times 3}{5 \times 3} = \frac{-6}{15}$

$\therefore$ two rational numbers between $\frac{-2}{3}$ and $\frac{-2}{3}$ are $\frac{-9}{15}, \frac{-8}{15}$.

4. Write five rational numbers between :

(a) $\frac{2}{3} = \frac{2 \times 13}{3 \times 13} = \frac{26}{39}$

and, $\frac{3}{13} = \frac{3 \times 3}{13 \times 3} = \frac{9}{39}$

So, five rotational numbers between $\frac{-2}{3}$ and $\frac{3}{13}$ are :

$$\frac{25}{39}, \frac{24}{39}, \frac{23}{39}, \frac{22}{39} \text{ and } \frac{21}{39}$$

(b) $\frac{3}{8} = \frac{3 \times 2}{8 \times 2} = \frac{6}{16}$

and, $\frac{-1 \times 8}{2 \times 8} = \frac{-8}{16}$

So, five rotational numbers between $\frac{3}{8}$ and $\frac{-1}{2}$ are :

$$\frac{5}{16}, \frac{4}{16}, \frac{3}{16}, \frac{2}{16} \text{ and } \frac{1}{16}.$$

(c) $\frac{-3}{11} = \frac{-3 \times 13}{11 \times 13} = \frac{-39}{143}$

and $\frac{-1}{13} = \frac{-1 \times 11}{13 \times 11} = \frac{-11}{143}$

So, five rational numbers between $\frac{-3}{11}$ and $\frac{-1}{13}$ are :

$$\frac{-38}{143}, \frac{-37}{143}, \frac{-36}{143}, \frac{-35}{143} \text{ and } \frac{-34}{143}.$$

5. (a) $\frac{7}{9} = \frac{7 \times 10}{9 \times 10} = \frac{70}{90}$

and, $\frac{8}{9} = \frac{8 \times 10}{9 \times 10} = \frac{80}{90}$

So, four rational numbers between $\frac{7}{9}$ and $\frac{8}{9}$ are :

$$\frac{71}{90}, \frac{72}{90}, \frac{73}{90} \text{ and } \frac{75}{90}.$$

(b) $\frac{-10}{19} = \frac{-10 \times 10}{19 \times 10} = \frac{-100}{190}$

and $\frac{-11}{19} = \frac{-11 \times 10}{19 \times 10} = \frac{110}{190}$

So, four rational numbers $\frac{-10}{19}$ and $\frac{-11}{19}$ are :

$$\frac{-101}{190}, \frac{-102}{190}, \frac{-103}{190} \text{ and } \frac{-105}{190}$$

(c) $\frac{7}{13}$ and $\frac{-4}{13}$

So, foru rational numbers between $\frac{7}{13}$ and $\frac{-4}{13}$ are :

$$\frac{-3}{13}, \frac{-2}{13}, \frac{-1}{13} \text{ and } \frac{2}{13}.$$

6. Find ten rational numbers between :

(a) $\frac{2}{5} = \frac{2 \times 7}{5 \times 7} = \frac{14}{35} = \frac{140}{350}$

and $\frac{1}{7} = \frac{1 \times 5}{7 \times 5} = \frac{5}{35} = \frac{50}{350}$

So, Ten rational numbers between $\frac{2}{5}$ and $\frac{1}{7}$ are :

$\frac{51}{350}, \frac{52}{350}, \frac{53}{350}, \frac{54}{350}, \frac{55}{350}, \frac{56}{350}, \frac{57}{350}, \frac{58}{350}, \frac{59}{350}$ and $\frac{60}{350}$.

(b) $\frac{-3}{7} = \frac{-3\times 9}{7\times 9} = \frac{-27}{63} = \frac{-270}{630}$

and $\frac{-2}{9} = \frac{-2\times 7}{9\times 7} = \frac{-14}{63} = \frac{140}{630}$

So, Ten rational numbers between $\frac{-3}{7}$ and $\frac{-2}{9}$ are :

$\frac{-141}{630}, \frac{-142}{630}, \frac{-143}{630}, \frac{-144}{630}, \frac{-145}{630}, \frac{-146}{630}, \frac{-147}{630}, \frac{-148}{630}, \frac{-149}{630}$ and $\frac{-150}{630}$.

Exercise 1.4

1. The cost of 1 m of cloth $= ₹\ 25\frac{1}{4}$.

$\therefore$ The cost of $5\frac{3}{4}$ m of cloth $= ₹\ 25\frac{1}{4} \times 5\frac{3}{4}$

$= ₹\ \frac{101}{4} \times \frac{23}{4}$

$= ₹\ \frac{2323}{16} = ₹\ 145\frac{3}{16}$

Hence, the requried cost of $5\frac{3}{4}$ m of cloth is $₹\ 145\frac{3}{16}$.

2. Sum of $\frac{65}{12}$ and $\frac{8}{3}$

$= \frac{65}{12} + \frac{8}{3} = \frac{65+32}{12} = \frac{97}{12}$

Difference of $\frac{65}{12}$ and $\frac{8}{3}$

$= \frac{65}{12} - \frac{8}{3} = \frac{63-32}{12} = \frac{33}{12}$

So, The required division $= \frac{97}{12} \div \frac{33}{12}$

$= \frac{97}{\cancel{12}} \times \frac{\cancel{12}}{33} = \frac{97}{33}$

Hence, the required answers $\frac{97}{33}$.

3. We have,

Distance $= 14\frac{2}{5}$ km, Time $= 2\frac{1}{4}$ hours, Speed $= ?$

Now,

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$= \left(14\frac{2}{5} \div 2\frac{1}{4}\right) \text{km/h}$$

$$= \left(\frac{72}{5} \div \frac{9}{4}\right) \text{km/h}$$

$$= \left(\frac{\cancel{72}^{8}}{5} \times \frac{4}{\cancel{9}}\right) \text{km/h}$$

$$= \frac{32}{5} \text{ km/h} = 6\frac{2}{5} \text{ km/h}$$

Hence, the required speed is $6\frac{2}{5}$ km/h.

4. We have,

Speed of car $= 50\frac{2}{5}$ km/h $= 50.4$ km/m

Distance $= 200$ km 100 m

$= 200.100$ km

Time $= ?$

We know that,

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

$$= \frac{200.100}{50.4} = \frac{200.1}{50.4}$$

$$= \frac{2001}{504} \text{ hours}$$

Hence, the required time is $\frac{2001}{504}$ hours.

5. Let the required number be 'x'.

Now,

According to question,

$$\frac{3}{5}x - \frac{2}{7}x = 44$$

$$\Rightarrow \quad \frac{21x - 10x}{35} = 44$$

$$\Rightarrow \quad \frac{11x}{35} = 44$$

$$\Rightarrow \quad 11x = 44 \times 35$$

$$\Rightarrow \quad x = \frac{\cancel{44}^{4} \times 35}{\cancel{11}_{1}} = 4 \times 35 = 140$$

$$\Rightarrow \quad x = 140$$

Hence, the required number is 140.

6. We have,

Length of rectangular park $= 45\frac{1}{2}$ m

Breadth of rectangular park $= 34\frac{3}{4}$ m

Now,

Perimeter of park $= 2 \times (L + B)$ m

$$= 2 \times \left(45\frac{1}{2} + 34\frac{3}{4}\right) \text{m}$$

$$= 2 \times (45.50 + 34.75) \text{ m}$$

$$= 2 \times (80.25) \text{ m}$$

$$= 160.50 \text{ m} = 160\frac{1}{2} \text{ m}$$

Area of the park $= L \times B$

$$= 45\frac{1}{2}\text{ m} \times 34\frac{3}{4}\text{ m}$$

$$= \frac{91}{2} \times \frac{139}{4}\text{ m}^2$$

$$= \frac{12649}{8}\text{ m}^2 = 1581\frac{1}{8}\text{ m}^2$$

Hence, the requried perimeter of rectangualr park is $160\frac{1}{2}$ m and area of rectangular park is $1581\frac{1}{8}\text{ m}^2$.

Mental Ability

A. Multiple Choice Questions :

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

B. Fill in the blanks :

1. $\frac{a}{b} \times \left(\frac{c}{d} + \frac{e}{f}\right) = \left(\frac{a}{b} \times \frac{c}{d}\right) + \left(\frac{a}{b} \times \frac{e}{f}\right)$

2. $\left(\frac{a}{b} + \frac{c}{d}\right) + \frac{e}{f} = \frac{a}{b} + \left(\frac{c}{d} + \frac{e}{f}\right)$

3. rational **4.** 0 **5.** $\frac{a}{b}$

C. State True (T) or False (F) :

1. True **2.** False **3.** True **4.** True **5.** False

Higher Order Thinking Skills

Sol. $1 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{3}}}$

$$= 1 + \cfrac{1}{1 + \cfrac{1}{\cfrac{(3+1)}{3}}} = 1 + \cfrac{1}{1 + \cfrac{1}{\cfrac{4}{3}}}$$

$$= 1 + \frac{1}{1 + \frac{3}{4}} = 1 + \frac{1}{\frac{(4+3)}{4}}$$

$$= 1 + \frac{1}{\left(\frac{7}{4}\right)} = 1 + \frac{4}{7} = \frac{(7+4)}{7}$$

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

So, (d) $1\frac{4}{7}$ is correct option.

Chapter

2 Exponent

Exercise 2.1

1. Find the value of the following :

(a) $(4)^{\frac{3}{2}} = (2 \times 2)^{\frac{3}{2}} \times (2^2)^{\frac{3}{2}}$

$$= (2)^{\cancel{2} \times \frac{3}{\cancel{2}}} = 2^3 = 2 \times 2 \times 2 = 8$$

(b) $(8)^{\frac{2}{3}} = (2 \times 2 \times 2)^{\frac{2}{3}} = (2^3)^{\frac{2}{3}}$

$$= (2)^{\cancel{3} \times \frac{2}{\cancel{3}}} = 2^2 = 2 \times 2 = 4$$

(c) $(121)^{\frac{-1}{2}} = \frac{1}{(121)^{\frac{1}{2}}} = \frac{1}{(11^2)^{\frac{1}{2}}}$

$$= \frac{1}{(11)^{\cancel{2} \times \frac{1}{\cancel{2}}}} = \frac{1}{11}$$

(d) $\left(\frac{3}{8}\right)^{-4} = \left(\frac{8}{3}\right)^4 = \frac{8 \times 8 \times 8 \times 8}{3 \times 3 \times 3 \times 3}$

$$= \frac{4096}{81}$$

(e) $(343)^{\frac{-1}{3}} = \frac{1}{(343)^{\frac{1}{3}}} = \frac{1}{(7^{\cancel{3}})^{\frac{1}{\cancel{3}}}}$

$$= \frac{1}{(7)^{3 \times \frac{1}{3}}} = \frac{1}{7}$$

(f) $(32768)^{\left(\frac{1}{15}\right)} = (2^{15})^{\frac{1}{15}} = (2)^{\cancel{15} \times \frac{1}{\cancel{15}}}$

$$= 2$$

(g) $(343)^{\frac{2}{3}} = (7^3)^{\frac{2}{3}} = (7)^{\cancel{3} \times \frac{2}{\cancel{3}}}$

$$= 7^2 = 7 \times 7 = 49$$

(h) $(279936)^{\frac{1}{7}} = (6^7)^{\frac{1}{7}} = (6)^{\cancel{7} \times \frac{1}{\cancel{7}}}$

$$= 6$$

2. Find the value of the following :

(a) $\left(\frac{32}{243}\right)^{\frac{4}{5}} = \left(\frac{2^5}{3^5}\right)^{\frac{4}{5}} = \left(\frac{2}{3}\right)^{\cancel{5} \times \frac{4}{\cancel{5}}}$

$$= \left(\frac{2}{3}\right)^4 = \frac{2 \times 2 \times 2 \times 2}{3 \times 3 \times 3 \times 3} = \frac{16}{81}$$

(b) $\left(\frac{1}{9}\right)^{\frac{-1}{2}} = \left(\frac{9}{1}\right)^{\frac{1}{2}} = (9)^{\frac{1}{2}}$

$$= (3^2)^{\frac{1}{2}} = 3^{\cancel{2} \times \frac{1}{\cancel{2}}} = 3$$

(c) $\left(\frac{25}{49}\right)^{\frac{7}{2}} = \left(\frac{5}{7}\right)^{\cancel{2} \times \frac{7}{\cancel{2}}} = \left(\frac{5}{7}\right)^7$

$$= \frac{5\times 5\times 5\times 5\times 5\times 5\times 5}{7\times 7\times 7\times 7\times 7\times 7\times 7}$$

$$= \frac{78125}{823543}$$

(d) $\left(\frac{625}{81}\right)^{\frac{-1}{4}} = \left(\frac{81}{625}\right)^{\frac{1}{4}}$

$$= \left(\frac{3^4}{5^4}\right)^{\frac{1}{4}} = \left(\frac{3}{5}\right)^{\cancel{4}\times\frac{1}{\cancel{4}}} = \frac{3}{5}$$

3. Find the value of the following :

(a) $(0.04)^{\frac{5}{2}} = \left(\frac{4}{100}\right)^{\frac{5}{2}} = \left(\frac{2}{10}\right)^{\cancel{2}\times\frac{5}{\cancel{2}}}$

$$= \left(\frac{2}{10}\right)^5 = (0.2)^5 = 0.2\times 0.2\times 0.2\times 0.2\times 0.2$$

$$= 0.00032$$

(b) $(0.125)^{\frac{2}{3}} = \left(\frac{125}{1000}\right)^{\frac{2}{3}} = \left(\frac{5}{10}\right)^{3\times\frac{2}{3}}$

$$= \left(\frac{5}{10}\right)^2 = \frac{25}{100} = 0.25$$

(c) $(0.000064)^{\frac{5}{6}} = \left(\frac{64}{1000000}\right)^{\frac{5}{6}}$

$$= \left(\frac{2^6}{10^6}\right) = \left(\frac{2}{10}\right)^{\cancel{6}\times\frac{5}{\cancel{6}}} = \left(\frac{2}{10}\right)^5$$

$$= (0.2)^5 = 0.00032$$

(d) $(0.000729)^{\frac{5}{6}} = \left(\frac{729}{1000000}\right)^{\frac{5}{6}}$

$$= \left(\frac{3^6}{10^6}\right)^{\frac{5}{6}} = \left(\frac{3}{10}\right)^{\cancel{6}\times\frac{5}{\cancel{6}}} = \left(\frac{3}{10}\right)^5$$

$$= (0.3)^5 = 0.3 \times 0.3 \times 0.3 \times 0.3 \times 0.3$$

$$= 0.00243$$

4. Simplify and write the answer in exponential notation :

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

$$= \left(\frac{2^4}{3^4}\right)^2 = \left(\frac{2}{3}\right)^{4\times 2} = \left(\frac{2}{3}\right)^8$$

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

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

(c) $\{5^{-7} \div 5^{-10}\} \times 5^{-3} = \left\{\frac{5^{-7}}{5^{-10}}\right\} \times 5^{-3}$

$$= \{5^{-7+10}\} \times 5^{-3} = 5^3 \times 5^{-3}$$

$$= 5^{3-3} = 5^0$$

5. Simplify :

(a) $\{6^{-1} - 5^{-1}\} \div 3^{-1}$

$$= \left\{\frac{1}{6^1} - \frac{1}{5^1}\right\} \div \frac{1}{3^1}$$

$$= \left\{\frac{5-}{30} \times \frac{3}{1}\right\} = \frac{-1}{\cancel{30}_{10}} \times \cancel{3} = \frac{-1}{10}$$

(b) $\{(3^{-1} \times 4^{-1})\}^{-1} \times 5^{-1}$

$$= \left\{\left(\frac{1}{3} \times \frac{1}{4}\right)\right\}^{-1} \times \frac{1}{5}$$

$$= \left\{\frac{1}{12}\right\}^{-1} \times \frac{1}{5} = \left(\frac{12}{1}\right) \times \frac{1}{5} = \frac{12}{5}$$

(b) $\{(3^{-1} \times 4^{-1})\}^{-1} \times 5^{-1}$

$$= \left\{\left(\frac{1}{3} \times \frac{1}{4}\right)\right\}^{-1} \times \frac{1}{5}$$

$$= \left\{\frac{1}{12}\right\}^{-1} \times \frac{1}{5} = \left(\frac{12}{1}\right) \times \frac{1}{5} = \frac{12}{5}$$

(c) $\left\{\left(\frac{1}{3}\right)^{-1} \times (-9)^{-1}\right\}^{-1} = \left\{\cancel{3} \times \frac{1}{-\cancel{9}_3}\right\}^{-1}$

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

(d) $\left\{\left(\frac{1}{3}\right)^{-3} - \left(\frac{1}{2}\right)^{-3}\right\} \div \left(\frac{1}{4}\right)^{-3}$

$$= \{(3)^3 - (2)^3\} \div 4^3$$

$$= (27 - 8) \div 4^3 = \frac{19}{4^3} = \frac{19}{64}$$

(e) $\left\{\left(\frac{2}{3}\right)^2\right\}^3 \times \left(\frac{1}{3}\right)^{-4} \times (3)^{-2} \times (2)^{-1}$

$$= \left(\frac{2}{3}\right)^6 \times 3^4 \times \frac{1}{3^2} \times \frac{1}{2^1} = \frac{2^{6-1}}{3^{8-4}}$$

$$= \frac{2^6}{3^6} \times 3^4 \times \frac{1}{3^2} \times \frac{1}{2^1} = \frac{2^{6-1}}{3^{8-4}}$$

$$= \frac{2^5}{3^4} = \frac{32}{81}$$

6. Evaluate :

(a) $(2^{-1} + 3^{-1} + 4^{-1})^0$

$$= \left(\frac{1}{2} + \frac{1}{3} + \frac{1}{4}\right)^0 = \left(\frac{6+4+3}{12}\right)^0$$

$$= \left(\frac{13}{12}\right)^0 = 1 \qquad (\because) a^0 = 1$$

(b) $\left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{2}\right)^{-2} + \left(\frac{1}{4}\right)^{-2}$

$$= \left(\frac{3}{1}\right)^2 + \left(\frac{2}{1}\right)^2 + \left(\frac{4}{1}\right)^2$$

$$= 3^2 + 2^2 + 4^2 = 9 + 4 + 16 = 29$$

(c) $(1^3 + 2^3 + 3^3)^{-5/2}$

$$= (36)^{\frac{-5}{2}} = (6^2)^{\frac{-5}{2}} = 6^{2 \times \frac{-5}{2}}$$

$$= (6)^{-5} = \frac{1}{6^5} = \frac{1}{7776}$$

(d) $\{(2^0 + 3^{-1}) \times 9^2\} = \left\{\left(1 + \frac{1}{3}\right) \times 9^2\right\}$

$$= \left\{\frac{4}{3} \times 9^2\right\} = \frac{4}{\cancel{3}} \times 9 \times \cancel{9}^3 = 12 \times 9$$

$$= 108$$

(e) $\frac{3^{-5} \times 10^{-5} \times 125}{5^{-7} \times 6^{-5}} = \frac{5^7 \times 6^5 \times 125}{3^5 \times 10^5}$

$$= \frac{5^7 \times \cancel{2}^{\cancel{5}} \times \cancel{3}^{\cancel{5}} \times 5^3}{\cancel{3}^{\cancel{5}} \times \cancel{2}^{\cancel{5}} \times 5^5} = \frac{5^{7+3}}{5^5}$$

$$= \frac{5^{10}}{5^5} = 5^{10-5} = 5^5 = 3125$$

7. We have

$$\frac{p}{q} = \left(-\frac{1}{3}\right)^{-3} \div \left(\frac{2}{3}\right)^{-4}$$

$$= \left(\frac{-3}{1}\right)^3 \div \left(\frac{3}{2}\right)^4$$

$$= (-3)^3 \times \frac{2^4}{3^4}$$

$$= (-1)^3 \times (3)^3 \times \frac{2^4}{(3)^4} = -\frac{2^4}{3^{(4-3)}}$$

$$= \frac{-16}{3}$$

Now,

(a) $\left(\frac{p}{q}\right)^{-1} = \left(\frac{-16}{3}\right)^{-1} = \frac{-3}{16}$

(b) $\left(\frac{p}{q} + \frac{q}{p}\right)^{-1} = \left(\frac{-265}{48}\right)^{-1}$

$$= \left(\frac{-256-9}{48}\right)^{-1} = \left(\frac{-265}{48}\right)^{-1}$$

$$= \frac{-48}{265}$$

8. Producto f two numbers $= \left(\frac{-5}{9}\right)^{-1}$

One number $= \left(\frac{1}{2}\right)^{-1}$

So, The other number $= \left(\frac{-5}{9}\right)^{-1} \div \left(\frac{1}{2}\right)^{-1}$

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

$$= \frac{-9}{5} \times \frac{1}{2} = \frac{-9}{10}$$

Hence, the required number is $\frac{-9}{10}$.

9. Let the required number be 'x'.

Now,

According to question,

$$\left(\frac{2}{9}\right)^5 \div x = \left(\frac{2}{9}\right)^3$$

$$\Rightarrow \left(\frac{9}{2}\right)^5 \times \frac{1}{x} = \frac{2^3}{9^3}$$

$$\Rightarrow \frac{1}{x} = \frac{2^3}{9^3} \times \frac{2^5}{9^5} = \frac{2^{3+5}}{9^{3+5}}$$

$$\Rightarrow \frac{1}{x} = \left(\frac{2}{9}\right)^8$$

$$\Rightarrow x = \left(\frac{2}{9}\right)^{-8}$$

Hence, the required number is $\left(\frac{2}{9}\right)^{-8}$.

10. Let the required number be 'x'.

Now,

According to question,

$$\left[\left(\frac{-7}{2}\right)^3\right]^{-3} \times x = \left(\frac{-2}{7}\right)^4$$

$$\Rightarrow \left[\left(\frac{-2}{7}\right)^{-3}\right]^{-3} \times x = \left(\frac{-2}{7}\right)^4$$

$$\Rightarrow \left(\frac{-2}{7}\right)^{+9} \times x \left(\frac{-2}{7}\right)^4$$

$$\Rightarrow x = \left(\frac{-2}{7}\right)^4 \div \left(\frac{-2}{7}\right)^9$$

$$= \left(\frac{-2}{7}\right)^{4-9} = \left(\frac{-2}{7}\right)^{-5}$$

$$= \left(\frac{-7}{2}\right)^{5}$$

11. (a) $\text{LHS} = \dfrac{x^{-1} - y^{-1}}{(xy)^{-1}} = \dfrac{\dfrac{1}{x} - \dfrac{1}{y}}{\dfrac{1}{(xy)'}}$

$$= \frac{\dfrac{(y-x)}{(xy)}}{\dfrac{1}{(xy)}}$$

$$= \frac{(y-x) \times \cancel{(xy)}}{\cancel{(xy)} \times 1}$$

$$= y - x = \text{RHS}$$

$\therefore$ LHS = RHS Hence proved.

(b) $\text{LHS} = (x^{-1} - m^{-1})(m-n)^{-1}$

$$= \frac{\left(\dfrac{1}{n} - \dfrac{1}{m}\right)}{(m-n)^{1}}$$

$$= \frac{\dfrac{(m-n)}{mn}}{\dfrac{(m-n)}{1}} = \frac{\cancel{(m-n)} \times 1}{(mn) \times \cancel{(m-n)}}$$

$$= \frac{1}{(mn)^{1}} = (mn)^{-1} = \text{RHS}$$

$\therefore$ LHS = RHS Hence proved.

12. $\text{LHS} = \dfrac{x^{m+n} \times x^{n+p} \times x^{p+m}}{(x^{m} \times x^{n} \times x^{p})^{2}}$

$$= \frac{x^{(m+n+n+p+p+m)}}{(x^{(m+n+p)})^2}$$

$$= \frac{x^{2m+2n+2p}}{x^{2m+2n+2p}} = x^{2m+2n+2p-2m-2n-2p}$$

$$= x^0 = 1 = \text{R.H.S.}$$

$\therefore$ LHS = R.H.S. Hence proved.

13. Find the value of m in each of the following :

(a) $(11)^{-4} \times (11)^{-8} = (11)^{4m}$

$\Rightarrow \quad (11)^{-4-8} = (11)^{4m}$

$\Rightarrow \quad (11)^{-12} = (11)^{4m}$

on comparing the powers since bases are equal, we get,

$\Rightarrow \quad -12 = 4m$

$\Rightarrow \quad m = \frac{-12^{3}}{4} = -3$

$\Rightarrow \quad m = -3$

(b) $\left(\frac{4}{5}\right)^{3m+1} \times \left(\frac{4}{5}\right)^{-15} = \left(\frac{4}{5}\right)^{m}$

$\Rightarrow \quad \left(\frac{4}{5}\right)^{(3m+1-15)} = \left(\frac{4}{5}\right)^{m}$

$\Rightarrow \quad \left(\frac{4}{5}\right)^{(3m-14)} = \left(\frac{4}{5}\right)^{m}$

On comparing the powers once bases are equal, we get

$3m - 14 = m$

$\Rightarrow \quad 3m - m = 14$

$\Rightarrow \quad 2m = 14$

$\Rightarrow \quad m = 7$

(c) $7^0 \div 7^{-2} = 7^x$

$\Rightarrow \quad 7^{0+2} = 7^x$

$\Rightarrow \quad 7^2 = 7^x$

On comparing powers since bases are equal, we get,

$$2 = x$$

$\therefore \quad x = 2$

(d) $\left(\frac{2}{7}\right)^{-17} \div \left(\frac{2}{7}\right)^{8} = \left(\frac{2}{7}\right)^{2m+1}$

$\Rightarrow \quad \left(\frac{2}{7}\right)^{-17-8} = \left(\frac{2}{7}\right)^{2m+1}$

$\Rightarrow \quad \left(\frac{2}{7}\right)^{-25} = \left(\frac{2}{7}\right)^{2m+1}$

On comparing powers since, bases are equal, we get,

$$-25 = 2m + 1$$

$\Rightarrow \quad -25 - 1 = 2m$

$\Rightarrow \quad -26 = 2m$

$\Rightarrow \quad m = \frac{-\cancel{26}^{13}}{\cancel{2}} = -13$

$\therefore \quad m = -13$

14. We have,

$$6^{2x+1} \div 36 = 216$$

$\Rightarrow \quad 6^{2x+1} = 216 \quad \Rightarrow \quad (6)^{2x-1} = (6)^3$

On comparing powers since bases are equal, we get

$$2x - 1 = 3$$

$\Rightarrow \quad 2x = 3 + 1 \quad \Rightarrow \quad 2x = 4 \quad \Rightarrow \quad x = \frac{4}{2} = 2$

$\Rightarrow \quad x = 2$

Hence, the requried value of x is 2.

Exercise 2.2

1. Write in standard form :

(a) $563 = \frac{563 \times 10^2}{10^2} = 5.63 \times 10^2$

(b) $0.78 = \frac{0.78 \times 10}{10} = \frac{7.8}{10} = 7.8 \times 10^{-1}$

(c) $\frac{9}{100000} = \frac{9}{10^5} = 9 \times 10^{-5}$

(d) $6803 \times 10^{-5} = \frac{6803 \times 10^{-5} \times 10^3}{10^3}$

6.803×10^{-2}

(e) $0.00000000005 = 5 \times 10^{-11}$

(f) $0.00000017 = \frac{0.00000017 \times 10^7}{10^7}$

$= \frac{1.7}{10^7} = 1.7 \times 10^{-7}$

2. Expand the following in the usual form :

(a) $7.0004 \times 10^7 = 700040000000$

$= 70004000$

(b) 0.9813×10^{-5}

$= \frac{0.9813}{10^5} = 0.000009813$

(c) $3.87 \times 10^{-3} = \frac{3.87}{10^3} = 0.00387$

(d) $8.37 \times 10^{-6} = \frac{8.37}{10^6} = 0.00000837$

(e) $5.3 \times 10^{-13} = 0.00000000000053$

(f) $8 \times (10)^{-9} = \frac{8}{10^9} = 0.000000008$

3. Express the following statements in scientific notation :

(a) 250,000,000,000 bytes

$= 2.5 \times 10^{11}$

(b) 58,000,000 km $= 5.8 \times 10^7$ km

(c) 300,000,000 m/s $= 3 \times 10^8$ m/s

(d) 0.0000005 m $= 5 \times 10^{-7}$ m

(e) 149,600,000 km $= 1.496 \times 10^8$ km

(f) 100,000 light years $= 1 \times 10^5$ eight years

4. We have,

Size of a red blood cell $= 0.000007$ m

$= 7 \times 10^{-6}$ m

Size of a plant cell $= 0.00001275$ m

$= 1.275 \times 10^{-5}$ m

So, The required ration $= \dfrac{1.275 \times 10^{-5}}{7 \times 10^{-6}}$

$= \dfrac{1.275 \times 10^{-5+6}}{7}$

$= \dfrac{1.275 \times 10^{1}}{7}$

$= \dfrac{12.75}{7}$

$= \dfrac{^{51}\cancel{1275}}{7 \times \cancel{100}_{4}} = \dfrac{51}{7 \times 4}$

$= \dfrac{51}{28}$

Hence, the requried ration is 51 : 28.

5. The diameter of sun $= 1.4 \times 10^9$ m

The diameter of earth $= 1.275 \times 10^7$ m

The required ration $= \dfrac{14 \times 10^9}{1.275 \times 10^7}$

$= \dfrac{1.4 \times 100 \times \cancel{10}^{7}}{1.275 \times \cancel{10}^{7}} = \dfrac{1400}{1.275}$

$= \dfrac{140 \times \cancel{1000}^{40}}{\cancel{1275}_{51}} = \dfrac{5600}{51}$

$= 5600 : 51$

Hence, the required ratio is 5600 : 51.

Mental Ability

A. Multiple Choice Questions :

1. (b) **2.** (d) **3.** (c) **4.** (d) **5.** (c)

B. Fill in the blanks :

1. $\left(\frac{7}{2}\right)^6$ **2.** 64 **3.** 8.136×10^{-4} **4.** 3 **5.** $\left(\frac{-5}{2}\right)^3$

C. State True (T) or False (F) :

1. True **2.** False **3.** True **4.** False **5.** False

Higher Order Thinking Skills

1. (a) $\left(\frac{390625}{6561}\right)^{\frac{1}{8}} = \left(\frac{5^8}{3^8}\right)^{\frac{1}{8}} = \left(\frac{5}{3}\right)^{8 \times \frac{1}{8}}$

$= \frac{5}{3} = 1\frac{2}{3}$

(b) $(32768)^{\frac{1}{15}} = (2^{15})^{\frac{1}{15}} = 2^{\cancel{15} \times \frac{1}{\cancel{15}}}$

$= 2$

2. $\text{LHS} = \left(\frac{x^a}{x^b}\right)^{a^2 + b^2 + ab} \times \left(\frac{x^b}{x^c}\right)^{b^2 + c^2 + bc} \times \left(\frac{x^c}{x^a}\right)^{c^2 + a^2 + ca}$

$= (x^{(a-b)})^{a^2 + b^2 + ab} \times x^{(b-c)(b^2 - c^2 + bc)} \times x^{(c-a)(c^2 + a^2 + ca)}$

$= x^{a^3 - b^3} \times x^{b^3 - c^3} \times x^{c^3 - a^3}$

$= x^{\cancel{a^3} - \cancel{b^3} + \cancel{b^3} - \cancel{c^3} - \cancel{c^3} + \cancel{a^3}}$

$= x^0 = 1 = \text{RHS}$

$\therefore$ LHS = RHS Hence proved.

Chapter

3 Square and Square

Exercise 3.1

1. Which of the following numbers are perfect square?

(a) 14641

First we find prime factors of 14641

$\therefore$ $14641 = \underline{11 \times 11} \times \underline{11 \times 11}$

Here, pairs of prime factors are complete.

So, 14641 is a perfect square.

11	14641
11	1331
11	121
11	11
	1

(b) 5928

First we find prime factors of 5928.

$\therefore$ $5928 = \underline{2 \times 2} \times 2 \times 3 \times 13 \times 10$

Here, All pairs of prime factors are not complete.

So, 5928 is not a perfect square.

2	5928
2	2964
2	1482
3	741
13	247
19	19
	1

(c) 22200

First we find the prime factors of 22200.

$\therefore$ $22200 = 2 \times 2 \times 2 \times 3 \times 5 \times 5 \times 37$

Here, all pairs of prime factors are not comdplete.

So, 22200 is not a perfect square number.

2	22200
2	11100
2	5550
3	2775
5	925
5	185
37	37
	1

(d) 123201

First we find prime factors of 123201,

$\therefore$ $12320 = \underline{3\times 3}\times \underline{3\times 3}\times \underline{3\times 3}\times \underline{13\times 13}$

Here, All pairs of prime factors are complete.

So, 12320 is a perfect square number.

3	123201
3	41067
3	13689
3	4563
3	1521
3	507
13	169
13	13
	1

2. Which of the following numbers are not perfect squares?

(a) 1632

First find prime factors of 1632.

$\therefore$ $1632 = \underline{2\times 2}\times \underline{2\times 2}\times 2\times 3\times 17$

Here, All pair of prime factors are not complete.

So, 1632 is not perfect square.

2	1632
2	816
2	408
2	204
2	102
3	51
17	17
	1

(b) 3000

First we find prime factors of 3000.

$\therefore$ $3000 = \underline{2\times 2}\times 2\times 3\times \underline{5\times 5}\times 5$

Here, All pairs of prime factors are not complete.

So, 3000 is not a perfect square number.

2	3000
2	1500
2	750
3	375
5	125
5	25
5	5
	1

(c) 2025

First, we find prime factors of 2025.

$\therefore$ $2025 = \underline{3 \times 3} \times \underline{3 \times 3} \times \underline{5 \times 5}$

Here, All pairs of prime factors are compelte.

So, 2025 is a perfect square number.

3	2025
3	675
3	225
3	75
5	25
5	5
	1

(d) 129600

First, we find prime factors of 129600.

$\therefore$ $129600 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{3 \times 3} \times \underline{5 \times 5}$

Here, All pairs of prime factors are complete.

So, 129600 is a perfect square number.

2	129600
2	64800
2	32400
2	16200
2	8100
2	4050
3	2025
3	675
3	225
3	75
5	25
5	5
	1

3. We know that,

Every square number can be expressed as the sum of successive odd numbers tarting from 1.

(a) $1 + 3 + 5 + 7 + 9 = 5^2 = 25$

(b) $1 + 3 + 5 + 7 + 9 + 11 + 13 = 7^2 = 49$

(c) $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 = 10^2 = 100$

4. Which of the following are Pythagorean triplet?

(a) (6, 8, 10) $\rightarrow$ $6^2 = 36$

$8^2 = 64$

$10^2 = 100$

$\therefore \quad 10^2 = 6^2 + 8^2$

So, (6, 8, 10) is a Pythagorian triplet.

(b) $(10, 24, 26) \rightarrow 10^2 = 100$

$24^2 = 576$

$26^2 = 676$

$\therefore \quad 26^2 = 10^2 + 24^2$

So, (10, 24, 26) is a Pythagorean triplet.

(c) $(6, 7, 8) \rightarrow 6^2 = 36$

$7^2 = 49$

$8^2 = 64$

$\therefore \quad 8^2 \neq 6^2 + 7^2$

So, (6, 7, 8) is not a Pythagorean triplet.

(d) $(26, 168, 170) \rightarrow 26^2 = 676$

$168^2 = 28224$

$170^2 = 28900$

$\therefore \quad (170)^2 = (26)^2 + (168)^2$

So, (26, 168, 170) is a Pythagorean triplet.

5. From the property : $(n+1)^2 - n^2 = (n+1) + n$

(a) $8^2 - 7^2 = 8 + 7$ 15

(b) $19^2 - 18^2 = 19 + 18 = 37$

(c) $35^2 - 34^2 = 35 + 34 = 69$

(d) $136^2 - 135^2 = 136 + 135 + 271$

6. 1228

First, we find prime factors of 1228.

$\therefore \quad 1228 = 2 \times 2 \times 307$

Here, All pairs of prime factors are not complete.

So, 1228 is not a perfect square.

2	1228
2	614
307	307
	1

7. 1764

First we find prime factors of 1764,

$\therefore$ $1764 = \overline{2\times 2}\times \overline{3\times 3}\times \overline{7\times 7}$

Here, All pairs of prime factors are codmplete.

So, 1764 is a perfect square.

Thus, $\sqrt{1764} = 2\times 3\times 7$

$= 42$

2	1764
2	882
3	441
3	147
7	49
7	7
	1

8. Express each of the following perfect squares as sum of odd numbers :

(a) $49 = 1+3+5+7+9+11+13$

(b) $64 = 1+3+5+7+9+11+13+15$

(c) $81 = 1+3+5+7+9+11+13+15+17$

9. Even $\rightarrow$ (b), (c, (f)

Odd $\rightarrow$ (d), (e)

10. Find the square of the following numbers by using column method :

(a) 36

We have, $(a+b)^2 = (a^2 + 2ab + b^2)$

Take $ab = 36, a = 3, b = 6$

Column I	Column II	Column III
a^2	$2\times a\times b$	b^2
3^2	$2\times 3\times 6$	6^2
9	36	36

After above, go through the following steps :

Step 1.

Column I	Column II	Column III	In Column III under line the units digit of b^2, if any $2ab$ in column II
a^2	$2\times a\times b$	b^2	
3^2	$2\times 3\times 6$	6^2	
9	36	36	

Step-2

Column I	Column II	Column III	In Colun III under line the units digit of b^2, if any $2ab$ in column II
a^2	$2ab$	b^2	
9	36	36	
	+3		
	39		

Under line the number in column I.

Step-3

Column I	Column II	Column III
a^2	$2 \times a \times b$	b^2
9	3 9	3 6
+ 3		
12		

The number obtained from underlined digits give the required square of ab.

$\therefore \quad 36^2 = 1296$

(b) 57

In number 57, let $a = 5$ and $b = 7$

Column I	Column II	Column III
a^2	$2ab$	b^2
5^2	$2 \times 5 \times 7$	7^2
25	70	4 9
+ 7	+ 4	
32	74	

The number obtained from underline digit is the square.

Thus, $57^2 = 3249$

11. We have,

$1 = \frac{1\times 2}{2}$; $1+2 = \frac{2\times 3}{2}$; $1+2+3 = \frac{3\times 4}{2}$

(a) $1+2+3+4 = \frac{4\times 5}{2}$ (b) $1+2+3+4+5 = \frac{5\times 6}{2}$

12. We have

$3^2+4^2+12^2 = 13^2$ $4^2+5^2+20^2 = 21^2$

$5^2+6^2+30^2 = 31^2$ $6^2+7^2+42^2 = 43^2$

Now,

(a) $1^2+2^2+\underline{2}^2 = \underline{3}^2$ (b) $5^2+\underline{6}^2+30^2 = \underline{31}^2$

(c) $\underline{2}^2+3^2+6^2 = \underline{7}^2$ (d) $8^2+\underline{9}^2+\underline{72}^2 = 73^2$

Exercise 3.2

1. Find the square root of the following numbers by prime factorisation method :

(a) 841

$\therefore$ $841 = \underline{29\times 29}$

So, $\sqrt{841} = \sqrt{29\times 29} = 29$

29	841
29	29
	1

(b) 3844

$\therefore$ $3844 = \underline{2\times 2}\times \underline{31\times 31}$

So, $\sqrt{3844} = 2\times 31 = 62$

2	3844
2	1922
31	961
31	31
	1

(c) 6400

$\therefore$ $6400 = \underline{2\times 2}\times \underline{2\times 2}\times \underline{2\times 2}\times \underline{2\times 2}\times \underline{5\times 5}$

So, $\sqrt{6400} = 2\times 2\times 2\times 2\times 5 = 80$

2	6400
2	3200
2	1600
2	800
2	400
2	200

2	100
2	50
5	25
5	5
	1

(d) 8281

$\therefore \quad 8281 = 7 \times 7 \times 13 \times 13$

So, $\sqrt{8281} = 7 \times 13$

$= 91$

7	8281
7	1183
13	169
13	13
	1

(e) 15876

$\therefore \quad 15876 = 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 7 \times 7$

So, $\sqrt{15876} = 2 \times 3 \times 3 \times 7$

$= 126$

2	15876
2	7938
3	3969
3	1323
3	441
3	147
7	49
7	7
	1

(f) 7744

$\therefore \quad 7744 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 11 \times 11$

So, $\sqrt{7744} = 2 \times 2 \times 2 \times 11 = 88$

2	7744
2	3872
2	1936
2	968
2	484
2	242
11	121
11	11
	1

(g) 562500

2	562500
2	281250
3	140625
3	46875
5	15625
5	3125

5	625
5	125
5	25
5	5
	1

$\therefore \quad 562500 = \underline{2\times 2}\times \underline{3\times 3}\times \underline{5\times 5}\times \underline{5\times 5}\times \underline{5\times 5}$

So, $\sqrt{562500} = 2\times 3\times 5\times 5$

$= 750$

(h) 1024000

2	102400
2	51200
2	25600
2	125800
2	6400
2	3200
2	1600
2	800

2	400
2	200
2	100
2	50
5	25
5	5
	1

$\therefore \quad 1024000 = 2\times 2\times 2\times 2\times\times 2\times 2\times 2\times 2\times 2\times 2\times 2\times 2\times 5\times 5$

So, $\sqrt{102400} = 2\times 2\times 2\times 2\times 2\times 2\times 5$

$= 320$

2. Find the square root of the following rational numbers by prime factorisation method :

(a) $\frac{625}{1296}$

5	625
5	125
5	25
5	5
	1

2	296
2	648
2	324
2	162
3	81
3	27
3	9
3	3
	1

$\therefore \quad 625 = 5 \times 5 \times 5 \times 5$

$1296 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3$

So, $\sqrt{\frac{625}{1296}} = \frac{5 \times 5}{2 \times 2 \times 3 \times 3} = \frac{25}{36}$

(b) $\frac{529}{841}$

23	529
23	23
	1

29	841
29	29
	1

$\therefore \quad 529 = 23 \times 23$ $\qquad 841 = 29 \times 29$

So, $\sqrt{\frac{529}{841}} = \frac{23}{29}$

(c) $2\frac{14}{25} = \frac{25 \times 2 \times 14}{25}$

$= \frac{50 + 14}{25} = \frac{64}{25}$

Now,

2	64
2	32
2	16
2	8
2	4
2	2
	1

5	25
5	5
	1

$\therefore \quad 64 = \underline{2\times 2\times 2\times 2\times 2\times 2}$ $\qquad 25 = \underline{5\times 5}$

So, $\sqrt{2\frac{14}{25}} = \frac{2\times \overline{2\times 2}}{5} = \frac{8}{5} = 1\frac{3}{5}$

(d) $23\frac{26}{121} = \frac{23\times 121 + 26}{121} = \frac{2783 + 26}{121} = \frac{2809}{121}$

53	2809
553	53
	1

11	121
11	11
	1

$\therefore \quad 2809 = 53\times 53$ $\qquad 121 = 11\times 1$

So, $\sqrt{23\frac{26}{121}} = \sqrt{\frac{2809}{121}} = \frac{53}{11} = 4\frac{9}{11}$

3. First, we find the prime factors of 1890,

$\therefore \quad 1890 = 2\times 3\times \overline{3\times 3}\times 5\times 7$

Here, we observe that all pairs of prime numbers are not complete. Thus, 1890 is not a erfect square. So, the given number should be multiplied by $(2\times 3\times 5\times 7)$ i.e. 2010 to mark the product a perfect square.

Hence, the required smalelst number is 210.

2	1890
3	945
3	315
3	105
5	35
7	7
	1

4. 9408

2	9408
2	4704
2	2352
2	1176
2	588
2	294

3	147
7	49
7	7
	1

$\therefore$ $9408 = \underline{2\times 2}\times \underline{2\times 2}\times \underline{2\times 2}\times 3\times \underline{7\times 7}$

Here, we observe that prime number 3 is in in paired form. Thus, 9408 is nto a perfect square. So, the given number should be divide by 3 to make the perfect square.

Hence, the requried smalelst number is 3.

5. 1200

2	1200
2	600
2	300
2	150
3	75
5	25
5	5
	1

$\therefore$ $1200 = \underline{2\times 2}\times \underline{2\times 2}\times 3\times \underline{5\times 5}$

Here, we observe that prime number 3 is in unpaired form. Thus, 1200 is not a perfect square. So, the given number should be divide by 3 to make the perfect square.

So, $\sqrt{\frac{1200}{3}} = \sqrt{400} = 20$

Hence, the required smallest number is 3.

6. 3656

3	3645
3	1215
3	405
3	135
3	45
3	15
5	5
	1

$\therefore$ $3645 = \underline{3\times 3}\times \underline{3\times 3}\times \underline{3\times 3}\times 5$

Hence, we observe that prime number 5 is in unpaired form.

Thus, 3645 is not a perfect square. So, the given number should be divide by 5 to make the perfect square.

Now,

$$\sqrt{\frac{3645}{5}} = \sqrt{729} = 3 \times 3 \times 3 = 27$$

Hence, the required smallest number is 5.

2	1764
2	882
3	441
3	147
7	49
7	7
	1

7. Number of rows in the garden $= \sqrt{1764}$

Now,

$\therefore \quad 1764 = 2 \times 2 \times 3 \times 3 \times 7 \times 7$

So, $\sqrt{1764} = 2 \times 3 \times 7 = 42$

Hence, the required number of square rows are 42.

8. Number of soilder in each row $= \sqrt{6400}$

2	6400
2	3200
2	1600
2	800
2	400
2	200

2	100
2	50
5	25
5	5
	1

Now,

$\therefore \quad 6400 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{5 \times 5}$

So, $\sqrt{6400} = 2 \times 2 \times 2 \times 2 \times 5 = 80$

Hence, each row has 80 soilders.

9. Let the required numbers be 'x' and $(16x)$.

According to question,

$$x \times 16x = 10000$$

$$\Rightarrow \quad 16x^2 = 10000$$

$$\Rightarrow \quad x^2 = \frac{10000}{16} = 625$$

$$\Rightarrow \quad x = \sqrt{625} = 25$$

$$\Rightarrow \quad x = 25$$

$\therefore \quad 16x = 16 \times 25 = 400$

Hence, the required numbers are 25 and 400.

10. Let the breadth of rectangular field be 'x' m.

$\therefore$ the length of rectangular field be $(2x)$ m.

Now, We have,

Area of square field $= 576\ \text{m}^2$

$\Rightarrow$ $\text{Side} \times \text{Side} = 576\ \text{m}^2$

$\Rightarrow$ $(\text{Side})^2 = 576\ \text{m}^2$

$\Rightarrow$ $\text{Side} = \sqrt{576\ \text{m}^2} = 24\ \text{m}$

According to question,

Perimeter of rectangular field = Perimeter of square field.

$\Rightarrow$ $2(L + B) = 4 \times \text{Side}$

$\Rightarrow$ $2(2x + x) = 4 \times 24\ \text{m}$

$\Rightarrow$ $2 \times 3 \times x = 4 \times 24\ \text{m}$

$\Rightarrow$ $x = \dfrac{\cancel{4}^{2} \times \cancel{24}^{8}\ \text{m}}{\cancel{2}_{1} \times \cancel{3}_{1}} = 2 \times 8\ \text{m}$

$\Rightarrow$ $x = 16\ \text{m}$

$\therefore$ $2x = 16 \times 2\ \text{m} = 32\ \text{m}$

So, Area of the rectangular field $= L \times B = (2x \times x)\ \text{m}^2$

$= 32 \times 16\ \text{m}^2 = 512\ \text{m}^2$

Hence, the required area of rectangular field is $512\ \text{m}^2$.

Exercise 3.3

1. Find the square root of the following numbers by division method :

(a)

	234
2	$\overline{5}\ \overline{47}\ \overline{56}$
$+2$	-4 ↓
43	1 47
$+3$	$-1\ 29$ ↓
464	18 56
$+4$	$-18\ 56$
	0

$\therefore$ $\sqrt{54756} = 234$

(b) 390625

	625
6	$\overline{39}\ \overline{06}\ \overline{25}$
6	-36 ↓
122	3 06
$+2$	$-2\ 44$ ↓
1245	62 25
	$-62\ 25$
	0

$\therefore \quad \sqrt{390625} = 625$

(c) 18225

	135
1	$\overline{1}\ \overline{82}\ \overline{25}$
$+1$	-1 ↓
23	82
$+3$	-69 ↓
265	13 25
	$-13\ 25$
	0

$\therefore \quad \sqrt{18225} = 135$

(d) 291600

	540
5	$\overline{29}\ \overline{16}\ \overline{00}$
$+5$	-25 ↓
104	4 16
$+4$	$-4\ 16$ ↓
1080	00 00
	$-00\ 00$
	0

$\therefore \quad \sqrt{291600} = 540$

2. Find the square root of the following numbers by division method :

(a) $\frac{2916}{2209}$

	54
5	$\overline{29}\ \overline{16}$
+5	−25 ↓
104	4 16
	−4 16
	0

	47
4	$\overline{22}\ \overline{09}$
+4	−16 ↓
87	6 09
	−6 09
	0

$\therefore \quad \sqrt{\frac{2916}{2209}} = \frac{54}{47}$

(b) $3\frac{16}{256}$

We have,

$$3\frac{16}{256} = \frac{3 \times 256 + 16}{256} = \frac{768 + 16}{256} = \frac{784}{256}$$

Now,

	28
2	$\overline{7}\ \overline{84}$
+2	−4 ↓
48	3 84
	−3 84
	0

	16
1	$\overline{2}\ \overline{56}$
+1	−1 ↓
26	1 56
	−1 56
	0

$\therefore \quad \sqrt{3\frac{16}{256}} = \sqrt{\frac{784}{256}} = \frac{28}{16}$

(c) $75\frac{46}{49}$

We have,

$$75\frac{46}{49} = \frac{75 \times 49 + 46}{46} = \frac{3675 + 46}{49} = \frac{3721}{49}$$

Now,

	61
6	$\overline{37}\ \overline{21}$
+6	−36 ↓
121	1 21
	−1 21
	0

	7
7	$\overline{49}$
+7	−49
	0

$\therefore \quad \sqrt{75\frac{46}{49}} = \sqrt{372149} = \frac{61}{7} = 8\frac{5}{7}$

(d) $10\frac{151}{225}$

We have, $10\frac{151}{225} = \frac{225 \times 10 \times 151}{225} = \frac{2250 + 151}{225} = \frac{2401}{225}$

Now,

	49
4	$\overline{24}\ \overline{01}$
+4	−16 ↓
89	8 01
	−8 01
	0

	15
1	$\overline{2}\ \overline{25}$
+1	−1 ↓
25	1 25
	−1 25
	0

$\therefore \quad \sqrt{10\frac{151}{225}} = \sqrt{\frac{2401}{225}} = \frac{49}{15} = 3\frac{4}{15}$

3. Greatest your digit number = 9999

Square root of 9999 = $\sqrt{9999}$

On finding square root, we observe that 9999 is 198 less than $(99)^2$.

So, the greatest number = 9999 − 198
= 9801

Hence, the required greatest four digit number is 9801 which is a perfect square.

	99
9	$\overline{99}\ \overline{99}$
	−81
189	18 99
	−17 01
	1 98

4. Greatest five digit number $= 99999$

Square root $99999 = \sqrt{99999}$

On finding square root, we observe that 99999 is 143 less than $(316)^2$.

So, the greatest number $= 99999 - 143$

$= 99856$

Hence, the required greatest five digit number 99856 which is a perfect square.

	316
3	$\overline{9}\ \overline{99}\ \overline{99}$
	-9
61	99
	-61
626	38 99
	-37 56
	1 43

5. Square root of $306452 = \sqrt{306452}$

This given number

$(553)^2 < 306452 < (554)^2$

Number should be added

$= (554)^2 - 36452$

$= 306916 - 306452$

$= 464$

Hence, the requried least number is 464.

So, $306452 + 464 = 306916$

$\Rightarrow \quad \sqrt{306916} = 554$

	553
5	306452
	-25
105	564
	-525
1103	3952
	-3309
	643

6. Square root of $194491 = \sqrt{194491}$

If we subtract 10 from the given number the remainder will be zero and ;the new number wil be a perfect square.

Perfect square number

$= 194491 - 10$

$= 194481$

Thus, $\sqrt{194481} = 441$

Hence, the requried numbers are 10 and 441.

	441
4	$\overline{19}\ \overline{44}\ \overline{91}$
	-16
84	3 44
	-3 36
881	8 91
	-8 81
	10

Exercise 3.4

1. Find the square root of the following decimal numbers :

(a) 16.81

	4.1
4	$\overline{16}.\overline{81}$
	-16
81	81
	-81
	0

$\therefore \quad \sqrt{16.81} = 4.1$

(b) 37.0881

	6.09
6	$\overline{37}.\overline{08}\ \overline{81}$
	-36
120	108
	-000
1209	108 81
	$-108\ 81$
	0

$\therefore \quad \sqrt{37.0881} = 6.09$

(c) 0.00002025

	0.0045
4	$0\ .\ \overline{00}\ \overline{00}\ \overline{20}\ \overline{25}$
	-16
85	4 25
	$-4\ 25$
	0

$\therefore \quad \sqrt{0.00002025} = 0.0045$

(d) 0.00038809

	0.0197
1	$0.\ \overline{00}\ \overline{03}\ \overline{88}\ \overline{09}$
	-1
29	2 88
	$-2\ 61$
387	27 09
	$-27\,09$
	0

$\therefore \quad \sqrt{0.00038809} = 0.0197$

2. Find the square root of the following decimal numbers correct to two places of decimal.

(a) $\sqrt{3}$

	1.73
1	3 . $\overline{00}$ $\overline{00}$
	−1
27	2 00
	−1 89
343	11 00
	− 10 29
	71

$\therefore \quad \sqrt{3} = 1.73$

(b) $\sqrt{19}$

	4.35
4	$\overline{19}$.$\overline{00}$ $\overline{00}$
	−16
83	3 00
	−2 49
865	51 00
	−43 25
	7 75

$\therefore \quad \sqrt{19} = 4.35$

(c) $\sqrt{1.7}$

	1.30
1	1.7000
	−1
23	070
	−69
260	100
	−000
	100

$\therefore \quad \sqrt{1.7} = 1.30$

(d) $\sqrt{0.8}$

	0.89
8	0.$\overline{80}$ $\overline{00}$
	−64
169	1600
	−1521
	79

$\therefore \quad \sqrt{0.8} = 0.89$

3. Simplify :

(a) $\dfrac{\sqrt{59.29}-\sqrt{5.29}}{\sqrt{59.29}+\sqrt{5.29}}$

	7.7
7	$\overline{59.29}$
	-49
147	10 29
	-1029
	0

	2.3
2	$\overline{5}\,.\,\overline{29}$
	-4
43	1 29
	-1 29
	0

$\therefore \quad \sqrt{59.29}=7.7$

Now, $\dfrac{\sqrt{59.29}-\sqrt{5.29}}{\sqrt{59.29}+\sqrt{5.29}}=\dfrac{7.7-2.3}{7.7+2.3}$

$=\dfrac{5.4}{10.0}=\dfrac{5.4}{10}=0.54$

(b) $\dfrac{\sqrt{0.2304}-\sqrt{0.1764}}{\sqrt{0.2304}+\sqrt{0.1764}}$

	0.48
4	$0.\overline{23}\ \overline{04}$
	-16
88	7 04
	-7 04
	0

	2.3
4	$0.\overline{17}\ \overline{64}$
	-16
82	1 64
	-1 64
	0

Now, $\dfrac{\sqrt{0.2304}-\sqrt{0.1764}}{\sqrt{0.2304}+\sqrt{0.1764}}=\dfrac{0.48-0.42}{0.48+0.42}$

$=\dfrac{0.06}{0.90}=\dfrac{6}{90}=\dfrac{1}{15}$

4.

	161
1	$2\ \overline{59}\ \overline{21}$
	-1
26	$1\ 59$
	$-1\ 56$
321	$3\ 21$
	$-3\ 21$
	0

$\therefore \quad \sqrt{25921} = 161$

Now, $\sqrt{259.21} - \sqrt{2.5921}$

$= 16.1 - 1.61$

$= 14.49$

Mental Ability

A. Multiple Choice Questions :

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

B. Fill in the blanks :

1. The sum of $1+3+5+7+9+11$ is square of the number = **6** .
2. $15^2 = 112 +$ **113** .
3. The square of an odd number is **odd** .
4. For a natural number $n > 1, (2n, n^2 - 1, n^2 + 1)$ is a **Pythagorian triplet** .
5. A number that ends with 2,3,7 or 8 is never a **perfect** square.

C. State True (T) or False (F) :

1. False **2.** True **3.** False **4.** False **5.** False

Higher Order Thinking Skills

1. The required missing digit is 1.

So, $\sqrt{22201} = 149$

2. We have, $12^2 = 144$

$21^2 = 441$

Now, other pairs like above,

$13^2 = 169$ $\qquad$ $31^2 = 961$

$102^2 = 10404$ $\qquad$ $201^2 = 40401$

So, required pairs are (13, 31) and (102, 201).

3.

	0.48
4	$0.\overline{23}\ \overline{04}$
	-16
88	704
	-704
	0

	0.42
4	0.1764
	-16
82	164
	-164
	0

Now, $$\frac{\sqrt{0.2304}-\sqrt{0.1764}}{\sqrt{0.2304}+\sqrt{0.1764}}=\frac{0.48-0.42}{0.48+0.42}$$

$$=\frac{0.06}{0.90}=\frac{6}{90}=\frac{1}{15}$$

Chapter

4 Cubes and Cube Root

Exercise 4.1

1. Write the units digit of the cube of each of the following numbers :
(a) 7 (b) 9 (c) 6 (d) 2 (e) 5 (f) 7

2. Which of the following are the cubes of even integers?
(a) 216 (c) 512 (e) 1000 (f) 13824

3. Which of the following numbers are the cubes of odd integers?
(b) 27 (c) 729 (e) 6859 (f) 531441

4. Find the cubes of the following numbers by alternative method :

(a) 42

Using the identity

$(a+b)^3=a^3+3a^2b+3ab^2+b^2$

Let, $a=40, b=2$

$\therefore\quad (40+2)^3 = (40)^3+3\times(40)^2\times 2+3\times 40\times 2^2+(2)^3$

$=64000+6\times 1600+480+8$

$=64000+9600+488$

$=74088$

(b) 87

Using the identity

$$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

Let $a = 80, b = 7$

$\therefore \quad (80+7)^3 = (80)^3 + 3\times(80)^2 \times 7 + 3\times(80)\times 7^2 + (7)^3$

$= 512000 + 21\times 6400 + 240\times 49 + 343$

$= 512000 + 134400 + 11760 + 343$

$= 658503$

(c) 56

Using the identity,

$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

Le $a = 50,\ b = 6$

$\therefore \quad (50+6)^3 = (50)^3 + 3\times(50)^2 \times 6 + 3\times(50)\times 6^2 + (6)^3$

$= 125000 + 18\times 2500 + 150\times 36 + 216$

$= 125000 + 45000 + 5400 + 216$

$= 175616$

(d) 92

Using the identity

$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

Let $a = 90$ and $b = 2$

$\therefore \quad (90+2)^3 = (90)^3 + 3\times(90)^2 \times 2 + 3\times(90)\times 2^2 + 2^3$

$= 729000 + 6\times 8100 + 1080 + 8$

$= 729000 + 48600 + 1088$

$= 778688$

5. Which of the following numbers are perfect cube?

(a) 16

$\therefore \quad 16 = \underline{2\times 2\times 2\times 2}$

Here, All the triplets are not complete.

So, 16 is not a perfect cube number.

2	16
2	8
2	4
2	2
	1

(b) 27

$\therefore$ $27 = 3 \times 3 \times 3$

Here, all the prime factors of 27 are grouped into triplet.

So, 27 is a perfect cube.

3	27
3	9
3	3
	1

(c) 81

$\therefore$ $81 = 3 \times 3 \times 3 \times 3$

Here, all the prime factors of 81 are not grouped into triplets, so81 is not a perfect cube number.

3	81
3	27
3	9
3	3
	1

(d) 216

$\therefore$ $216 = 2 \times 2 \times 2 \times 3 \times 3 \times 3$

Here, all the prime factors of 216 are grouped into triplets.

So, 216 is a perfect cube number.

2	216
2	108
2	54
3	27
3	9
3	3
	1

(e) 212

$\therefore$ $212 = 2 \times 2 \times 53$

Here, all the prime factors of 212 are not grouped into triplets, so, 212 is not a perfect cube number.

2	212
2	106
53	53
	1

(f) 729

$\therefore$ $729 = 3 \times 3 \times 3 \times 3 \times 3 \times 3$

Here, all the prime factors of 729 are grouped into triplets, so 729 is a perfect cube number.

3	729
3	243
3	81
3	27
3	9
3	3
	1

(g) 1000

$\therefore$ $1000 = \underline{2\times 2\times 2}\times \underline{5\times 5\times 5}$

Here, all the prime factors of 1000 are grouped into triplets. So, 1000 is a perfect cube number.

2	1000
2	500
2	250
5	125
5	25
5	5
	1

(h) 4608

$\therefore$ $4608 = \underline{2\times 2\times 2}\times \underline{2\times 2\times 2}\times \underline{2\times 2\times 2}\times 3\times 3$

2	4608
2	2304
2	1152
2	576
2	288
2	144

2	72
2	36
2	18
3	9
3	3
	1

Here, all the prime factors of 4608 are not grouped into triplets.

So, 4608 is not a perfect cube number.

6. By which smallest number 43200 must be multiplied, so that the products is a perfect cube?

$\therefore$ $43200 = \underline{2\times 2\times 2}\times \underline{2\times 2\times 2}\times \underline{3\times 3\times 3}\times 5\times 5$

Thus, to make it a perfect cube, it must be multiplied by 5.

hence, we must multiply 43200 by 5, so that product become a perfect cube.

Sto, the required smallest number is 5.

2	43200
2	21600
2	10800
2	5400
2	2700
2	1350
3	675
3	225
3	75
5	25
5	5
	1

7. By which smallest number 13122 must be divided, so that the quotient is a perfect cube?

$\therefore$ $13122 = 2 \times 3 \times 3 \times \underline{3 \times 3 \times 3} \times \underline{3 \times 3 \times 3}$

Thus, it is clear that to make it a perfect cube it must be divde by $2 \times 3 \times 3 = 18$.

Hence, the required smallest number is 18.

2	13122
3	6561
3	2187
3	729
3	243
3	81
3	27
3	9
3	3
	1

8. The edge of a cuboid tank is 1.8 metre. Find the volume of that water to be filled in the tank.

We have, The edge of a cubical tank = 1.8 m

So, The volume of that water to be filled in the tank

$$= (\text{edge})^3 \text{ cu units}$$
$$= (1.8)^3 \text{ m}^3$$
$$= 1.8 \times 1.8 \times 1.8 \text{ m}^3 = 5.832 \text{ m}^3$$

Hence, the required volume of water is 5.832 m^3.

9. Verify the following statements by taking different values of n :

(a) Let $n = 3, 5, 7 \ldots\ldots$

Then, $n^3 = (3)^3 = 27$ (odd no.)

For, $n = 5, (n)^3 = (5)^3 = 125$ (odd no.)

For $n = 7$,

$(n)^3 = (7)^3 = 343$ (odd no.) Hence verified.

(b) Let, $n = 4, 7, 13$

$\therefore$ $3\overline{)4}$ (1) $3\overline{)7}$ (2) $3\overline{)13}$ (4)

-3 -6 -12

1 1 1

Here, all remainder value are 1. Hence, verified.

(c) Let $n = 2, 4, 6 \ldots\ldots$ (even nos.)

then $(n)^3 = (2)^3 = 8$ {for $n = 2$}

$(n)^3 = (4)^3 = 64$ {for $n = 4$}

$(n)^3 = (6)^3 = 216$ {for $n = 6$}

So, 8, 64, 216 …… (are even numbers). Hence, verified.

(d) Let $n = 1, 2, 3 \ldots\ldots$

Now, cube of $(3n + 1)^3 = (3 \times 1 + 1)^3 = (4)^3 = 64$

$= (3 \times 21 + 1)$

For $n = 2$,

$(3 \times 2 + 1)^3 = (7)^3 = 343 = (3 \times 114 + 1)$

For $n = 3$

$(3 \times 3 + 1)^3 = (10)^3 = 1000 = (3 \times 333 + 1)$

10. Write true (T) or false (F) for the following statements:

(a) False (b) False (c) True (d) True (e) False (f) True

Exercise 4.2

1. Find the cube root of the following numbers using prime factorisation method :

(a) 91125

3	91125
3	30375
3	10125
3	3375
3	1125
3	375
5	125
5	25
5	5
	1

$\therefore$ 91125

$= 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 5 \times 5 \times 5$

So, $\sqrt[3]{91125}$

$= 3 \times 3 \times 5 = 45$

(b) 531441

3	531441
3	177147
3	59049
3	19683
3	6561
3	2187
3	729

3	243
3	81
3	27
3	9
3	3
	1

$\therefore \quad 531441 = \underline{3\times 3\times 3}\times \underline{3\times 3\times 3}\times \underline{3\times 3\times 3}\times \underline{3\times 3\times 3}$

So, $\sqrt[3]{531441} = 3\times 3\times 3\times 3 = 81$

(c) 250047

3	250047
3	83349
3	27783
3	9261
3	3087

3	1029
7	343
7	49
7	7
	1

$\therefore \quad 250047 = 3\times 3\times 3\times 3\times 3\times 3\times 7\times 7\times 7$

So, $\sqrt[3]{250047} = 3\times 3\times 7 = 63$

(d) 551368

2	551368
2	275684
2	137842
41	68921
41	1681
41	41
	1

$551368 = 2\times 2\times 2\times 41\times 41\times 41$

$\sqrt[3]{551368} = 2\times 41 = 82$

(e) –74088

2	74088
2	37044
2	18522
3	9261
3	3087
3	1029
7	343
7	49
7	7
	1

We know that,

$$\sqrt[3]{-74088} = -\sqrt[3]{74088}$$

Now,

$\therefore \quad 74088 = 2\times 2\times 2\times 3\times 3\times 3\times 7\times 7\times 7$

So,

$$\sqrt[3]{-74088} = -\sqrt[3]{74088} = 2\times 3\times 7$$
$$= 6\times 7$$
$$= 42$$

(f) We know that, $\sqrt[3]{-175616} = \sqrt[3]{175616}$

Now,

2	175616
2	87808
2	43904
2	21952
2	10976
2	5488
2	2744

2	1372
2	686
7	343
7	49
7	7
	1

So, $175616 = \underline{2\times 2\times 2}\times \underline{2\times 2\times 2}\times \underline{2\times 2\times 2}\times \underline{7\times 7\times 7}$

$\therefore \quad \sqrt[3]{-175616} = -\sqrt[3]{175616}$

$$= -\sqrt[3]{175616}$$
$$= -2\times 2\times \times 7$$
$$= -56$$

2. Find the value of the following:

(a) $\sqrt[3]{\frac{3375}{4913}}$

3	3375
3	1125
3	375
5	125
5	25
5	5
	1

17	4913
17	289
17	17
	1

$\therefore \quad 3375 = 3 \times 3 \times 3 \times 5 \times 5 \times 5$

$4913 = 17 \times 17 \times 17$

So, $\sqrt[3]{\frac{3375}{4913}} = \frac{3 \times 5}{17} = \frac{15}{17}$

(b) $\sqrt[3]{\frac{2197}{1331}}$

13	2197
13	169
13	13
	1

11	1331
11	121
11	11
	1

$\therefore \quad 2197 = 13 \times 13 \times 13$

$1331 = 11 \times 11 \times 11$

So, $\sqrt[3]{\frac{2197}{1331}} = \frac{13}{11} = 1\frac{2}{11}$

(c) $\sqrt[3]{\frac{-343}{166375}}$

We have that,

$$\sqrt[3]{\frac{-343}{166375}} = -\sqrt[3]{\frac{343}{166375}}$$

Now,

7	343
7	49
7	7
	1

5	166375
5	33275
5	6655
11	1331
11	121
11	11
	1

So, $\sqrt[3]{\frac{-343}{166375}} = -\sqrt[3]{\frac{343}{166375}} = \frac{-7}{5\times 11} = \frac{-7}{55}$

(d) $\sqrt[3]{\frac{-9261}{42875}}$

We know that,

$$\sqrt[3]{\frac{-9261}{42875}} = -\sqrt[3]{\frac{9261}{42875}}$$

Now,

3	9261
3	3087
3	1029
7	343
7	49
7	7
	1

5	42875
5	8575
5	1715
7	343
7	49
7	7
	1

$\therefore \quad 9261 = 3\times 3\times 3\times 7\times 7\times 7$

$42875 = 5\times 5\times 5\times 7\times 7\times 7$

So, $\sqrt[3]{\frac{-9261}{42875}} = \frac{-3\times 7}{5\times 7} = \frac{-3}{5}$

3. Find the value of the following numbers :

(a) $\sqrt[3]{373.248} = \frac{\sqrt[3]{373248}}{\sqrt[3]{1000}} = \frac{\sqrt[3]{373248}}{10}$

2	373248
2	186624
2	93312
2	46656
2	23328
2	11664
2	5832
2	2916
2	1458

3	729
3	243
3	81
3	27
3	9
3	3
	1

$\therefore \quad 373248 = \underline{2\times 2\times 2}\times \underline{2\times 2\times 2}\times \underline{2\times 2\times 2}\times \underline{3\times 3\times 3}\times \underline{3\times 3\times 3}$

So, $\sqrt[3]{373.248} = 7.2$

(b) $\sqrt[3]{0.085184}$

2	85184
2	42592
2	21296
2	10648
2	5324
2	2662
11	1331
11	121
11	11
	1

$\therefore \quad 85184 = \underline{2\times 2\times 2}\times \underline{2\times 2\times 2}\times \underline{11\times 11\times 11}$

So, $\sqrt[3]{0.085184} = \frac{\sqrt[3]{85184}}{\sqrt[3]{1000000}} = \frac{44}{100} = 0.44$

(c) $\sqrt[3]{0.000729}$

3	729
3	243
3	81
3	27
3	9
3	3
	1

$\therefore \quad 729 = \underline{3\times 3\times 3}\times \underline{3\times 3\times 3}$

So, $\sqrt[3]{0.000729} = 0.09$

(d) $\sqrt[3]{0.003375}$

3	3375
3	1125
3	375
5	125
5	25
5	5
	1

$\therefore \quad 3375 = 3\times 3\times 3\times 5\times 5\times 5]$

So, $\sqrt[3]{0.003375} = \dfrac{\sqrt[3]{3375}}{\sqrt[3]{1000000}}$

$= \dfrac{15}{100} = 0.15$

4. Find the smallest perfect number by which, following numbers are multiplied, so that the product is a perfect cube find out cube root :

(a) 6750

On resolving 6750 into prime factors,

$\therefore \quad 6750 = 2\times \underline{3\times 3\times 3}\times \underline{5\times 5\times 5}$

Thus, To make it a perfect cube it must be multiplied by $2\times 2 = 4$.

So, $6750\times 4 = \underline{2\times 2\times 2}\times \underline{3\times 3\times 3}\times \underline{5\times 5\times 5}$

$\therefore \quad \sqrt{27000} = 2\times 3\times 5 = 30$

Hence, the required smallest number is 4.

2	6750
3	3375
3	1125
3	375
5	125
5	25
5	5
	1

(b) 3087

On resolving 3087 into prime factors.

$\therefore \quad 3087 = 3 \times 3 \times 7 \times 7 \times 7$

Thus, to make it a perfect cube it must be multiplied by 3.

So, $3087 \times 3 = 3 \times 3 \times 3 \times 7 \times 7 \times 7$

$\Rightarrow \quad \sqrt[3]{9261} = 3 \times 7 = 21$

Hence, the required smallest number is 3.

So, $3087 \times 3 = 3 \times 3 \times 3 \times 7 \times 7 \times 7$

$\Rightarrow \quad \sqrt[3]{9261} = 3 \times 7 = 21$

Hence, the required smallest number is 3.

3	3087
3	1029
7	343
7	49
7	7
	1

(c) 43200

On resolving 43200 into prime factors.

$\therefore \quad 43200$

$= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 5 \times 5$

Thus,to make it a perfect cube it must be multiplied by 5.

So, 43200×5

$= \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3} \times \underline{5 \times 5 \times 5}$

$\Rightarrow \quad \sqrt[3]{216000} = 2 \times 2 \times 3 \times 5 = 60$

Hence, the required red smallest number is 5.

2	43200
2	21600
2	10800
2	5400
2	2700
2	1350
3	675
3	225
3	75
5	25
5	5
	1

(d) 33275

On resolving 33275 into prime factors

$\therefore \quad 33275 = 5 \times 5 \times \underline{11 \times 11 \times 11}$

Thus, to make it a perfect cube it must be multiplied by 5.

So, $33275 \times 5 = \underline{5 \times 5 \times 5} \times \underline{11 \times 11 \times 11}$

$\Rightarrow \quad \sqrt[3]{166375} = 5 \times 11 = 55$

Hence, the required smallest number is 5.

5	33275
5	6655
11	1331
11	121
11	11
	1

5. Find the smallest number, by which, following numbers can be divided to find perfect cube root of the quotient :

(a) 15552

On resolving 15552 into prime factors,

$\therefore \quad 15552 = 2\times 2\times 2\times 2\times 2\times 2\times 3\times 3\times 3\times 3\times 3$

Thus, to make it perfect cube it must be divide by $3\times 3 = 9$

So, $15552 \div 9$

$$= \frac{\underline{2\times 2\times 2}\times \underline{2\times 2\times 2}\times \underline{3\times 3\times 3}\times 3\times 3}{3\times 3}$$

$\Rightarrow \quad 1728 = 2\times 2\times 2\times 2\times 2\times 2\times 3\times 3\times 3\times 3$

$\sqrt[3]{1728} = 2\times 2\times 3 = 12$

Hence, the rquired smallest number is 9.

2	15552
2	7776
2	3888
2	1944
2	972
2	486
3	243
3	81
3	27
3	9
3	3
	1

(b) 3087

On resolving 3087 into prime factors,

$\therefore \quad 3087 = 3\times 3\times \underline{7\times 7\times 7}$

Thus, to make it perfect cube it must be divide by $3\times 3 = 9$.

So, $3087 \div 9 = \dfrac{3\times 3\times 7\times 7\times 7}{9}$

$\Rightarrow \quad \sqrt[3]{343} = 7$

Hence, the required smallest number is 9.

3	3087
3	1029
7	343
7	49
7	7
	1

(c) 31250

On resolving 31250 into prime factors.

$\therefore \quad 31250 = 2\times \underline{5\times 5\times 5\times 5\times 5\times 5}$

Thus, to make it perfect cube it must be divide by 2.

So, $31250 \div 2 = \dfrac{2\times 5\times 5\times 5\times 5\times 5\times 5}{2}$

$\Rightarrow \quad 15625 = 5\times 5\times 5\times 5\times 5\times 5$

2	31250
5	15625
5	3125
5	625
5	125
5	25
5	5
	1

$\Rightarrow \quad \sqrt[3]{15625} = 5 \times 5 = 25$

hence, the required smallest number is 2.

(d) 120393

On resolving 120393 into prime factors,

$\therefore \quad 120393 = 3 \times 3 \times 3 \times 7 \times 7 \times 7 \times 13$

Thus, to make it perfect cube it must be divide by 13.

So, $\frac{120393}{13} = \frac{3 \times 3 \times 3 \times 7 \times 7 \times 7 \times 13}{13}$

$\Rightarrow \quad 9261 = 3 \times 3 \times 3 \times 7 \times 7 \times 7$

$\Rightarrow \quad \sqrt[3]{9261} = 3 \times 7 = 21$

Hence, the requried smallest number is 13.

3	120393
3	40131
3	13377
7	4459
7	637
7	91
13	13
	1

6. Estimate the cube root of the following correct up to two decimal places.

(a) $260 = \sqrt[3]{26 \times 10} = \sqrt[3]{26} \times \sqrt[3]{10}$

$= 2.962 \times 2.154 = 6.38$

(b) $89.5 = 90.0$ (Estimated)

$\therefore \quad \sqrt[3]{90} = 4.481$ (2 decimal places)

$= 4.48$ (By using cube root table)

(c) 125×63

We have,

$125 \times 63 = 5 \times 25 \times 63$

$\therefore \quad \sqrt[3]{125 \times 63} = \sqrt[3]{5 \times 25 \times 63}$

$= \sqrt[3]{5} \times \sqrt[3]{25} \times \sqrt[3]{63}$

$= 1.710 \times 2.924 \times 3.979$

$= 19.895$ By using the cube root table

$= 19.90$

(d) $\frac{83}{94}$

We have

$\therefore \quad \sqrt[3]{\frac{83}{94}} = \frac{\sqrt[3]{83}}{\sqrt[3]{94}}$

$$= \frac{4.362}{4.547} \qquad \{\text{By using cube root table}\}$$
$$= 0.959$$
$$= 0.96$$

(e) 3375

We have,

$3375 = 3 \times 3 \times 3 \times 5 \times 5 \times 5$

$= 3 \times 3 \times 5 \times 3 \times 5 \times 5$

$= 45 \times 75$

$\Rightarrow \quad 3375 = 45 \times 75$

$\therefore \quad \sqrt[3]{3375} = \sqrt[3]{45 \times 75}$

$= \sqrt[3]{45} \times \sqrt[3]{75}$

$= 3.557 \times 4.217$ {By using cube root table

$= 14.9998 = 15.00$

(f) 68921

$68921 = 41 \times 41 \times 41$

Now,

$\sqrt[3]{68921} = \sqrt[3]{41 \times 41 \times 41}$

$= \sqrt[3]{41} \times \sqrt[3]{41} \times \sqrt[3]{41}$

$= 3.448 \times 3.448 \times 3.448$ {By using cube root}

$= 40.9922$

$= 40.99$

41	68921
41	1681
41	41
	1

(g) 300763

We have,

$300763 = 67 \times 67 \times 67$

Now, $\sqrt[3]{300763}$

$= \sqrt[3]{67 \times 67 \times 67}$

$= 4.062 \times 4.062 \times 4.062$

{By using cube root table}

$= 67.022$

$= 67.02$

67	300763
67	4489
67	67
	1

(h) 15.625

We have,

$$15.625 = \frac{15625}{1000}$$

Now,

$$15625 = 5\times 5\times 5\times 5\times 5\times 5$$
$$= 25\times 25\times 25$$

So, $\sqrt[3]{15.625} = \sqrt[3]{\frac{15625}{1000}} = \frac{\sqrt[3]{15625}}{\sqrt[3]{1000}}$

$$= \frac{\sqrt[3]{25\times 25\times 25}}{10} = \frac{\sqrt[3]{25}\times\sqrt[3]{25}\ \sqrt[3]{25}}{10}$$
$$= \frac{2.924\times 2.924\times 2.925}{10}$$

{By using cube root table}

$$= 24.999 = 25.00$$

5	15625
5	3125
5	625
5	125
5	25
5	5
	1

Mental Ability

A. Multiple Choice Questions :

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

B. Fill in the blanks :

1. The units place in cube of 97 is **3**.
2. If $\sqrt[3]{a} = 3$, then the value of 'a' is **27**.
3. Complete the pattern 1, 8, 27, 64, **125** , **216**.
4. The number of zeros in cube of 300 are **Six**.

C. State True (T) or False (F) :

1. False **2.** True **3.** False **4.** False

Higher Order Thinking Skills

Sol. $P = \frac{7}{9}\times\frac{26}{28}\times\frac{63}{65}\times\ldots\ldots\times\frac{K^3-1}{K^3+1}\times\ldots\ldots$

$$= \frac{1\times 7}{3\times 3}\times\frac{2\times 13}{4\times 7}\times\frac{3\times 21}{5\times 13}\ldots\ldots$$
$$= \frac{1\times 2}{3}$$

Chapter

5 Playing with Numbers

Exercise 5.1

1. Let the required number be 'x'.

Now, according to question,

$$(x+18)\times 7 = 182$$

$$\Rightarrow \quad x+8 = \frac{182}{7} = 26$$

$$\Rightarrow \quad x+18 = 26$$

$$\Rightarrow \quad x = 26-18 = 8$$

Hence, the required number is 8.

2. We have,

$$(P+7)\times 9 = 216$$

$$\Rightarrow \quad P+7 = \frac{216}{9} = 24$$

$$\Rightarrow \quad P+7 = 24$$

$$\Rightarrow \quad P = 24-7 \quad \Rightarrow \quad P = 17$$

Hence, the value of P is 17.

3. Fill the values of unknown :

(b)
$$\begin{array}{r} p\ 7 \\ +\ 6\ q \\ \hline 1\ 1\ 1 \end{array} \longrightarrow \begin{array}{r} 4\ 7 \\ +6\ 4 \\ \hline 111 \end{array} \qquad \begin{array}{l} p=4 \\ q=4 \end{array}$$

(b)
$$\begin{array}{r} 8\ p \\ +5\ 6 \\ \hline 1\ 4\ 1 \end{array} \longrightarrow \begin{array}{r} 8\ 5 \\ +5\ 6 \\ \hline 1\ 4\ 1 \end{array} \qquad \{p=5$$

(c)
$$\begin{array}{r} 4\ n\ 6 \\ +l\ 7\ m \\ \hline 14\ 5\ 4 \end{array} \longrightarrow \begin{array}{r} 4\ 7\ 6 \\ +9\ 7\ 8 \\ \hline 14\ 5\ 4 \end{array} \qquad \begin{array}{l} n=7 \\ l=9 \\ m=8 \end{array}$$

(d)
$$\begin{array}{r} r\ 3\ 8 \\ -2\ 9\ \mathrm{p} \\ \hline 3\ q\ 5 \end{array} \longrightarrow \begin{array}{r} 6\ 3\ 8 \\ -2\ 9\ 3 \\ \hline 3\ 4\ 5 \end{array} \qquad \begin{array}{l} p=3 \\ q=4 \\ r=6 \end{array}$$

(e)
$$\begin{array}{r} 8\ a\ 5 \\ -\ b\ 8\ 6 \\ \hline 1\ 0\ c \end{array} \longrightarrow \begin{array}{r} 8\ 9\ 5 \\ -\ 7\ 8\ 6 \\ \hline 1\ 0\ 9 \end{array}$$
$a = 9$
$b = 7$
$c = 9$

(f)
$$\begin{array}{r} 7\ y\ x \\ -\ 2\ 9\ 9 \\ \hline 4\ 9\ 9 \end{array} \longrightarrow \begin{array}{r} 7\ 9\ 8 \\ -\ 2\ 9\ 9 \\ \hline 4\ 9\ 9 \end{array}$$
$x = 8$
$y = 9$
$z = 2$

4. (a)
$$\begin{array}{r} 2\ x \\ \times\ y\ 9 \\ \hline 2\ 1\ 6 \\ 1\ 2\ 0\ \times \\ \hline 1\ 4\ 1\ 6 \end{array} \longrightarrow \begin{array}{r} 2\ 4 \\ \times\ 5\ 9 \\ \hline 2\ 1\ 6 \\ 1\ 2\ 0\ \times \\ \hline 1\ 4\ 1\ 6 \end{array}$$
$x = 4$
$y = 5$

(b)
$$\begin{array}{r} x\ y \\ \times\ 7\ 6 \\ \hline 5\ 1\ 0 \\ 5\ 9\ 5\ \times \\ \hline 6\ 4\ 6\ 0 \end{array} \longrightarrow \begin{array}{r} 8\ 5 \\ \times\ 7\ 6 \\ \hline 5\ 1\ 0 \\ 5\ 9\ 5\ \times \\ \hline 6\ 4\ 6\ 0 \end{array}$$
$x = 8$
$y = 5$

(c)
$$\begin{array}{r} 8\ y\ 8 \\ \times\ x\ 7\ z \\ \hline 7\ 9\ 9\ 2 \\ 6\ 2\ 1\ 6\ \times \\ 3\ 5\ 5\ 2\ \times\times \\ \hline 4\ 2\ 5\ 3\ 5\ 2 \end{array} \longrightarrow \begin{array}{r} 8\ 8\ 8 \\ \times\ 4\ 7\ 9 \\ \hline 7\ 9\ 9\ 2 \\ 6\ 2\ 1\ 6\ \times \\ 3\ 5\ 5\ 2\ \times\ \times \\ \hline 4\ 2\ 5\ 3\ 5\ 2 \end{array}$$
$x = 4$
$y = 8$
$z = 9$

5. We have

Magic order $= 3 \times 3$

Magic sun $= 54$

$\therefore$ Middle number $= \dfrac{54}{3} = 18$

Now,

15	20	19
22	18	14
17	16	21

6. Take a set of 16 consecutive numbers starting from 31. Now write them in order frodm the beginning of the first box in the first row to the last box in the last row, as shown in fig.

31	32	33	34
35	36	37	38
39	40	41	42
43	44	45	46

Now, write the diagonals in reverse order as shown in fig and fill up the other numbers as they were placed in first fig.

46	32	33	43
35	41	40	38
39	37	36	42
34	44	45	31

This is the requried magic square of 4×4 order.

7. Complete the magic squares given below :

(a)

6	1	8
7	5	3
2	9	4

(use, 1-9 digits only)

(b)

6	12	7	9
1	15	4	14
11	5	10	8
16	2	13	3

(use, 1-6 digits only)

Exercise 5.2

1. Test the divisibility by 2,3,5 and 9.

(a) We have,

$80 + 9 = 89$

This number is not divisible by 2, 3, 5 and 9.

(b) $400 + 70 + 5 = 475$

this number is divisible by 5 because ones digit is 5 in it.

(c) $9000 + 600 + 20 + 1 = 9621$

Here, sum of digits $= 9 + 6 + 2 + 1 = 18$

So, 9621 is divisible by 3 and 9 because 18 is the multiple of 3 and 9.

2. Given number is

$900 + 10b + 6$

If $b = 3$, then $900 + 10 \times 3 + 6 = 936$

So, 936 is a multiple of 3 and 9.

Hence, the requried value of b is 3.

3. Give two examples of a number which is divisible by :

(a) 6, 15 (b) 4, 8 (c) 12, 20

4. All the possible numbers are 3902, 3920, 9320, 3290, 9302, 3092, 9032, 9230.

5. Using the tests of divisibility, determine which of the following numbers are divisible by 9:

(a) 1258

Here, sum of digits $= 1 + 2 + 5 + 8$

$= 16$

So, 16 is not a multiple of 9.

Hence, 1258 is not divisible by 9.

(b) 4338

$\therefore$ Sum of digits $= 4 + 3 + 3 + 8$

$= 18$

So, 18 is a multiple of 18.

Hence, 4338 is divisible by 9.

(c) 7905

Now, sum of digits $= 7 + 9 + 0 + 5$

$= 21$

So, 21 is not a multiple of 9.

Hence, 7905 is not divisible by 9.

(d) 63909

Now, sum of digits $= 6 + 3 + 9 + 0 + 9 = 27$

So, 27 is a multiple of 9.

So, 63909 is divisible by 9.

6. Write the smallest and the greatest values of a in each of the following numbers so that the number formed is divisible by 3:

(a) $a6724$

If $a = 2$, then,

Sum of digits $= 2 + \ + 7 + \ + 4 = 21$

So, 21 is a multiple of 3

If $a = 8$, then,

Sum of digits $= 8 + 6 + 7 + 2 + 4 = 27$

So, 27 is a multiple of 3.

Hence, the required smallest and greatest values of 'a' are 2 and 8.

(b) $4765a2$

If $a = 0$, then,

Sum of digits $= 4 + 7 + 6 + 5 + 0 + 2 = 24$

So, 24 is a multiple of 3.

If $a = 9$, then,

Sum of digits $= 4 + 7 + 6 + 5 + 9 + 2 = 33$

So, 33 is a multiple of 3.

Hence, the required smallest and greatest number of 'a' are 0 and 9.

7. Write the values of a and b in the following odd numbers so that the numbers formed are divisible by 3 and 5 :

(a) $7a25$

If $a = 1$, then

Sum of digits $= 7 + 1 + 2 \ \ 5$

$= 15$

So, 15 is a multiple of 3 and 5.

Hence 7125 is divisible by 3 and 5 both.

(b) $8ab4b$

If $a = 1$ and $b = 1$, then

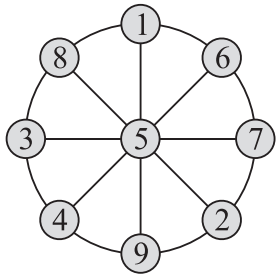
Sum of digits $= 8 + 1 + 1 + \ + 1$

$= 15$

So, 15 is a multiple of 3 and 5 both.

Hence, 81141 is divisible by 3.

8.



Here, sum of each diameter is 15, so digits 1 to 9 are in proper place.

9. If $c = 0$, then

Number $= 900 + 30 + 0 = 930$

Hence, the number 930 is divisible by 5 and 10 both, because its ones place digit is 0.

10. If $c = 0$, then

Number $= 600 + 30 + 0 = 630$

Now,

Sum of digits $= 6 + 3 + 0 = 9$

So, 9 is a multiple of 3 and 9.

Hence, 630 is divisible by 9 exactly.

Mental Ability

A. Multiple Choice Questions :

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

B. Fill in the blanks :

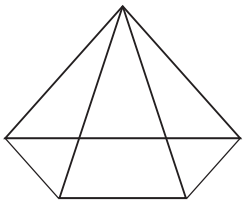
1. The number 5, 7, 10, 14, 19 **25**.
2. A number represented as $100a + 10b + c$ will have **three** digits in it.
3. The generalized form of a 3-digits number is **$(100a + 10b + c)$**.
4. $2^2 \times 3^2$ is divisible by **2** and **3**.

C. State True (T) or False (F) :

1. False **2.** True **3.** False **4.** True

Higher Order Thinking Skills

1.



Here, The number of triangle in above fig. are 35.

2. $99+\frac{9}{9}=99+1=100$

Chapter

6 Algebraic Expressions

Exercise 6.1

1. Identify which of the following expressions are polynomials. If the expression is not a polynomial. say why?

(a) is a polynomial

(b) is not a polynomial since the degree of the variable is fraction.

(c) is a polynomial

(d) is not a polynomial since the degree of the variable x a fraction $\left(\frac{3}{7}\right)$.

2. Write the degree of each of the following polynomials.

(a) 3 (b) 4 (c) 5 (d) 5 (e) 7

3. Arrange each of the polynomials in : (a) ascending order of the first variable, and (b) in descending order of the second variable.

(a) $-2xy+3x^2y^3+x^3y^3-4x^4y;$

$3x^2y^3+x^2y^2-2xy-4x^4y$

(b) $ab^5-6ab^3+5a^2b^4; ab^5+5a^2b^4-6ab^3$

(c) $1 - pq - pq^3 + p^2q^4;\ p^2q^4 - pq^3 - pq + 1$

(d) $xy^3 + x^3y;\ x^3y + xy^3$

(e) $8xy^4 - 9x^2y^3 - 7x^5y + x^6y^2;$

$8xy^4 - 9x^2y^3 + x^6y^2 - 7x^5y$

4. Add the polynomials.

(a) $3x^2 - 4x + 6x^3 - 5$ and $8x^3 - 4x^2 + 5x + 5$

$= 3x^2 - 4x + 6x^3 - 5 + 8x^3 - 4x^2 + 5x + 5$

$= (6x^3 + 8x^3) + (3x^2 - 4x^2) + (5x - 4x) + (-5 + 5)$

$= 14x^3 - x^2 + x + 0$

$= 14x^3 - x^2 + x$

(b) $7a^3b - 8a^2b^2 + 9ab$ and $1 - 6ab$

$= 7a^3b - 8a^2b^2 + 9ab + 1 - 6ab$

$= 7a^3b - 8a^2b^2 + 3ab + 1$

(c) $5pq^2 + 6p^2q - 9pq$ and $9pq - 6p^2q - 5pq^2$

$= 5pq^2 + 6p^2q - 9pq + 9pq - 6p^2q - 5pq^2$

$= (6p^2q - 6p^2q) + (5pq^2 - 5pq^2) + (+9pq - 9pq)$

$= 0 + 0 + 0$

$= 0$

(d) $3 - abc + abc^2$ and $-2abc^2 + abc$

$= 3 - abc + abc^2 - 2abc^2 + abc$

$= -abc^2 + 3$

(e) $\left(\frac{-2xy}{3} + \frac{3x^2y}{4} + \frac{4xy^2}{5}\right) + \left(\frac{xy}{3} + \frac{-2x^2y}{5} + \frac{3xy^2}{5}\right)$

$= \frac{-2xy}{3} + \frac{3x^2y}{4} + \frac{4xy^2}{5} + \frac{xy}{3} - \frac{2x^2y}{5} + \frac{3xy^2}{5}$

$= \left(\frac{-2xy}{3} + \frac{xy}{3}\right) + \left(\frac{3x^2y}{4} - \frac{2x^2y}{5}\right) + \left(\frac{4xy^2}{5} + \frac{3xy^2}{5}\right)$

$$= \frac{-xy}{3} + \frac{(15x^2y - 8x^2y)}{20} + \frac{7xy^2}{5}$$

$$= \frac{-xy}{3} + \frac{7x^2y}{20} + \frac{7xy^2}{5}$$

5. Subtract the first polynomial from the second.

(a) $(-5x + 7x^2 + 9) - (6x^2 + 5x - 1)$

$= -5x + 7x^2 + 9 - 6x^2 - 5x + 12$

$= 7x^2 - 6x^2 - 5x - 5x + 9 + 1$

$= x^2 - 10x + 10$

(b) $(12 - x^2) - (6x^2 - 15x + 4)$

$= 12 - x^2 - 6x^2 + 15x - 4$

$= -7x^2 + 15x + 8$

(c) $(a^3 - 4a^2 - a + 5) - (a^2 - 5a + 6)$

$= a^3 - 4a^2 - a + 5 - a^2 + 5a - 6$

$= a^3 - 5a^2 + 4a - 1$

6. Multiply :

(a) $(-5a^2b^2) \times (-6ab)$

$= (-5) \times (-6)a^2b^2 \times ab$

$= 30a^3b^3$

(b) $(xyz) \times (-3x^2y^2z) = -3x^4y^3z^2$

(c) $\left(\frac{-2}{3}xy\right) \times \left(\frac{3}{2}x^2y^2z\right) = -x^3y^3z$

(d) $(3x - 1) \times (2x^2 - 4x + 1)$

$= 3x(2x^2 - 4x + 1) - 1(2x^2 - 4x + 1)$

$= 6x^3 - 12x^2 + 3x - 2x^2 + 4x - 1$

$= 6x^3 - 14x^2 + 7x - 1$

(e) $(3 - x) \times (3x^3 - 6x^2y + xy^2 + 2)$

$= 3 \times (3x^3 - 6x^2y + xy^2 + 2) - x(3x^3 - 6x^2y + xy^2 + 2)$

$= 9x^3 - 18x^2y + 3xy^2 + 6 - 3x^4 + 6x^3y - x^2y^2 - 2x$

$= -3x^4 + 9x^3 + 6x^3y - 18x^2y + 3xy^2 - x^2y^2 - 2x + 6$

(f) $(x - y)(x^3 - y^3) = x(x^3 - y^3) - y(x^3 - y^3)$

$= x^4 - xy^2 - x^3y + y^4$

$= x^4 - x^3y - xy^3 + y^4$

(g) $(2x - y)(x^2 - 7x + 6) = 2x(x^2 - 7x + 6) - y(x^2 - 7x + 6)$

$= 2x^3 - 14x^2 + 12x - x^2y + 7xy - 6y$

$= 2x^3 - 14x^2 - x^2y + 12x + 7xy - 6y$

(h) $(1 - xy)(x + y - xy) = 1(x + y - xy) - xy(x + y - xy)$

$= x + y - xy - x^2y - xy^2 + x^2y^2$

$= x^2y^2 - x^2y - xy^2 - xy + x + y$

(i) $(3a^3 - 7b^3)(2a^2b + ab^2)$

$= 3a^3(2a^2b + ab^2) - 7b^3(2a^2b + ab^2)$

$= 6a^5b + 3a^4b^2 - 14a^2b^4 - 7ab^5$

(j) $(y^2 + 2y + 3) \times (y^2 + 2y - 3)$

$= y^2(y^2 + 2y - 3) + 2y(y^2 + 2y - 3) + 3(y^2 + 2y - 3)$

$= y^4 + 2y^3 - 3y^2 + 2y^3 + 4y^2 - 6y + 3y^2 + 6y - 9$

$= y^4 + 4y^3 + 4y^2 - 9$

7. Indicate whether true or false. Correct the mistakes.

(a) False, $2 + a$ (b) False, $3a + b$

(c) True (d) False, a^2

Exercise 6.2

1. $\frac{\overset{3}{\cancel{21}}x^2y^3z^4}{\cancel{7}xy^2z^2} = 3x^{2-1}y^{3-2}z^{4-3}$

$= 3x^1y^1z^1$

$= 2xyz$

2. Divide :

(a) $\dfrac{(6a^2b + 3ab^2 + 12ab)}{2a} = \dfrac{6a^2b}{2a} + \dfrac{3ab^2}{2a} + \dfrac{12ab}{2a}$

$= 3ab + \dfrac{3}{2}b^2 + 6b$

(b) $\dfrac{(18a^3 - 12a^2c + 9ac^2)}{3ac} = \dfrac{18a^3}{3ac} - \dfrac{12a^2c}{3ac} + \dfrac{9ac^2}{3ac}$

$= \dfrac{6a^2}{c} - 4a + 3c$

3. Divide :

(a) $\dfrac{(4y^4 + 10y^3 + 18y^2 + 14)}{2y} = \dfrac{4y^4}{2y} + \dfrac{10y^3}{2y} + \dfrac{18y^2}{2y} + \dfrac{14}{2y}$

$= 2y^3 + 5y^2 + 9y + \dfrac{7}{y}$

(b) $\dfrac{(7x^2yz - 3xy^2z + 10xyz^2)}{3xyz} = \dfrac{7x^2yz}{3xyz} - \dfrac{3xy^2z}{3xyz} + \dfrac{10xyz^2}{3xyz}$

$= \dfrac{7}{3}x - y + \dfrac{10}{3}z$

4. Divide and write down the quotient and remainder for each :

(a) $(x + 2)\overline{)x^2 + 5x + 6}$

$x + 3$

$x^2 + 2x$

$3x + 6$

$3x + 6$

0

$[\because\ Q = (x + 3), R = 0]$

(b) $y+1 \overline{)\, y^2 - 2y + 5}$

$y - 3$

$y^2 + 1y$

$-3y + 5$

$-3y - 3$

$+8$

$[\because\ Q = (y-3)\ R = +8]$

(c) $m-2 \overline{)\, m^2 - 3m + 7}$

$m - 1$

$m^2 - 2m$

$-1m + 7$

$-1m + 2$

5

$[\because\ Q = (m-1)\ R = 5]$

(d) $x+4 \overline{)\, x^2 - 8x - 12}$

$x - 12$

$x^2 + 4x$

$-12x - 12$

$-12x - 48$

36

$[\because\ Q = (x-12),\ R = 36]$

(e) $3y-2 \overline{)\, 3y^2 + 10y - 9}$

$y + 4$

$3y^2 - 2y$

$12y - 9$

$12y - 8$

-1

$[\because\ Q = (y+4),\ R = -1]$

5. $-4x-6\overline{)-8x^2+12x+36}$ $\quad 2x-6$

$-8x^2-12x$

$+\quad +$

$24x+36$

$24x+36$

$-\quad -$

0

$[\because \quad Q=(2x-6)=2(x-3)]$

6. $x+1\overline{)x^4+1}$ $\quad x^3-x^2+x-1$

x^4+x^3

$-\quad -$

$-x^3+1$

$-x^3-x^3$

$+\quad +$

x^2+1

x^2+x

$-\quad -$

$-x+1$

$-x-1$

$+\quad +$

$+2$

$[\because \quad Q=x^3-x^2+x-1, R=2]$

Verification :

Dividend $=$ Divisor $\times$ Quotient $+$ Remainder

$\Rightarrow \quad (x^4+1) = (x+1)(x^3-x^2+x-1)+2$

$= x^4-x^3+x^2-x+x^3-x^2+x-1+2$

$= (x^4+1)$ Hence, verified.

7. We have,

$m^2+9n^2+6mn-14m-42n+6$

$=(m+3n)^2-14(m+3n)+6$

And, $m+3n-14=(m+3n)-14$

Now, Let $(m+3n)=x$

then,

$$
\begin{array}{r|l}
 & x \\
\hline
x-14 & x^2-14x+6 \\
 & x^2-14x \\
 & - \quad + \\
\hline
 & +6
\end{array}
$$

So, $Q = x = (m+3n)$ & $R = 6$

8. Find the value of k, if the divisor is a factor of the dividend.

(a) Divide $2x^3 - 14 + k$ by $x + 3$

Now,

$$
\begin{array}{r|l}
 & 2x^2-6x+18 \\
\hline
x+3 & 2x^3-14+K \\
 & 2x^3+6x^2 \\
 & - \quad - \\
\hline
 & -x^2-14 \\
 & -6x^2-18x \\
 & + \quad + \\
\hline
 & 18x-14+K \\
 & 18x+54 \\
 & - \quad - \\
\hline
 & -68+K
\end{array}
$$

For the remainder to be zero, $K = +68$

(b)

$$
\begin{array}{r|l}
 & 2x^2-7x-15 \\
\hline
2x+1 & 4x^3-12x^2-37x+K \\
 & 4x^3+2x^2 \\
 & - \quad - \\
\hline
 & -14x^2-37x \\
 & -14x^2-7x \\
 & + \quad + \\
\hline
 & -30x+K \\
 & -30x-15 \\
 & + \quad + \\
\hline
 & 0
\end{array}
$$

For the remainder to be zero $K = -15$

9. Since, The volume = length × width × height

We have, $\text{height} = \dfrac{\text{Volume}}{(\text{length} \times \text{width})}$

$\text{length} \times \text{width} = (2x-1)(x+3)$

$= 2x^2 + 6x - x - 3 = (2x^2 + 5x - 3)$

Hence, $\text{Height} = (2x^3 + 7x^2 + 2x - 3) \div (2x^2 + 5x - 3)$

$$
\begin{array}{r|l}
 & x+1 \\
\hline
2x^2+5x-3 & 2x^3+7x^2+2x-3 \\
 & 2x^3+5x^2-3x \\
\hline
 & 2x^2+5x-3 \\
 & 2x^2+5x-3 \\
\hline
 & 0
\end{array}
$$

Hence, the required height is $(x+1)$.

10. We have,

$(x+1)$ is a factor of $(x^3 + 3x^2 + 3x + K)$

So,

$$
\begin{array}{r|l}
 & x^2+2x+1 \\
\hline
x+1 & x^3+3x^2+3x+K \\
 & x^3+x^2 \\
\hline
 & 2x^2+3x \\
 & 2x^2+2x \\
\hline
 & 1x+K \\
 & 1x+1 \\
\hline
 & 0
\end{array}
$$

For the remainder the be zero, $K = 1$.

Hence, the required value of K is 1.

11.
$$
\begin{array}{r|l}
y-3 & y^2+y+6 \\
\hline
 & y^3-2y^2+3y-18 \\
 & y^3-3y^2 \\
 & \quad - \quad + \\
\hline
 & \quad -1y^2+3y \\
 & \quad 1y^2-3y \\
 & \quad - \quad + \\
\hline
 & \quad 6y-18 \\
 & \quad 6y-18 \\
 & \quad - \quad + \\
\hline
 & \quad 0
\end{array}
$$

Hence, $(y-3)$ is a factor of $(y^3-2y^2+3y-18)$.

Exercise 6.3

1. Using identities, find the values.

(a) $(298)^2 = (300-2)^2$

$= (300)^2 + (2)^2 - 2\times 300\times 2$

$= 90000 + 4 - 1200$

$= 90004 - 1200 = 88{,}804$

(b) $102 \times 98 = (100+2)(100-2)$

$= (100)^2 - (2)^2$

$= 10000 - 4$

$= 9996$

(c) $(2.98)^2 = (3-0.02)^2$

$= (3)^2 + (0.02)^2 - 2\times 3\times 0.02$

$= 9 + 0.0004 - 0.12$

$= 9.0004 - 0.1200$

$= 8.8804$

(d) $151\times 151 - 51\times 51 = (151)^2 - (51)^2$

$= (151+51)(151-51)$

$= (202)\times(100)$

$= 20{,}200$

2. Expand :

(a) $(2x+3)^2 = (2x)^2 + (3)^2 + 2\times 2x\times 3$

$= 4x^2 + 9 + 12x$

$= 4x^2 + 12x + 9$

(b) $(5a-3b)^2 = (5a)^2 - 2(5a)(3b) + (3b)^2$

$= 25a^2 - 30ab + 9b^2$

(c) $(-3x+5x)^2 = (-3x)^2 + 2(-3x)(5y) + (5y)^2$

$= 9x^2 - 30xy + 25y^2$

(d) $[5x+(-3y)]^2 = (5x)^2 + 2(5x)(-3y) + (-3y)^2$

$= 25x^2 - 30xy + 9y^2$

(e) $[(-4a)-(-2b)]^2 = (-4a)^2 - 2(-4a)(-2b) + (-2b)^2$

$= 16a^2 - 16ab + 4b^2$

(f) $[9a+(-2b)]^2 = (9a)^2 + 2(9a)\times(-2b) + (-2b)^2$

$= 81a^2 - 36ab + 4b^2$

(g) $(\sqrt{2}x-5y)^2 = (\sqrt{2}x)^2 - 2(\sqrt{2}x)(5y) + (5y)^2$

$= 2x^2 - 10\sqrt{2}xy + 25y^2$

$= 2x^2 + 25y^2 - 10\sqrt{2}xy$

(h) $(\sqrt{3}a+\sqrt{2}b)^2 = (\sqrt{3}a)^2 + (\sqrt{2}b)^2 + 2(\sqrt{3}a)(\sqrt{2}b)$

$= 3a^2 + 2b^2 + 2\sqrt{6}ab$

3. Find the product.

(a) $(2x-1)(2x+1) = (2x)^2 - (1)^2$

$= 4x^2 - 1$

(b) $(-2x+y)(2x+y) = (y-2x)(y+2x)$

$= y^2 - (2x)^2$

$= y^2 - 4x^2$

4. We have,

$$\left(x+\frac{1}{x}\right)=4$$

By squaring both sides,

$$\left(x+\frac{1}{x}\right)^2=(4)^2$$

$$\Rightarrow \quad x^2+\frac{1}{x^2}+2\times x\times\frac{1}{x}=16$$

$$\Rightarrow \quad x^2+\frac{1}{x^2}+2=16$$

$$\Rightarrow \quad x^2+\frac{1}{x^2}=16-2$$

$$\Rightarrow \quad \left(x^2+\frac{1}{x^2}\right)=14 \qquad \ldots(a)$$

Again squaring both sides,

$$\left(x^2+\frac{1}{x^2}\right)^2=(14)^2$$

$$\Rightarrow \quad x^4+\frac{1}{x^4}+2\times \cancel{x^2}\times\frac{1}{\cancel{x^2}}=196$$

$$\Rightarrow \quad x^4+\frac{1}{x^4}+2=196$$

$$\Rightarrow \quad x^4+\frac{1}{x^4}=196-2$$

$$\Rightarrow \quad x^4+\frac{1}{x^4}=194 \qquad \ldots(b)$$

5. We have,

$$\left(x^2+\frac{1}{x^2}\right)=(62)$$

By adding 2 on both sides, we get,

$$x^2+\frac{1}{x^2}+2=62+2$$

$$\Rightarrow \quad x^2+\frac{1}{x^2}+2\times x\times\frac{1}{x}=64$$

$$\Rightarrow \quad \left(x+\frac{1}{x}\right)^2=(8)^2$$

$$\Rightarrow \quad \left(x+\frac{1}{x}\right)=8$$

6. We have,

$$\left(x^2+\frac{1}{x^2}\right)=102$$

By subtracting 2 from both, sides, we get,

$$x^2+\frac{1}{x^2}-2=102-2$$

$$\Rightarrow \quad x^2+\frac{1}{x^2}-2\times x\times\frac{1}{x}=100$$

$$\Rightarrow \quad \left(x-\frac{1}{x}\right)^2=(10)^2$$

$$\Rightarrow \quad \left(x-\frac{1}{x}\right)=10$$

7. We have, $ab=2$ and $(a+2b)=5$

By squaring both sides, we get,

$(a+2b)^2=5^2$

$$\Rightarrow \quad (a)^2+(2b)^2+2(a)(2b)=25$$

$$\Rightarrow \quad a^2+4b^2+4ab=25$$

$$\Rightarrow \quad a^2+4b^2+4\times 2=25 \qquad (\because ab=2)$$

$$\Rightarrow \quad a^2+4b^2+8=25$$

$$\Rightarrow \quad a^2+4b^2=25-8$$

$$\Rightarrow \quad (a^2+4b^2)=17$$

8. We have,

$$(x^2+9y^2)=9$$

and $$xy=1$$

Now,

$$(2x+6y)^2 = 4x^2 + 36y^2 + 2\times(2x)(6y)$$
$$= 4x^2 + 36y^2 + 24xy = 4(x^2 + 9y^2) + 24\times(xy)$$
$$= 4\times 9 + 24\times 1 = 36 + 24 = 60$$

Hence, the rvalue of $(2x+6y)^2$ is 60.

9. We know that,

$$(x+y)^2 = x^2 + y^2 + 2xy$$
$$= x^2 + y^2 - 2xy + 2xy + 2xy = (x-y)^2 + 4xy$$
$$= (12)^2 + \cancel{4}\times\frac{25}{\cancel{4}} \qquad \{\because x-y=12 \;\; xy = 6\frac{1}{4} = \frac{25}{4}\}$$
$$= 144 + 25$$

$\Rightarrow \quad (x+y)^2 = 169$

$\Rightarrow \quad (x+y)^2 = (13)^2$

$\Rightarrow \quad (x+y) = 13$

10. We have,

$(64x^2 + y^2) = 72$ and $xy = 2$

Now, $\left(4x + \frac{y}{2}\right)^2 = \left(\frac{8x+y}{2}\right)^2 = \left[\frac{(8x+y)^2}{(2)^2}\right]$

$$= \frac{1}{4}[8x+y]^2 = \frac{1}{4}[64x^2 + y^2 + 2(8x)(y)]$$
$$= \frac{1}{4}[64x^2 + y^2 + 16xy]$$
$$= \frac{1}{4}[72 + 16\times 2] \qquad \text{(By putting above values)}$$
$$= \frac{1}{4}[72 + 32]$$
$$= \frac{1}{4}\times 104 = \frac{104}{4} = 26$$

Hence, the required value of $\left(4x + \frac{y}{2}\right)^2$ is 26.

11. We have,

$$\left(x-\frac{1}{x}\right)=8$$

By squaring both sides, we get

$$\left(x-\frac{1}{x}\right)^2=8^2$$

$$\Rightarrow \quad x^2+\frac{1}{x^2}-2\times x\times\frac{1}{x}=64$$

$$\Rightarrow \quad x^2+\frac{1}{x^2}-2=64$$

$$\Rightarrow \quad x^2+\frac{1}{x^2}=64+2$$

$$\Rightarrow \quad \left(x^2+\frac{1}{x^2}\right)=66 \qquad \ldots(a)$$

Again squaring both sides, we get

$$\left(x^2+\frac{1}{x^2}\right)^2=(66)^2$$

$$\Rightarrow \quad x^4+\frac{1}{x^4}+2\times x^2\times\frac{1}{x^2}=4356$$

$$\Rightarrow \quad x^4+\frac{1}{x^4}+2=4356$$

$$\Rightarrow \quad x^4+\frac{1}{x^4}=4356-2$$

$$\Rightarrow \quad \left(x^4+\frac{1}{x^4}\right)=4354 \qquad \ldots(b)$$

12. We have,

$$\left(x+\frac{1}{x}\right)=\sqrt{3}$$

By squaring both sides, we get

$$\left(x+\frac{1}{x}\right)^2=(\sqrt{3})^2$$

$$\Rightarrow \quad x^2 + \frac{1}{x^2} + 2 \times \cancel{x} \times \frac{1}{\cancel{x}} = 3$$

$$\Rightarrow \quad x^2 + \frac{1}{x^2} = 3 - 2$$

$$\Rightarrow \quad \left(x^2 + \frac{1}{x^2}\right) = 1 \qquad \ldots(a)$$

Again squaring both sides, we get

$$\left(x^2 + \frac{1}{x^2}\right)^2 = 1^2$$

$$\Rightarrow \quad x^4 + \frac{1}{x^4} + 2 \times \cancel{x^2} \times \frac{1}{\cancel{x^2}} = 1$$

$$\Rightarrow \quad x^4 + \frac{1}{x^4} + 2 = 1$$

$$\Rightarrow \quad x^4 + \frac{1}{x^4} = 1 - 2$$

$$\Rightarrow \quad \left(x^4 + \frac{1}{x^4}\right) = -1 \qquad \ldots(b)$$

13. Expand and simplify :

(a) $(a+b)(a-b)(a^2+b^2) = (a^2-b^2)(a^2+b^2)$

$= (a^2)^2 - (b^2)^2 = a^4 - b^4$

(b) $(a+b)^2 - (a-b)^2 = a^2 + b^2 + 2ab - a^2 - b^2 + 2ab$

$= 2ab + 2ab = 4ab$

(c) $(a+b)^2 - (a+b)(a-b) = (a+b)^2 - (a^2 - b^2)$

$= a^2 + b^2 + 2ab - a^2 + b^2$

$= 2b^2 + 2ab$

Exercise 6.4

1. Find the greatest common factor of the following monomials.

(a) $x^2 y = x \times x \times y$

$\underline{xy^2 = x \times y \times y}$

$\therefore$ Greatest common factor $= x \times y = xy$

(b) $16p^2qr^4 = 1\times 2\times 7\times p\times p\times q\times r\times r\times r\times r$

$49p^2q^2r = 1\times 7\times 7\times p\times p\times q\times q\times r$

$35pqr = 1\times 5\times 7\times p\times q\times r$

$\therefore$ Greatest common factor $= 1\times 7\times p\times q\times r = 7pqr$

(c) $6a^2 = 1\times 2\times 3\times a\times a$

$-18a^6 = -1\times 2\times 3\times 3\times a\times a\times a\times a\times a\times a$

$-12a^2 = 1\times 2\times 2\times 3\times a\times a$

$\therefore$ Greatest common factor $= 1\times 2\times 3\times a\times a = 6a^2$

(d) $91y^2a = 1\times 7\times 13\times y\times y\times a$

$39ya^2 = 1\times 3\times 13\times y\times a\times a$

$13ya = 1\times 13\times y\times y$

$\therefore$ Greatest common factor $= 1\times 13\times y\times a = 13ya$

2. Write each of the following as the product of two factors :

(a) $2x+8 = 2(x+4)$ (b) $3a-9 = 3(a-3)$

(c) $5a^2+15 = 5(a^2+3)$

(d) $10p^2qr + 15pq^2r = 5pqr(2p+3q)$

(e) $14x - 28x^2 = 14x(1-2x)$ (f) $6ab - a = a(6b-1)$

(g) $3x^2+9x+12$ (h) $8a^3 - 16a^2 + 4a$

$= 3(x^2+3x+4)$ $= 4a(2a^2-4a+1)$

(i) $4x^2 - 12x^2y^2 - 8x$ (j) $496 + 8ab^2 + 12a^2b$

$= 4x(x-3xy^2-2)$ $= 4ab(1+2b+3a)$

3. Factorise :

(a) $ax - ay + bx - by = a(x-y) + b(x-y)$

$= (x-y)(a+b)$

(b) $(a-b)^3 + (a-b)^2 = (a-b)^2\{a-b+1\}$

$= (a-b)^2(a-b+1)$

(c) $y(x-1) - x(x-1) = (x-1)(y-x)$

(d) $3x^2(y-1) + 2x(y-1) = (y-1)(3x^2+2x)$

$= x(3x+2)(y-1)$

(e) $x(x-y)^2 + y(x-y)^2 = (x-y)^2(x+y)$

(f) $x^2 - y^2 + x^3 - xy^2 = (x^2 - y^2) + x(x^2 - y^2)$
$= (x^2 - y^2)(1+x))$
$= (x+1)(x^2 - y^2)$

(g) $ax^2 + ay^2 - bx^2 - by^2 = a(x^2 + y^2) - b(x^2 + y^2)$
$= (x^2 + y^2)(a-b)$

(h) $xy^2 - yx^2 - xy + x^2 = xy(y-x) - x(y-x)$
$= (y-x)(xy-x)$
$= x(y-1)(y-x)$
$= x(x-y)(1-y)$

(i) $4ab + 8ab^2 + 12a^2b = 4ab(1 + 2b + 3a)$

Exercise 6.5

1. Express the following as the product of two factors :

(a) $a^2 + 14a + 49 = (a)^2 + 2\times(a)\times(7) + (7)^2$
$= (a+7)^2$
$= (a+7)(a+7)$

(b) $4q^2 + 8q + 4 = (2q)^2 + 2\times(2q)\times 2 + (2)^2$
$= (2q+2)^2$
$= (2q+2)(2q+2)$
$= 4(q+1)(q+1)$
$= 4(q+1)^2$

(c) $9x^2 - 24x + 16 = (3x)^2 - 2\times(3x)\times(4) + (4)^2$
$= (3x-4)^2$
$= (3x-4)(3x-4)$

(d) $p^4 - 8p^2q^2 + 16q^4 - 121$
$= (p^2)^2 - 2(p^2)(4q^2) + (4q^2)^2 - 121$
$= (P^2 - 4q^2)^2 - (11)^2$
$= (p^2 - 4q^2 + 11)(p^2 - 49^2 - 11)$

(e) $4a^2 + 24a + 36 = (2a)^2 + 2(2a)(6) + (6)^2$

$= (2a + 6)^2 = (2a + 6)(2a + 6)$

$= 4(a + 3)(a + 3) = 4(a + 3)$

(f) $a^4 - 4a^3 + 4a^2 = a^2(a^2 - 4a + 4)$

$= a^2(a - 2)^2$

(g) $3y^4 - 36y^2 + 108 = 3(y^4 - 12y^2 + 36)$

$= 3[(y^2)^2 - 2(y^2) \times 6 + 6^2]$

$= 3(y^2 - 6)^2$

(h) $10a^2 - 20ab + 10b^2 = 10(a^2 - 2ab + b^2)$

$= 10(a - b)^2$

(i) $2x^2 + 12x + 18 = 2(x^2 + 6x + 9)$

$= 2(x^2 + 2 \times x \times 3 + 3^2)$

$= 2(x + 3)^2$

(j) $5a^3 - 30a^2 + 45a = 5a(a^2 - 6a + 9)$

$= 5a(a^2 - 2 \times a \times 3 + 3^2)$

$= 5a(a - 3)^2$

(k) $25a^2 + 10a + 1 = (5a)^2 + 2 \times (5a) \times 1 + 1^2$

$= (5a + 1)^2$

$= (5a + 1)(5a + 1)$

(*l*) $a^2 - 4ab + 4b^2 = (a)^2 - 2 \times (a) \times (2b) + (2b)^2$

$= (a - 2b)^2 = (a - 2b)(a - 2b)$

(m) $36x^2 + 84x + 49 = (6x)^2 + 2(6x) \times (7) + (7)^2$

$= (6x + 7)^2 = (6x + 7)(6x + 7)$

(n) $x^4 - 18x^2y^2 + 81y^4 = (x^2)^2 - 2(x^2)(9y^2) + (9y^2)^2$

$= (x^2 - 9y^2)^2$

$= [(x^2)^2 - (3y)^2]^2$

$= [(x - 3y)(x + 3y)]^2$

(o) $25-(4a^2+12a+9) = 25-[(2a)^2+2\times(2a)\times 3+(3)^2]$

$= 25-(2a+3)^2$

$= (5)^2-(2a+3)^2$

$= (5+2a+3)(5-2a-3)$

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

$= 2(a+4)\times 2(1-a)$

$= 4(a+4)(1-a)$

2. Factorise :

(a) $p^2-256 = (p)^2-(16)^2 = (p+16)(p-16)$

(b) $4-9x^4 = (2)^2-(3x^2)^2 = (2-3x^2)(2+3x^2)$

(c) $25x^2-81y^2 = (5x)^2-(9y)^2 = (5x-9y)(5x+9y)$

(d) $121x^2-1 = (11x)^2-(1) = (11x+1)(11x-1)$

(e) $9x^2-49 = (3x)^2-(7)^2 = (3x+9)(3x-9)$

(f) $\frac{x^2}{36}-\frac{y^2}{25} = \left(\frac{x}{6}\right)^2-\left(\frac{y}{5}\right)^2 = \left(\frac{x}{6}+\frac{y}{5}\right)\left(\frac{x}{6}-\frac{y}{b}\right)$

(g) $4a^2-b^2 = (2a)^2-(b)^2 = (2a+b)(2a-b)$

(h) $x^2-\frac{1}{36} = (x)^2-\left(\frac{1}{6}\right)^2 = \left(x+\frac{1}{6}\right)\left(x-\frac{1}{6}\right)$

(i) $25-4y^2 = (5)^2-(2y)^2$

$= (5+2y)(5-2y)$

(j) $25a^2b^2-49x^2y^2 = (5ab)^2-(7xy)^2$

$= (5ab+7xy)(5ab-7xy)$

(k) $(2p-3q)^2-(3p+2q)^2$

$= [(2p-3q)+(3p+2q)][(2p-3q)-(3p+2q)]$

$= (2p-3q+3p+2q)(2p-3q-3p-2q)$

$= (5p-q)(-p-5q) = (-1)(q-5p)(-1)(p+5q)$

$= (p+5q)(q-5p)$

(l) $a^2b^4c^6-1 = (ab^2c^2)^2-(1)^2$

$= (ab^2c^3+1)(ab^2c^2-1)$

(m) $a^4 - 1 = (a^2)^2 - (1)^2 = (a^2 + 1)(a^2 - 1)$

$= (a^2 + 1)(a + 1)(a - 1)$

(n) $(x^2 - 4x + 4) - 81 = (x - 2)^2 - (9)^2$

$= (x - 2 + 9)(x - 2 - 9) = (x + 7)(x - 11)$

(o) $a^4 - (a + b)^4 = [(a)^2]^2 - [(a + b)^2]^2$

$= [(a)^2 + (a + b)^2][(a)^2 - (a + b)^2]$

$= [a^2 + (a + b)^2][(a + a + b)(a - a - b)]$

$= [a^2 + (a + b)^2](2a + b)(-b)$

3. The following expressions are supposed to be perfect squares. However, one term has been incorrectly written in each. Write the correct expression to make each a perfect square.

(a) $4x^2 + 20x + 25$ (b) $9x^2 - 6x + 1$

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

Mental Ability

A. Multiple Choice Questions :

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

B. Fill in the blanks :

1. $(x + y)^2 = x^2 + \boldsymbol{y^2} + \boldsymbol{2xy}$.
2. $\left(\frac{3x}{4} - \frac{4y}{3}\right)^2 = \frac{9x^2}{16} + \frac{16y^2}{9} + \boldsymbol{-2xy}$.
3. The equivalent of $4x^2 + 4x + 1$ is equal to $\boldsymbol{(2x + 1)^2}$.
4. If $(z - 2)$ is one factor of $z^2 - az - 6 = 0$, then a is $\boldsymbol{a = -1}$.
5. The greatest common factor of $2ab^2, 6a^2b^2$ and $4a^3b^2$ is $\boldsymbol{2ab^2}$.

C. State True (T) or False (F) :

1. False **2.** True **3.** True **4.** False **5.** True

Higher Order Thinking Skills

1. $x^3 + 1 \overline{)\, x^6 - 1}$

$$\begin{array}{r} x^3 - 1 \\ x^3 + 1 \overline{)\, x^6 - 1} \\ \cancel{x^6} + x^3 \\ - \quad - \\ \hline -\cancel{x^3} - 1 \\ -x^3 - 1 \\ + \quad + \\ \hline 0 \end{array}$$

$\therefore \quad Q = x^3 - 1$

Hence, the required quotient is $(x^3 - 1)$.

2. $x - a \overline{)\, x^6 - a^6}$

$$\begin{array}{r} x^5 + ax^4 + a^2x^2 + a^3x^2 + a^4x + a^5 \\ x - a \overline{)\, x^6 - a^6} \\ -\cancel{x^6} - ax^5 \\ - \quad + \\ \hline ax^5 - a^6 \\ \cancel{ax^5} - a^2x^4 \\ - \quad + \\ \hline a^2x^4 - a^6 \\ \cancel{a^2x^4} - a^3x^3 \\ - \quad + \\ \hline a^3x^3 - a^6 \\ \cancel{a^3x^3} - a^4x^2 \\ - \quad + \\ \hline a^4x^2 - a^6 \\ \cancel{a^4x^2} - a^5x \\ - \quad + \\ \hline a^5x - a^6 \\ \cancel{a^5x} - a^6 \\ - \quad + \\ \hline 0 \end{array}$$

Hence, $(x - a)$ is a factor of $(x^6 - a^6)$.

Chapter

7 Linear Equation in one Variable

Exercise 7.1

1. Solve, and check by substitution if your answer is correct.

(a) $\frac{x}{2} + 5 = x$

$\Rightarrow \quad \frac{x+10}{2} = x \quad \Rightarrow \quad x + 10 = 2x$

$\Rightarrow \quad 10 = 2x - x \quad \Rightarrow \quad 10 = x$

$\Rightarrow \quad x = 10$

Check :

$\text{LHS} = \frac{x}{2} + 5 = \frac{10}{2} + 5 = 5 + 5 = 10$

$\text{RHS} = x = 10$

Thus, LHS = RHS, result is correct.

(b) $\frac{x}{3} + 6 = \frac{1}{9}$

$\Rightarrow \quad \frac{x}{3} = \frac{1}{9} - 6 = \frac{1}{9} - \frac{6}{1} = \frac{1-54}{9}$

$\Rightarrow \quad \frac{x}{3} = \frac{-53}{9} \quad \Rightarrow \quad x = \frac{-53 \times \cancel{3}}{\cancel{9}_3}$

$\Rightarrow \quad x = \frac{-53}{3}$

Check :

$\text{LHS} = \frac{x}{3} + 6 = \frac{-53}{3 \times 3} + 6$

$= \frac{-53}{9} + \frac{6}{1} = \frac{-53+54}{9} = \frac{1}{9}$

$= \text{RHS}$

Thus, LHS = RHS, Answer is correct.

(c) $-x + 24 = -3x - 20$

$\Rightarrow \quad -x + 3x = -20 - 24$

$\Rightarrow \quad 2x = -44 \qquad \Rightarrow \quad x = \dfrac{-44}{2} = -22$

Check :

$\text{LHS} = -x + 24 = -(-22) + 24 = +22 + 24 = 46$

$\text{RHS} = -3(x) - 20 = -3(-22) - 20 = 66 - 20 = 46$

Thus, LHS = RHS, Answer is correct.

(d) $4(1-p) = 3(p-2)$

$\Rightarrow \quad 4 - 4p = 3p - 6$

$\Rightarrow \quad 4 + 6 = 3p + 4p$

$\Rightarrow \quad 10 = 7p$

$\therefore \quad p = \dfrac{10}{7}$

Check :

$$\text{LHS} = 4(1-p) = 4\left(1 - \frac{10}{7}\right) = 4\left(\frac{7-10}{7}\right)$$

$$= 4\left(\frac{-3}{7}\right) = \frac{-12}{7}$$

$$\text{RHS} = 3(p-2) = 3\left(\frac{10}{7} - 2\right) = 3\left(\frac{10-14}{7}\right)$$

$$= 3 \times \frac{(-4)7}{} = \frac{-12}{7}$$

Thus, LHS = RHS, Answer is correct.

(e) $3x + 4 - 2x = 6x - 8 - 3$

$\Rightarrow \quad x + 4 = 6x - 11$

$\Rightarrow \quad 4 + 11 = 6x - x$

$\Rightarrow \quad 15 = 5x$

$\therefore \quad x = \dfrac{15}{5} = 3$

Check :

$\text{LHS} = 3x + 4 - 2x = 3 \times 3 + 4 - 2 \times 3$

$= 9 + 4 - 6 = 13 - 6 = 7$

$\text{RHS} = 6x - 8 - 3 = 6 \times 3 - 8 - 3$

$= 18 - 11 = 7$

Thus, LHS = RHS, Answer is correct.

(f) $\frac{1}{3}x - \frac{2}{3} = \frac{5}{6}$

$\Rightarrow \quad \frac{1}{3}x = \frac{5}{6} + \frac{2}{3} = \left(\frac{5+4}{6}\right)$

$\Rightarrow \quad \frac{1}{3}x = \frac{9}{6} \qquad \Rightarrow \quad x = \frac{9 \times \cancel{3}^{1}}{\cancel{6}_{2}}$

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

Check :

$$\text{LHS} = \frac{1}{3}x - \frac{2}{3} = \frac{1}{\cancel{3}} \times \frac{\cancel{9}^{3}}{2} - \frac{2}{3}$$
$$= \frac{3}{2} - \frac{2}{3} = \frac{9-4}{6} = \frac{5}{6}$$
$$= \text{RHS}$$

Thus, LHS = RHS, answer is correct.

2. Solve :

(a) $\frac{a-4}{7} - a = \frac{5-a}{3} + 1$

$\Rightarrow \quad \frac{a-4-7a}{7} = \frac{5-a+3}{3}$

$\Rightarrow \quad \frac{-6a-4}{7} = \frac{-a+8}{3}$

$\Rightarrow \quad 3(-6a-4) = 7(-a+8)$

$\Rightarrow \quad -18a - 12 = -7a + 56$

$\Rightarrow \quad -18a + 7a = 56 + 12$

$\Rightarrow \quad -11a = 68$

$\Rightarrow \quad a = \frac{-68}{11}$

(b) $7p - 13 = 3(5p - 4)$

$\Rightarrow \quad 7p - 13 = 15p - 12$

$\Rightarrow \quad 7p - 15p = -12 + 13 \qquad \Rightarrow \quad -8p = 1$

$\Rightarrow \quad p = \frac{-1}{8}$

(c) $4x-2(3x-5)+\frac{2}{3}(4x-7)=0$

$\Rightarrow \quad 4x-6x+10+\frac{8x}{3}-\frac{14}{3}=0$

$\Rightarrow \quad -2x+\frac{8x}{3}=\frac{14}{3}-\frac{10}{1}$

$\Rightarrow \quad \frac{(-6x+8x)}{3}=\frac{(14-30)}{3}$

$\Rightarrow \quad 2x=-16 \qquad \Rightarrow \qquad x=\frac{-16}{2}\, l=-8$

$\Rightarrow \quad x=-8$

(d) $q-\frac{q+1}{3}=\frac{q-1}{5}+q$

$\Rightarrow \quad \frac{(3q-q-1)}{3}=\frac{(q-1+5q)}{5}$

$\Rightarrow \quad \frac{(2q-1)}{3}=\frac{(6q-1)}{5} \qquad \Rightarrow \quad 5(2q-1)=3(6q-1)$

$\Rightarrow \quad 10q-5=18q-3 \qquad \Rightarrow \quad 10q-18q=-3+5$

$\Rightarrow \quad -8q=+2 \qquad \Rightarrow \quad q=\frac{2}{-8}=\frac{-1}{4}$

(e) $\frac{3y-\frac{6}{7}}{4}+1=\frac{2y-\frac{1}{3}}{3}+5$

$\Rightarrow \quad \frac{(21y-6)}{7\times 4}+1=\frac{(6y-1)}{3\times 3}+5$

$\Rightarrow \quad \frac{(21y-6)+28}{28}=\frac{(6y-1)\ +45}{9}$

$\Rightarrow \quad \frac{21y-6+28}{28}=\frac{6y-1+45}{9}$

$\Rightarrow \quad \frac{21y+22}{28}=\frac{6y+44}{9}$

$\Rightarrow \quad (21y+22)\times 9=(6y+44)\times 28$

$\Rightarrow \quad 189y+198=168y+1232$

$\Rightarrow \quad 189y-168y=1232-198$

$\Rightarrow \quad 21y = 1034$

$\Rightarrow \quad y = \frac{1034}{21}$

(f) $\frac{x+2}{5} - \frac{x-1}{2} = \frac{3x-9}{2}.$

$\Rightarrow \quad \frac{x+2}{5} = \frac{3x-9}{2} + \frac{x-1}{2}$

$\Rightarrow \quad \frac{x+2}{5} = \frac{3x-9+x-1}{2}$

$\Rightarrow \quad \frac{(x+2)}{5} = \frac{(4x-10)}{2}$

$\Rightarrow \quad 2(x+2) = 5(4x-10)$

$\Rightarrow \quad 2x + 4 = 20x - 50$

$\Rightarrow \quad 2x - 20x = -50 - 4$

$\Rightarrow \quad -18x = -54$

$\Rightarrow \quad x = \frac{-54}{-18} = 3$

$\therefore \quad x = 3$

3. Write the equation and solve :

(a) Let the number be 'x'.

Now,

According to question,

$\frac{1}{5}(x) = 60$

$\Rightarrow \quad \frac{x}{5} = \frac{60}{1}$

$\Rightarrow \quad x = 60 \times 5 = 300 \qquad \Rightarrow \quad x = 300$

Hence, the required number is 300.

(b) Let the number be 'x'.

Now,

According to question,

10% of $x = 63$

$\Rightarrow \quad \frac{10}{100} \times x = 63 \qquad \Rightarrow \quad \frac{x}{10} = 63$

$\Rightarrow \quad x = 63 \times 10 = 630$

Hence, the required number is 630.

(c) Let the Rajan's age be 'x' years.

According to question,

$$\text{Priti's age} = (x - 4)\text{ years}$$

$\Rightarrow \quad 18\text{ years} = (x - 4)\text{ years}$

$\Rightarrow \quad 18 = x - 4$

$\Rightarrow \quad 18 + 4 = x$

$\therefore \quad x = 22\text{ years}$

Hence, the Rajan's age is 22 years.

4. Write an equation and solve :

(a) Let the number be x.

Now,

According to question,

$$3x - 8 = 1$$

$\Rightarrow \quad 3x = 1 + 8$

$\Rightarrow \quad 3x = 9 \quad \Rightarrow \quad x = \frac{9}{3} = 3$

Hence, the required number is 3.

(b) Let the number be x.

Now, According to question,

$$2x + 5 = x + 10$$

$\Rightarrow \quad 2x - x = 10 - 5 \quad \Rightarrow \quad x = 5$

Hence, the required number is 5.

(c) Let the number be x.

Now, According to question,

$$\left(\frac{2}{3}x - 4\right) + x = 1$$

$\Rightarrow \quad \frac{2x}{3} - 4 + x = 1$

$\Rightarrow \quad \frac{2x}{3} + x = 1 + 4$

$\Rightarrow \quad \frac{(2x + 3x)}{3} = \frac{5}{1} \quad \Rightarrow \quad \frac{5x}{3} = \frac{5}{1}$

$\Rightarrow \quad 5x = 3 \times 5 \quad \Rightarrow \quad 5x = 15$

$\Rightarrow \quad x = \frac{15}{5} = 3$

Hence, the requried number is 3.

(d) Let the number be x.

Now, According to question,

$$\frac{x}{4} + 11 = 3 \times \frac{x}{4}$$

$\Rightarrow \quad \left(\frac{x}{4} + 11\right) = \frac{3x}{4}$

$\Rightarrow \quad \frac{x}{4} - \frac{3x}{4} = -11$

$\Rightarrow \quad \frac{(x - 3x)}{4} = -11 \quad \Rightarrow \quad \frac{\overset{1}{-2x}}{4_2} = -11$

$\Rightarrow \quad x = -11 \times (-2) \quad \Rightarrow \quad x = 22$

Exercise 7.2

1. Let three consecutive even numbers are $(2x), (2x + 2), (2x + 4)$.

Now, According to question,

$$2x + (2x + 2) + (2x + 4) = 72$$

$\Rightarrow \quad 2x + 2x + 2 + 2x + 4 = 72$

$\Rightarrow \quad 6x + 6 = 72$

$\Rightarrow \quad 6x = 72 - 6 = 66$

$\Rightarrow \quad x = \frac{66}{6} = 11$

So, required numbers are :

$(2 \times 1), (2 \times 11 + 2)$ and $(2 \times 11 + 4)$

or 22, 24 and 26.

2. Let the rational number be 'x'.

Now, According to question,

$$\left(x + \frac{1}{2}\right) = \frac{17}{2 \times 7}$$

$$\Rightarrow \quad x+\frac{1}{2}=\frac{17}{2\times 7}$$

$$\Rightarrow \quad x+\frac{1}{2}=\frac{17}{4}$$

$$\Rightarrow \quad x=\frac{17}{4}-\frac{1}{2}=\frac{17-7}{4}=\frac{10}{4}$$

$$\Rightarrow \quad x=\frac{5}{7}$$

Hence, the required rational number is $\frac{5}{7}$.

3. Let the denominator of a fraction be 'x'.

$\therefore$ Numerator of fraction $=(x+3)$

Now, According to question,

$$\frac{(x+3)+5}{x+5}=\frac{10}{7}$$

$$\Rightarrow \quad \frac{x+3+5}{5}=\frac{10}{7}$$

$$\Rightarrow \quad \frac{x+8}{5}=\frac{10}{7}$$

$$\Rightarrow \quad 7(x+8)=10\times 5$$

$$\Rightarrow \quad 7x+56=50$$

$$\Rightarrow \quad 7x=50-56=-6$$

$$\Rightarrow \quad x=\frac{-6}{7}$$

So, Fraction $=\frac{x+3}{x}=\frac{\frac{-6}{7}+3}{\frac{-6}{7}}=\frac{\frac{-6+21}{7}}{\frac{-6}{7}}$

$$=\frac{15}{-6}=\frac{5}{-2}=\frac{-5}{2}$$

Hence, the required fraction is $\frac{-5}{2}$.

4. Let three consecutive position integer are $x, (x+1)$ and $(x+2)$.

Now, According to question,

$$x + (x+1) + (x+2) = 258$$

$\Rightarrow$ $3x + 3 = 258$

$\Rightarrow$ $3x = 258 - 3$

$\Rightarrow$ $3x = 255$

$\Rightarrow$ $x = \frac{255}{3} = 85$

Hence, the requried integers are 85, 86 and 87.

5. Let the three consecutive multiple of 9 are $x, (x+9)$ and $(x+18)$.

Now, According to question,

$$x + x + 9 + x + 18 = 378$$

$\Rightarrow$ $3x + 27 = 378$

$\Rightarrow$ $3x = 378 - 27 = 351$

$\Rightarrow$ $x = \frac{351}{3} = 117$

Hence, required multiple of 9 are 117, 126 are 135.

6. Let the required added number be 'x'.

According to question,

$$\frac{2+x}{5+x} = \frac{2}{3}$$

$\Rightarrow$ $3(2+x) = 2(5+x)$

$\Rightarrow$ $6 + 3x = 10 + 2x$

$\Rightarrow$ $3x - 2x = 10 - 6$

$\Rightarrow$ $x = 4$

Hence, the required added number is 4.

7. Let the required numbers be $(5x)$ and $(8x)$.

Now, According to question,

$$\frac{5x+10}{8x+10} = \frac{7}{10}$$

$\Rightarrow$ $10(5x+10) = 7(8x+10)$

$\Rightarrow$ $50x + 100 = 56x + 70$

$\Rightarrow \quad 100 - 70 = 56x - 50x$

$\Rightarrow \quad 30 = 6x$

$\Rightarrow \quad \frac{30}{6} = x \quad \Rightarrow \quad x = 5$

$\therefore \quad 5x = 5 \times 5 = 25$

and, $\quad 8x = 8 \times 5 = 40$

Hence, the required numbers are 25 and 40.

8. Let the present age of father $= x$ years

$\therefore$ The present age of boy $= \frac{1}{4}(x)$ years

After 24 years :

Father's age$= (x + 24)$ years

Boy's age $= \left(\frac{x}{4} + 24\right)$ years

Now, According to question,

$$\left(\frac{x}{4} + 24\right) = \frac{1}{2}(x + 24)$$

$\Rightarrow \quad \left(\frac{x + 96}{4}\right) = \frac{(x + 24)}{2}$

$\Rightarrow \quad 4(x + 24) = 2(x + 96)$

$\Rightarrow \quad 4x + 96 = 2x + 192$

$\Rightarrow \quad 4x - 2x = 192 - 96$

$\Rightarrow \quad 2x = 96$

$\Rightarrow \quad x = \frac{96}{2} = 48$

$\Rightarrow \quad x = 48$ years

So, The present age of father $= 48$ years

and, the present age of Boy $= \frac{48}{4}$ years

$= 12$ years

9. Let the smaller number be x.

$\therefore$ The larger number $= (x + 5)$

Now, According to question,

$$5(x) = 4(x + 5)$$

$$\Rightarrow \quad 5x = 4x + 20$$

$$\Rightarrow \quad 5x - 4x = 20$$

$$\Rightarrow \quad x = 20$$

So, the smaller number $= 20$

and, larger number $= 20 + 5 = 25$

Hence, the requried numbers are 20 and 25.

10. Let the required number be 'x'.

Now, According to question,

$$x - \frac{2}{3} \times 9^3 = \frac{1}{4}(x + 45)$$

$$\Rightarrow \quad x - 2 \times 3 = \frac{1}{4}(x + 45)$$

$$\Rightarrow \quad \frac{(x - 6)}{1} = \frac{(x + 45)}{4}$$

$$\Rightarrow \quad 4(x - 6) = (x + 45)$$

$$\Rightarrow \quad 4x - 24\,l = x + 45$$

$$\Rightarrow \quad 4x - x = 45 + 24$$

$$\Rightarrow \quad 3x = 69$$

$$\Rightarrow \quad x = \frac{69}{3} = 23$$

$$\Rightarrow \quad x = 23$$

Hence, the requried number is 23.

11. Let the required number be 'x'.

Now, According to question,

$$3x + 7 = 31$$

$$\Rightarrow \quad 3x = 31 - 7$$

$$\Rightarrow \quad 3x = 24$$

$$\Rightarrow \quad x = \frac{24}{3} = 8$$

Hence, the requried number is 8.

12. Let the required sides of a triangle are $x, (x+3)$ and $(x+6)$ units.

Now, According to question,

Perimeter of triangle $= 81\,\text{cm}$

$\Rightarrow \quad x + x + 3 + x + 6 = 81\,\text{cm}$

$\Rightarrow \quad 3x + 9 = 81\,\text{cm}$

$\Rightarrow \quad 3x = (81 - 9)\,\text{cm}$

$\Rightarrow \quad 3x = 72\,\text{cm}$

$\Rightarrow \quad x = \frac{72}{3}\,\text{cm} = 24\,\text{cm}$

Hence, the rqeuired length of sides ofp triangle are 24 cm, 27 cm and 30 cm.

13. Let the denominator of given fraction be 'x'.

Then, numerator $= (x-2)$

$\therefore$ Original fraction $= \frac{(x-2)}{x}$

Now, According to question,

$$\frac{(x+2)+1}{x+1} = \frac{3}{4}$$

$\Rightarrow \quad \frac{x-1}{x+1} = \frac{3}{4}$

$\Rightarrow \quad 4(x-1) = 3(x+1)$

$\Rightarrow \quad 4x - 4 = 3x + 3$

$\Rightarrow \quad 4x - 3x = 3 + 4$

$\Rightarrow \quad x = 7$

Hence, the original fraction is $\frac{5}{7}$.

14. Let the number of 20 p coins be x.

We have, ₹ $2 = 200\,\text{p}$

Now,

Number of 5p coins $= (2x)$

Number of 50p coins $= \frac{1}{5}x = \frac{x}{5}$

According to question,

$$5(2x) + 20(x) + 50 \times \frac{x}{5} = 200$$

$\Rightarrow \quad 10x + 20x + 10x = 200$

$\Rightarrow \quad 40x = 200$

$\Rightarrow \quad x = \frac{200}{40} = 5$

So, Number of 5p coins $= 2 \times x = 2 \times 5 = 10$

Number of 20p coins $= x = 5$

Number of 50p coins $= \frac{1}{5} \times x = \frac{1}{5} \times 5 = 1$

15. We have, Total money $= ₹\ 15.50$

Money in the form of 50p coins $= ₹\ 3.50$

$\therefore$ Number of 50p coins $= \frac{3.50 \times 100}{50} = \frac{350}{50} = 7$

Now, Let the number of 10p coins be (x).

$\therefore$ The number of 25p coins $= (2x)$

So, money in the form of 10p coins and 20 p coins

$= ₹\ 15.50 - ₹\ 3.50$

$= ₹\ 12 = 1200$ p

$\therefore \quad 10x + 25 \times (2x) = ₹\ 12000$

$\Rightarrow \quad 10x + 50x = 1200$p

$\Rightarrow \quad 60x = 1200$

$\Rightarrow \quad x = \frac{1200}{60} = \frac{120}{6} = 20$

Hence, The number of 10p coins $= x = 20$

The number of 25 p coins $= 2x = 40$

The number of 50p coins $= 7$

Mental Ability

A. Multiple Choice Questions :

1. (c) **2.** (c) **3.** (c) **4.** (c) **5.** (b)

B. Fill in the blanks :

1. The solution of the equation $2(x-5)=4x-8$ is **-1**.
2. Equation involving only linear polynomials is called a **linear equation**.
3. The process of taking any term of an equation from one side to the other is called **transposition**.
4. An equation in which the highest power of the variable is **1** called a linear equation.

C. State True (T) or False (F) :

1. True **2.** True **3.** True **4.** True

Higher Order Thinking Skills

1. (d) option is correct.

2. We have $\sqrt{2+\sqrt{x}}=3$

By squaring on both sides

$$2+\sqrt{x}=9$$

$$\Rightarrow \quad \sqrt{x}=9-2=7$$

Again squaring on both sides

$$x=7^2=49 \quad \Rightarrow \quad x=49$$

$\therefore$ (d) option is correct.

Chapter

8 Applications of Percentage

Exercise 8.1

1. Find x, if :

(a) 40% of $x=50$

$$\Rightarrow \quad \frac{40}{100}\times x=50$$

$$\Rightarrow \quad x=\frac{\cancel{50}^{25}\times \cancel{10}^{5}}{\cancel{4}\cancel{2}_{1}}=25\times 5$$

$$\Rightarrow \quad x=125$$

(b) 10% of $x = 4$

$\Rightarrow \quad \frac{10}{100} \times x = 4$

$\Rightarrow \quad x = 4 \times 10 \quad \Rightarrow \quad x = 40$

2. (a) $42\% = \frac{42}{100} = 0.42$

(b) $6\frac{1}{9} = \frac{55}{9} = \left(\frac{55}{9} \times 100\right)\% = \frac{5500}{9}\% = 611\frac{1}{9}\%$

(c) $81 : 9 = \frac{81}{9} = \left(\frac{81^{9}}{9_{1}} \times 100\right)\% = 900\%$

3. (a) Let the required percent be $x\%$.

$x\%$ of $45 = 20$

$\Rightarrow \quad \frac{x}{100} \times 45 = 20$

$\Rightarrow \quad x = \frac{20 \times \cancel{100}^{20}}{\cancel{45}_{9}} = \frac{20 \times 20}{9} = \frac{400}{9}$

$\Rightarrow \quad x = 44\frac{4}{9}\%$

(b) $x\%$ of ₹ $7.50 =$ ₹ 6

$\Rightarrow \quad \frac{x}{100} \times$ ₹ $7.50 =$ ₹ 6

$\Rightarrow \quad x = \frac{6 \times 100}{7.50} = \frac{\cancel{6}^{2} \times \cancel{100}^{20} \times \overset{2}{\cancel{10}\cancel{0}}}{\cancel{75}\cancel{0}_{\cancel{15}_{3_{1}}}}$

$\Rightarrow \quad x = 20 \times 4 = 80$

$\Rightarrow \quad x\% = 80\%$

4. We have,

The population percentage of men $= 40\%$

The population percentage of women $= 35\%$

So, The percentage of children $= 100 - (35 + 40)$

$= (100 - 75)\% = 25\%$

Hence, the required percentage of children is 25%.

5. Total number of students $= 1800$

$\therefore$ The number of girls $= 55\%$ of 1800

$$\frac{55}{100} \times 1800 = 55 \times 18 = 990$$

$\therefore$ The number of boys in the school $= 1800 - 990 = 810$

Hence, the required number of boys are 810.

6. Let the total number of votes be 'x'.

We have, Winning margin $= 9600$

Winning margin percentage $= 53\% - 47\% = 6\%$

So, 6% of $x = 9600$

$$\Rightarrow \quad \frac{6}{100} \times x = 9600$$

$$\Rightarrow \quad x = \frac{\overset{1600}{\cancel{9600}} \times 100}{\cancel{6}_{1}}$$

$$\Rightarrow \quad x = 1600 \times 100 = 1{,}60{,}000$$

Hence, the total number of votes are 1,60,000.

7. Total number of trees in the garden $= 320$

$\therefore$ Number of apple trees $= 25\%$ of 320

$$= \frac{\cancel{25}^{1}}{\underset{4}{\cancel{100}}} \times 320 = \frac{320}{4} = 80$$

Number of lemon trees $= 62.5\%$ of 320

$$= \frac{62.5}{100} \times 320 = 6.25 \times 32 = 200$$

Now,

The number mango trees $= 320 - (200 + 80)$

$$= 320 - 280 = 40$$

8. Let the price of land before increase in price be ₹ x.

Now, According to question,

$$x + 20\% \text{ of } x = ₹\ 18000$$

$$\Rightarrow \quad x + \frac{20}{100} \times x = ₹\ 18000$$

$$\Rightarrow \quad x + \frac{\overset{1}{\cancel{2}}x}{\underset{5}{\cancel{10}}} = ₹\ 18000$$

$$\Rightarrow \quad x + \frac{x}{5} = ₹\ 18000$$

$$\Rightarrow \quad \frac{(5x + x)}{5} = ₹\ 18000$$

$$\Rightarrow \quad 6x = ₹\ 18000 \times 5$$

$$\Rightarrow \quad x = \frac{₹\ \overset{3000}{\cancel{18000}} \times 5}{\cancel{6}} = ₹\ 15000$$

Hence, the required cost of land is ₹ 15000.

9. We have,

S.P. of an article = ₹ 1200

Loss = 10%

$$\therefore \quad \text{C.P.} = \frac{\text{S.P.} \times 100}{(100 - L\%)} = \frac{₹\ 1200 \times 100}{100 - 10}$$

$$= \frac{₹\ \overset{400}{\cancel{1200}} \times 100}{\underset{3}{\cancel{90}}} = \frac{₹\ 4000}{3}$$

$$= ₹\ 1333.33$$

Now, To gain : 10%

$$\text{S.P.} = \frac{\text{C.P.}\ (100 + P\%)}{100} = \frac{₹\ 1333.33 \times (100 + 10)}{100}$$

$$= \frac{₹\ 1333.33 \times 110}{100}$$

$$= ₹\ 133.333 \times 11$$

$$= ₹\ 1466.63$$

10. Let Sushil's income be ₹ 100

Then, Ravi's income = ₹ 160

If Ravi's income is ₹ 160

Then Sushil's income = $₹ \left(\frac{100 \times 100}{160} \right) = ₹\ 62.50$

$\therefore$ Sushil's income is less than Ravi's income by $(100 - 62.50)\%$

$= 37.5\%$

Hence, the required percent is 37.5%.

11. Let the required population one year ago be x.

Now, According to question,

$$x + 15\% \text{ of } x = 20700$$

$$\Rightarrow \quad x + \frac{15^{3}}{100_{20}} \times x = 20700$$

$$\Rightarrow \quad x + \frac{3x}{20} = 20700$$

$$\Rightarrow \quad \frac{20x + 3x}{20} = 20700$$

$$\Rightarrow \quad \frac{23x}{20} = 20700$$

$$\Rightarrow \quad 23x = 20700 \times 20$$

$$\Rightarrow \quad x = \frac{20700 \times 20}{23_{1}} = 900 \times 20 \quad (900)$$

$$\Rightarrow \quad x = 18000$$

Hence, the required one year ago population is 18000.

12. Let the monthly income of a man be ₹ x.

We know that,

Total money $-$ Spent money $=$ Savings

Here, monthly savings $=$ ₹ $16200 \div 12$

Percentage of spent money $= (100 - 10)\% = 90\%$

$\therefore \quad x - 90\% \text{ of } x =$ ₹ $16200 \div 12$

$$\Rightarrow \quad x - \frac{90}{100} \times x = ₹\ 16200 \div 12$$

$$\Rightarrow \quad \frac{(10x - 9x)}{10} = ₹\ 1620 \div 12$$

$$\Rightarrow \quad x = ₹\ 1350 \times 10$$

$$\Rightarrow \quad x = ₹\ 13500$$

13. Let the value of a machine after one year be ₹ x.

Now,

According to question,

$$x = ₹\ 30000 - 20\% \text{ of } ₹\ 30000$$

$$= ₹\ 30000 - \frac{20}{100} \times ₹\ 30000$$

$$= ₹\ 30000 - ₹\ 6000 = ₹\ 24000$$

Hence, the required value of machine is ₹ 24000.

14. We have,

The present value of land = ₹ 2,32,000

Now, According to question,

(a) The value of the land after a year

$$= ₹\ 2,32,000 + 16\% \text{ of } ₹\ 2,32,000$$

$$= ₹\ 2,32,000 + \frac{16}{100} \times ₹\ 2,32,000$$

$$= ₹\ 2,32,000 + ₹\ 37,120$$

$$= ₹\ 2,69,120$$

(b) Let the value of the land a year earlier be ₹ x.

Now,

$x + 16\% \text{ of } x = ₹\ 2,32,000$

$$\Rightarrow \quad x + \frac{16^{4}}{100_{25}} \times x = 232000$$

$$\Rightarrow \quad x + \frac{4x}{25} l = ₹\ 232000$$

$$\Rightarrow \quad \frac{(25x + 4x)}{25} = ₹\ 232000$$

$$\Rightarrow \quad 29x = ₹\ 232000 \times 25$$

$$\Rightarrow \quad x = \frac{₹\ \overset{8000}{\cancel{232000}} \times 25}{\cancel{29}_{1}}$$

$$= ₹\ 8000 \times 25$$

$$= ₹\ 200000$$

$$\therefore \quad x = ₹\ 200000$$

15. We have,

The price of 1 kg of mangoes = ₹ 80

Decrease in price = ₹ 80 − ₹ 60 = ₹ 20

So, The percent decrease per kg $= \left(\frac{20}{80_4} \times 100\right)\%$

$= \left(\frac{100}{4}\right)\% = 25\%$

Hence, the required decrease percentage is 25%.

Exercise 8.2

1. We have,

M.P. = ₹ 1880, S.P. = ₹ 1504

Discount = ₹ 1880 − ₹ 1504 = ₹ 376

$\therefore \quad \text{Discount\%} = \frac{\text{discount}}{\text{M.P.}} \times 100\%$

$= \frac{376}{1880} \times 100\% = \frac{37600}{1880}\% = 20\%$

Hence, the requried discount rate is 20%.

2. Marked price = ₹ 35000 and discount = 12%

We know that,

$\text{S.P.} = \text{M.P.} \times \left(\frac{100 - D\%}{100}\right)$

$= ₹\ 35000 \times \left(\frac{100 - 12}{100}\right)$

$= ₹\ 350 \times 88 = ₹\ 30800$

3. Le the required selling price be ₹ x.

Now, According to question,

$x - 8\%$ of $x = ₹\ 4416$

$\Rightarrow \quad x - \frac{8}{100} \times x = ₹\ 4416$

$\Rightarrow \quad \frac{(100x - 8x)}{100} = ₹\ 4416$

$\Rightarrow \quad 92x = 4416 \times 100$

$\Rightarrow \quad x = \dfrac{₹\ 441600}{92} = ₹\ 4800$

Hence, the required selling price of almirah is ₹ 4800.

4. We have,

Discount% = 10%, Profit% = 26%

M.P. = ₹ 1120

Now, $\text{S.P.} = \text{M.P.} = \left(\dfrac{100 - D\%}{100}\right)$

$= ₹\ 1120 \dfrac{(100-10)}{100}$

$= 112 \times \dfrac{90}{10} = ₹\ 1008$

Now, $\text{C.P.} = \dfrac{100 \times \text{S.P.}}{100 + \text{Profit}\%}$

$= \dfrac{100 \times ₹\ 1008}{100 + 26} = \dfrac{₹\ 100800}{126}$

$= ₹\ 800$

Hence, the required cost price is ₹ 800.

5. We have,

Discount% = 12.5%, Profit% = 10%

C.P. = ₹ 1480

$\therefore \quad \text{Profit}\% = \dfrac{\text{Profit}}{\text{C.P.}} \times 100$

$\Rightarrow \quad \text{Profit} = \dfrac{\text{C.P.} \times \text{Profit}\%}{100}$

$= \dfrac{₹\ 1480 \times 10}{100} = ₹\ 148$

$\therefore \quad \text{S.P.} = \text{C.P.} = \text{Profit}$

$= ₹\ 1480 + ₹\ 148$

$= ₹\ 1628$

$$\text{Marked Price} = \frac{100 \times \text{S.P.}}{100 - D\%} = \frac{100 \times ₹\ 1628}{100 - 12.5}$$

$$= \frac{₹\ 162800}{87.5} = \frac{₹\ 1628000}{875} = ₹\ 1860$$

Hence, the required marked price is ₹ 1860.

6. We have,

C.P. = ₹ 2200, gain% = 12%, discount% = 26%

Now,

$$\text{gain} = \frac{\text{C.P.} \times \text{gain}\%}{100} = \frac{₹\ 2200 \times 12}{100} = ₹\ 264$$

$$\therefore \quad \text{S.P.} = \text{C.P.} + \text{gain} = ₹\ 2200 + ₹\ 264 = ₹\ 2464$$

$$\text{So, Marked Price} = \frac{100 \times \text{S.P.}}{100 - D\%} = \frac{100 \times ₹\ 2464}{(100 - 26)}$$

$$= \frac{₹\ 246400}{74} = ₹\ 3329.97$$

7. We have,

M.P. = ₹ 3500, discount% = 10%

We know that,

$$\text{S.P.} = \text{M.P.} \times \left(\frac{100 - D\%}{100}\right)$$

$$= ₹\ 3500 \times \frac{(100 - 10)}{100}$$

$$= ₹\ 35 \times 90 = ₹\ 3150$$

$$\text{Now, Sales tax} = \frac{\text{Rate of sales tax}}{100} \times \text{S.P.}$$

$$= \frac{10 \times ₹\ 3150}{100} = ₹\ 315$$

So,

$$\text{The total amount paid by customer} = \text{S.P.} + \text{Sales tax}$$

$$= ₹\ 3150 + ₹\ 315$$

$$= ₹\ 3465$$

Hence, the required amount is ₹ 3465.

8. Let the market price of instrument = ₹ x.

$\therefore$ Discount $= ₹\, x \times \frac{20}{100} = ₹\left(\frac{x}{5}\right)$

$\therefore$ S.P. $= ₹\, x - ₹\left(\frac{x}{5}\right) = ₹\, \frac{4x}{5}$

Profit% $= 25\%$

So, C.P. $= \frac{100 \times \text{S.P}}{(100+25)} = \frac{100 \times ₹\, \frac{4x}{5}}{125}$

$\Rightarrow$ C.P. $= ₹\left(\frac{16x}{25}\right)$

According to question,

S.P. $-$ C.P. $=$ profit.

$\Rightarrow \quad \frac{4x}{5} - \frac{16x}{25} = ₹\, 150$

$\Rightarrow \quad \frac{(20x - 16x)}{25} = ₹\, 150$

$\Rightarrow \quad 4x = ₹\, 150 \times 25$

$\Rightarrow \quad x = ₹\, \frac{150 \times 25}{4} = ₹\, \frac{75 \times 25}{2}$

$\Rightarrow \quad x = ₹\, 937.50$

Thus, marked price = ₹ 937.50

Exercise 8.3

1. We have,

Price of stationery = ₹ 450

Sales tax $= 7\%$ of ₹ 450

$= \frac{7}{100} \times ₹\, 450 = ₹\, 31.5 = ₹\, 31.50$

$\therefore$ Total amount paid by Arun $= ₹\, 450 + ₹\, 31.50$

$= ₹\, 481.50$

2. Let the selling price of geyser be ₹ x.

Now, According to question,

$$x + 8\% \text{ of } x = ₹\ 1242$$

$$\Rightarrow \quad x + \frac{8^{2}}{100_{25}} \times x = ₹\ 1242$$

$$\Rightarrow \quad \frac{(25x + 2x)}{25} = ₹\ 1242$$

$$\Rightarrow \quad 27x = ₹\ 1242 \times 25$$

$$\Rightarrow \quad x = ₹\ \frac{\overset{514}{\cancel{1242}} \times 25}{\cancel{27}_{9}} = ₹\ \frac{\overset{46}{\cancel{414}} \times 25}{\cancel{9}_{1}}$$

$$\Rightarrow \quad x = ₹\ 46 \times 25 = ₹\ 1150$$

Hence, the requried selling price of geyser is ₹ 1150.

3. We have,

Sales tax = ₹ 1980 − ₹ 1800 = ₹ 180

S.P. = ₹ 1800

Now,

$$\text{Rate of sales tax} = \frac{\text{Sales tax}}{\text{S.P.}} \times 100$$

$$= \left(\frac{180}{1800} \times 100\right)\% = 10\%$$

Hence, the rate of sales tax is 10%.

4. Let the marked price of pant be ₹ x.

$\therefore$ Marked price of shirt = ₹ $(980 - x)$

Now, According to question.

$$10\%x + 5\% \text{ of } (980 - x) = ₹\ 94$$

$$\Rightarrow \quad \frac{10x}{100} + \frac{5}{100} \times (980 - x) = ₹\ 94$$

$$\Rightarrow \quad 10x + 5 \times (980 - x) = ₹\ 94 \times 100$$

$$\Rightarrow \quad 10x + 4900 - 5x = ₹\ 94 \times 100$$

$$\Rightarrow \quad 5x = ₹\ (9400 - 4900)$$

$\Rightarrow \quad x \text{ ₹}\left(\frac{4500}{5}\right) = \text{₹ } 900$

So, marked price of pant = ₹ 900

and, marked price of shirt = ₹ $(980 - 900)$ = ₹ 80

Mental Ability

A. Multiple Choice Questions :

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

B. Fill in the blanks :

1. If 5% of y is 4. Then y is **80**.
2. A number which is 50% less than 130 is **65**.
3. A number which is 60% more than 180 is **288**.
4. Discount is always calculated on **marked price**.

C. State True (T) or False (F)

1. False **2.** False **3.** False **4.** True **5.** True

Higher Order Thinking Skills

1. Let x be the original production.

After fall in manpower, production decreased to :

Decreased production $= x - 25\%$ of x

$= x - 0.25x = 0.75x$

To restore the production to original, hours increased will be :

$$\text{Hours to increase} = \frac{(x - 0.75x)}{0.75x}$$

$$= \frac{0.25x}{0.75x}$$

$$= \frac{\cancel{25}^{1}}{\cancel{75}_{3}} = \frac{1}{3} = 0.33$$

$\therefore$ Hours to increase = 33%

Hence, 33% hours should be increased in order to restore original production.

Chapter

9 Compound Interest

Exercise 9.1

1. Interest for the 1st year $= \frac{P \times R \times T}{100} = ₹ \frac{1250 \times 5^{1} \times 1}{100} = ₹ 62.50$

Principal for 2nd year $= ₹ 1250 + ₹ 62.50 = ₹ 1312.50$

Interest for the 2nd year $= \frac{₹ 1312.50 \times 50 \times 1}{100}$

$= ₹ \frac{6562.50}{100} \quad = ₹ 65.63$

Principal for 3rd year $= ₹ 1312.50 + 65.63 = ₹ 1378.13$

Interest for 3rd year $= ₹ \frac{1378.13 \times 5 \times 1}{100} = ₹ \frac{6890.65}{100} = ₹ 68.91$

Now,

Compound interest for 3 years $= ₹ 62.50 + 65.63 + ₹ 68.91$

$= ₹ 197.04$

3. Interest for 1st year $= \frac{P \times R \times T}{100}$

$= ₹ \frac{12000 \times 9 \times 1}{100} = ₹ 1080$

Principal for 2nd year $= ₹ 12000 + ₹ 1080 = ₹ 13080$

Interest for 2nd year $= ₹ \frac{13080 \times 9 \times 1}{100} = \frac{₹ 11772}{10} = ₹ 1177.2$

Now,

S.I. for 2 years $= ₹ \frac{12000 \times 9 \times 2}{100} = ₹ 1080 \times 2 = ₹ 2160$

C.I. for 2 years $= ₹ 1080 + ₹ 1177.20 = ₹ 2257.20$

So,

The difference between C.I. and S.I.

$= ₹ 2257.20 - ₹ 2160$

$= ₹ 97.20$

3. Interest for 1st year $= \dfrac{P \times R \times T}{100}$

$= ₹ \dfrac{40000 \times 7 \times 1}{100}$

$= ₹\ 2800$

Principal for 2nd year $= ₹\ 40000 + ₹\ 2800$

Interest for 2nd year $= ₹ \dfrac{42800 \times 7 \times 1}{100} = ₹\ 2996$

$\therefore$ Compound interst for 2 years $= ₹\ 2800 + ₹\ 2996 = ₹\ 5796$

4. We know that,

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$\Rightarrow \quad ₹\ 200 = \frac{P \times 10 \times 2^{1}}{100_{5}}$$

$$\Rightarrow \quad P = ₹\ 200 \times 5 = ₹\ 1000$$

Now,

Interest for 1st year $= \dfrac{P \times R \times T}{100} = ₹ \dfrac{1000 \times 10 \times 1}{100} = ₹\ 100$

Principal for 2nd year $= ₹\ 1000 + ₹\ 100 = ₹\ 1100$

Interest for 2nd year $= ₹ \dfrac{1100 \times 10 \times 1}{100} = ₹\ 110$

$\therefore$ Compound interest for 2 years $= ₹\ 100 + ₹\ 110 = ₹\ 210$

5. Interest for 1st year $= \dfrac{P \times R \times T}{100}$

$= ₹ \dfrac{15000 \times 5 \times 1}{100}$

$= ₹\ 750$

Principal for 2nd year $= ₹\ 15000 + ₹\ 750 = ₹\ 15750$

Interest for 2nd year $= ₹ \dfrac{15750 \times 8 \times 1}{100} = ₹ \dfrac{12600}{10} = ₹\ 1260$

Principal for 3rd year $= ₹\ 15750 + ₹\ 1260 = ₹\ 17010$

Interest for 3rd year $= ₹\ \frac{17010 \times 10 \times 1}{100} = ₹\ 1701$

$\therefore$ Compound interest $= ₹\ 750 + ₹\ 1260 + ₹\ 1701 = ₹\ 3711$

Amount $₹\ 1500 + ₹\ 3711 = ₹\ 18711$

Exercise 9.2

1. Complete the following table :

	Principal (₹)	Rate% (p.a)	Time	Interest (₹)	Amount (₹)
(a)	₹ 3520			₹ 250	**₹ 3770**
(b)	₹ 5780			**₹ 460**	₹ 6240
(c)	₹ 2750	10%	2 years	**₹ 550**	**₹ 3300**
(d)	₹ 9600	8%	3 months	**₹ 192**	**₹ 9792**
(e)	**₹ 10000**	5%	3 years	₹ 1500	**₹ 11500**
(f)	₹ 4750	$12\frac{1}{2}\%$	2 years	**₹ 1187.50**	**₹ 5937.50**
(g)	**₹ 25000**	10%	73 days	₹ 500	**₹ 25500**
(h)	₹ 5000	9%	**6 years**	₹ 2700	**₹ 7700**

2. (a) S.I. for 4 years $= \frac{P \times R \times T}{100}$

$= ₹\ \frac{30000 \times 9 \times 4}{100}$

$= ₹\ 10800$

(b) Total amount $= ₹\ 30000 + ₹\ 1080 = ₹\ 40800$

(c) The monthly amount to be paid $= ₹\ 40800 \div 48 = ₹\ 850$

3. We have, Time = 5 years and

S.I. $= ₹\ 5400 - ₹\ 4000$

$= ₹\ 1400$

Now,

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$1400 = \frac{4000\,R \times 5}{100}$$

$$\Rightarrow \quad R = \frac{1400}{40 \times 5_1} = \frac{28}{4} = 7\%$$

So, S.I. of ₹ 5600 for 3 years

$$= \frac{5600 \times 7 \times 3}{100}$$

$$= ₹\ 56 \times 7 \times 3 = ₹\ 56 \times 21$$

$$= ₹\ 1176$$

So, The amount paid by Amit

$$= ₹\ 5600 + ₹\ 1176$$

$$= ₹\ 6776$$

4. We have,

$P = ₹\ 3650, R = 10\%$

$\text{Time} = 29 + 28 + 16 = 73 \text{ days} = \frac{73}{365}$ year

Now,

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$= ₹\ \frac{3550 \times 10 \times 73}{100 \times 365}$$

$$= ₹\ 73$$

Hence, the required amount of interst is ₹ 73.

5. We have,

$\text{S.I.} = ₹\ 840, R = 2\frac{1}{2}\% = \frac{5}{2}\%$

$\text{Time} = 3$ years $\qquad P = ?$

Now,

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$\Rightarrow \quad ₹\ 840 = \frac{P \times 5 \times 3}{100 \times 2}$$

$$\Rightarrow \quad P = ₹\ \frac{\overset{280}{840} \times \overset{20}{100} \times 2}{5_1 \times 3_1}$$

$$= ₹\ 280 \times 20 \times 2$$

$$= ₹\ 5600 \times 2$$

$$= ₹\ 11200$$

Hence, the requried principal is ₹ 11200.

6. $P = ₹\ 10000,$

$T = 2, R = 10\%$

We know that

$$A = P\left(1 + \frac{R}{100}\right)^n$$

$$= ₹\ 10000 \times \left(1 + \frac{10}{100}\right)^3$$

$$= ₹\ 10000 \times \left(\frac{11}{10}\right)^3$$

$$= ₹\ 10000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10}$$

$$= ₹\ 13310$$

Now,

$$\text{C.I.} = A - P = ₹\ 13310 - ₹\ 10000$$

$$= ₹\ 3310$$

Hence, the required compound interest is ₹ 3310.

7. We have,

$P = ₹\ 8000, R = 12\frac{1}{2}\% = \frac{25}{2}\%$

Time = 2 years

We know that,

$$A = P\left(1+\frac{r}{100}\right)^n$$

$$= ₹\ 8000 \times \left(1+\frac{25^{1}}{2\times 100_{4}}\right)^2$$

$$= ₹\ 8000 \times \left(1+\frac{1}{8}\right)^2$$

$$= ₹\ 8000 \times \left(\frac{9}{8}\right)^2$$

$$= ₹\ \overset{1000}{8000} \times \frac{9}{8} \times \frac{9}{8}$$

$$= ₹\ \frac{\overset{125}{1000} \times 81}{8_1} = ₹\ 125 \times 81$$

$$= ₹\ 10125$$

Now, C.I. $= A - P$

$= ₹\ 10125 - ₹\ 8000$

$= ₹\ 2125$

Hence, the required C.I. is ₹ 2125.

8. We have,

$P = ₹\ 2000, R = 10\%$, Time = 3 years

We know that,

$$A = P\left(1+\frac{r}{100}\right)^n$$

$$= ₹\ 2000 \times \left(1+\frac{10}{100}\right)^3$$

$$A = ₹\ 2000 \times \left(\frac{11}{10}\right)^3$$

$$= ₹\ 2000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10}$$

$$= ₹\ 2 \times 1331 = ₹\ 2662$$

Now,

$$\text{C.I.} = A - P = ₹\ 2662 - v2000$$

$$= ₹\ 662$$

9. We have,

$P = ₹\ 2500, R = 20\%, \text{Time} = 3 \text{ years}$

$$\therefore \text{ S.I.} = \frac{P \times R \times T}{100} = ₹\ \frac{2500 \times 20 \times 3}{100}$$

Now,

$$A = P\left(1 + \frac{R}{100}\right)^n$$

$$= ₹\ 2500 \times \left(1 + \frac{20^1}{100_5}\right)^3$$

$$= ₹\ 2500 \times \left(\frac{6}{5}\right)^3$$

$$= ₹\ \overset{100}{\overset{500}{2500}} \times \frac{6}{5_1} \times \frac{6}{5_1} \times \frac{6}{5_1}^{20}$$

$$= ₹\ 720 \times 6 = ₹\ 4320$$

$$\therefore \quad \text{C.I.} = A - P = ₹\ 4320 - ₹\ 2500$$

$$\Rightarrow \quad \text{C.I.} = ₹\ 1820$$

The difference in S.I. and C.I. $= ₹\ 1820 - ₹\ 1500 = ₹\ 320$

Hence, the required difference is ₹ 320.

10. We have,

$P = ₹\ 3500, R = 8\%, \text{Time} = 2 \text{ years}$

We know that,

$$A = P\left(1 + \frac{R}{100}\right)^n$$

$$= ₹\ 3500 \times \left(1 + \frac{8^2}{100}\right)^2$$

$$= ₹\ 3500 \times \left(1 + \frac{2}{25}\right)^2$$

$$= ₹\ 3500 \times \left(\frac{27}{25}\right)^2$$

$$= ₹\ \overset{140}{\overset{700}{2500}} \times \frac{27}{25_5} \times \frac{27}{25_5}$$

$$= ₹\ \frac{140 \times 27 \times 27}{25}$$

$$= ₹\ \frac{102060}{25} = ₹\ 4082.40$$

Hence, the required amount is ₹ 4082.40.

11. We have,

$P = ₹\ 93750, R = 9.6\%$, Time $= 3$ year

Now,

(a) Amount at the end of second year $= ₹\ 93750 \times \left(1 + \frac{9.6}{100}\right)^2$

$$= ₹\ 93750 \times \left(1 + \frac{96}{1000}\right)^2$$

$$= ₹\ 93750 \times \left(\frac{1096}{1000}\right)^2$$

$$= ₹\ \frac{93750 \times 1096 \times 1096}{1000 \times 1000}$$

$$= ₹\ \frac{12614000000}{1000000}$$

$$= ₹\ 112614$$

(b) Now,

$$\text{Interest for 3rd year} = \frac{P \times R \times T}{100}$$

$$= ₹\ \frac{112614 \times 9.6 \times 1}{100}$$

$$= ₹\ 10810.94$$

12. Rate of interest = 8% per annum

$$= \frac{8}{2}\% \text{ per half yearly}$$

$$= 4\% \text{ per half yearly.}$$

$$\text{Time} = 1\frac{1}{2} \text{ years} = \frac{3}{2} \text{ years}$$

$$= \frac{3}{2} \times 2 \text{ half years}$$

$$= 3 \text{ half years}$$

Now,

Principal for 1st half-year = ₹ 1000

$$\text{Interest for 1st half year} = \frac{₹\ 1000 \times 4 \times 1}{100} = 40$$

Principal for 2nd half-year = ₹ 1000 + ₹ 40 = ₹ 1040

$$\text{Interes for 2nd half-year} = ₹\ \frac{1040 \times 4 \times 1}{100} = ₹\ \frac{416}{10} = ₹\ 41.6$$

Principal for 3rd hal year = ₹ 1040 + ₹ 41.6 = ₹ 1081.6

$$\text{Interst for 3rd half year} = \frac{1081.6 \times 4 \times 1}{100}$$

$$\Rightarrow \quad ₹\ 10.816 \times 4 = ₹\ 43.264$$

So,

Compound interest = ₹ 40 + ₹ 41.60 + ₹ 43.264

= ₹ 124.864

Hence, the required C.I. is ₹ 124.864.

13. We have,

$$P = ₹\ 9600, R = 5\frac{1}{2}\% = \frac{11}{2}\%$$

Time = 3 years

Now,

$$A = P\left(1+\frac{r}{100}\right)^n$$

$$= ₹\ 9600\times\left(1+\frac{11}{2\times 100}\right)^3$$

$$= 9600\times\left(\frac{211}{200}\right)^3$$

$$= ₹\ 9600\times\frac{211\times 211\times 211}{200\times 200\times 200}$$

$$= ₹\ \frac{901817376}{80000} = ₹\ 11272.72$$

So, Interest $= A - P = ₹\ 1127.72 - ₹\ 9600 = ₹\ 1672.72$

Hence, the required interest is ₹ 1672.72.

Exercise 9.3

1. Let the required sum be ₹ x.

$A = ₹\ 7290$, Time = 2 years, $R = 8\%$ p.a.

$P = ₹\ x$

Now,

$$A = P\left(1+\frac{R}{100}\right)^n$$

$$₹\ 7290 = x\left(1+\frac{8^2}{100}\right)^2$$

$$\Rightarrow \quad ₹\ 7290 = x\times\left(\frac{27}{25}\right)^2$$

$$\Rightarrow \quad x = \frac{₹\ 7290\times 25\times 25}{27\times 27}$$

$$\Rightarrow \qquad x = ₹\ \frac{\overset{10}{\overset{270}{810}} \times 25 \times 25}{3_1 \times 27_1} = ₹\ 6250$$

Hence, the required sum is ₹ 6250.

2. Find the amount, if :

$P = ₹\ 2500, R = 5\%$, Time $= 4$ years

$A = ?$

Now,

$$A = P\left(1 + \frac{R}{100}\right)^4$$

$$= ₹\ 2500 \times \left(1 + \frac{5^1}{100_{20}}\right)^4$$

$$= ₹\ 2500 \times \left(\frac{21}{20}\right)^4$$

$$= ₹\ \frac{2500 \times 21 \times 21 \times 21 \times 21}{20 \times 20 \times 20 \times 20}$$

$$= ₹\ \frac{4862025}{1600} = ₹\ 3038.765$$

Hence, the required amount is ₹ 3038.77.

(b) We have,

$P = ₹\ 9360$, Time $= 3$ years, $R = 6\%$, $A = ?$

Now,

$$A = P\left(1 + \frac{R}{100}\right)^n$$

$$= ₹\ 9360 \times \left(1 + \frac{6^3}{100_{50}}\right)^3$$

$$= ₹\ 9360 \times \left(1 + \frac{3}{50}\right)^3$$

$$= ₹\ 9360 \times \left(\frac{53}{50}\right)^3$$

$$= \frac{9360 \times 53 \times 53 \times 53}{50 \times 50 \times 50}$$

$$= \frac{139348872}{12500}$$

$$= ₹\ 11147.909 = ₹\ 11147.91$$

Hence, the required amount is ₹ 11147.91

3. Here, $P = ₹\ 10000, R = 5\%$ p.a.

$T = 2\frac{1}{2}$ years

We know that,

$$A = P\left(1 + \frac{R}{100}\right)^n = ₹\ 10000 \times \left(1 + \frac{5}{100}\right)^{2\frac{1}{2}}$$

$$= ₹\ 10000 \times \left(1 + \frac{5^1}{100_{20}}\right)^2 \times \left(1 + \frac{5}{200_{40}}\right)^1$$

$$= ₹\ 10000 \times \frac{21 \times 21}{20 \times 20} \times \frac{41}{40}$$

$$= ₹\ \frac{180810}{16} = ₹\ 11300.625 = ₹\ \ 11300.63$$

Now,

C.I. $= A - P$

$= ₹\ 11300.63 - ₹\ 10000$

$= ₹\ 1300.63$

Hence, the required C.I. is ₹ 1300.63.

4. We have,

$P = ₹\ 40000, A = ₹\ 44100, R = 5\%$, Time $= ?$

We know that,

$$A = P\left(1 + \frac{R}{100}\right)^n$$

$$\Rightarrow \quad 44100 = 40000\left(1+\frac{5^{1}}{100_{20}}\right)^{n}$$

$$\Rightarrow \quad \frac{441}{400} = \left(\frac{21}{20}\right)^{n}$$

$$\Rightarrow \quad \left(\frac{21}{20}\right)^{2} = \left(\frac{21}{20}\right)^{n}$$

By equating the exponent on both side.

$\Rightarrow \quad 2 = n \Rightarrow \quad n = 2$ years

$\Rightarrow$ So, Required time $= 2$ years

5. We have,

$P = ₹\ 6750, A = ₹\ 8192, R = 6\frac{2}{3}\%$ p.a. $= \frac{20}{3}\%$ p.a.

We know that,

$$A = P\left(1+\frac{R}{100}\right)^{n}$$

$$\Rightarrow \quad ₹\ 8192 = ₹\ 6750\left(1+\frac{20^{1}}{3\times 100_{5}}\right)^{n}$$

$$\Rightarrow \quad \frac{₹\ 8192}{₹\ 6750} = \left(1+\frac{1}{5}\right)$$

$$\Rightarrow \quad \frac{8192}{6750} = \left(\frac{16}{15}\right)^{n}$$

$$\Rightarrow \quad \frac{4096}{3375} = \left(\frac{16}{15}\right)^{n}$$

$$\Rightarrow \quad \left(\frac{16}{15}\right)^{3} = \left(\frac{16}{15}\right)^{n}$$

$\Rightarrow$ By equating exponent

$\Rightarrow \quad n = 3$ years

Hence, the required number of years are 3 years.

6. We know that

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$\Rightarrow \quad ₹\,1000 = \frac{P \times 10 \times 2^{1}}{\overset{5}{\cancel{100}}}$$

$$\Rightarrow \quad P = ₹\,1000 \times 5$$

$$\Rightarrow \quad P = ₹\,5000$$

Now,

$$A = P\left(1 + \frac{R}{100}\right)^{n}$$

$$= ₹\,500\left(1 + \frac{8^{2}}{100_{25}}\right)^{2}$$

$$= ₹\,5000\left(1 + \frac{2}{25}\right)^{2}$$

$$= ₹\,5000 \times \left(\frac{27}{25}\right)^{2}$$

$$= ₹\,\overset{200}{\cancel{5000}} \times \frac{27 \times 27}{25_{1} \times \cancel{25}}$$

$$= ₹\,\overset{8}{\cancel{200}} \times \frac{27 \times 27}{25_{1}}$$

$$= ₹\,5832$$

So, C.I. $= A - P = ₹\,5832 - ₹\,5000$

C.I. $= ₹\,832$

Hence, the required C.I. is ₹ 832 and amount is ₹ 5832.

7. We have,

$$P = ₹\,15000, R = 6\%\ \text{p.a.} = \frac{6}{2}\%\ \text{Half years}$$

$$= 3\%\ \text{Half yearly}$$

Time $= 1\frac{1}{2}$ years $= \frac{3}{2} \times 2$ half years $= 3$ half years

We know that

$$A = P\left(1 + \frac{R}{100}\right)^n$$

$$= ₹\ 15000\left(1 + \frac{3}{100}\right)^3$$

$$= ₹\ 15000 \times \left(\frac{103}{100}\right)^3$$

$$= ₹\ 15000 \times \frac{103 \times 103 \times 103}{100 \times 100 \times 100}$$

$$= \frac{16390905}{1000} = ₹\ 16390.905$$

$$= ₹\ 16390.91$$

Now, C.I. $= A - P$

$= ₹\ 16390.91 - ₹\ 15000$

$= ₹\ 1390.91$

Hence, the required C.I. is ₹ 1390.91.

8. Let the required sum be ₹ x.

Now,

$$A = P\left(1 + \frac{R}{100}\right)^n$$

$$₹\ 12167 = x\left(1 + \frac{15^3}{100_{20}}\right)^3$$

$$\Rightarrow \quad ₹\ 12167 = x\left(\frac{23}{20}\right)^3$$

$$\Rightarrow \quad ₹\ 12167 = x \times \frac{23 \times 23 \times 23}{20 \times 20 \times 20}$$

$$\Rightarrow \quad x = \frac{₹\ 12167 \times 20 \times 20 \times 20}{23 \times 23 \times 23}$$

$$= ₹\ \frac{13167 \times 8000}{12167} = ₹\ 8000$$

Hence, the required sum is ₹ 8000.

9. We have,

$P = ₹\ 6400$, Time $= ₹\ 2$ years, $R = 6\frac{1}{4}\% = \frac{25}{4}\%$

Now,

$$\text{S.I.} = \frac{P \times R \times T}{100} = \frac{₹\ 6400 \times 25 \times 2^{1}}{100 \times 4_{2}} = ₹\ 32 \times 25 = ₹\ 800$$

We know that,

$$A = P\left(1 + \frac{R}{100}\right)^{n}$$

$$= ₹\ 6400\left(1 + \frac{25^{1}}{\underset{4}{100} \times 4}\right)$$

$$= ₹\ 6400\left(1 + \frac{1}{16}\right)^{2}$$

$$= ₹\ 6400\left(\frac{17}{16}\right)^{2}$$

$$= ₹\ \overset{400}{6400} \times \frac{17 \times 17}{16_{1} \times 16}$$

$$= ₹\ \frac{\overset{25}{\underset{100}{400}} \times 17 \times 17}{16_{4_{1}}}$$

$$= ₹\ 25 \times 17 \times 7$$

$$= ₹\ 25 \times 289 = ₹\ 7225$$

$\therefore$ C.I. $= A - P = ₹\ 7225 - ₹\ 6400 = ₹\ 825$

So,

The difference between S.I. and C.I.

$$= ₹\ 825 - ₹\ 800$$

$$= ₹\ 25$$

Hence, the required difference is ₹ 25.

10. Let the required sum be ₹ x.

We have, $\text{C.I.} = (A - P)$

$\therefore$ $\text{C.I.} - \text{S.I.} = ₹\ 183$

$$\Rightarrow \left[x\left(1+\frac{5^{1}}{100_{20}}\right)^{3} - x\right] - \frac{(x + 5\times 3)}{\underset{20}{100}} = ₹\ 183$$

$$\Rightarrow x\left(\frac{21}{20}\right)^{3} - \frac{x}{1} - \frac{3x}{20} = ₹\ 183$$

$$\Rightarrow x\left(\frac{21}{20}\right)^{3} - \frac{23x}{20} = ₹\ 183$$

$$\Rightarrow x\left[\left(\frac{21}{20}\right)^{3} - \frac{23}{20}\right] = ₹\ 183$$

$$\Rightarrow x\left[\frac{9261}{800} - \frac{23}{20}\right] = ₹\ 183$$

$$\Rightarrow x\left[\frac{9261 - 23\times 400}{8000}\right] = ₹\ 183$$

$$\Rightarrow x\left[\frac{9261 - 9200}{8000}\right] = ₹\ 183$$

$$\Rightarrow x\times\frac{61}{8000} = ₹\ 183$$

$$\Rightarrow x = ₹\ \frac{\overset{3}{183}\times 8000}{61_{1}} = ₹\ 24000$$

Hence, the required sum is ₹ 24000.

11. We have,

$P = ₹\ 6250, A = ₹\ 6760, R = 4\%$

Time = ?

We know that,

$$A = P\left(1 + \frac{R}{100}\right)^n$$

$$\Rightarrow \quad ₹\ 6760 = 6250\left(1 + \frac{4^1}{100_{25}}\right)^n$$

$$\Rightarrow \quad \frac{₹\ 6760}{₹\ 6250} = \left(1 + \frac{1}{25}\right)^n$$

$$\Rightarrow \quad \left(\frac{676}{625}\right) = \left(\frac{26}{25}\right)^n$$

$$\Rightarrow \quad \left(\frac{26}{25}\right)^2 = \left(\frac{26}{25}\right)^n$$

$$\Rightarrow \quad 2 = n$$

(By equating exponent on both sides)

$$\Rightarrow \quad n = 2 \text{ years}$$

Hence, the required time is 2 years.

12. We have, S.I. $= ₹\ 2400, T = 3$ years, $R = 10\%$

Now,

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$\Rightarrow \quad ₹\ 2400 = \frac{P \times 10 \times 3}{100}$$

$$\Rightarrow \quad P = \frac{₹\ \overset{800}{2400} \times 10}{3_1} = ₹\ 8000$$

So, we know that,

$$A = P\left(1 + \frac{R}{100}\right)^n$$

$$= ₹\ 8000 \times \left(1 + \frac{10}{100}\right)^3$$

$$= ₹\ 8000 \times \left(\frac{11}{10}\right)^3$$

$$= ₹\ 8000 \times \frac{11 \times 11 \times 11}{10 \times 10 \times 10}$$

$$= 8 \times 1331 = ₹\ 10648$$

$\therefore$ C.I. $= A - P = ₹\ 10648 - ₹\ 8000$

$\Rightarrow$ C.I. $= ₹\ 2648.$

Hence, the required C.I. is ₹ 2648.

13. We have,

$R = ?$

Let the certain sum be ₹ x.

Now,

According to question,

$$A = P\left(1 + \frac{R}{100}\right)^n$$

$$\Rightarrow \quad ₹\ 7396 = ₹\ x\left(1 + \frac{R}{100}\right) \qquad \ldots(1)$$

And,

$$₹\ 7950.70 = ₹\ x\left(1 + \frac{R}{100}\right)^3 \qquad \ldots(2)$$

By dividing eqn. (2) by eqn. (1),

We get,

$$\frac{₹\ 7950.70}{₹\ 7396} = \frac{₹\ x\left(1 + \frac{R}{100}\right)^3}{₹\ x\,1 + \left(\frac{R}{100}\right)^2}$$

$$\Rightarrow \quad \frac{7950.70}{7396} = \left(1+\frac{R}{100}\right)^{3-2}$$

$$\Rightarrow \quad \frac{7950.70}{7396} = \left(1+\frac{R}{100}\right)^{1}$$

$$\Rightarrow \quad \frac{7950.70}{7396} - 1 = \frac{R}{100}$$

$$\Rightarrow \quad \frac{(7950.70-7396)}{7396} = \frac{R}{100}$$

$$\Rightarrow \quad \frac{554.7}{7396} = \frac{R}{100}$$

$$\Rightarrow \quad R = \left(\frac{554.7\times 100}{7396}\right)\%$$

$$= \left(\frac{55470}{7396}\right)\%$$

$$= 7.5\%$$

Hence, the required rate is 75% p.a.

14. We have,

$P = ₹\ 15625$, Time $= 9$ months $= \frac{9^{3}}{12_{4}}$ years

Time $= \frac{3}{4}$ year $= \frac{3}{4}\times 4$ quarters $= 3$ quarters

Rate $= 16\%$ p.a. $= \frac{16^{4}}{4_{1}}\%$ quarterly $= 4$ quarterly

Now,

$$A = P\left(1+\frac{R}{100}\right)^{n}$$

$$= 15625\left(1+\frac{4^{1}}{100_{25}}\right)^{3}$$

$$= 15625\left(\frac{26}{25}\right)^3$$

$$= 15625 \times \frac{26 \times 26 \times 26}{25 \times 25 \times 25}$$

$$= ₹\ \frac{15625 \times 17576}{15625}$$

$$= ₹\ 17576$$

Hence, the requried amount is ₹ 17576.

Exercise 9.4

1. We have,

$P = ₹\ 6250, R = 4\%$ p.a., $T = 2$ years

Now,

We know that,

$$A = P\left(1 + \frac{R}{100}\right)^n$$

$$\Rightarrow \quad A = ₹\ 6250 \times \left(1 + \frac{4^1}{100_{25}}\right)^2$$

$$= ₹\ 6250 \times \left(1 + \frac{1}{25}\right)^2$$

$$= ₹\ 6250 \times \left(\frac{2625}{}\right)^2$$

$$= ₹\ \overset{250}{6250} \times \frac{26 \times 26}{25_1 \times 25_1}$$

$$= ₹\ 10 \times 26 \times 26 = ₹\ 6760$$

Now,

$$\text{C.I.} = A - P = ₹\ 6760 - ₹\ 6250$$

$$\text{C.I.} = ₹\ 510$$

2. We have,

$P = ₹\ 20000, R = 7.5\%$ p.a., Time $= 3$ years.

Now,

$$A = P\left(1+\frac{R}{100}\right)^n$$

$$= ₹\ 20000 \times \left(1+\frac{75}{100}\right)^3$$

$$= ₹\ 20000 \times \left(1+\frac{75^3}{1000_{40}}\right)^3$$

$$= ₹\ 20000 \times \left(\frac{43}{40}\right)^3$$

$$= ₹\ \overset{5}{20000} \times \frac{43\times 43\times 43}{\underset{1}{40}\times 40\times 40}$$

$$= ₹\ \frac{5\times 43\times 43\times 43}{4\times 4}$$

$$= ₹\ \frac{397535}{16} = ₹\ 24845.94$$

$\therefore$ C.I. $= A - P = 24845.94 - 20000$

$= ₹\ 4845.94$

3. Let the required sum be ₹ x.

We have, $R = 10\%$ p.a., Time $= 2$ years

C.I. $= (A - P)$

No,

According to question,

$$\text{C.I.} - \text{S.I.} = ₹\ 300$$

$$\Rightarrow \left[x\left(1+\frac{10}{100}\right)^2 - x\right] - \left[\frac{x\times 10\times 2^1}{100_5}\right] = ₹\ 300$$

$$\Rightarrow \left[x\left(1+\frac{1}{10}\right)^2 - x\right] - \left[\frac{x}{5}\right] = ₹\ 300$$

$$\Rightarrow \quad \left[x\left(\frac{11}{10}\right)^2 - x\right] - \frac{x}{5} = ₹\ 300$$

$$\Rightarrow \quad x \times \frac{121}{100} - x - \frac{x}{5} = ₹\ 300$$

$$\Rightarrow \quad \frac{121x}{100} - \frac{6x}{5} = ₹\ 300$$

$$\Rightarrow \quad \frac{121x - 120x}{100} = ₹\ 300$$

$$\Rightarrow \quad x = ₹\ 300 \times 100 = ₹\ 30{,}000$$

Hence, the requried sum is ₹ 30000.

4. We have,

$P = ₹\ 1000, R = 10\%$ p.a. $= \frac{10}{2}\%$ half yearly $= 5\%$ half yearly

$$\text{Time} = 18 \text{ months} = \frac{18}{12} \text{ year}$$

$$= \frac{3}{2} \text{ years} = \frac{3}{2} \times 2 \text{ half years}$$

$$= 3 \text{ half years}$$

Now,

$$A = P\left(1 + \frac{R}{100}\right)^n$$

$$= ₹\ 1000\left(1 + \frac{5^1}{100_{20}}\right)^3$$

$$= ₹\ 1000\left(\frac{21}{20}\right)^3$$

$$= ₹\ 1000 \times \frac{9261}{8000}$$

$$= ₹\ \frac{9261}{8}$$

$$= ₹\ 1157.625$$

So, C.I. $= A - P =$ ₹ 1157.625 − 1000 = ₹ 157.625

5. We have,

$P =$ ₹ 1600, $R = 10\%$ p.a. $= \frac{10}{4}\%$ quarterly

Time $= 6$ months $= \frac{6}{12}$ year $= \frac{6^2}{12_{3_1}} \times 4$ quarter $= 2$ quarters

Now,

$$A = P\left(1 + \frac{R}{100}\right)^n$$

$$= ₹\ 1600 \times \left(1 + \frac{10}{4 \times 100}\right)^2$$

$$= ₹\ 1600 \times \left(1 + \frac{1}{40}\right)^2$$

$$= ₹\ 1600 \times \left(\frac{41}{40}\right)^2$$

$$= ₹\ \overset{4}{1}\overset{1}{6}00 \times \frac{41 \times 41}{\underset{1}{40} \times \underset{1}{40}}$$

$$= ₹\ 41 \times 41 = ₹\ 1681$$

So,

$$\text{C.I.} = A - P = ₹\ 1681 - ₹\ 1600 = ₹\ 81$$

Hence, the required C.I. is ₹ 81.

6. We have,

$P =$ ₹ 1000, $R = 5\%$ p.a. $= \frac{5}{2}\%$ Half yearly

Time $=$ one year $= 1 \times 2$ half years $= 2$ half years

Now,

$$A = P\left(1 + \frac{R}{100}\right)^n$$

$$= ₹\ 1000 \times \left(1 + \frac{5^{1}}{2 \times 100_{20}}\right)^{2}$$

$$= ₹\ 1000 \times \left(1 + \frac{1}{40}\right)^{2}$$

$$\Rightarrow \quad A = ₹\ 1000 \times \left(\frac{41}{40}\right)^{2}$$

$$= ₹\ 1000 \times \frac{41 \times 41}{40 \times 40}$$

$$= ₹\ \frac{10 \times 41 \times 41}{16}$$

$$= ₹\ \frac{16810}{16}$$

$$= ₹\ 1050.625$$

So, C.I. $= A - P = ₹\ 1050.625 - ₹\ 1000 = ₹\ 50.625$

Hence, the required C.I. is ₹ 50.625.

7. Let the cost of mortar cycle before two years be ₹ P.

Now, $$A = P\left(1 - \frac{r}{100}\right)^{2}$$

$$₹\ 10830 = P\left(1 - \frac{5^{1}}{100_{20}}\right)^{2}$$

$$\Rightarrow \quad ₹\ 10830 = P\left(\frac{19}{20}\right)^{2}$$

$$= P \times \frac{19 \times 19}{20 \times 20}$$

$$\Rightarrow \quad P = \frac{₹\ 10{,}830 \times 20 \times 20}{19 \times 19} = \frac{4332000}{361}$$

$$\Rightarrow \quad P = ₹\ 12000$$

Hence, the required cost is ₹ 12000.

8. Let the required sum be ₹ x.

Now,

$$A = P\left(1+\frac{R}{100}\right)^n$$

$$\Rightarrow \quad ₹\ 5832 = x\left(1+\frac{8^2}{100_{25}}\right)^2$$

$$\Rightarrow \quad ₹\ 5832 = x\left(\frac{27}{25}\right)^2 = \frac{x\times 27\times 27}{25\times 25}$$

$$\Rightarrow \quad x = \frac{₹\ 5832\times 25\times 25}{27\times 27} = ₹\ \frac{3645000}{729}$$

$$\Rightarrow \quad x = ₹\ 5000$$

Hence, the required sum is ₹ 5000.

9. We have,

$R = ?$, $P = ₹\ 1000$, $A = ₹\ 1102.50$

Time = 2 years

Now,

$$A = P\left(1+\frac{R}{100}\right)^n$$

$$\Rightarrow \quad ₹\ 1102.50 = ₹\ 1000\times\left(1+\frac{R}{100}\right)^2$$

$$\Rightarrow \quad \frac{₹\ 1102.50}{₹\ 1000} = \left(1+\frac{R}{100}\right)^2$$

$$\Rightarrow \quad \frac{110250}{100000} = \left(1+\frac{R}{100}\right)^2$$

$$\Rightarrow \quad \frac{11025}{10000} = \left(1+\frac{R}{100}\right)^2$$

$$\Rightarrow \quad \left(\frac{105}{100}\right)^2 = \left(1+\frac{R}{100}\right)^2$$

By equating base on both sides

$$\Rightarrow \quad \frac{105}{100} = 1 + \frac{R}{100}$$

$$\Rightarrow \quad 1.05 - 1 = \frac{R}{100}$$

$$\Rightarrow \quad 0.05 = \frac{R}{100}$$

$$\Rightarrow \quad R = 0.05 \times 100 = 5\%$$

Hence, the required rate is 5% p.a.

10. We have,

$P = ₹\ 1800, R = 10\%$ p.a., C.I. $= ₹\ 378$

We know that, Time = ?

$$\text{C.I.} = A - P$$

$$\Rightarrow \quad \text{C.I.} = P\left(1 + \frac{R}{100}\right)^n - P$$

$$\Rightarrow \quad ₹\ 378 = P\left[\left(1 + \frac{10}{100}\right)^n - 1\right]$$

$$\Rightarrow \quad ₹\ 378 = ₹\ 1800\left[\left(1 + \frac{1}{10}\right)^n - 1\right]$$

$$\Rightarrow \quad \frac{₹\ 378}{₹\ 1800} = \left(\frac{11}{10}\right)^n - 1$$

$$\Rightarrow \quad \frac{378}{1800} + 1 = \left(\frac{11}{10}\right)^n$$

$$\Rightarrow \quad \frac{378 + 1800}{1800} = \left(\frac{11}{10}\right)^n$$

$$\Rightarrow \quad \frac{\overset{121}{2178}}{\underset{100}{1800}} = \left(\frac{11}{10}\right)^n$$

$$\Rightarrow \quad \left(\frac{121}{100}\right)=\left(\frac{11}{10}\right)^4 \Rightarrow \left(\frac{11}{10}\right)^2=\left(\frac{11}{10}\right)^n$$

$$\Rightarrow \quad n = 2 \text{ years}$$

Hence, the required time is 2 years.

11. We have,

$P = 1000000, A = 1225043, \text{Time} = 3 \text{ years}$

$R = ?$

Now,

$$A = P\left(1+\frac{R}{100}\right)^n$$

$$\Rightarrow \quad 1225043 = 1000000\left(1+\frac{R}{100}\right)^3$$

$$\Rightarrow \quad \frac{1225043}{1000000}=\left(1+\frac{R}{100}\right)^3$$

$$\Rightarrow \quad \left(\frac{107}{100}\right)^3=\left(1+\frac{R}{100}\right)^3$$

By equating base on both sides

$$\Rightarrow \quad \frac{107}{100}=1+\frac{R}{100}$$

$$\Rightarrow \quad \frac{107}{100}-1=\frac{R}{100}$$

$$\Rightarrow \quad \frac{107-100}{100}=\frac{R}{100}$$

$$\Rightarrow \quad \frac{7}{100}=\frac{R}{100}$$

$$\Rightarrow \quad R=\frac{7\times 100}{100}=7$$

$$\Rightarrow \quad R = 7\% \text{ p.a.}$$

Hence, the required rate of growth is 7% per annum.

12. We have

$P = 60000, A = 79860, R = 10\%$ p.a.

Time = ?

We know that,

$$A = P\left(1+\frac{R}{100}\right)^n$$

$$\Rightarrow \quad 79860 = 60000\left(1+\frac{10}{100}\right)^n$$

$$\Rightarrow \quad 7986060000 = \left(1+\frac{1}{10}\right)^n$$

$$\Rightarrow \quad \frac{79860}{60000} = \left(1+\frac{1}{10}\right)^n$$

$$\Rightarrow \quad \frac{7986}{6000} = \left(\frac{11}{10}\right)^n$$

$$\Rightarrow \quad \frac{1331}{1000} = \left(\frac{11}{10}\right)^n$$

$$\Rightarrow \quad \left(\frac{11}{10}\right)^3 = \left(\frac{11}{10}\right)^n$$

$\Rightarrow$ By equating exponent on both sides,

$$3 = n$$

$$\therefore \quad n = 3 \text{ years}$$

Hence, the required time is 3 years.

13. We have,

$P = ₹\ 800, A = ₹\ 926.10, R = 10\%$ p.a.

$$= \frac{10}{2}\% \text{ half yearly}$$

$$= 5\% \text{ half-yearly}$$

Let the required

Time = $2n$ half years

We know that,

$$A = P\left(1+\frac{R}{100}\right)^n$$

$\Rightarrow$ $$926.10 = ₹\ 800\left(1+\frac{5^1}{100_{20}}\right)^{2n}$$

$\Rightarrow$ $$\frac{₹\ 926.10}{₹\ 800} = \left(1+\frac{1}{20}\right)^{2n}$$

$\Rightarrow$ $$\frac{92610}{80000} = \left(\frac{21}{20}\right)^{2n}$$

$\Rightarrow$ $$\left(\frac{21}{20}\right)^3 = \left(\frac{21}{20}\right)^{2n}$$

Now,

By equating exponent on both sides

$\Rightarrow$ $$3 = 2n$$

$\Rightarrow$ $$n = \frac{3}{2}\text{ years} = 1\frac{1}{2}\text{ years}$$

Hence, the required time is $1\frac{1}{2}$ years.

14. We have,

$P = ₹\ 31250, A = ₹\ 35152$

Time $1\frac{1}{2}$ years $= \frac{3}{2}$ years

$= \frac{3}{2} \times 2$ half years

$= 3$ half years

Let the required rate $= \frac{R}{2}$ half yearly

Now,

We know that,

$$A = P\left(1+\frac{R}{100}\right)n$$

$$\Rightarrow \quad ₹\ 35152 = ₹\ 31250\left(1+\frac{R}{2\times 100}\right)^3$$

$$\Rightarrow \quad \frac{35152}{31250} = \left(1+\frac{R}{200}\right)^3$$

$$\Rightarrow \quad (1.124864) = \left(1+\frac{R}{200}\right)^3$$

$$\Rightarrow \quad \left(\frac{1124864}{1000000}\right) = \left(1+\frac{R}{200}\right)^3$$

$$\Rightarrow \quad \left(\frac{104}{100}\right)^3 = \left(1+\frac{R}{200}\right)^3$$

By equating base on both sides,

$$\Rightarrow \quad \frac{104}{100} = 1+\frac{R}{200}$$

$$\Rightarrow \quad \frac{104}{100}-1 = \frac{R}{200}$$

$$\Rightarrow \quad \frac{104-100}{100} = \frac{R}{200}$$

$$\Rightarrow \quad \frac{4}{100} = \frac{R}{200}$$

$$\Rightarrow \quad R = \frac{4\times 200}{100}\ l = 8\%\ \text{p.a.}$$

Hence, the required rate is 8% per annum.

Exercise 9.5

1. We have,

Present population $(P) = 90{,}000$

Rate of increase $(R) = 7\%$

Time $= 2$ years

So,

Population after two years

$$= 90000 \times \left(1 + \frac{7}{100}\right)\left(1 + \frac{7}{100}\right)$$

$$= 90000 \times \frac{107}{100} \times \frac{107}{100}$$

$$= 9 \times 107 \times 107 = 103041$$

Hence, the required population of the town after two years is 103041.

2. We have,

The present population $(P) = 2{,}00{,}000$

Constant rate $(R) = 5\%$ p.a.

Time $= 3$ yars

Let the population after 3 years be A.

Now,

$$A = P\left(1 + \frac{R}{100}\right)^n$$

$$= 200000\left(1 + \frac{5^1}{100_{20}}\right)^3$$

$$= 200000 \times \left(\frac{21}{25}\right)^3$$

$$= {}^{100}2{,}00{,}000 \times \frac{21 \times 21 \times 21}{{}^{50}20_1 \times 21_1 \times {}^{25}20_1}$$

$$= 25 \times 21 \times 21 \times 21$$

$$= 231525$$

Hence, the required population is 231525.

3. Let the present population of villege be (A).

Now,

According to question,

Present population $(A) = 25000\left(1 + \frac{5}{100}\right)\left(1 + \frac{6}{100}\right)\left(1 + \frac{8}{100}\right)$

$$= {}^{1}25000 \times \frac{103}{100_4} \times \frac{106}{100} \times \frac{108}{100}$$

$$= \frac{105 \times 106 \times 108^{54}}{40_{20}}$$

$$= \frac{105 \times 106 \times 54}{20}$$

$$= \frac{501020}{20} = \frac{60102}{2}$$

$$= 30051$$

Hence, the required resent population of the village is 30051.

4. Let the population of village two years age be (P).

We have,

$A = 11881, R = 9\%, \text{Time} = 2 \text{ years}$

Now,

$$A = P\left(1 + \frac{B}{100}\right)^n$$

$$\Rightarrow \quad 11881 = P\left(1 + \frac{9}{100}\right)^2$$

$$\Rightarrow \quad 11881 = P\left(\frac{109}{100}\right)^2$$

$$\Rightarrow \quad P = \frac{11881 \times 100 \times 100}{109 \times 109}$$

$$= \frac{118810000}{11881} = 10{,}000$$

Hence, the required population of village two years ago is 10,000.

5. Let the population two years ago be (P).

Now,

$$A = P\left(1 - \frac{r_1}{100}\right)\left(1 - \frac{r_2}{100}\right)$$

$$\Rightarrow \quad 315840 = P\left(1-\frac{4}{100}\right)\left(1-\frac{6}{100}\right)$$

$$\Rightarrow \quad 315840 = P\times\left(\frac{96}{100}\right)\times\left(\frac{94}{100}\right)$$

$$\Rightarrow \quad P = \frac{315840\times 100\times 100}{96\times 94}$$

$$= \frac{318400000}{9024} = 350{,}000$$

Hence, the required population is 350000.

Mental Ability

A. Multiple Choice Questions :

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

B. Fill in the blanks :

1. **Compound** of interest allows a principal amount to grow at a faster rate than **Simple** interest.
2. When the interest is compounded annually but the time is in fraction, then amount will be $\boldsymbol{A = P\left(1+\frac{r}{100}\right)^{n}\left(1+\frac{\frac{l}{m}r}{100}\right)}$.
3. Amount after n years, when compounded quarterly = $\boldsymbol{\left(1+\frac{r}{4\times 100}\right)^{4n}}$.

C. State True (T) or False (F) :

1. True **2.** False **3.** True **4.** False **5.** False

Highe Order Thinking Skills

1. We know that,

Radioactive decay follows first order kinetics.

Half-life of C-14

= Time taken to reduce the original amount to 50%.

= 5568 years

Now,

$$\lambda = \frac{0.693}{t_{\frac{1}{2}}} = \frac{0.693}{5568} = 1.24 \times 10^{-4} \text{ year}^{-1}$$

Expression for rate law for first order kinetics is given by :

$$t = \frac{2.303}{K} \log\left(\frac{a}{a-x}\right).$$

Where,

K = rate constant
t = time taken for decay process
a = initial amount of the reactant
= 100 gm
$(a-x)$ = amount left after decay process
= 12.5 gm

Putting values in the above equation,
We get

$$t = \frac{2.30}{1.24 \times 10^{-4} \text{ year}^{-1}} \log\left(\frac{100\,\text{g}}{12.5\,\text{g}}\right)$$

$\Rightarrow$ $t = 16704$ years

Hence, the required age is 16704 years.

2. (a) We have,

$A = 54000, R = 5\%, \text{Time} = 2 \text{ years}, P = ?$

$\therefore$ $$A = P\left(1 + \frac{R}{100}\right)^n$$

$\Rightarrow$ $$54000 = P\left(1 + \frac{5^1}{100_{20}}\right)^2$$

$\Rightarrow$ $$54000 = P\left(\frac{21}{20}\right)^2$$

$\Rightarrow$ $$P = \frac{54000 \times 20 \times 20}{21 \times 21} = \frac{21600000}{441}$$

$\Rightarrow \quad P = 48979.5 = 48980$

Hence, the required population in 2012 is 48980.

(b) We have,

$P = 54000, R = 5\%, A = ?,$ Time = years

Now,

$$A = P\left(1 + \frac{R}{100}\right)^n$$

$$= 54000 \times \left(1 + \frac{5^1}{100_{20}}\right)^2$$

$$= 54000\left(\frac{21}{20}\right)^2$$

$$= 27000 \times \frac{21 \times 21}{20_1 \times 20}$$

$$= \frac{270^{135} \times 21 \times 21}{2_1}$$

$$= 135 \times 21 \times 21$$

$$= 59535$$

Hence, the required population 2016 is 59535.

Chapter

10 Direct and Inverse Variations

Exercise 10.1

1. (a) No, (b) Yes (c) No

2. $q_2 = \frac{9 \times 28^4}{7} = 9 \times 4 = 36$

$q_4 = \frac{15 \times 28^4}{7} = 15 \times 4 = 60$

$$p_3 = \frac{7^1 \times 44^{11}}{28_{4_1}} = 1 \times 11 = 11$$

$$p_4 = \frac{7^1 \times 76}{28_4} = \frac{76}{4} = 19$$

3. We have,

$$\frac{x}{y} = K = 40$$

$$\Rightarrow \quad \frac{x}{y} = 40$$

Now, $y = 400$

Then,

$$\frac{x}{400} = 40$$

$$\Rightarrow \quad x = 40 \times 400 = 16000$$

4. We have,

$$\text{Constant of variation} = \frac{y}{x}$$

$$\Rightarrow \quad \text{constant of variation} = \frac{8}{2} l = 4$$

(For $x = 2$ & $y = 8$)

So, the cosntant of variation is 4.

5. Let the required number of over be x.

So, $$\frac{100}{25} = \frac{180}{x}$$

$$\Rightarrow \quad x = \frac{180 \times 25^1}{100_4} = \frac{180}{4} = 45$$

$$\Rightarrow \quad x = 45 \text{ overs}$$

Hence, the required number of overs are 45.

6. We have,

$$\frac{p}{q} = \frac{282}{5.1}$$

Now,

If $q = 6.8$, then

$$\frac{p}{6.8} = \frac{282}{5.1}$$

$$\Rightarrow \quad P = \frac{282 \times 6.8^{4}}{5.1_{3}} = \frac{\overset{94}{282} \times 4}{3_{1}}$$

$$\Rightarrow \quad P = 94 \times 4 = 376$$

Hence, the required value of P is 376.

7. Let the required number of cartons be x.

According to question,

$$\frac{72}{4} = \frac{540}{x}$$

$$\Rightarrow \quad 72 \times x = 540 \times 4$$

$$\Rightarrow \quad x = \frac{540 \times 4^{1}}{72_{18}} = \frac{540^{30}}{18_{1}} = 30$$

Hence, the required number of cartons are 30.

8. Since food and person vary directly. Let the required quantity of food be 'x' kg.

So,
$$\frac{95}{5} = \frac{x}{23}$$

$$\Rightarrow \quad 5 \times x = 23 \times 95$$

$$\Rightarrow \quad = \frac{23 \times 95^{19}}{5} = 23 \times 19$$

$$\Rightarrow \quad x = 437\,\text{kg}$$

Hence, the required quantity of food is 437 kg.

9. We have,

8 woemn $= 5$ men

$$\therefore \quad 1 \text{ women} = \frac{5}{8} \text{ men}$$

$$\Rightarrow \quad 12 \text{ women} = 12^{3} \times \frac{5}{8_{2}} \text{ men}$$

$$= \frac{15}{2} \text{ men}$$

Now,

Let the required earning be ₹ 'x'.

Here, variation is direct.

$$\therefore \quad \frac{5}{625} = \frac{\left(8 + \frac{15}{2}\right)}{x}$$

$$\Rightarrow \quad \frac{5}{625} = \frac{31}{2x}$$

$$\Rightarrow \quad 5 \times 2x = 31 \times 625$$

$$\Rightarrow \quad x = \frac{31 \times 625}{5 \times 2} = \frac{19375}{10} = 1935.5$$

$$\Rightarrow \quad x = ₹\ 1937.50.$$

10. Let the required number of days be 'x'.

Here,

Variation is direct.

$$\therefore \quad \frac{1209}{13} = \frac{1953}{x}$$

$$\Rightarrow \quad 1209 \times x = 1953 \times 13$$

$$\Rightarrow \quad x = \frac{1953 \times 13}{1209_{93}} = \frac{1953}{93} = 21$$

$$\Rightarrow \quad x = 21 \text{ days}$$

Hence, the requried number of days are 21.

11. Let the required number of words be x.

We have,

1 hour = 60 minutes

Here, variation is direct.

$$\therefore \quad \frac{630}{60} = \frac{x}{40}$$

$$\Rightarrow \quad x \times 60 = 40 \times 630$$

$$\Rightarrow \quad x = \frac{40 \times 630^{105}}{60_1} = 4 \times 105$$

$$\Rightarrow \quad x = 420 \text{ words}$$

Hence, the required number of words are 420.

12. Let the required number of days be 'x'.

Here, variation is direct.

So, $$\frac{880}{8} = \frac{2860}{x}$$

$$\Rightarrow \quad 880 \times x = 2860 \times 8$$

$$\Rightarrow \quad x = \frac{\overset{26}{2860} \times \overset{1}{8}}{\underset{11_1}{880}} = 26$$

$$\Rightarrow \quad x = 26 \text{ days}$$

Hence, the requried number of days are 26.

Exercise 10.2

1. (a) and (c) in inverse variation.

2. (a) Here,

$a \times b = 4 \times 16 = 8 \times 8 = 16 \times 4 = 32 \times 2 = 64 \times 1 = 64$

So, a and b vary inversely.

(b) Here,

$a \times b = 2 \times 20 \neq 5 \times 50 \neq 10 \times 100$

So, a and b not vary inversely.

3. Let required number of days be 'x'

Here,

Variation is inverse,

So,

$$15 \times 24 = 9 \times x$$

$$\Rightarrow \quad x = \frac{\overset{5}{15} \times \overset{8}{24}}{9_{3_1}} = 5 \times 8 = 40$$

$$\Rightarrow \quad x = 40 \text{ days.}$$

4. Let the required number of days be 'x'.

Here, variation is inverse.

So,

According to question,

$$300 \times 42 = 350 \times x$$

$$\Rightarrow \quad x = \frac{{}^{6}\,300 \times 42^{6}}{350_{1}} = 6 \times 6 = 36$$

$$\Rightarrow \quad x = 36 \text{ days}$$

Hence, the required number of days are 36.

5. Let the required speed of car be 'x' km/h.

Here, variation is inverse.

So,

According to question,

$$45 \times 40 = 25 \times x$$

$$\Rightarrow \quad x = \frac{45 \times 40^{8}}{25_{5}} = \frac{45^{9} \times 8}{5_{1}} = 9 \times 8$$

$$\Rightarrow \quad x = 72 \text{ km/h}$$

Hence, the required speed of car 72 km/h.

6. Let the required number of days be 'x'.

Here, variation is inverse.

So,

According to question,

$$105 \times 21 = (105 - 42) \times x$$

$$\Rightarrow \quad 105 \times 21 = 63 \times x$$

$$\Rightarrow \quad x = \frac{105 \times 21^{1}}{63_{3}} = \frac{105}{3} = 35$$

$$\Rightarrow \quad x = 35 \text{ days}$$

Hence, the required number of days are 35.

7. Let the required number of cows be 'x'.

Here, variation is inverse.

So,

According to question,

$$33 \times 12 = x \times 9$$

$$\Rightarrow \quad x = \frac{33 \times 12^{4}}{9_{3}}$$

$$= \frac{^{11}33 \times 4}{3_{1}} = 11 \times 4 = 44$$

$$\Rightarrow \quad x = 44 \text{ cows}$$

Hence, the required number of cows are 44.

8. Let the required number of pages be 'x'.

Here, variation is inverse.

So,

According to question,

$$8 \times 15 = 10 \times x$$

$$\Rightarrow \quad x = \frac{8 \times 15^{3}}{10_{2}} = \frac{^{4}8 \times 3}{2} = 4 \times 3 = 12$$

$$\Rightarrow \quad x = 12 \text{ pages.}$$

Hence, the required number of pages are 12.

9. Let the required number of soldiers be 'x'.

Here, variation is inverse.

So,

According to question,

$$1200 \times (28 - 4) = (1200 - x) \times 32$$

$$\Rightarrow \quad 1200 \times 24 = (1200 - x) \times 32$$

$$\Rightarrow \quad \frac{1200 \times 24^{3}}{32_{4}} = (1200 - x)$$

$$\Rightarrow \quad \frac{^{300}1200 \times 3}{4_{1}} = 1200 - x$$

$$\Rightarrow \quad 300 \times 3 = 1200 - x$$

$$\Rightarrow \quad 900 = 1200 - x$$

$$\Rightarrow \quad x = 1200 - 900 = 300$$

$\Rightarrow \quad x = 300 \text{ soldiers}$

Hence, the required number of soldiers are 300.

10. Let the required weight of potatoes be 'x' kg.

Here, variation is inverse.

So,

According to question,

$$10 \times 18 = x \times 20$$

$$\Rightarrow \quad x = \frac{10 \times 18}{20_2} = \frac{18^9}{2_1} = 9$$

$$\Rightarrow \quad x = 9 \text{ kg}$$

Hence, the required weight of potatoes is 9 kg.

Exercise 10.3

1. We have,

Sandeep one day's work $= \frac{1}{20}$ part of work

$\therefore$ Time taken to complete work $= 1 \div \frac{1}{20} = 1 \times 20 = 20$ days.

Hence, the required number of days are 20 days for complete the work.

2. We have,

$A's$ one day work $= \frac{1}{8}$

$B's$ one day work $= \frac{1}{10}$

$(A + B)'s$ one day work $= \frac{1}{8} + \frac{1}{10} = \frac{10 + 8}{80} = \frac{18}{8}$

$\therefore$ Both A and B will finish the work $= \frac{80}{18} = \frac{40}{9} = 4\frac{4}{9}$ days

Hence, the required number of days are $4\frac{4}{9}$ days.

3. We have,

Vikas's one day reap $= \frac{1}{20}$

Manish's one day reap $= \frac{1}{30}$

Vikas and Manish one day's reap $= \frac{1}{20} + \frac{1}{30} = \frac{3+2}{60} = \frac{5}{60}$

$\therefore$ Time taken to complete the reap by Vikas and Manish.

$$= \frac{60}{5} = 12 \text{ days.}$$

Hence, the required number of days are 12 days.

4. We have,

Diya and Rehana's one day work $= \frac{1}{6}$

Rehana's one day work $= \frac{1}{9}$

$\therefore$ Diya's one day work $= \frac{1}{6} - \frac{1}{9} = \frac{3-2}{18} = \frac{1}{18}$

So,

Diya can complete the work in 18 days.

5. Peter and Tony's one day work $= \frac{1}{\left(\frac{15}{2}\right)} = \frac{2}{5}$

Peter's one day work $= \frac{1}{20}$

$\therefore$ Tony's one day work $= \frac{2}{15} - \frac{1}{20} = \frac{5}{60} = \frac{1}{12}$

So, Tony can complete the work in 12 days.

6. Let the required amount be ₹ 'x'.

Labourers	Day	Amoung (in ₹)
12	5	3600
9	8	x

$\therefore$ According to question,

$$\frac{9}{12} \times \frac{8}{5} = \frac{x}{3600}$$

$$\Rightarrow \quad x = \frac{9 \times 8 \times \overset{60}{\overset{300}{3600}}}{12_1 \times 5_1}$$

$$= 9 \times 8 \times 60 = 72 \times 60 = 4320$$

$$\Rightarrow \quad x = ₹\ 4320$$

Hence, the required amount is ₹ 4320.

7. We have,

A's one day work $= \frac{1}{12}$

B's one day work $= \frac{1}{15}$

$\therefore$ A's 4 days work $= 4 \times \frac{1}{12} = \frac{4}{12} = \frac{1}{3}$

Now,

Remaining work $= 1 - \frac{1}{3} = \frac{2}{3}$

A and B's one day work $= \frac{1}{12} + \frac{1}{15} = \frac{5+4}{60} = \frac{9}{60}$

So,

To finish the remaining work together, the seed

$$= \frac{2}{3} \div \frac{9}{60}$$

$$= \frac{2}{3} \times \frac{60}{9} = \frac{2 \times 20}{9}$$

$$= \frac{40}{9} = 4\frac{4}{9} \text{ days.}$$

Hence, the required number of days are $4\frac{4}{9}$ days.

8. We have,

$(A + B + C)$'s one day work $= \frac{1}{6}$

$(A + B)$'s one day work $= \frac{1}{10}$

So,

C's one day work $= \frac{1}{6} - \frac{1}{10} = \frac{10-6}{60} = \frac{4}{60} = \frac{1}{15}$

$\therefore$ C can take to finish the work in 15 days.

Hence, the required number of days are 15 days.

9. Time taken by the pipe A to fill the tank $= 24$ minutes

The take bye the pipe B to fill the tank $= 32$ minutes

Time taken by the pipe C to empty the tank $= 16$ minutes

$\therefore$ Work done by the pipe A in 1 minute $= \frac{1}{24}$

Work done by the pipe B in 1 minute $= \frac{1}{32}$

and, Work done by the pipe C in 1 minute $= \frac{1}{16}$

So,

Workdone by the all pipes in 1 minute to fill the tank

$$= \frac{1}{24} + \frac{1}{32} - \frac{1}{16}$$

$$= \frac{4+3-6}{96} = \frac{7-6}{96} = \frac{1}{96}$$

$\therefore$ All the pipes will fill the tank together in 96 minutes.

Hence, the required time is 96 minutes.

10. Let the number of guests to joined the family be 'x'.

Here,

The variation is inverse.

So, According to question,

$$8\times 30=(8\times x)\times x$$

$$\Rightarrow \quad \frac{\overset{4}{\cancel{8}}\times 30}{\underset{1}{\cancel{20}}}=(8+x)$$

$$\Rightarrow \quad 4\times 3=8+x$$

$$\Rightarrow \quad 12-8=x$$

$$\Rightarrow \quad x=4$$

Hence, 4 guests to joined the family.

11. Let the required number of days be 'x'.

Now,

Men	Hours	Day
120	9	40
150	6	x

So, According to question,

$$\frac{120}{150}\times\frac{9}{6}=\frac{x}{40}$$

$$\Rightarrow \quad \frac{120\times 9}{150\times 6}=\frac{x}{40}$$

$$\Rightarrow \quad x=\frac{\overset{2}{\cancel{120}}\times 9\times 40}{150\times \underset{1}{\cancel{6}}}=\frac{18\times \overset{8}{\cancel{40}}}{\underset{3}{\cancel{15}}}$$

$$\Rightarrow \quad x=\frac{\overset{6}{\cancel{18}}\times 8}{\underset{1}{\cancel{3}}}=6\times 8=48$$

$$\Rightarrow \quad x=48\text{ days.}$$

Hence, the required number of days to complete the road are 48 days.

12. We have,

$$3\text{ Boys}=5\text{ girls}$$

$$\therefore \quad 1\text{ girl}=\frac{3}{5}\text{ boys}$$

So,

$$2\text{ Boys} + 2\text{ girls} = 2\text{ boys} + 2\times\frac{3}{5}\text{ boys}$$

$$= 2\text{ boys} + \frac{6}{5}\text{ boys}$$

$$= \left(\frac{2}{1}+\frac{6}{5}\right)\text{boys}$$

$$= \frac{16}{5}\text{ boys.}$$

Now,

Let the required number of hours to clean the compound be 'x'.

According to question,

$$3\times 8 = \frac{16}{5}\times x$$

$$\Rightarrow \quad 3\times 8\times 5 = 16x$$

$$\Rightarrow \quad x = \frac{3\times 8^{1}\times 5}{16_{2}} = \frac{15}{2} = 7\frac{1}{2}$$

$$\Rightarrow \quad x = 7\frac{1}{2}\text{ hours}$$

Hence, $7\frac{1}{2}$ hours are required to clean the compound.

13. Time taken by the pipe A to fill the cistern $= 5$ hours.

Time taken by the pipe B to fill the cistern $= 10$ hours

$\therefore$ Work done by the pipe A in 1 hour $= \frac{1}{5}$

Work done day the pipe B in 1 hour $= \frac{1}{10}$

Pipes A and B's Two hours work $= 2\left(\frac{1}{5}+\frac{1}{10}\right) = 2\left(\frac{2+1}{10}\right) = \frac{6}{10}$

Now,

Remaining work $= 1 - \frac{6}{10}$

$$= \frac{(10-6)}{10} = \frac{4}{10}$$

So, time needed for B pipe to fill the remaining cistern

$$= \frac{4}{10} \div \frac{1}{10} = \frac{4}{10} \times \frac{10}{1}$$

$$= 4 \text{ hours}$$

Hence, the required time is 4 hours.

14. Time taken by tap X to fill the tank $= 15$ hours.

Time taken by tap Y to fill the tank $= 12$ hours

Time taken by tap Z to empty the full tank $= 8$ hours

$\therefore$ Work done by the tape X in 1 hour $= \frac{1}{15}$.

Work done by the tap Y in 1 hour $= \frac{1}{12}$

and work done by the tap Z in one hour $= \frac{1}{8}$

So, work done by the all taps (X, Y, Z) in one hour

$$= \frac{1}{15} + \frac{1}{12} - \frac{1}{8}$$

$$= \frac{8+10-15}{20} = \frac{18-15}{120} = \frac{3}{120} = \frac{1}{40}$$

$\therefore$ All the taps will fill the tank together in 40 hours.

$\therefore$ Time needed to half full the tank $= \frac{40}{2}$ hours $= 20$ hours

Hence, the required time is 20 hours.

15. Time taken by the tap A to fill the tank $= 6$ hours.

Time taken by the tap B to fill the tank$= 8$ hours

Time taken by the tap C to fill the tank $= 12$ hours.

$\therefore$ Work done by the tap A in 1 hours $= \frac{1}{6}$

Work done by the tap B in 1 hour $= \frac{1}{8}$

And, work done by the tap C in 1 hour $= \frac{1}{12}$

So,

Work done by the all taps (A, B and C) in 2 hours

$$= 2 \times \left(\frac{1}{6} + \frac{1}{8} + \frac{1}{12} \right)$$

$$= 2 \times \left(\frac{4+3+2}{24} \right)$$

$$= \frac{2 \times 9}{24_{12}} = \frac{9^{3}}{12_{4}} = \frac{3}{4}$$

Now,

Remaining work $= 1 - \frac{3}{4} = \frac{1}{4}$

$\therefore$ Time needed to fill the remaning part of the tank by the tap A

$$= \frac{1}{4} \div \frac{1}{6} = \frac{1}{4} \times \frac{6}{1} = \frac{6}{4}$$

$$= \frac{3}{2} = 1\frac{1}{2} \text{ hours} = 1 \text{ hours } 30 \text{ min.}$$

Hence, the required time is 1 hour 30 minutes.

Exercise 10.4

1. (a) $27 \text{ km/h} = 27^{3} \times \frac{5}{18_{2}} \text{ m/s} \quad = \frac{15}{2} \text{ m/s} = 7.5 \text{ m/s}$

(b) $30 \text{ m/s} = 30^{6} \times \frac{18}{5_{1}} \text{ km/h} = 6 \times 18 \text{ km/h} = 108 \text{ km/h}$

2. $36 \text{ km/h} = 36^{2} \times \frac{5}{18_{1}} \text{ m/s} = 2 \times 5 \text{ m/s} = 10 \text{ m/s}$

3. Speed of a train $= 35 \text{ m/s}$

$$= 35^{7} \times \frac{18}{5_{1}} \text{ km/h}$$

$$= 7 \times 18 \text{ km/h}$$

$$= 126 \text{ km/h}$$

4. Speed of bullock – cart $= \frac{18}{5}$ km/h $= \frac{18}{5} \times \frac{5}{18}$ m/s $= 1$ m/s

5. Speed of cycle $= 18$ km/h $= 18 \times \frac{5}{18}$ m/s $= 5$ m/s

6. Speed of a train $= 15$ m/s

$$= 15^{3} \times \frac{18}{5_{1}} \text{ km/h}$$

$$= 3 \times 18 \text{ km/h}$$

$$= 54 \text{ km/h}$$

7. We have,

Speed of an aeroplaen $= 320$ km/h

Time $= 3$ hours

We know that

Distance $=$ Speed $\times$ Time

$= 320 \times 3$ km

$= 960$ km $= 960000$ m

Hence, the required distance is 960000 m.

8. Speed of truch $= 36$ km/h

$$= 36^{2} \times \frac{5}{18} \text{ m/s}$$

$$= 10 \text{ m/s}$$

Time $= 18$ second

$\therefore$ Distance $=$ Speed $\times$ Time

$= 10$ m/s $\times$ 18 s

$= 10 \times 18$ m

$= 180$ m

Hence, the required distance is 180 m.

9. We have,

Time $= 7$ seconds

Distance $= 210$ m

$\therefore$ Speed $= \frac{\text{Distance}}{\text{Time}}$

$$= \frac{210\,\text{m}}{7\,\text{sec.}} = 30\ \text{m/s}$$

Hence, the required speed of the train is 30 m/s.

10. Case-I

$$\text{Time} = 10\,\text{hours, speed} = 40\,\text{km/h}$$

$$\therefore \quad \text{Distance} = \text{Speed} \times \text{Time}$$
$$= 40 \times 10\,\text{km}$$
$$= 400\,\text{km}$$

Case-II

$$\text{Time} = ? \qquad \text{Distance} = 400\,\text{km}$$
$$\text{Speed} = (40 + 10)\,\text{km/h} = 50\,\text{km/h}$$

We know that,

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}} = \frac{400}{50}\,\text{hour}$$
$$= \frac{40}{5}\,\text{hour} = 8\,\text{hours}$$

Hence, the requried time is 8 hours.

11. We have,

$$\text{Time} = 12\ \text{hours}\ 20\ \text{minutes}$$
$$= 12\frac{20}{60}\,\text{hours}$$
$$= 12\frac{1}{3}\,\text{hours} = \frac{37}{3}\,\text{hours}$$

$$\text{Speed of train} = 25\,\text{m/s} = 25^{5} \times \frac{18}{5_{1}}\,\text{km/h}$$
$$= 90\,\text{km/h}$$

Now,

$$\text{Distance} = \text{Speed} \times \text{Time}$$
$$= \overset{30}{90}\,\text{km/h} \times \frac{37}{3_{1}}\,\text{h}$$
$$= 30 \times 37\,\text{km}$$
$$= 1110\,\text{km}$$

Hence, the distance between the cities A and B is 1110 km.

12. We have,

$$\text{Distance} = 225 \text{ m}, \text{ Time} = 10 \text{ sec.}$$

$$\therefore \quad \text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{225}{10} \text{ m/s}$$

$$= 22.5 \text{ m/s} = 81 \text{ km/h}$$

Now,

$$\text{New Distance} = (225 + 405) = 630 \text{ m}$$

$$\text{Speed} = 22.5 \text{ m/s}$$

So,
$$\text{Time} = \frac{\text{Distance}}{\text{Speed}} = \frac{630 \times 10}{225} \text{ sec.}$$

$$= \frac{6300}{225} \text{ sec} = 28 \text{ sec.}$$

Hence, the required time is 28 sec.

Mental Ability

A. Multiple Choice Question :

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

B. Fill in the blanks :

1. Two quantities p and q are said to be in direct variation, when $\boldsymbol{p \propto q}$.
2. If $xy = 48$ and $y = 6$, then $x = \mathbf{8}$.
3. 20 m/s = **72** km/h.
4. Time is **inversely** proportional to work.
5. If Heena knits 35 scarves in 25 days, she will take $\mathbf{39\frac{2}{7}}$ days to knit 55 scarves.

C. State True (T) or False (F) :

1. False **2.** False **3.** True **4.** False **5.** True

Higher Order Thinking Skill

1. Let the required number of days be 'x'.

We have,

$$(8m + 12w) \times 9 = (10m + 20w) \times 6$$

$$\Rightarrow \quad 72m + 108w = 60m + 120w$$

$$\Rightarrow \quad 72m - 60m = 120w - 108w$$

$$\Rightarrow \quad 12m = 12w$$

$$\Rightarrow \quad 1m = 1w$$

{where $m \rightarrow$ men

$w \rightarrow$ women

So,

According to question,

$$(5m + 15w) \times x = (8m + 12w) \times 9$$

$$\Rightarrow \quad x = \frac{20m}{20m} \times 9 = 1 \times 9$$

$$\Rightarrow \quad x = 9 \text{ days}$$

Hence, required number of days are 9.

2. We have,

Speed of a man in still water = 6 km/h

Speed of current = 4 km/h

So,

$\therefore$ Speed upstream = $6 - 4 = 2$ km/h

Speed downstream = $6 + 4 = 10$ km

Distance = 15 km

(a) $\text{Time} = \dfrac{\text{Distance}}{\text{Speed}}$

$$= \frac{15}{2} \text{ h}$$

$$= 7.5 \text{ hours}$$

(b) $\text{Time} = \dfrac{\text{Distance}}{\text{Speed}}$

$$= \frac{15}{10} \text{ hours}$$

$$= 1.5 \text{ hours}$$

Chapter

11 Quadrilaterals

Exercise 11.1

1. (a), (b), (d) are concave and (c) is convex;

Not all two points when joined lie wholly in the interior of the quadrilateral.

2. (a) Missing angle $= 360° - (90° + 95° + 110°)$

$= 360° - (295°)$

$= 65°$

(b) Let the value of two equal missing angle be $(x°)$.

$\therefore \quad x° + x° + 30° + 40° = 360°$

$\Rightarrow \quad 2x° = 360° - 70°$

$\Rightarrow \quad 2x° = 290°$

$\Rightarrow \quad x° = \frac{290°}{2} = 145°$

(c) From given polygon,

$x° = 180° - 60° = 12°$

$y° = 180° - 70° = 110°$

$w = 70°$ (alternate $\angle S$)

$z = 60°$ (alternate $\angle S$)

(d) By angle sum property of Δ.

$w + 50° + 80° = 180°$

$\Rightarrow \quad w = 180° - 130°$

$\Rightarrow \quad w = 50°$

$x + 80° = 180°$ (Linear pair)

$\Rightarrow \quad x = 180° - 80° = 100°$

$y + w = 180°$ (Linear pair)

$\Rightarrow \quad y + 50° = 180°$

$\Rightarrow \quad y = 180° - 50° = 130°$

$\Rightarrow \quad x = 180° - 50° = 130°$

$\therefore \quad x + y + 2 = 100° + 130° + 130° \, l = 360°$

(e) We know that,

Sum of exterior angles of a polygon $= 360°$

$\therefore \quad x + y + z + w = 360°$

3. (a) We have,

Number of sides of regular polygon $= 12$

So, The nmeasure of each exterior angle $= \dfrac{360°}{12} = 30°$

(b) Number of sides $= 18$

$\therefore$ The measure of each exterior angle $= \dfrac{360°}{18} = 20°$

(c) Number of sides $= 8$

$\therefore$ The measure of each exterior angle $= \dfrac{360°}{8} = 45°$

4. (a) Heptagon (b) Sum of interior angle of a regular octagon

$$= (8-2) \times 180°$$
$$= 6 \times 180° = 1080°$$

5. We have,

$\angle B = 65°, \angle OPB = 90°, \angle OQB = 90°$

So, in quadrilateral $OPBQ$,

$$\angle POQ = 360° - (65° + 90° + 90°)$$
$$= 360° - 245°$$
$$= 115°$$

Hence, the value fo $\angle POQ$ is $115°$.

6. (a) Let the measure of the angles be $x, 2x, 3x$ and $4x$.

Then, $x + 2x + 3x + 4x = 360°$

$\Rightarrow \quad 10x = 360°$

$\Rightarrow \quad x = \dfrac{360°}{10} = 36°$

Hence, the angles are :

$36°, 72°, 108°, 144°$

(b) Let the measure of the angles be $2x$, $2x$, $3x$ and 5x.

Then, $2x + 2x + 3x + 5x = 360°$

$\Rightarrow \quad 12x = 360°$

$\Rightarrow \quad x = \frac{360°}{12} = 30°$

Hence, the angles are 60°, 60°, 150°.

(c) Let the measure of the angles be $3x$, $5x$, $7x$ and $9x$.

Then, $3x + 5x + 7x + 9x = 360°$

$\Rightarrow \quad 24x = 360°$

$\Rightarrow \quad x = \frac{360°}{24} = \frac{30°}{2} = 15°$

Hence, the angles are 45°, 75°, 105°, 135°.

7. We have

$\angle A = \angle C$ and $\angle B = \angle D$

and, $\angle A = 2\angle B$

Then,

$\angle A + \angle B + \angle C + \angle D = 360°$

$\Rightarrow \quad 2\angle B + \angle B + 2\angle B + \angle B = 360°$

$\Rightarrow \quad 6\angle B = 360°$

$\Rightarrow \quad \angle B = \frac{360°}{6} = 60°$

$\therefore \quad \angle D = 60°$

$\angle A = 2 \times 60° = 120°$

$\angle C = 2 \times 60° = 120°$

So,

$\angle A = 120°, \angle B = 60°, \angle C = 120°$ and $\angle D = 60°$

8. Let the measure of equal angles be x.

Now, measure of fourth angle $= 2x$

So,

$x + x + x + 2x = 360°$

$\Rightarrow \quad 5x = 360°$

$\Rightarrow \quad x = \frac{360°}{5} = 72°$

Hence, the angles are, 72°, 72°, 72°, 144°.

9. In quadrialteral $STUV$,

By angles sum property,

$$\angle S + \angle T + \angle U + \angle V = 360°$$

$$\Rightarrow \quad 60° + 80° + \angle U + \angle V = 360°$$

$$\Rightarrow \quad 140° + \angle U + \angle V = 360°$$

$$\Rightarrow \quad \angle U + \angle V = 360° - 140°$$

$$\Rightarrow \quad \frac{1}{2}(\angle U + \angle V) = \frac{220°}{2} = 110°$$

$$\Rightarrow \quad \frac{1}{2}\angle U + \frac{1}{2}\angle V = 110°$$

$$\Rightarrow \quad \angle OUV + \angle OVU = 110°$$

Now, in ΔOVU,

By angles sum property of Δ,

$$\Rightarrow \quad \angle UOV + 110° = 180°$$

$$\Rightarrow \quad \angle UOV = 180° - 110°$$

$$\Rightarrow \quad \angle UOV = 70°$$

10. Let the measure of equal angles be 'x'.

We know that,

$$\angle A + \angle B + \angle C + \angle D = 360°$$

$$\Rightarrow \quad x + x + x + x = 360°$$

$$\Rightarrow \quad 4x = 360°$$

$$\Rightarrow \quad x = \frac{360°}{4} = 90°$$

Hence, the required measure of each angle is 90°.

11. In quadrilateral $PQRS$,

$PQ \,||\, SR$ and $\angle S = \angle R = 69°$

So, $\angle P + \angle S = 180°$ (Interior $\angle S$ of some side of transversal)

$$\Rightarrow \quad \angle P + 60° = 180°$$

$$\Rightarrow \quad \angle P = 180° - 60° = 120°$$

also,

$$\angle Q + \angle R = 180°$$

$$\Rightarrow \quad \angle Q + 60° = 180°$$

$\Rightarrow \quad \angle Q = 180° - 60° = 120°$

Hence, $\angle P = \angle Q = 120°$

12. In the given figure,

We have,

$\angle x = 40°, \angle x = 90°, \angle z = 90°$

So,

$\angle x + \angle y + \angle z + \angle w = 360°$

$\Rightarrow \quad 90° + \angle xyz + 90° + 40° = 360°$

$\Rightarrow \quad \angle xyz + 220° = 360°$

$\Rightarrow \quad \angle xyz = 360° - 220° = 140°$

13. (a) False $\rightarrow$ never collinear

(b) False $\rightarrow$ can have

(c) False $\rightarrow$ can have,

(d) False

(e) False $\rightarrow$ Joning the opposite vertices

Exercise 11.2

1. In a parallelogram,

We have,

$\angle A = 40°$

$\therefore \quad \angle A + \angle B = 180°$ (Sum of adjacent $\angle S$)

$\Rightarrow \quad 40° + \angle B = 180°$

$\Rightarrow \quad \angle B = 180° + 40° = 140°$

Now,

$\angle C = \angle A = 40°$ (opposite $\angle S$ are equal.)

$\angle D = \angle B = 140°$ (opposite $\angle S$ are equal.)

Hence, the required angles are 140°, 40°, 140°.

2. Let $ABCD$ is a parallelogram, & $\angle A = x°$

So, $\angle B = (x + 30°)$

Now,

$$\angle A + \angle B = 180^\circ \qquad \text{(Sum of adjacent } \angle S\text{)}$$

$$\Rightarrow \quad x^\circ + x^\circ + 30^\circ = 180^\circ$$

$$\Rightarrow \quad 2x^\circ = 180^\circ - 30^\circ = 150^\circ$$

$$\Rightarrow \quad x^\circ = \frac{150^\circ}{2} = 75^\circ$$

$$\therefore \quad \angle A = 75^\circ, \angle B = 75^\circ + 30 = 105^\circ$$

Hence, the requried angles are 75°, 105°.

3. (a) Angle BCD and DAB should each be 135°.

(b) Angle CDA should be 25°.

(c) Angles BCD and DAB should each be 90°.

4. Let the adjacent sides of a rectangle be $(2x)$ and $(3x)$.

Now, According to question,

Perimeter of rectangle $= 80\,\text{cm}$

$$\Rightarrow \quad 2(3x + 2x) = 80\,\text{cm}$$

$$\Rightarrow \quad x \times 5x = 80\,\text{cm}$$

$$\Rightarrow \quad x = \frac{80\,\text{cm}}{10} = 8\,\text{cm}$$

Hence, the required measure of sides is 16 cm and 24 cm.

5. We know that,

The perimeter of a parallelogram $= 2 \times$ (sum of adjacent sides)

$$= 2 \times (8\,\text{cm} + 6\,\text{cm})$$

$$= 2 \times 14\,\text{cm} = 28\,\text{cm}$$

Hence, the rquried perimeter of ||gm is 28 cm.

6. Let the length of BC be 'x' cm.

$\therefore$ Length of $AB = (x + 8)\,\text{cm}$

Now, we know that,

Perimeter of ||gm $= 2$ (sum of adjacent sides)

$$\Rightarrow \quad 40\,\text{cm} = 2(x + x + 8)$$

$$\Rightarrow \quad 40\,\text{cm} = 2(2x + 8)$$

$$\Rightarrow \quad \frac{40}{2}\,\text{cm} = 2x + 8$$

$\Rightarrow \quad 20\text{ cm} = 2x + 8$

$\Rightarrow \quad 2x = l20\text{ cm} - 8\text{ cm} = 12\text{ cm}$

$\Rightarrow \quad x = 6\text{ cm}$

Hence, the length of each side is 6 cm and 14 cm.

7. Let the adjacent sides of ||gm be $(1x)$ and $(2x)$.

Now,

The perimeter of ||gm = 24 cm

$\Rightarrow \quad 2(1x + 2x) = 24\text{ cm}$

$\Rightarrow \quad 2(3x) = 24\text{ cm}$

$\Rightarrow \quad 6x = 24\text{ cm}$

$\Rightarrow \quad x = \dfrac{24\text{ cm}}{6} = 4\text{ cm}$

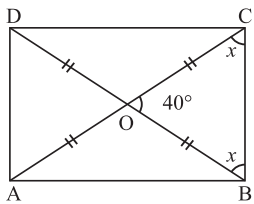
Hence, the required dimensions of parallelogram are 4 cm and 8 cm.

8. Given that,

$\angle BOC = 40°$

Here,

ABCD is a rectangle.



So, $AC = BD$ (Diogonals are equal in length)

$\therefore \quad OC = OB$ ($\because$ Diagonals bisect each other)

$= x$ (say)

Now, in triangle *OBC*,

By angles sum property of triangle,

$x + x + 40° = 180°$

$\Rightarrow \quad 2x + 40° = 1806$

$\Rightarrow \quad 2x = 180° - 40° = 140°$

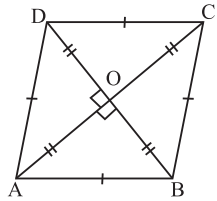
$\Rightarrow \quad x = \dfrac{140°}{2} = 70°$

Hence, $\angle OBC = 70°$ & $\angle OCB = 70°$

9. We have,

In rhombus *ABCD*.

$AC = 8\,\text{cm}$ and $BD = 6\,\text{cm}$



So, $OA = \frac{1}{2} \times 8\,\text{cm} = 4\,\text{cm}$

and, $OB = \frac{1}{2} \times 6\,\text{cm} = 3\,\text{cm}$

$\because$ diagonals bisect each other at right angle.

$$\angle AOB = 90^\circ$$

Now,

In right triangle AOB,

$$AB^2 = OA^2 + OB^2$$
$$= 4^2 + 3^2$$
$$= 16 + 9$$

$\Rightarrow$ $AB^2 = 25$

$\Rightarrow$ $AB = \sqrt{25} = 5\,\text{cm}$

Hence, the requried length of side of rhombus is 5 cm.

10. We have,

In given rectangle $ABCD$,

$$\angle AOB = 80^\circ$$

Now,

$\angle AOB + \angle AOD = 180^\circ$ (Linear pair $\angle S$)

$\Rightarrow$ $80^\circ + \angle AOD = 180^\circ$

$\Rightarrow$ $\angle AOD = 180^\circ - 80^\circ = 100^\circ$

$AC = BD$ ($\because$ diagonal are equal in length)

$\therefore$ $OA = OD$ ($\because$ diagonals bisects each other)

$\therefore$ $\angle ADO = \angle OAD = (x)$ say

In ΔAOD,

By angle sum property of Δ.

$$x + x + 100^\circ = 180^\circ$$

$\Rightarrow$ $2x + 100^\circ = 180^\circ$

$\Rightarrow$ $2x = 180^\circ - 100^\circ = 80^\circ$

(a) $\angle ADO = x° = 40°$

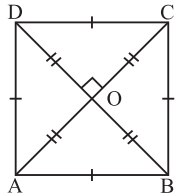
(b) $\angle OAD = 40°$

So, $\angle OAB = 90° - 40° = 50°$

$\therefore$ $\angle DCA = \angle OAB = 50°$ (alt. angle)

11. Let the square be $ABCD$ and point of intersection be 'O'.

So, Triangles are AOB, AOD, BOC, DOC.



Considering ΔAOB and ΔOC.

$AO = DO$ (half the diagonals)

$OC = OB$ (half the diagonals)

$\angle AOB = \angle DOC$ (opposite $\angle S$ are equal)

So, $\Delta AOB \cong \Delta DOC$

Now,

In ΔAOD and ΔDOC,

$DO = DO$ (Common)

$DC = AD$ (Sides of square)

$\angle AOD = \angle DOC = 90°$

So, $\Delta AOD \cong \Delta DOC$

Similarly, $\Delta AOB \cong \Delta BOC$

So, four Δ concurrent. Hence proved.

12. Let the required length of QR be 'x' cm.

$\therefore$ $PQ = (x + 6)$ cm

Now,

Perimeter of || gm $PQRS = 36$ cm

$\Rightarrow$ $2(x + x + 6) = 36$ cm

$\Rightarrow$ $2(2x + 6) = 36$ cm

$\Rightarrow$ $2x + 6 = 36$ cm$/2 = 18$ cm

$\Rightarrow$ $2x = (18 - 6)$ cm $= 12$ cm

$\Rightarrow$ $x = \dfrac{12\text{ cm}}{2} = 6$ cm

Hence, the required length of each side (QR & PQ) is 6 cm and 12 cm.

13. We have,

In ||gm $PQRS$,

$$\angle Q = 50° \text{ and } \angle PRS = 70°$$

We know that,

Sum of adjacent angles $= 180°$

$\Rightarrow \quad \angle Q + \angle R = 180°$

$\Rightarrow \quad 50° + \angle R = 180°$

$\Rightarrow \quad \angle R = 180° - 50° = 130°$

$\Rightarrow \quad \angle QRP + \angle PRS = 130°$

$\Rightarrow \quad \angle QRP + 70° = 130°$

$\Rightarrow \quad \angle QRP = 130° - 70° = 60°$

$\Rightarrow \quad \angle QRP = 60°$

So, $\angle SPR = \angle QRP = 60°$ (Alterante angles are equal in measure)

hence, the measure of required angles is 60° each.

14. We have,

$PQRS$ and $PTUV$ and ||gms. and $\angle V = 100°$

Now,

We know that,

Sum of adjacent angles $= 180°$

$\Rightarrow \quad \angle V + \angle U = 180°$

$\Rightarrow \quad 100° + \angle U = 180°$

$\Rightarrow \quad \angle U = 180° - 100° = 80°$

$\therefore \quad \angle P = \angle U = 80°$ (opposite angles are equal in measure)

$\Rightarrow \quad \angle R = \angle P = 80°$ (opposite angles are equal in measure)

$\angle RSP = \angle UVP = 100° \quad (\because VU \,||\, SR)$

(a) Hence, $\angle P = 80°$ (b) $\angle U = 80°$

(c) $\angle R = 80°$

(d) and, $\angle RSP = 100°$

15. (a) True (b) False (c) True (d) True (e) False (f) True (g) True

Mental Ability

A. Multiple Choice Question :

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

B. Fill in the blanks :

1. The angles of a quadrilateral are in the ratio 1 : 2 : 3 : 4. What are its angles **36°, 72°, 108°, 144°**.
2. A polygon with seven sides is called **Heptagon**.
3. In a concave quadrilateral, the measure of at least one angle is more than **180°**.
4. Adjacent angles are **Supplementary** in rhombus.

C. State True (T) or False (F) :

1. False **2.** True **3.** True **4.** False **5.** True

Higher Order Thinking Skills

1. Let required exterior and interior angles of polygon be $(1x°)$ and $(5x)°$.

Now,

$$1x° + 5x° = 180°$$

$$\Rightarrow \quad 6x° = 180°$$

$$\Rightarrow \quad x° = \frac{180°}{6} = 30°$$

$\therefore$ exterior angle $= 30°$

interior angle $= 150°$

So,

The required number of sides of polygon $= \frac{360°}{30°} = 12$

Hence, required number of sides of polygon are 12.

2. From figure,

We have, $SA \,||\, TQ$ and $PT \,||\, AR$

So, $$\angle S = \angle 3 = \frac{1}{2}\angle ART \qquad \ldots(1)$$

(Alternate angles are equal in measure)

and, $$\angle Q = \angle 1 = \frac{1}{2}\angle TPA \qquad \ldots(2)$$

(Alterante angles are equal in measure)

By adding equations (1) & (2)

We get,

$$\angle S + \angle Q = \frac{1}{2}\angle ART + \frac{1}{2}\angle TPA$$

$$\Rightarrow \quad \angle S + \angle Q = \frac{1}{2}(\angle ART + \angle TPA)$$ Hence proved.

Chapter

12 Construction of Quadrilaterals

Exercise 12.1

1. Construction the following quadrilaterals, *ABCD*. Name them if they are special quadrilaterals.

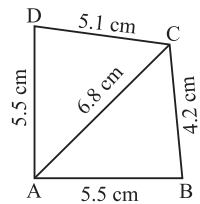
(a) Draw rough sketch of the quadrilateral *ABCD* and indicate the given dimensions on ti.

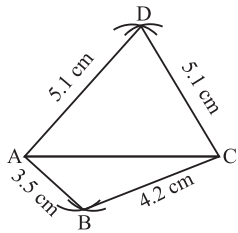
We have,

$AB = 3.5$ m, $BC = 4.2$ cm

$CD = 5.1$ cm, $DA = 5.5$ cm

$AC = 6.8$ cm





Steps of Construction :

(i) Draw $AC = 6.8$ cm.

(ii) With *A* as centre and radius 3.5 cm draw an arc below *AC*.

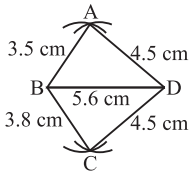
(iii) With *C* as centre and radius 4.2 cm draw another arc to cut the previous arc at *B*.

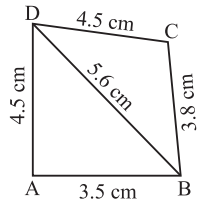
(iv) With *A* as centre and radius 5.5 cm draw an arc above the *AC*.

(v) With *C* as centre and radius 5.1 cm draw another arc to cut the previous arc at *D*.

(vi) Join *AB*, *BC*, *CD* and *DA*.

1. (b) Draw a rought sketch of the quad. *ABCD* and indicate the given dimensions on it.





Steps of Construction :

(i) Draw $BD = 5.6$ cm.

(ii) With B as centre and radius 3.8 cm, draw an arc below the BD.

(iii) With D as centre and radius 4.5 cm, draw another arc to cut previous arc at C.

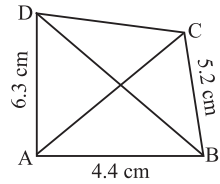
(iv) With B as centre and radius 3.5 cm draw an arc above the BD.

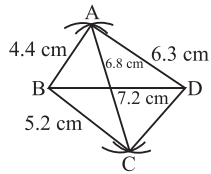
(v) With D as centre and radius 4.5 cm.

(vi) Join AB, BC, CD and DA.

Thus, $ABCD$ is the required quadrialteral.

1. (c) Draw the rough sketch of the quadrilateral $ABCD$ and indicate the given dimensions on it.





Steps of Construction :

(i) Draw the $BD = 7.2$ cm.

(ii) With B as center as radius 4.4 cm draw an arc above the BD.

(iii) With D as centre and radius 6.3 cm draw an other arc to cut the previous arc at A.

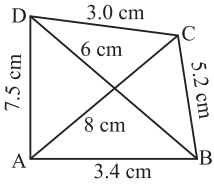
(iv) With B as centre and radius 5.2 cm draw an arc below the BD.

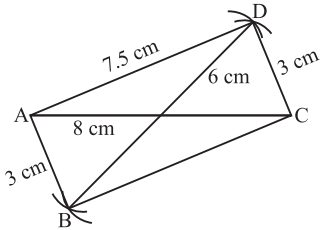
(v) With as centre and radius 6.8 cm draw another arc to cut the previous arc at C.

(vi) Join AB, BC, CD, DA and AC.

Thus, $ABCD$ is the rquired quadrilateral.

1. (d) Draw the rought sketch of the quadrilateral $ABCD$ and indicate the given dimensions on it.





Steps of construction :

(i) Draw the $AC = 8$ cm.

(ii) With A as centre and radius 7.5 cm, draw an arc above the AC.

(iii) With C as centre and radius 3 cm draw another arc to cut the previous arc at D.

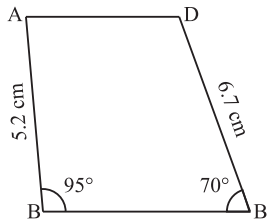
(iv) With A as centre and radius 3.4 cm, draw an arc below AC.

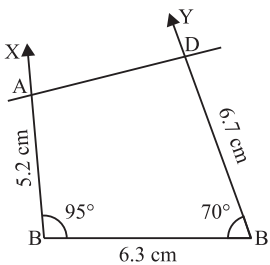
(v) With D as centre and radius 6.0 cm, draw another arc to cut the previous arc at B.

(vi) Join AB, BC, CD, DA and BD.

Thus, $ABCD$ is the required quad.

1. (e) Draw the rought sketch of the quad. $ABCD$ and indicate the given dimensions on it.





Steps of Construction :

(i) Draw $BC = 6.3$ cm.

(ii) At B draw $\angle CBX = 95°$.

(iii) With B as centre and radius 5.2 cm cut off $BA = 5.2$ cm on the ray BX.

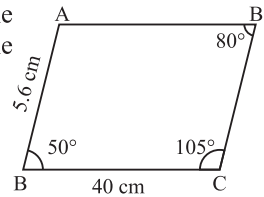
(iv) At C draw $\angle BCY = 70°$.

(v) With C as centre and radius 6.7 cm cut off $CD = 6.7$ cm on the ray CY.

(vi) Join AD.

Thus, $ABCD$ is the required quadrilateral.

1. (f) Draw the rought sketch of the quadrilateral $ABCD$ and indicate the given dimension on it.



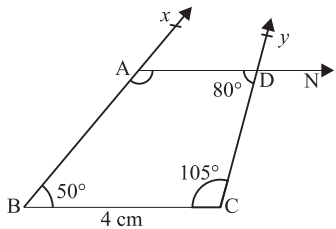
Here, we find $\angle A$.

So,

$\angle A = 360° - (50 + 80 + 105)$

$= 360° - 235 = 125°$

$\therefore \quad \angle A = 125°$



Steps of Construction :

(i) Draw $BC = 4$ cm.

(ii) At B, draw $\angle CBX = 50°$.

(iii) At C, draw $\angle ACY = 105°$.

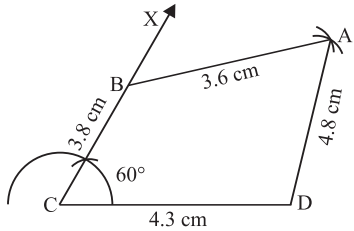
(iv) With B as centre and radius 5.6 cm, cut off $BA = 5.6$ cm on the ray BX.

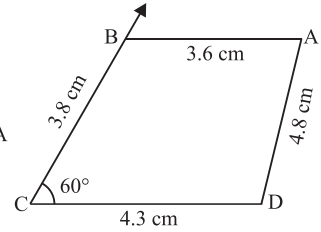
(v) At A, draw $\angle BAZ = 125°$.

So, ray AZ and ray CY intersect at D.

Thus, $ABCD$ is the required quadrilateral.

1. (g) Draw the rought sketch of the quadrilateral $ABCD$ and indicate the given dimensions on it.





Steps of Construction :

(i) Draw $CD = 4.3$ cm.

(ii) At C, draw $\angle DCX = 60°$.

(iii) With C centre and radius 3.8 cm, cut off $CB = 3.8$ cm on the ray CX.

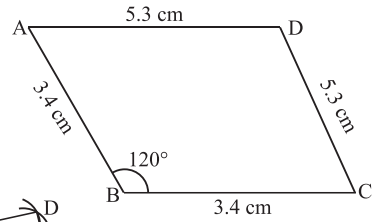
(iv) With B as centre and radius 3.6 cm draw an arc.

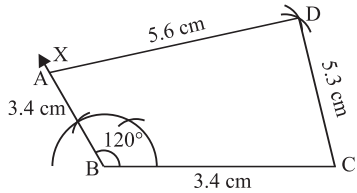
(v) With D as centre and radius 4.8 cm, draw another arc to cut the previous arc at A.

(vi) Join AB and AD.

Thus, $ABCD$ is the required quadrilateral.

1. (h) Draw the rought sketch of quad. $ABCD$ and indicate the given dimensions on it.





Steps of Construction :

(i) Draw $BC = 3.4$ cm.

(ii) At B, draw $\angle CBX = 120°$

(iii) With B as centre and radius 3.4 cm cut off $BA = 3.4$ cm on the ray BX.

(iv) With A as centre and radius 5.3 cm drawn an arc.

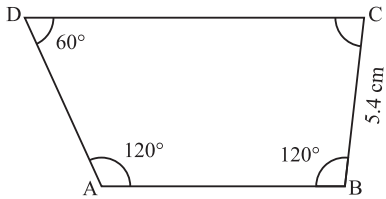
(v) With C as centre and radius 5.3 cm draw another arc to cut the previous arc at D.

(vi) Join AD and DC.

Thus, $ABCD$ is the required quadrilateral.

This special quad. $ABCD$ is known as Kite.

1. (i) Draw the rought sketch of the quad. $ABCD$ and indicate the given dimensions on it.



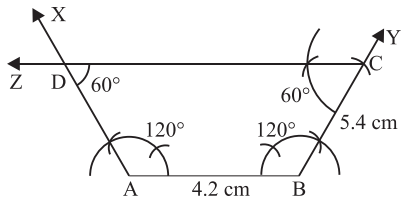
Here,

We find $\angle C$.

$\therefore \quad \angle C = 360° - (120° + 120° + 60°)$

$\Rightarrow \quad \angle C = 360° - 300°$

$\Rightarrow \quad \angle C = 60°$



Steps of Construction :

(i) Draw $AB = 4.2$ cm.

(ii) At A, draw $\angle BAX = 120°$

(iii) At B, draw $\angle ABY = 120°$

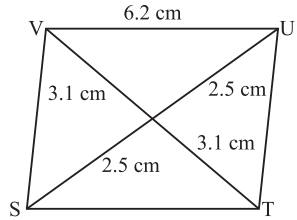
(iv) With B as centre and radius 54 cm draw an arc above the AB. This arc intersect at C on BY ray.

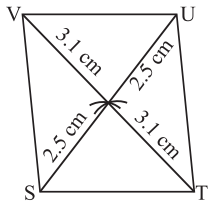
(v) At C, draw $\angle BCZ = 60°$, so ray CZ and ray AX intersect at D.

Thus, $ABCD$ is the required quadrilateral. This quadrilateral $ABCD$ is know as trapezium.

Exercise 12.2

1. (a) Draw a rought sketch of a parallelogram $STUV$ and note down its dimensions on it.





Steps of Construction :

(i) Draw $ST = 3.5$ cm.

(ii) With S as cenre and radius 2.5 cm, draw an arc (Half of SU)

(iii) With T as centre and radius 3.1 cm (Half of VT) draw another arc to cut the previous arc at O. Then O is the point of intersection of the diagonals.

(iv) Join SO and TO.

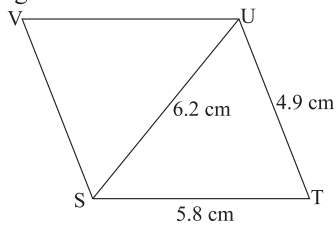
(v) Product SO to U such that $SO = OU$.

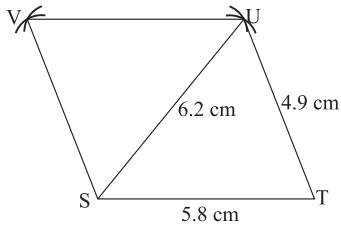
(vi) Produce to V such that $TO = OV$.

(vii) Join TU, UV and VS.

Thus, $STUV$ is the required parallelogram.

1. (b) Draw a rought sketch of a parallelogram $STUV$ and note down its dimension on it.





Steps of Construction :

(i) Draw $ST = 5.8$ cm.

(ii) With S as centre and radius 6.2 m draw an arc above the ST.

(iii) $With T$ as centre and radius 4.9 cm, draw another arc to cut the previous arc at U.

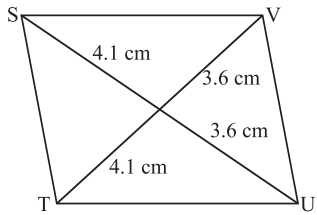
(iv) With U as centre and radius 5.8 cm, draw an arc. above the point S.

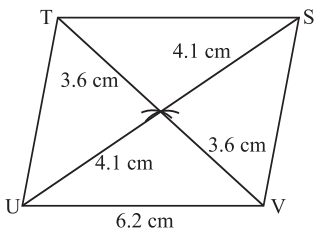
(v) With S as centre and radius 4.9 cm, draw another arc to cut the previous arc at V.

(vi) Join TU, UV and VS.

Thus, $STUV$ is the required parallelogram.

1. (c) Draw a rought sketch of a parallelogram $STUV$ and indicate given dimenions on it.





Steps of Construction :

(i) Draw $UV = 6.2$ cvm.

(ii) With U as centre and radius 4.1 cm, draw an arc above UV.

(iii) with V as centre and radius 3.6 cm, draw another arc to cut the previous arc at O, then is the intersection point of the diagonals.

(iv) Join OU and OV.

(v) Produce UO to S such that $UO = OS$.

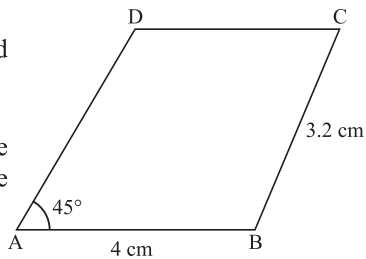
(vi) Produce VO to T such that $VO = OT$.

(vii) Join ST, TU and SV.

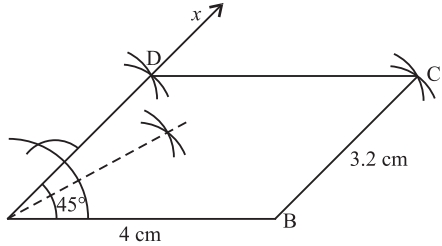
Thus, $STUV$ is the required parallelogram.

2. (a) Draw a rought sketch of the parallelogram and indicate the given dimensions on it.

We have,



$BC = AD = 3.2$ cm (opposite sides are equal).



Steps of Construction :

(i) Draw $AB = 4$ cm.

(ii) At A, draw $\angle BAx = 45°$.

(iii) with A as centre and radius 3.2 cm. Cut $AD = 3.2$ cm on Ax ray.

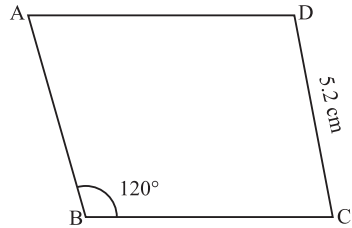
(iv) With D as centre and radius 4.0 cm draw an arc.

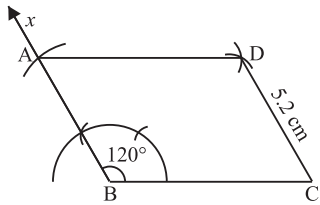
(v) With B as centre and radius 3.2 cm, draw another arc to cut the previous arc at C.

(vi) Join DC and BC.

Thus, $ABCD$ is the rqeuired parallelogram.

2. (b) Draw a rought sketch of the parallelogram $ABCD$ and indicate given dimensions on it.





Steps to Constructions :

(i) Draw $BC = 4.2$ cm.

(ii) At B, draw $\angle CBx = 120°$.

(iii) Cut the line segment $BA = 5.2$ cm from ray BX.

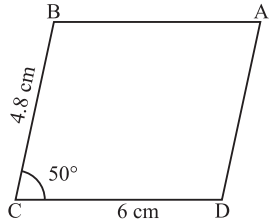
(iv) With A as centre and radius 4.2 cm draw an arc.

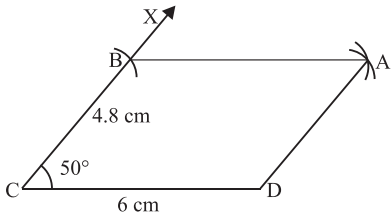
(v) With C and centre and radius 5.2 cm draw another arc to cut the previous arc at D.

(vi) Join AD and CD.

Thus, $ABCD$ is the required parallelogram.

2. (c) Draw a rought sketch of the parallelogram $ABCD$ and indicate given dimensions on it.





Steps of Construction :

(i) Draw $CD = 6$ cm.

(ii) At C draw $\angle DCX = 50°$.

(iii) Cut the line segment $CB = 4.8$ cm, on the ray CX.

(iv) With B as centre and radius 6 cm, draw an arc.

(v) With D as centre and radius 4.8 cm, draw another arc to cut the previous arc at A.

(vi) Join BA and DA.

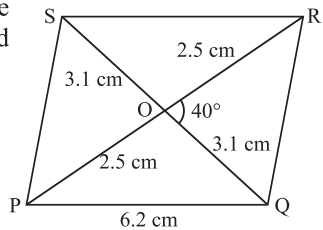
Thus, $ABCD$ is the rquired parallelogram.

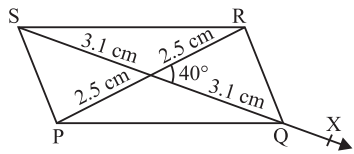
3. (a) Draw a rought sketch of the parallelogram $PQRS$ and indicate given dimensions on it.

Here,

$$OR = \frac{1}{2}(PR)$$

and, $$OQ = \frac{1}{2}(SQ)$$





Steps of Construction :

(i) Draw $OR = 2.5$ cm (half of PR)

(ii) At O, draw $\angle ROX = 40°$.

(iii) On OX cut off $OQ = 3.1$ cm (half of SQ).

(iv) Extend RO to P such that $OP = 2.5$ cm.

(v) Extend QO to S such that $OS = 3.1$ cm.

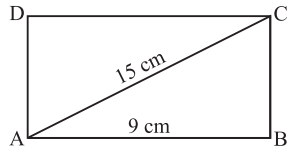
(vi) Join PQ, QR, RS and SQ.

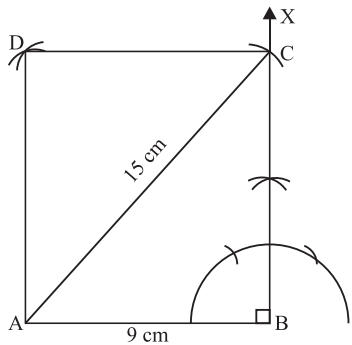
Thus, $PQRS$ is the required parallelogram.

Similarly,

3(b) and 3(c) $\rightarrow$ do your self.

4. (a) Draw a rought sketch of the rectangle $ABCD$ and indicate given dimensions on it.





Steps of Construction :

(i) Draw $AB = 9$ cm.

(ii) At B construct a perpendicular BX.

(iii) With A as centre and radius 15 cm, draw an arc to cut the perpendicular at C.

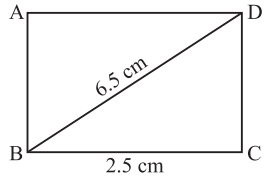
(iv) With A as centre and radius $= BC$, draw an arc.

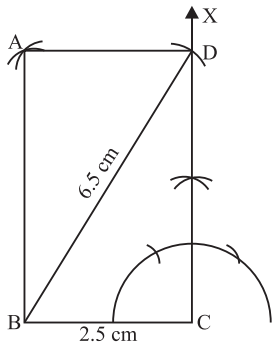
(v) With C as centre and radius $= AB$, draw an arc to cut the previous arc at D.

(vi) Join AD and CD.

Thus, $ABCD$ is the require rectangle.

4. (b) Draw the rought sketch of the rectangle $ABCD$ and indicate given dimensions on it.





Steps of Construction :

(i) Draw $BC = 2.5$ cm.

(ii) At C construct a perpendicular CX.

(iii) With B as centre and radius 6.5 cm, draw an arc to cut the perpendicular at D.

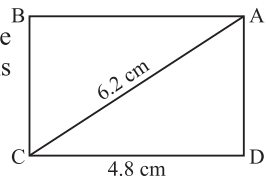
(iv) With C as centre and radius $= CD$, draw an arc.

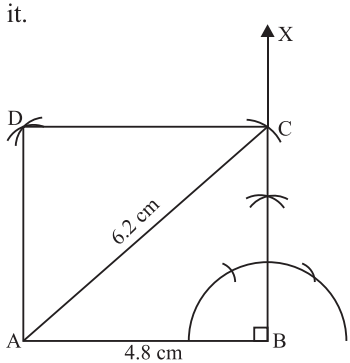
(v) With D as centre and radius $= BC$, draw an arc to cut the previous arc at A.

(vi) Join AB and AD.

Thus, $ABCD$ is the required rectangle.

4. (c) Draw the rough sketch of the rectangle $ABCD$ and indicate given dimensions on it.





Steps of Construction :

(i) Draw $CD = 4.8$ cm.

(ii) At D, construct $\angle CDX = 90°$.

(iii) With C as centre and radius 6.2 cm draw an arc to cut the ray DX at A.

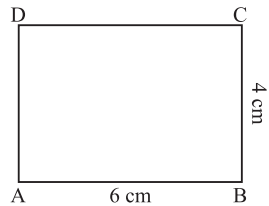
(iv) With A as centre and radius 4.8 cm draw an arc.

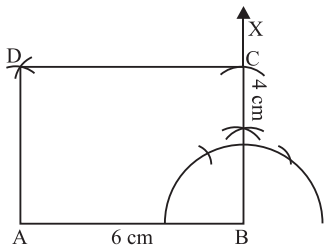
(v) With C as centre and radius = DA draw an other arc to intersect the previous arc at B.

(vi) Join AB, CB and CA.

Thus, $ABCD$ is the requried rectangle.

4. (d) draw the rought sketch of the rectangle $ABCD$ and indicate the given dimensions on it.





Steps of Construction :

(i) Draw $AB = 6$ cm.

(ii) At B, construct $\angle ABX = 90°$.

(iii) With B as centre and radius 4 cm, cut off $BC = 4$ cm on the ray BX.

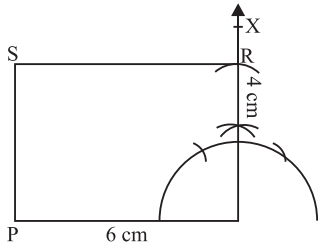
(iv) With A as centre and radius 4 cm, draw an arc.

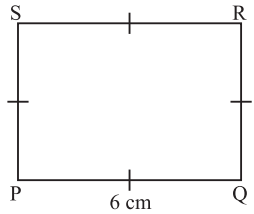
(v) With C as centre and radius 6 cm, draw another arc to intersect the previous arc at D.

(vi) Join CD and DA.

Thus, $ABCD$ is the required rectangle.

5. (a) Draw the rough sketch of the rectangle $ABCD$ adn indicate given dimensions on it.





Steps of Construction :

(i) Draw $PQ = 6$ cm.

(ii) At Q, construct $\angle PQX = 90°$.

(iii) With Q as centre and radius 6 cm cut off QR on the ray QX.

(iv) With R as centre and radius 56 cm, draw an arc.

(v) With P as centre and radius 6 cm, draw another arc to cut the previous arc at S.

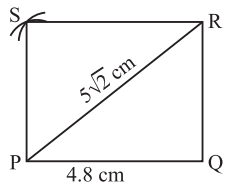
(vi) join RS and SP.

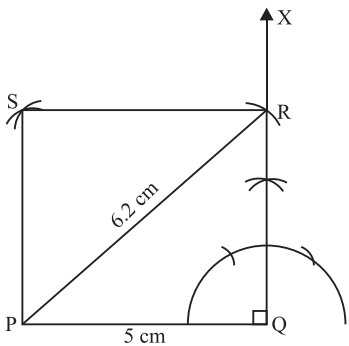
Thus, $PQRS$ is the required square.

5. (b) Draw a rought sketch of the square $PQRS$ and indicate the given dimensions on it.

We know that,

Length of a square diagonal is '$a\sqrt{2}$' units then length of square side is 'a'.





Steps of Construction :

(i) Draw $PQ = 5$ cm.

(ii) At Q, construct $\angle PQX = 90°$.

(iii) With Q as centre and radius 5 cm, cut off $QR = 5$ cm on the ray QX.

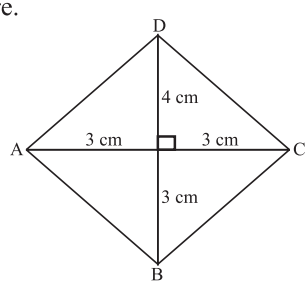
(iv) With R as centre and radius 5 cm, draw an arc.

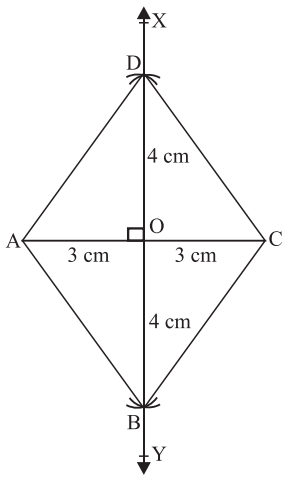
(v) With P as centre and radius 5 cm, draw another arc to cut the previous arct at S.

(vi) Join RS and SP.

Thus, $PQRS$ is the requried square.

6. (a) Draw a rough sketch of the rhombus $ABCD$ and indicate the given dimensions on it.





Steps of Construction :

(i) Draw $AC = 6$ cm.

(ii) Draw the perpendicular bisector XY or AC, this is intersect at O.

(iii) On OX cut off $OD = 4$ cm (half of BD)

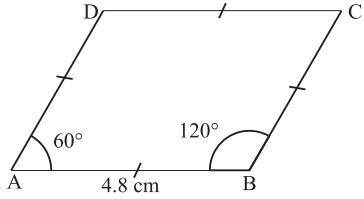
(iv) On OY cut off $OB = 4$ cm (half of BD)

(v) Join AB, BC, CD and DA.

Thus, $ABCD$ is the requried rhombus.

6. (b) Draw a rought sketch of the rhombus $ABCD$ and indicate the given dimensions on it.

Here,



adjacent angle of $120° = (180° - 120°)$

$= 60°$

$\therefore \quad \angle A = 60°$

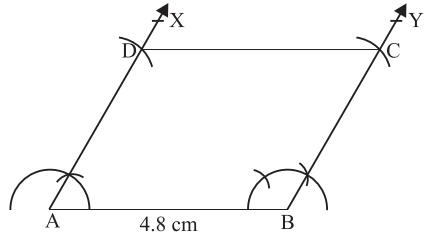
Steps of Construction :

(i) Draw $AB = 4.8$ cm.

(ii) At B, draw $\angle ABY = 120°$.

(iii) At A, draw $\angle BAX = 60°$.

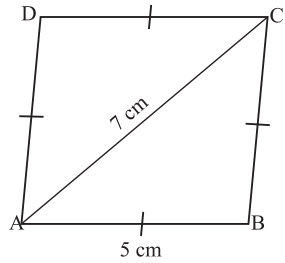
(iv) With B as centre and radius 4.8 cm, draw an arc cut off BC on the ray BY.

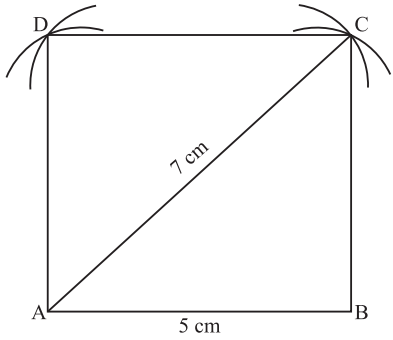


(v) With A as centre and radius 4.8 cm, draw an arc cut off AD on the ray AX.

(vi) Join DC.

6. (c) Draw a rough sketch of the rhombus $ABCD$ and indicate given dimensions on it.





Steps of Construction :

(i) Draw $AB = 5$ cm.

(ii) With B as centre and radius $BC = AB$ draw an arc.

(iii) With A as centre and radius 7 cm, draw another arc to cut the previous arc at C.

(iv) With C as centre and radius 5 cm draw an arc.

(v) With A as centre and radius 5 cm, draw another arc to cut the previous arc at D.

(vi) Join BC, CD, DA and AC.

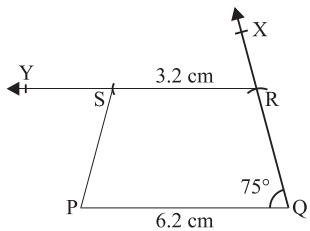
Thus, $ABCD$ is the requried rhombus.

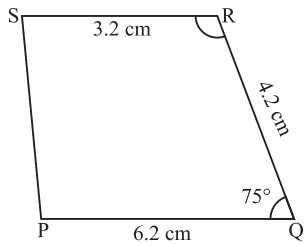
(d) Do yourself, this is same as (b) part.

7. Draw a rough sketch of the trapezium and indicate the given dimensions on it.

Here, $PQ \parallel SR$

$\therefore \quad \angle R = 180° - 75° = 105°$





Steps of Construction :

(i) Draw $PQ = 6.2$ cm. (ii) At Q, draw $\angle PQX = 75°$.

(iii) With Q as centre and radius 4.2 cm, cut off QR on the say QX.

(iv) At R, draw $\angle QRY = (180° - 75°) = 105°$.

(v) With R as centre and radius 3.2 cm, cut off RS on the ray RY.

(vi) Join SP.

Thus, $PQRS$ is the required trapezium.

Mental Ability

A. Multiple Choice Questions :

1. (c) **2.** (b) **3.** (a)

B. State True (T) or False (F) :

1. True **2.** True **3.** False **4.** True

Chapter

13 Visualising Solid Shpaes

Exercise 13.1

1. (a) Yes (b) Yes (c) No

2. (a) is a polyhedron.

3.

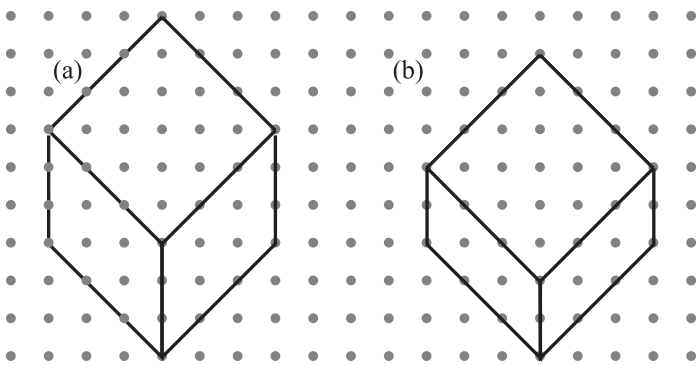
3.

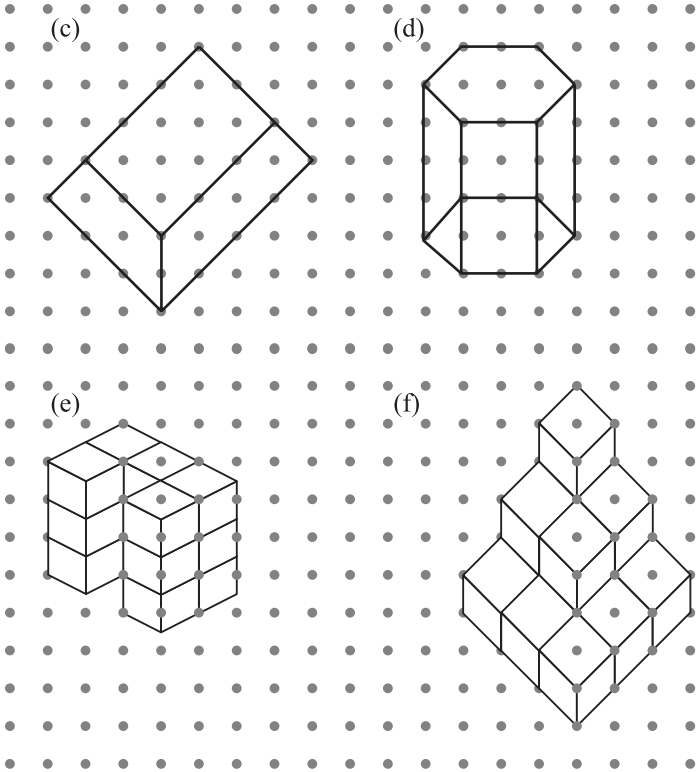
	Solid	V	V	E	$V + F - E$
(a)	Triangular	6	5	9	2
(b)	Hexagonal prism	12	8	18	2
(c)	Hexagonal pyramid	7	7	12	2
(d)	Pentagonal pyramid	6	6	10	2
(e)	Cube	8	6	12	2

4. (a) → (iv), (b) → (i), (c) → (ii), (d) → (iii)

Exercise 13.2

1.





2. We have

$V = 12, E = 30, F = ?$

We know that,

$$V + F - E = 2$$

$$\Rightarrow \quad 12 + F - 30 = 2$$

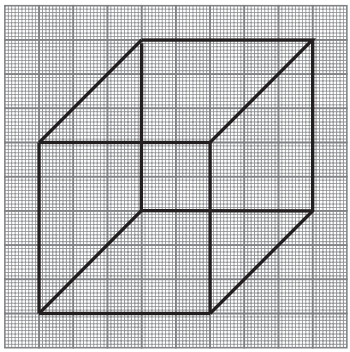
$$\Rightarrow \quad F = 2 + 30 - 12$$

$$= 32 - 12 = 20$$

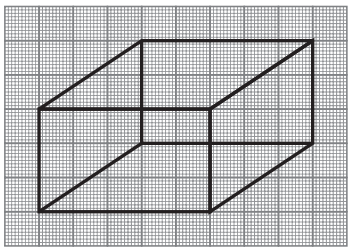
$$\Rightarrow \quad F = 20$$

Hence, the required number of faces are 20.

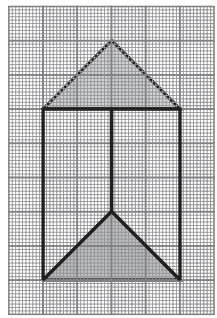
3. (a)



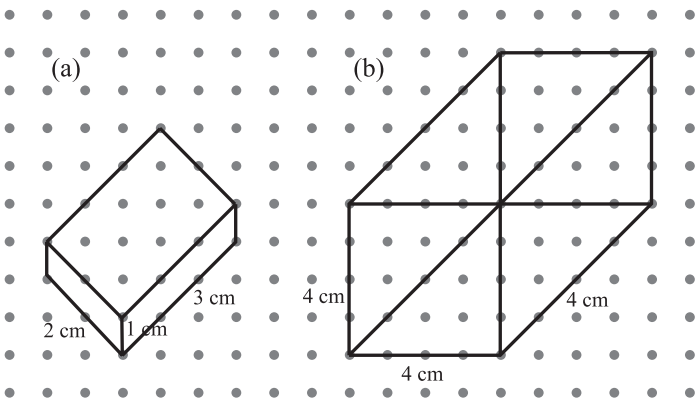
(b)



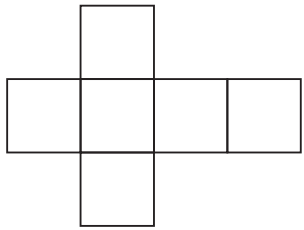
(c)



4.

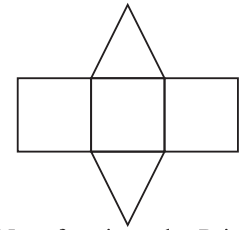


5. (a)



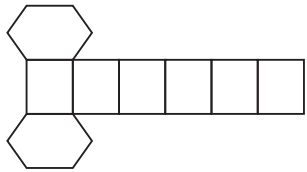
Net of a cube

(b)

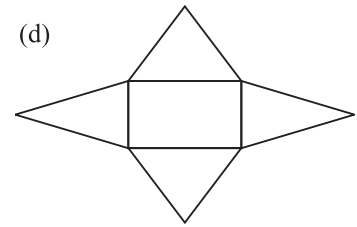


Net of a triangular Prism

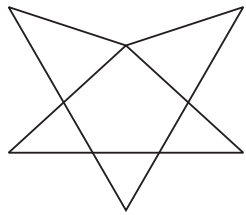
(c)



(d)



(e)



Mental Ability

A. Multiple Choice Question :

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

B. Fill in the blanks :

1. A solid bounded by plane surfaces is known as a **Polygon**.
2. In Euler's formula $F + V = \boldsymbol{E} + 2$.
3. The net of a cuboid has 6 **rectangular** faces.
4. The 2-D representation of 3-D solid is called **a net**.

C. State True (T) or False (F) :

1. False **2.** True **3.** True **4.** False

Higher Order Thinking Skills

1. (a) There are 54 squares in all.

(b) 48 squares are stamped.

(c) 6 squares are not stamped.

Chapter

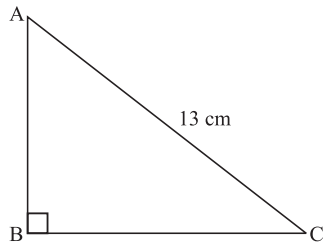
14 Area of 2-D Figures

Exercise 14.1

1. First we draw right-angled triangle.

Given, hypotenuse $AC = 13\,\text{cm}$ and $BC = 12\,\text{cm}$.

Now, By pythagoras property,



$$AC^2 = AB^2 + BC^2$$

$$\Rightarrow \quad 13^2 = AB^2 + 12^2$$

$$\Rightarrow \quad 13^2 - 12^2 = AB^2$$

$$\Rightarrow \quad 169 - 144 = AB^2$$

$$\Rightarrow \quad 25 = AB^2$$

$$\Rightarrow \quad AB = \sqrt{25} = 5\,\text{cm}.$$

$$\therefore \quad \text{Area of this triangle} = \frac{1}{2} \times AB \times BC$$

$$= \frac{1}{2} \times 5 \times 12^6\ \text{cm}^2$$

$$= 5 \times 6\,\text{cm}^2 = 30\,\text{cm}^2$$

Hence, the required area is $30\,\text{cm}^2$.

2. We have,

Length of one side of ||gm $= 125\,\text{cm}$

Distance between two sides $= 60\,\text{cm}$

$\therefore$ Area of parallelogram = Base × Corresponding altitude

$$= 125 \times 60\,\text{cm}^2 = 7500\,\text{cm}^2$$

Hence, the required area of parallelogram is $7500\,\text{cm}^2$.

3. Let the length of each side of the triangle be 'x' m.

We know that,

$$\text{Area of equilateral triangle} = \frac{\sqrt{3}}{4}(x)^2$$

$\Rightarrow \quad 64\sqrt{3} = \frac{\sqrt{3}}{4} \times (x)^2$

$\Rightarrow \quad 64 \times 4 = x^2 \quad \Rightarrow \quad 8^2 \times 2^2 = x^2$

$\Rightarrow \quad (8 \times 2)^2 = x^2 \quad \Rightarrow \quad (16)^2 = x^2$

By equating base,

$\Rightarrow \quad 16 = x \quad \Rightarrow \quad x = 16\,\text{m}$

Hence, the required length of each side is 16 m.

4. Let $ABCD$ be the given quadrilateral.

The Area of quadrilateral $ABCD$

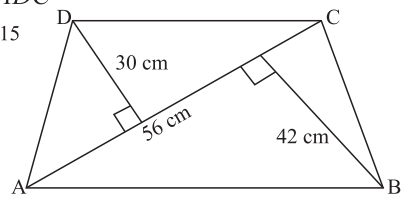
= Area of ΔABC + Area of ΔADC

$= \frac{1}{2} \times 56 \times 41^{21} + \frac{1}{2} \times 56 \times 30^{15}$

$= 56 \times 21 + 56 \times 15$

$= 1176 + 840$

$= 2016\,\text{cm}^2$



Hence, the required area is $2016\,\text{cm}^2$.

5. We know that,

$\text{Area of trapezium} = \frac{1}{2} \times h \times (a + b)$

$= \frac{1}{2} \times 5 \times (14 + 12)$

$= \frac{1}{2} \times 5 \times 26^{13}\ \text{cm}^2 = 65\,\text{cm}^2$

Hence, the required area of trapezium is $65\,\text{cm}^2$.

6. Let the lengths of parallel sides of trapezium be (x) and $(2x)$.

So, $\text{Area of trapezium} = \frac{1}{2} \times h \times (a + b)$

$\Rightarrow \quad 180\,\text{cm}^2 = \frac{1}{2} \times 12^6 \times (x + 2x)$

$\Rightarrow \quad 180\,\text{cm}^2 = 6 \times (3x)$

$\Rightarrow \quad 180 = 18x$

$\Rightarrow \quad x = \frac{180}{18}\,\text{cm} = 10\,\text{cm}$

Hence, the required lengths of parallel sides of trapezium are 10 cm and 20 cm.

7. Let one parallel side be 'x', m.

$\therefore$ The other parallel sides $= (x + 10)\,\text{m}$

Now, Area of trapezium $= \frac{1}{2} \times h \times (a + b)$

$\Rightarrow \quad 120 = \frac{1}{2} \times 12^{6} \times (x + x + 10)$

$\Rightarrow \quad 120 = 6 \times (2x + 10)$

$\Rightarrow \quad \frac{120^{20}}{6} = (2x + 10)$

$\Rightarrow \quad 20 = 2x + 10$

$\Rightarrow \quad 20 - 10 = 2x$

$\Rightarrow \quad 10 = 2x$

$\Rightarrow \quad x = 5\,\text{m}$

Hence, the required lengths of parallel sides of trapezium are 5 m and 15 m.

8. Let the distance between the parallel sides be 'h' cm.

Now, Area of trapezium $= \frac{1}{2} \times h \times (a + b)$

$\Rightarrow \quad 1080 = \frac{1}{2} \times h \times (55.6 + 34.4)$

$\Rightarrow \quad 1080 = \frac{1}{2} \times h \times (90.0)$

$\Rightarrow \quad h = \frac{\overset{12}{\cancel{1080}} \times 2}{\underset{1}{\cancel{90}}} = 12 \times 12\,\text{cm}.$

$\Rightarrow \quad h = 24\ \text{cm}$

Hence, the requried distance between parallel sides is 24 cm.

9. We have,

$a = 172.5$ cm, $b = 91.5$ cm, $h = 26\,\text{cm}$.

So, Area of trapezium $= \frac{1}{2} \times H \times (a + b)$

$= \frac{1}{2} \times 26^{13} \times (172.5 + 91.5)$

$= 13 \times (264.0)\,\text{cm}^2$

$= 13 \times 264\,\text{cm}^2 = 3432\,\text{cm}^2$

Hence, the required area of trapezium is $3432\,\text{cm}^2$.

10. (i) Area of shaded portion
= Area of square with side 14 cm
– Area of circle with radius 7 cm.

$= (14)^2 - \pi \times (7)^2 = 196 - \frac{22}{7} \times 7 \times 7$

$= 196 - 154 = 42\,\text{cm}^2$

(ii) Area of shaded portion $= 4 \times \frac{1}{4} \pi r^2$

$= 4 \times \frac{1}{4} \cdot \pi r^2 = 4 \times \frac{1}{4} \times \frac{22}{7} \times (7)$

$= \frac{22}{7} \times 7 \times 7\,\text{cm}^2 = 154\,\text{cm}^2$

11. (i) Area of shaded portion $= \frac{1}{2} \times \frac{1}{2} \times 4 \times 13.5 + 11 \times 13.5$

$= 13.5 + 148.5$

$= 162.0\,\text{cm}^2$

$= 162\,\text{cm}^2$

(ii) Area of shaded portion $= (40 - 10) \times 12\,\text{cm}^2$

$= 30 \times 12\,\text{cm}^2$

$= 360\,\text{cm}^2$

(iii) Area of shaded portion $= \frac{1}{2} \times 30 \times 7.5\,\text{cm}^2$

$= 15 \times 7.5\,\text{cm}^2$

$= 112.5\,\text{cm}^2$

Exercise 14.2

1. (a) The area of the polygon

$$= \text{Area of } \Delta ABC + \text{Area of } \Delta ADC$$

$$= \frac{1}{2} \times 12 \times 8 + \frac{1}{2} \times 12 \times 4 = 6 \times 8 + 6 \times 4$$

$$= 48 + 24 = 72\,\text{cm}^2$$

(b) The area of the polygon

$= \text{area of } \Delta AGE + \text{area of } \Delta ECF + \text{area of trapezium } BCFH + \text{area of } \Delta ABH$

$$= \frac{1}{2} \times 20^{10} \times 130 + \frac{1}{2} \times 60^{30} \times 50 + \frac{1}{2} \times 30^{15}\,(50 + 40) + \frac{1}{2} \times 40^{20} \times 40$$

$$= 10 \times 130 + 30 \times 50 + 15 \times 90 + 20 \times\ 40$$

$$= 1300 + 1500 + 1350 + 800 = 4950\,\text{m}^2$$

(c) The area of the polygon

$= \text{area of } \Delta AFE + \text{area of rectangle } ABDE + \text{area of } \Delta BCD$

$$= \frac{1}{2} \times 200 \times 120 + 180 \times 280 + \frac{1}{2} \times 200 \times 120$$

$$= 100 \times 120 + 180 \times 280 + 100 \times 120$$

$$= 12000 + 50400 + 12000 = 74400\,\text{m}^2$$

2. Here, $x = 8\,\text{cm}$, $R = 7\,\text{cm}$ and $n = 5$.

$$\text{Area of the pentagon} = \left(\frac{5}{2} \times x \times \sqrt{R^2 - \frac{x^2}{4}} \right) \text{sq. unit}$$

$$= \left(\frac{5}{2} \times 8 \times \sqrt{(7)^2 - \frac{8^2}{4}} \right) \text{cm}^2$$

$$= \left(20 \times \sqrt{\frac{49}{1} - \frac{64}{4}} \right) \text{cm}^2$$

$$= 20 \times \sqrt{\frac{196 - 64}{4}}\,\text{cm}^2$$

$$= 20 \times \sqrt{\frac{132}{4}}\ \text{cm}^2 = 20 \times \sqrt{33}\ \text{cm}^2$$

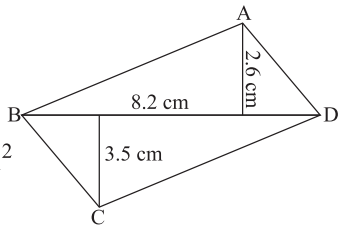
$$= 20 \times 5.74\ \text{cm}^2 = 114.8\ \text{cm}^2$$

3. We know that the area of a polygon of n side is given by :

$$A = \left(\frac{n}{2} \times x \times r\right) \text{sq. units}$$

$$= \frac{5}{2} \times 5 \times 3.5\ \text{cm}^2 = 43.75\ \text{cm}^2$$

4. We have a quadrilateral $ABCD$.



Now,

Area of quadrilateral $ABCD$

$= \text{Area of } \Delta BCD$

$$= \left(\frac{1}{2} \times 8.2 \times 2.6 + \frac{1}{2} \times 8.2 \times 3.5\right)\text{cm}^2$$

$$= (4.1 \times 2.6 + 4.1 \times 3.5)\ \text{cm}^2$$

$$= (10.66 + 14.35)\ \text{cm}^2$$

$$= 25.01\ \text{cm}^2$$

5. We have, $AC = 18\,\text{m}, d_1 = 11\,\text{m}, d_2 = 9\,\text{m}$

$$\therefore \text{Area of quadrilateral } ABCD = \frac{1}{2} \times AC \times (d_1 + d_2)$$

$$= \frac{1}{2} \times 18^{9} \times (11 + 9)$$

$$= 9 \times 20\ \text{m}^2 = 180\ \text{m}^2$$

6. (a) We know that,

$$\text{Area of a regular hexagon} = \left(\frac{3\sqrt{3}x^2}{2}\right) \text{sq. units}, (x = \text{side})$$

$$= \frac{3\sqrt{3} \times 8^2}{2} = \frac{3\sqrt{3} \times 64}{2}\ \text{cm}^2$$

$$= 3 \times \sqrt{3} \times 32$$

$$= 3 \times 1.732 \times 32\ \text{cm}^3$$

$$= 96 \times 1.732\ \text{cm}^2 = 166.272\ \text{cm}^2$$

(b) Area of a regular hexagon $= \dfrac{3\sqrt{3}\,x^2}{2}$ sq. unit

$= \dfrac{3\sqrt{3}}{2} \times 6^2 = \dfrac{3\sqrt{3} \times 36}{2}\,\text{cm}^2$

$= 3 \times 1.732\ 18\,\text{cm}^2$

$= 54 \times 1.732\,\text{cm}^2 = 93.528\,\text{cm}^2$

7. (a) We know that,

Area of a regular octagon $= 2x^2\,(1+\sqrt{2})$ sq. units (x = side)

$= 2 \times 4^2 \times (1+\sqrt{2})\,\text{cm}^2$

$= 32 \times (1+\sqrt{2})\,\text{cm}^2$

$= 32 \times (1 + 1.414)\,\text{cm}^2$

$= 32 \times 2.414\,\text{cm}^2 = 77.248\,\text{cm}^2$

(b) Area of a regular octagon $= 2x^2\,(1+\sqrt{2})$ sq. units

$= 2 \times 5^2 \times (1+1.414)\,\text{cm}^2$

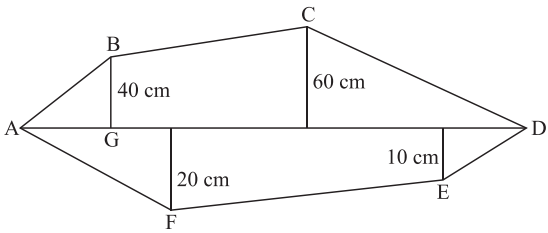
$= 50 \times 2.414\,\text{cm}^2$

$= 120.700\,\text{cm}^2$

$= 120.7\,\text{cm}^2$

8. We have,

$FP = 10$ cm, $FQ = 20$ cm, $FR = 50$ cm, $FS = 60$ cm and $FC = 100$



Now,

Area of polygon $ABCDEF$

= Area of ΔFPE + area of trapezium $PRDE$

+ area of trapezium $ABSQ$ + Area of ΔAQF

$$= \left(\frac{1}{2} \times 10 \times 40 + \frac{1}{2} \times 40 \times (40 + 60)\right) + \frac{1}{2} \times 60 \times 50$$
$$+ \frac{1}{2} \times 10 \times 40 + \frac{1}{2} \times 40 \times (20 + 10)$$
$$\left(\frac{1}{2} \times 20 \times 20\right) \text{cm}^2$$
$$= (5 \times 40 + 20 \times 100 + 30 \times 50 + 5 \times 40 +$$
$$20 \times 30 + 10 \times 20) \text{cm}^2$$
$$= (200 + 2000 + 1500 + 200 + 600 + 200)\,\text{cm}^2$$
$$= (4500 + 200)\,\text{cm}^2$$
$$= 4700\,\text{cm}^2$$

Hence, the required area of polygon $ABCDEF$ is $4700\,\text{cm}^2$

Mental Ability

A. Multiple Choice Questions :

1. (d) **2.** (a) **3.** (b) **4.** (b)

B. Fill in the blanks :

1. Area is a **2** dimensional concept.
2. $1\text{dm}^2 = \frac{\mathbf{1}}{\mathbf{100}}\,\text{m}^2$.
3. Area of a rhombus $= \frac{1}{2} \times d_1 \times d_2$.
4. A hectare is equal to **10,000** m^2.

C. State True (T) or False (F) :

1. False **2.** True **3.** False **4.** True **5.** False

Higher Order Thinking Skills

1. Here,

Part (C), has the least path.

Chapter

15 Surface Area and Volume

Exercise 15.1

1. Let the side of a cube 'x'.

We have,

Total surface area of cube $= 3750\ \text{m}^2$

$\Rightarrow \quad 6(x)^2 = 3750\ \text{m}^2$

$\Rightarrow \quad x^2 = \dfrac{3750}{6}\ \text{m}^2 = 625\ \text{m}^2$

$\Rightarrow \quad x = \sqrt{625\ \text{m}^2} = 25\ \text{m}$

Hence, the required side of a cube is 25 m.

2. Surface area of cuboidal box

$$= 2(lb + bh + hl)\ \text{sq. units}$$
$$= 2(70 \times 50 + 50 \times 60 + 60 \times 70)\ \text{cm}^2$$
$$= 2(3500 + 3000 + 4200)\ \text{cm}^2$$
$$= 2 \times (10700)\ \text{cm}^2 = 21400\ \text{cm}^2$$

Now, Surface area of cubical box $= 6(a)^2$

$$= 6 \times 60 \times 60\ \text{cm}^2$$
$$= 6 \times 3600\ \text{cm}^2$$
$$= 21600\ \text{cm}^2$$

So, Cubical box requires more material to make it.

3. We have, $l = 18\ \text{cm}, b = 8\ \text{cm}$ and $h = 1.8\ \text{cm}$

So, the surface area of geometric box

$$= 2(lb + bh + hl)\ \text{sq. units}$$
$$= 2 \times (18 \times 8 + 8 \times 1.8 + 1.8 \times 18)\ \text{cm}^2$$
$$= 2 \times (190.8)\ \text{cm}^2 = 381.6\ \text{cm}^2$$

Hence, the required surface area of geometric box is $381.6\ \text{cm}^2$.

4. We have, $l = 10\,\text{cm}, b = 8\,\text{cm}, h = 6\,\text{cm}$

So, Required surface area of cardboard

$= 2(lb + bh + hl)$ sq. units

$= 2(10 \times 8 \times 6 + 6 \times 10)\,\text{cm}^2$

$= 2(80 + 48 + 60)\,\text{cm}^2$

$= 2 \times 188\,\text{cm}^2 = 376\,\text{cm}^2$

Hence, the required area of cardboard to make a tea-box is $376\,\text{cm}^2$.

5. (a) Surface area of cube with edge

$6\text{ cm} = 6(a)^2$ sq. units

$= 6(6)^2\ \text{cm}^2$

$= 6 \times 36\,\text{cm}^2 = 216\,\text{cm}^2$

(b) Surface area of cube with edge 3.4 cm.

$= 6(3.4)^2\ \text{cm}^2$

$= 6 \times 11.56\,\text{cm}^2$

$= 69.36\,\text{cm}^2$

(c) Surface area of cube with edge 1.2 m.

$= 6(1.2)^2\ \text{cm}^2$

$= 6 \times 1.44\,\text{cm}^2$

$= 8.64\,\text{cm}^2$

(d) Surface area of cube with edge 23 cm.

$= 6(23)^2\ \text{cm}^2$

$= 3174\,\text{cm}^2$

6. We have, $l = 45\,\text{cm}, b = 30\,\text{cm}, h = 30\,\text{cm}$

So, Surface area of one tin box

$= 2(lb + bh + hl)$ sq. units

$= 2(45 + 30 + 30 \times 30 + 30 \times 45)\,\text{cm}^2$

$= 2 \times (1350 + 900 + 1350)\,\text{cm}^2$

$= 2 \times 3600\,\text{cm}^2 = 7200\,\text{cm}^2$

$\therefore$ Area of such 25 tin boxes $= 25 \times 7200\,\text{cm}^2 = 180000\,\text{cm}^2$

Hence, the rquired area of tin sheets is $180000\,\text{cm}^2$.

7. We have, $l = 22\,\text{m}, b = 16\,\text{m}, h = 10\,\text{m}$

So, the area of floor and four walls of water reservoir

$$= l \times b + 2h(l + b)$$
$$= 22 \times 16 + 2 \times 10(22 + 16)\,\text{cm}$$
$$= (352 + 20 \times 38)\,\text{m}^2$$
$$= (352 + 760)\,\text{m}^2 = 1112\,\text{m}^2$$

Now, the cost of cementing of floor and flour water

$$= ₹\ 1112 \times 19$$
$$= ₹\ 21{,}128$$

Hence, the required cost of cementing is ₹ 21,128

8. Let the length of an edge be 'x' cm.

We have,

Surface area of cubical box $= 486\,\text{cm}^2$

$$\Rightarrow \quad 6(x)^2 = 486\,\text{cm}^2$$

$$\Rightarrow \quad x^2 = \frac{486}{6}\,\text{cm}^2 = 81\,\text{cm}^2$$

$$\Rightarrow \quad x = \sqrt{81\,\text{cm}^2} = 9\,\text{cm}$$

Hence, the required length of an edge of box is 9 cm.

9. Let the dimensions of a cuboid be $(5x), (3x)$ and $(1x)$.

So, $l = 5x, b = 3x, h = 1x$

Now, total surface area of cuboid $= 414\,\text{m}^2$

$$\Rightarrow \quad 2(lb + bh + hl) = 414\,\text{m}^2$$

$$\Rightarrow \quad 2(5x \times 3x + 3x + 1x + 1x \times 5x) = 414\,\text{m}^2$$

$$\Rightarrow \quad 2(15x^2 + 3x^2 + 5x^2) = 414\,\text{m}^2$$

$$\Rightarrow \quad 2 \times 23x^2 = 414\,\text{m}^2$$

$$\Rightarrow \quad x^2 = \frac{414}{2 \times 23}\,\text{m}^2 = \frac{414}{46}\,\text{m}^2$$

$\Rightarrow \quad x^2 = 9\,\text{m}^2$

$\Rightarrow \quad x = \sqrt{9\,\text{m}^2} = 3\,\text{m}$

Hence, the required dimensions of cuboid are : 15 m, 9 m and 3 m.

10. We have,

Perimeter of the floor of a drawing room = 66 m.

$\Rightarrow \quad 2(l + b) = 66\,\text{m}$

and, height of the room $(h) = 5.2$ m.

So, the area of the four walls of the room

$$= 2h\,(l + b)$$
$$= h \times 2(l + b)$$
$$= 5.2 \times 66\,\text{m}^2$$
$$= 343.2\,\text{m}^2$$

Hence, the requried area of four walls of the room is $343.2\,\text{m}^2$.

11. We have, lateral surface area $= 135\,\text{m}^2$ of cuboid

$\Rightarrow \quad 2h\,(l + b) = 135\,\text{m}^2$

$\Rightarrow \quad 2hl + 2hb = 135\,\text{m}^2 \qquad \ldots(1)$

and, Total surface area of cuboid $= 149\,\text{m}^2$

$\Rightarrow \quad 2(lb + bh + hl) = 149\,\text{m}^2$

$\Rightarrow \quad 2lb + 2bh + hl = 149\,\text{m}^2$

$\Rightarrow \quad 2lb + 2h\,(l + b) = 149\,\text{m}^2 \qquad \ldots(2)$

Now, From equation (1) & (2), we get

$$2lb + 135 = 149\,\text{m}^2$$

$\Rightarrow \quad 2lb = (149 - 135)\,\text{m}^2$

$\Rightarrow \quad 2lb = 14\,\text{m}^2$

$\Rightarrow \quad lb = \frac{14}{2}\,\text{m}^2$

$$= 7\,\text{m}^2$$

Hence, the required area of base is $7\,\text{m}^2$.

12. We have, $l = 3.8$ m, $b = 4.5$ m and $h = 3.5$ m

Now,

Area of four walls of room $= 2h(l + b)$ sq. units

$$= 2 \times 3.5 \times (3.8 + 4.5)\ \text{m}^2$$

$$= 7.0 \times (8.3)\ \text{m}^2 = 58.1\ \text{m}^2$$

So,

The cost of panelling the four walls of a room

$$= ₹\ 58.1 \times 285$$

$$= ₹\ 16558.5$$

Hence, the required cost of panelling is ₹ 16558.5.

Exercise 15.2

1. We have,

Base radius of cylinder $= 3.5$ cm

height of cylinder $= 6$ cm

Now,

The lateral surface area of a right circular cylinder

$$= 2\pi rh \text{ sq. units}$$

$$= 2 \times \frac{22}{7} \times 3.5^{\cdot 5} \times 6\,\text{cm}^2$$

$$= 2 \times .5 \times 22 \times 6\,\text{cm}^2$$

$$= 1.0 \times 132\ \text{cm}^2 = 132\ \text{cm}^2$$

Hence, the required lateral surface area of cylinder is $132\ \text{cm}^2$.

2. We have,

The circumference of the base of cylinder $= 154$ cm $= 1.54$ m

$\Rightarrow$ $2\pi r = 1.54$ m

and, height of cylinder $= 1.5$ m

Now, $h = 1.5$ m

Lateral surface area of cylinder $= 2\pi rh$ sq. units

$$= 1.54\ \text{m} \times 1.5\ \text{m}$$

$$= 2.31\ \text{m}^2$$

Hence, the required lateral surface area of cylinder is $2.31\ \text{m}^2$.

3. We have,

Area of the base of cylinder $= 140\,\text{cm}^2$

$\Rightarrow \quad \pi r^2 = 140\,\text{cm}^2$

and, height of cylinder $= 17\,\text{cm}$

$\Rightarrow \quad h = 17\,\text{cm}$

Now,

The volume of the cylinder $= \pi r^2 h$

$= 140 \times 17\,\text{cm}^3 = 2380\,\text{cm}^3$

Hence, the requied volume of cylinder is $2380\,\text{cm}^3$.

4. Given, $r = 9\,\text{m}$ and $h = 21\,\text{m}$.

Now, inner surface area of tunnel $= 2\pi rh$

$= 2 \times \frac{22}{7} \times 9 \times 21^3\ \text{m}^2$

$= 132 \times 9\,\text{m}^2 = 1188\,\text{m}^2$

So, The cost of painting the inner surface of the tunnel

$= ₹\ 1188 \times 8 = ₹\ 9504$

Hence, the required cost of painting is ₹ 9504.

5. We have, $h = 30\,\text{cm}$, radius $(r) = 2.8$ cm

Now,

The capacity of talcum powder tin $= \pi r^2 h$ cu units

$= \frac{22}{7} \times 2.8^{\cdot 4} \times 2.8 \times 30\,\text{cm}^3$

$= 22 \times 2.8 \times 12.0\,\text{cm}^3$

$= 739.2\,\text{cm}^3$

Hence, the requried amount of powder is $739.2\,\text{cm}^3$.

6. We have,

Height of cylinderical tin (h) $= 80\,\text{cm}$

$= 0.80$ m

Base radius (r) $= 63$ cm

$= 0.63$ m

Now,

Total surface area of cylinderical tin

$$= 2\pi r(h + r) \text{ sq. units}$$

$$= 2 \times \frac{22}{7} \times 0.63^{0.9} \times (0.80 + 0.63)\ \text{m}^2$$

$$= 44 \times 0.09 \times 1.43\ \text{m}^2 = 5.6628\ \text{m}^2$$

So, The cost of tin to make the cylindrical biscuit box

$$= ₹\ 5.6628 \times 5 = ₹\ 28.31$$

7. We have,

Radius of roller $(r) = \frac{77}{2}$ cm

leng;th of roller $(h) = 105$ cm.

So, The area covered in one revolution

$$= 2\pi rh \text{ sq. units}$$

$$= 2 \times \frac{22}{7} \times \frac{77^{11}}{2} \times 105\,\text{cm}^2$$

$$= 22 \times 11 \times 105\,\text{cm}^2$$

$$= 242 \times 105\,\text{cm}^2 = 25410\,\text{cm}$$

$\therefore$ The required area of polyground cover by roller in 600 revolutions

$$= 25410 \times 600\,\text{cm}^2 = \frac{25410 \times 600}{100 \times 100}\ \text{m}^2$$

$$= 254.1 \times 6\ \text{m}^2 = 1524.6\ \text{m}^2$$

Hence, the rquired area of playground is $1524.6\ \text{m}^2$.

8. We have, $r = 10$ cm and height $= 10.5$ cm

Now,

Lateral surface area of cylinder $= 2\pi rh$ sq. units.

$$= 2 \times \frac{22}{7_1} \times 10 \times 10.5^{1.5}\ \text{cm}^2$$

$$= 44 \times 15.0\,\text{cm}^2 = 660\,\text{cm}^2$$

Hence, the required lateral surface area of cylinder is $660\ \text{cm}^2$.

9. We have,

The inner radius of circular well $= \frac{3.5}{2}$ m and depth of the well

$= 15$ m.

So, The inner curved surface area of well

$= 2\pi rh$ sq. units

$= 2 \times \frac{22}{7} \times \frac{3.5^{.5}}{2} \times 15\,\text{m}^2$

$= 11.0 \times 15\,\text{m}^2 = 165\ \text{m}^2$

Now, The cot of plastering of well $= ₹\ 165 \times 25 = ₹\ 4125$

Hence, the cost of plastering of well is ₹ 4125.

10. We have,

Radius of road roller $(r) = \frac{98}{2}$ cm $= 49$ cm

length of road roller $(h) = 1.25$ m

Now, Area of coverd by roller in one revolution

$= 2\pi rh$ sq. units

$= 2 \times \frac{22}{7} \times 0.49 \times 1.25\ \text{m}^2$

$= 44 \times 0.07 \times 1.25\ \text{m}^2 = 3.85\ \ \text{m}^2$

So, The required area of road cover by roller in 900 revolutions

$= 900 \times 3.85\ \text{m}^2 = 3465\,\text{m}^2$

Hence, the required area of road is 3465 m^2.

11. We have,

Radius of cylinderical pillar $(r) = \frac{3.5}{2}$ m

Required length of the pillar to be painted

$= 7.5\ \text{m} - 0.5\ \text{m}$

$= 7.0$ $(\because 50\ \text{cm} = .5\ \text{m})$

So, the reuried area of the painted the pillar

$= 2\pi rh$ sq. units

$$= 2 \times \frac{22}{7} \times \frac{3.5}{2} \times 7\ \text{m}^2$$

$$= 22 \times 3.5\ \text{m}^2 = 77\ \text{m}^2$$

Hence, the required area of pillar for paint is $77\ \text{m}^2$.

Exercise 15.3

1. (b) 240 (b) 12 cm (c) 9 cm (d) 6.4 cm

2. (a) Side of the cube (a) $= 7.5$ cm

$\therefore$ Volume of the cube $= a^3 = (7.5)^3\ \text{cm}^3$

$= 421.875\ \text{cm}^3 = 421.88\ \text{cm}^3$

Hence, the volume of the cube is $421.88\ \text{cm}^3$.

(b) Side of the cube $(a) = 3.8$ cm

$\therefore$ Volume of the cube $= a^3$

$= (3.8)^3\ \text{cm}^3 = 54.87\ \text{cm}^3$

Hence, the volume of the cube is $54.87\ \text{cm}^3$.

(c) Side of the cube $(a) = 43$ mm

$\therefore$ Volume of the cube $= a^3$

$= (43)^3\ \text{mm}^3 = 79507\ \text{mm}^3$

Hence, the volume of the cube is $79507\ \text{mm}^3$.

3. Let the edge of cube be 'x'.

We have,

The volume of cube $= 729\ \text{cm}^3$

$\Rightarrow \quad (x)^3 = 729\ \text{cm}^3$

$\Rightarrow \quad x^3 = (9)^3\ \text{cm}^3$

$\Rightarrow \quad x = 9\ \text{cm}$

Hence, the edge of cube is 9 cm.

4. We have, $l = 3.8$ m, $b = 2.3$ m, $h = 2$m

Now,

Volume of the stack of wood $= l \times b \times h$ cu. units

$= 3.8\ \text{m} \times 2.3\ \text{m} \times 2\text{m}$

$= 3.8 \times 2.3 \times 2\ \text{m}^3 = 17.48\ \text{m}^3$

Hence, the requried volume of stack of wood is $17.48\ \text{m}^3$.

5. Let the required height of water level in tank be 'x'.

Here, $l = 260\,\text{m}$, $b = 140\ \text{m}$, $h = x$

Volume of water $= 54600\ \text{m}^3$

$$260 \times 140 \times x = 54600\ \text{m}^3$$

$$\Rightarrow \quad x = \frac{54600\ \text{m}^3}{260\ \text{m} \times 140\ \text{m}} = \frac{546^{21}}{26_1 \times 14}\ \text{m}$$

$$\Rightarrow \quad x = \frac{21^3}{14_2}\ \text{m} = \frac{3}{2}\ \text{m} = 1.5\ \text{m}$$

Hence, the required height of water level in tank is 1.5 m.

6. let the requried height of wooden block be 'x' cm.

Here, $l = 36\,\text{cm}$, $b = 8\,\text{cm}$, $h = x\,\text{cm}$

Now, Volume of wooden block $= 1440\,\text{cm}^3$

$$\Rightarrow \quad 36\,\text{cm} \times 8\,\text{cm} \times x = 1440\,\text{cm}^3$$

$$\Rightarrow \quad x = \frac{^{120}1440\,\text{cm}^3}{36\,\text{cm} \times 8\,\text{cm}}$$

$$= \frac{\cancel{120}^{40}\ \text{cm}}{\cancel{3}_1 \times 8}$$

$$= \frac{\cancel{40}^5}{\cancel{8}_1}\ \text{cm} = 5\,\text{cm}$$

$$\Rightarrow \quad x = 5\,\text{cm}.$$

Hence, the required height of wooden block is 5 cm.

7. We have, for cardboard carton,

$l = 60\,\text{cm}$, $b = 30\,\text{cm}$, $h = 30\,\text{cm}$.

So, The volume of cardobard carton $= l \times b \times h$ cu units

$= 60 \times 30 \times 30\,\text{cm}^3$

$= 54000\,\text{cm}^3$

For, cube edge $= 5\,\text{cm}$

So, Volume of cube $= (\text{edge})^3$ cu units

$= (5)^3\ \text{cm}^3 = 125\,\text{cm}^3$

Now, Required number of cubes $= \dfrac{54000\,\text{cm}^3}{125\,\text{cm}^3} = 432$ cubes

Hence, the required number of cubes are 432.

8. Given that,

The volume of a block of gold $= 0.8\ \text{m}^3$

and, 1 hectare $= 10000\ \text{m}^2$

Now, The thickness of the sheet $= \dfrac{\text{Volume}}{\text{area}} = \left(\dfrac{0.8}{10000}\right)\text{m}$

$= \dfrac{0.80 \times 100 \times 10}{10000}\ \text{mm} = 0.08\ \text{mm}$

Hence, the required thickness of sheet is 0.08 mm.

9. We know that,

$$3\ \text{km/h} = \frac{3^1 \times 1000}{1 \times 60_2}\ \text{m/min.} = \frac{100}{2}\ \text{m/min} = 50\ \text{m/min}$$

Here $l = 50\ \text{m}, b = 45\ \text{m}, h = 2\ \text{m}$.

Now,

The required quantity of water that runs into the see per minute

$= l \times b \times h$ cu units

$= 50\,\text{m} \times 45\,\text{m} \times 2\,\text{m}$

$= 100 \times 45\ \text{m}^3$

$= 4500\ \text{m}^3$

Hence, the required quantity of water is $4500\ \text{m}^3$.

10. We have,

Volume of tea-box $= 1200 \times 9 \times 4\,\text{cm}^3$

$= 10800 \times 4\,\text{cm}^3$

$= 43200\,\text{cm}^3$

Volume of cardboard box

$$= (0.6 \times 100) \times (0.45 \times 100) \times (0.8 \times 100)\,\text{cm}^3$$
$$= 60 \times 45 \times 80\,\text{cm}^3$$
$$= 4800 \times 45\,\text{cm}^3 = 216000\,\text{cm}^3$$

Now, Required number of tea-boxes $= \dfrac{216000\,\text{cm}^3}{43200\,\text{cm}^3}$

$$= \frac{2160}{432} = 5$$

Hence, the reuqired number of boxes are 5.

11. We have, $l = 60\,\text{cm}$, $b = 48\,\text{cm}$, $h = 36\,\text{cm}$

$\therefore$ The volume of metal block $= l \times b \times h$ cu units.

$$= 60 \times 48 \times 36\,\text{cm}^3 = 103680\,\text{cm}^3$$

($\because$ Weight of 1 cm^3 metal $= 9$ grams)

So, The total weight of metal block $= 103680 \times 9$ grams

$$= 103680 \times 9\,\text{grams}$$
$$= 933120 = \frac{933120}{1000}\,\text{kg}$$
$$= 933.120\,\text{kg} = 933.12\,\text{kg}$$

Hence, the requried weight of metal block is 933.12 kg.

12. We have,

External dimensions of box.

$l = 36\,\text{cm}$, $b = 25\,\text{cm}$, $h = 16.5$

Now, Internal dimensions of open box,

$$l' = 36 - (1.5 + 1.5) = 36 - 3 = 33\ \text{cm.}$$
$$b' = 25 - (1.5 + 1.5) = 25 - 3 = 22\,\text{cm}$$
$$h' = 16.5 - 1.5 = 15.0 = 15\ \text{cm.}$$

So, Volume of metal (iron)

$$= \text{External volume of box} - \text{Internal Volume of box}$$
$$= (36 \times 25 \times 16.5)\,\text{cm}^3 - (33 \times 22 \times 1.5)\,\text{cm}^3$$
$$= 3960\,\text{cm}^3 \qquad (\because 1\ \text{cm}^3 = 8.5\ \text{gram})$$

$\therefore$ Weight of empty box $= 3960 \times 8.5$ grams $= 33660$ grams

$$= \frac{33660}{1000} \text{ kg} = 33.66 \text{ kg}$$

Hence, The volume of iron $= 3960 \text{ cm}^3$

and, weight of empty box $= 33.66$ kg

Exercise 15.4

1. We have,

Base radius of cylinder $(r) = 4.2$ cm, and height $(h) = 12$ cm.

Now, Volume of right circular cylinder

$$= \pi r^2 h \text{ cu units} = \frac{22}{7} \times 4.2^{\cdot 6} \times 4.2 \times 12 \text{ cm}^3$$

$$= 4.4 \times 11.2 \text{ m}^3 = 49.28 \text{ m}^3$$

Hence, the required volume of cylinder is 49.28 m^3.

3. We have,

Circumference of the base of the cylinder $= 44$ m

$\Rightarrow \quad 2\pi r = 44$ m

$$\Rightarrow \quad r = \frac{44}{2 \times \pi} \text{ m} = \frac{44^2 \times 7}{2 \times 22} \text{ m} = \frac{2 \times 7}{2} \text{ m} = 7 \text{ m}$$

Height of cylinder $(h) = 10$ m.

Now, The volume of the cylinder $= \pi r^2 h$

$$= \frac{22}{7} \times 7 \times 7 \times 10 \text{ m}^3$$

$$= 154 \times 10 \text{ m}^3 = 1540 \text{ m}^3$$

Hence, the required volume of cylinder is 1540 m^3.

4. We have,

Radius of the circular well $(r) = 3$ m

and depth of the well $(h) = 24.5$ m

Now,

The volumeo f the earth dug out from the circular well

$$= \pi r^2 h \text{ cu units}$$

$$= \frac{22}{7} \times 3 \times 3 \times 25.5^{3.5} \text{ m}^3 = 22 \times 9 \times 3.5 \text{ m}^3$$

$$= 22 \times 9 \times 3.5 \text{ m}^3 = 693 \text{ m}^3$$

Hence, the required volume of the earth dug out from the well is 693 m^3.

5. We have,

The area of the base of a cylindrical water tank $= 9.63 \text{ m}^2$

$\Rightarrow \quad \pi r^2 = 9.63 \text{ m}^2$

and height $(h) = 4$ m

So, The volume of water tank $= \pi r^2 - h$ cu units

$$= 9.63 \times \text{m}^3 = 38.52 \text{ m}^3$$

$$= 38.52 \text{ kl.} \qquad (\because 1 \text{ m}^3 = 1 \text{ kl})$$

Hence, the capacity of water tank is 38.52 kl.

6. We have,

height (h) of cylinder $= 10$ cm

and, $2\pi r = 22$ cm

$\Rightarrow \quad r = \frac{22}{2\pi} \text{ cm} = \frac{22 \times 7}{2 \times 22} \text{ cm} = 3.5 \text{ cm}$

Now, The required volume of cylinder

$$= \pi r^2 h \text{ cu units} = \frac{22}{7} \times 3.5^{0.5} \times 3.5 \times 10 \text{cm}^3$$

$$= 11.0 \times 35.0 \text{ cm}^3 = 385 \text{ cm}^3$$

Hence, the required volume of the cylinder is 385 cm^3.

7. Here,

Volume of metal cube with edge (14) cm $= (14)^3 \text{ cm}^3 = 2744 \text{ cm}^3$

Let the length of wire be 'h' cm radius of cylindrical wire (r)

$$= \frac{0.84}{2} \text{ cm} = 0.42 \text{ cm}$$

According to question,

Volume of metal cube = Volume of cylindrical wire

$$2744\ \text{cm}^3 = \pi r^2 h \text{ cu units}$$

$$\Rightarrow \quad 2744\ \text{cm}^3 = \frac{22}{7} \times 0.42^{0.06} \times 0.42 \times h\ \text{m}^3$$

$$\Rightarrow \quad h = \frac{2744\ \text{cm}^3}{22 \times 0.06 \times 0.42\ \text{cm}^2}$$

$$\Rightarrow \quad h = \frac{2744}{0.5544}\ \text{cm} = \frac{2744 \times 10000}{5544}\ \text{cm}$$

$$= 4949.49\ \text{cm} = 4949.5\ \text{cm}$$

Hence, the requried length of wiere is 4949.5 cm.

8. We have,

Length of metal pipe $(h) = 63$ cm

Inner radius $(r) = \frac{6}{2}$ cm

Outer radius $(R) = \frac{7}{2}$ cm

$1\text{cm}^3 = 7.5$ g

Now,

Volume of metal of pipe $=$ External Volume $-$ Internal volume

$$= \pi r^2 h - \pi r^2 h$$

$$= \pi h (R^2 - r^2) \text{ cu units}$$

$$= \frac{22}{7} \times 63^9 \left[\left(\frac{7}{2}\right)^2 - \left(\frac{6}{2}\right)^2 \right] \text{cm}^3$$

$$= 22 \times 9 (3.5^2 - 3^2)\text{cm}^3$$

$$= 22 \times 9 \times (3.5 + 3)(3.5 - 3)\text{cm}^3$$

$$= 22 \times 9 \times 6.5 \times 0.5\ \text{cm}^3 = 643.5\ \text{cm}^3$$

So, The weight of the metal pipe $= 643.5 \times 7.5$ g $= 4826.25$ grams

Mental Ability

A. Multiple Choice Questions :

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

B. Fill in the blanks :

1. Surface area of cube $6a^2$.
2. The sum of the areas of all six faces of a cuboid is the **Total surface area** of the cuboid.
3. The volume of a cuboid of dimensions is $30abc$.
4. The space occupied by a solid body is called its **Volume**.
5. Diagonal of a cuboid is $\sqrt{l^2 + b^2 + h^2}$ sq. units.

C. State True (T) or False (F) :

1. False **2.** False **3.** True **4.** False **5.** True **6.** True **7.** True

Higher Order Thinking Skills

1. We have,

$$V = abc \qquad \ldots(1)$$

and, $$S = 2(ab + bc + ca) \qquad \ldots(2)$$

Now,

$$\text{RHS} = \frac{2}{5}\left(\frac{1}{a} + \frac{1}{b} + \frac{1}{c}\right) = \frac{2}{5}\left(\frac{bc + ac + ab}{abc}\right)$$

$$= \frac{2 \times (ab + bc + ca)}{5\,abc} = \frac{5}{5(abc)} = \frac{1}{abc} = \frac{1}{V}$$

$$= \text{LHS}$$

$\therefore$ LHS = RHS Hence proved.

2. Let the required height of water in the tank be 'h'.

According to question,

Volume of roof water = Volume of tank water.

$$\Rightarrow \quad (18 \times 16.5 \times 0.10)\ \text{m}^3 = \frac{22}{7} \times 4 \times 4 \times h$$

$$\Rightarrow \quad h = \frac{18 \times 16.5 \times 0.10 \times 7}{22 \times 4 \times 4}\ \text{m} = \frac{207.9}{352}\ \text{m}$$

$$= \frac{20790}{352}\ \text{cm} = 59.06\ \text{cm}$$

Hence, the rise water level in tank is 59.06 cm.

Chapter

16 Introduction to Graphs

Exercise 16.1

1. (a) ordinate = 6

(b) ordinate = −4

(c) ordinate = −3

(d) ordinate = −4

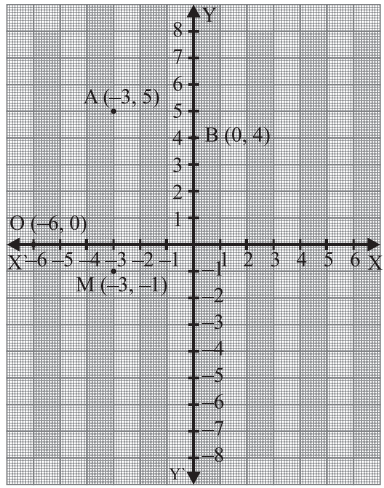
2. (a) II quadrante

(b) IV quadrant

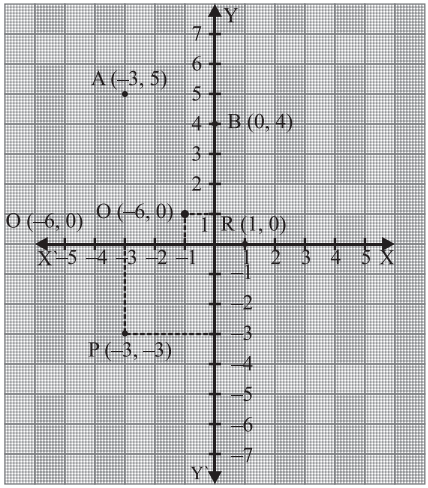
(c) III quadrant

(d) I quadrant

3.



4.



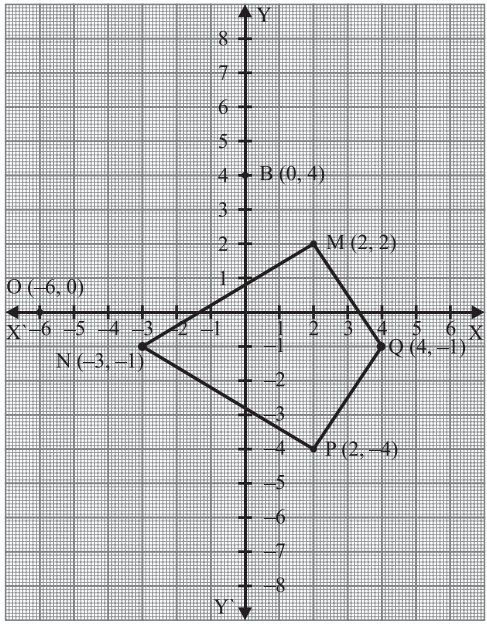
5. (a) $(x, y) = (-2, 0)$ (b) $(x, y) = (4, -6)$

6. (b) $(4, 0)$ lies on x-axis.

7. Co-ordinate of mid point $= \left(\frac{-5+3}{2}, \frac{4+2}{2}\right)$

$= \left(\frac{-2}{2}, \frac{6}{2}\right) = (1, 3)$

8.



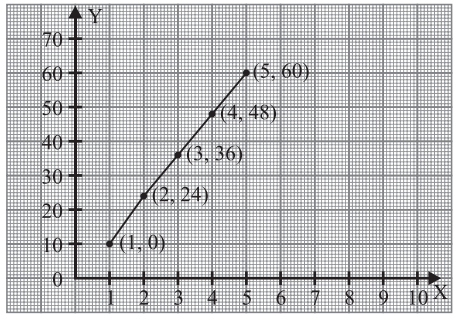
From the figure, we get quadrilateral shape by joining the points *MNPQ*.

9. (a) $A\,(2, 2)$
$B\,(1, -3)$
$C\,(-3, -2)$
$D\,(-3, 1)$

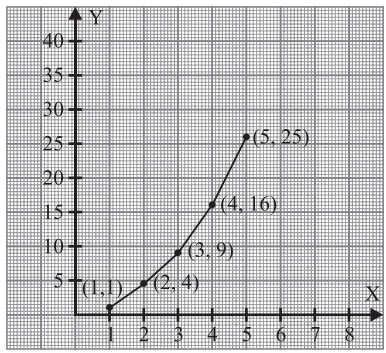
(b) $A\,(0, 1)$
$B\,(1, 2)$
$C\,(3, 1)$
$D\,(4, 4)$
$E\,(2, 0)$

Exercise 16.2

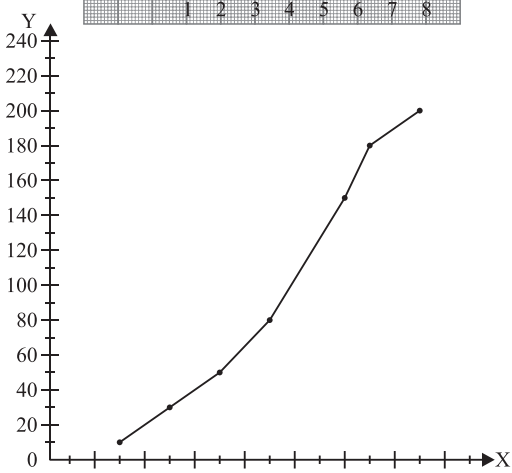
1. (a)



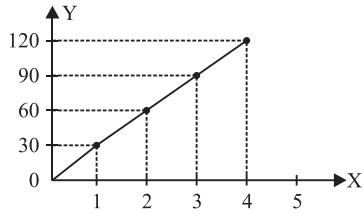
(b)



2.

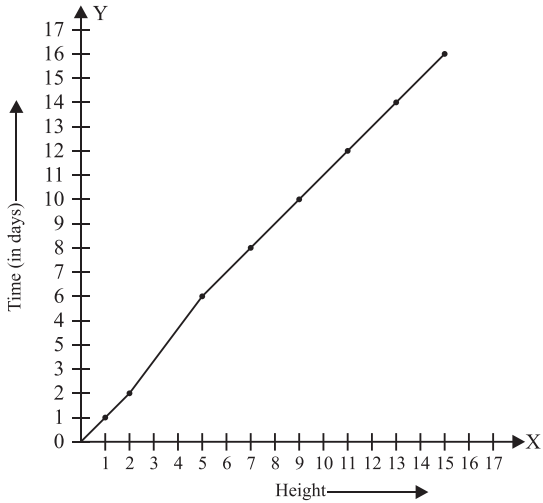


3.



Required time taken by Lalita is hours.

4.



5. (a) 101°F (b) 12 am (c) between 10 am to 11 am

6. (a) June (b) August (c) 500 water purifier

7. (a) pm (b) between 3 pm and 5 pm (c) 360 km

Mental Ability

A. Multiple Choie Questions :

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

B. Fill in the balnks :

1. x-coordinate is called **abscissa**.
2. The point of intersection of X-axis sand Y-axis is called **origin (0, 0)** and is denoted as **6**.
3. The distance of K $(6, 0)$ is **6** units from Y-axis.

4. A carterian plane is divided into **4** quadrant.
5. The point $(6, -3)$ lies in **IV** quadrant.

C. State True (T) or False (F) :

1. False **2.** True **3.** False **4.** True **5.** True

Higher Order Thinking Skills

1. Obtained closed figure is squalre *ABCD*.

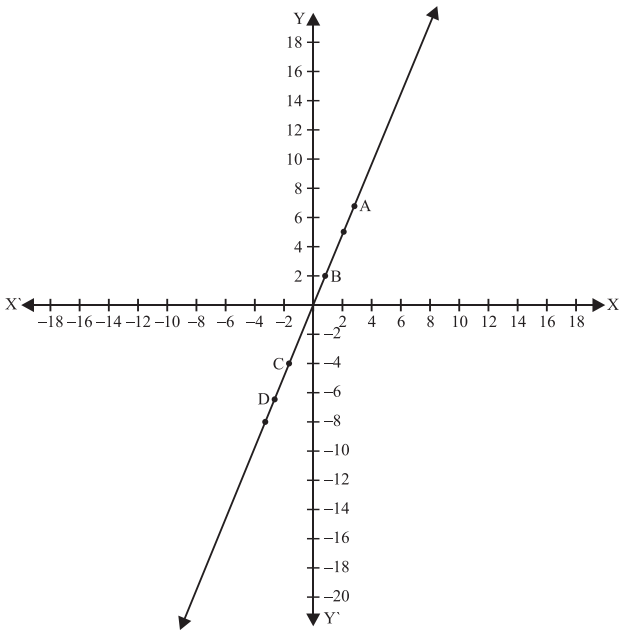
2. Let,

$y = 2\pi x$ {where, $y \to$ Circumference, $x \to$ Radius

$\Rightarrow \quad y = 2 \times 3.14\, x$

$\Rightarrow \quad y = 6.28\, x$

x	1	0	-1.03	-1.27
y	6.28	0	-6.46	-7.76
Points	*A*	*B*	*C*	*D*



Chapter

17 Data Handling

Exercise 17.1

1.

Marks	Tally	Frequency
0–5	|	1
5–10	𝍸 |||	8
10–15	𝍸 |||	8
15–20	𝍸 ||	7
20–25	𝍸 |	6

2.

Class interval	Tally marks	Frequency
40–50	𝍸 ||	7
50–60	𝍸 ||	7
60–70	||||	4
70–80	||||	4
80–90	||	2
90–100	|	1

3.

Class interval	Tally marks	Frequency
100–200	||||	4
200–300	|	1
300–400	|||	3
400–500	|||	4
500–600	|	1
600–700	||	2
700–800	𝍸	5
800–900	𝍸	5
900–1000	𝍸	5

4. (a) 50 (b) 5 (c) 60 (d) 47.5 and 57.5 (e) 5

5. (a)

Class-interval	Tally marks	Frequency
1000–1200	𝍸 ||	7
1200–1400	|||	3
1400–1600	𝍸 ||	7
1600–1800	||	2
1800–2000	||||	4
2000–2200	|||	3
2200–2400	||	2
2400–2600	||	2

(b) 13 (c) 11 (d) (1000 – 1200) and (1400 – 1600)

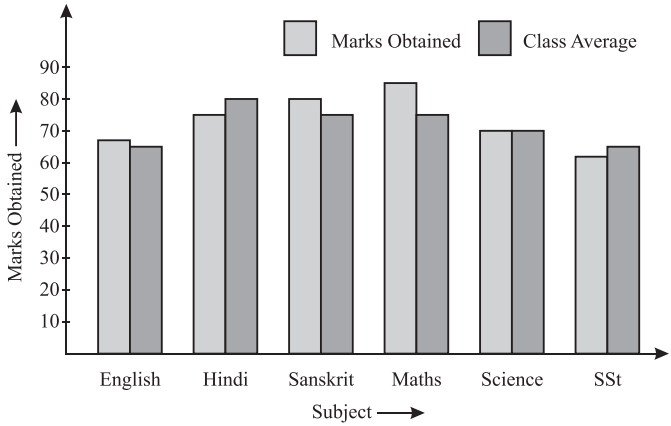
Exercise 17.2

1. (a) The bar graph given information about the number of fans sold by a shop on each day of a certain week.
(b) Sunday
(c) Wednesday
(d) Monday and Thursday
(e) 540

2. (a) Science
(b) 20
(c) marks obtained by Kabir
(d) 6 : 5

3. (a) The bar graph shows the result percentage of a certain school in 5 different years.
(b) 2013
(c) 2014
(d) 84%

4.

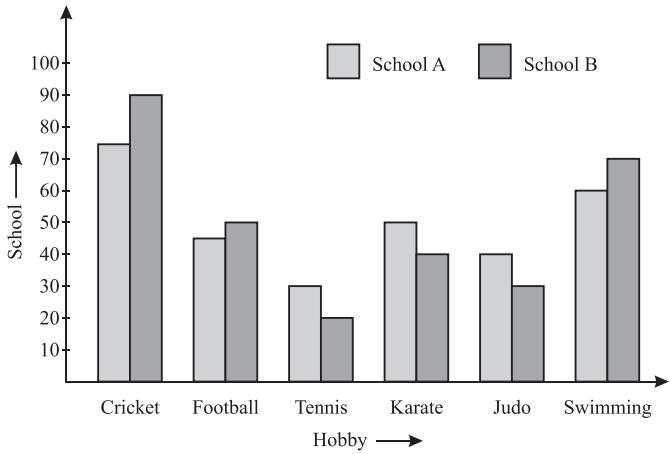


(a) English, Sanskrit and Maths

(b) Hindi and Social Science

(c) Science

5.



(a) School B (b) School A (c) School B

(d) School A ⟶ 20% School B ⟶ 23.33%

6. (a) Sale of the car in the year 2018

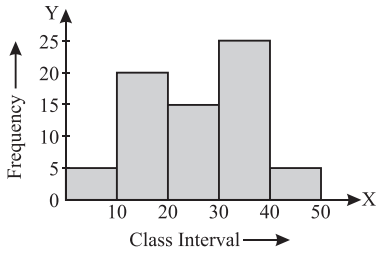
(b) April (c) July

(d) January, June, September and December

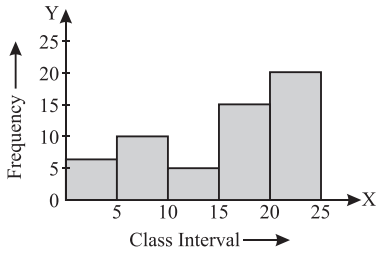
(e) 35 + 10 + 15 = 60

Exercise 17.3

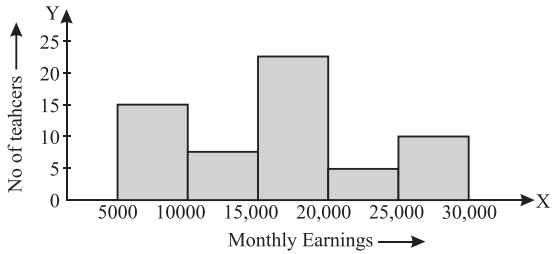
1. (a)



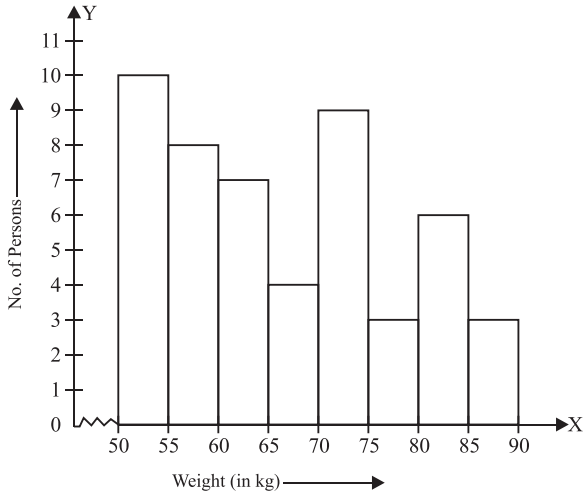
(b)



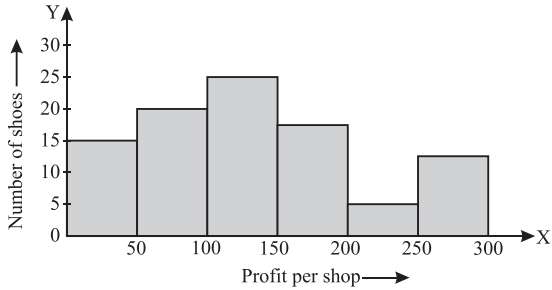
2.



3.



4.

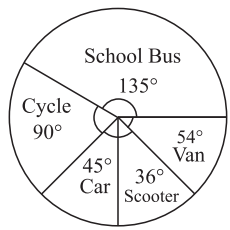


5. (a) 3200
(b) 15–20
(c) 10–15

Exercise 17.4

1.

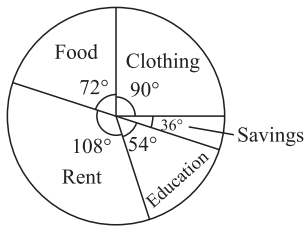
Modes of transport	No. of students	Central angle
Van	60	$\left(\frac{60}{400} \times 360\right)^\circ = 54^\circ$
Scooter	40	$\left(\frac{40}{400} \times 360\right)^\circ = 36^\circ$
School Bus	150	$\left(\frac{150}{400} \times 360\right)^\circ = 135^\circ$
Car	50	$\left(\frac{50}{400} \times 360^\circ\right) = 45^\circ$
Cycle	100	$\left(\frac{100}{400} \times 360\right)^\circ = 90^\circ$



2.

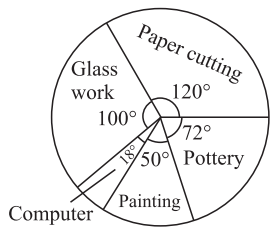
Items	Expenditure (in percent)	Central angle
Clothing	25%	$\left(\frac{25}{100} \times 360\right)^\circ = 90^\circ$
Food	20%	$\left(\frac{20}{100} \times 360\right)^\circ = 72^\circ$
Rent	30%	$\left(\frac{30}{100} \times 360\right)^\circ = 108^\circ$

Education	15%	$\left(\frac{15}{100} \times 360^\circ\right) = 54^\circ$
Savings	10%	$\left(\frac{10}{100} \times 360\right)^\circ = 36^\circ$



3.

Hobbies	Number of Students	Central angle
Computer	27	$\left(\frac{27}{540} \times 360\right)^\circ = 18^\circ$
Painting	75	$\left(\frac{75}{540} \times 360^\circ\right)^\circ = 50^\circ$
Pottery	108	$\left(\frac{108}{540} \times 360^\circ\right)^\circ = 72^\circ$
Paper cutting	180	$\left(\frac{180}{540} \times 360\right)^\circ = 120^\circ$
Glass work	150	$\left(\frac{150}{540} \times 360\right)^\circ = 100^\circ$



4. (a) Medical (sector) $= 23\%$ of $25,560$

$$= \frac{23}{100} \times 20560 = 4729 \text{ Females}$$

HR (sector) $= 27\%$ of 20560

$$= \frac{27}{100} \times 20560 = 5551 \text{ females}$$

IT-(Sector) $= 36\%$ of 20560

$$= \frac{36}{100} \times 20560 = 7401 \text{ Females}$$

Engineering (sector) $= 11\%$ of 20560

$$= \frac{10}{100} \times 20560 = 2262 \text{ females}$$

Other (sector) $= 3\%$ of 20560

$$= \frac{3}{100} \times 20560 = 617 \text{ females}$$

(b) IT-sector (c) Other sector

5. (a) Bihar

(b) Required number of people $= \frac{110^\circ}{360^\circ} \times 1{,}08{,}000 = 33{,}000$

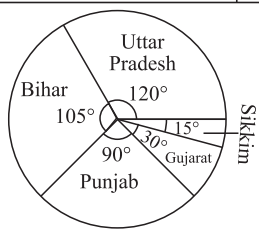
(c) Required number of people $= \frac{80^\circ}{360^\circ} \times 108{,}000 = 24{,}000$

(d) Punjab,

Required number of people $= \frac{50^\circ}{360^\circ} \times 108{,}000 = 15{,}000$

States	Number of People	Central angle
Uttar Pradesh	8000	$\left(\frac{8000}{24000} \times 360\right)^\circ = 120^\circ$
Bihar	7000	$\left(\frac{7000}{24000} \times 360\right)^\circ = 105^\circ$
Punjab	6000	$\left(\frac{6000}{24000} \times 360\right)^\circ = 90^\circ$

Gujarat	2000	$\left(\frac{2000}{24000} \times 360\right)^\circ = 30^\circ$
Sikkim	1000	$\left(\frac{1000}{24000} \times 360\right)^\circ = 15^\circ$



7. (a) Marks obtained in Maths $= \frac{90^\circ}{360^\circ} \times 540 = 135$

Marks obtained in English $= \frac{65^\circ}{360^\circ} \times 540 = 97.5$

Marks obtained in hindi $= \frac{80^\circ}{360^\circ} \times 54^\circ = 120$

Marks obtained in Science $= \frac{70^\circ}{360^\circ} \times 540 = 105$

Marks obtained in SST $= \frac{550^\circ}{360^\circ} \times 540^\circ = 82.5$

(b) Rajni got the highest marks in Maths.

8.

Name of Game	Number of Studnents	Central angle
Cricket	1000	$\left(\frac{1000}{2500} \times 360\right)^\circ = 144$
Football	6500	$\left(\frac{650}{2500} \times 360\right)^\circ = 93.6^\circ$
Tennis	450	$\left(\frac{450}{2500} \times 360\right)^\circ = 64.8$

Basketball	150	$\left(\frac{150}{2500}\times 360\right)^\circ = 21.6^\circ$
Not like any game	250	$\left(\frac{250}{2500}\times 360\right)^\circ = 36^\circ$

Exercise 17.5

1. We know that,

Probability $P(E) = \frac{\text{Favourable Outcomes}}{\text{Possible Outcomes}}$

$\therefore$ Probability of getting a vowel $= \left(\frac{2}{7}\right)$

{$\because$ Possible outcome $= 2$, total outcomes $= 7$

Hence, the required probability is $\frac{2}{7}$.

2. We have,

Possible outcomes $= 4$

Total outcomes $= 9$

$\therefore$ Probability of choosing a prime number,

$$P(E) = \frac{n(E)}{n} = \left(\frac{4}{9}\right)$$

Hence, the requried probability is $\frac{4}{9}$.

3. (a) HH, HT, TH, TH

(b) HHH, HHT, HTH, THH, HTT, THT, TTH, TTT

(c) HHH, HHHT, HHTH, HHTT, HTHH, HTHT, HTTH, HTTT, THHH, THHT, THTH, ?THTT, TTHH, THHT, TTTH, TTTT

4. We have,

Total possible outcomes = {l, 2, 3, 4, 5, 6}

(a) Favourable outcomes $= 3$

Total outcomes $= 6$

$\therefore$ $$P(E) = \frac{3^1}{6_2} = \frac{1}{2}$$

(b) Favourable outcomes = 3

Total outcomes = 6

$$\therefore \quad P(E) = \frac{3^1}{6_2} = \frac{1}{2}$$

(c) Favourable outcomes = 2

Total outcomes = 6

$$\therefore \quad P(E) = \frac{2}{6} = \frac{1}{3}$$

(d) Favourable outcomes= 4

Total outcomes = 6

$$\therefore \quad P(E) = \frac{4}{6} = \frac{2}{3}$$

5. (a) We have,

Favourable outcomes = 4

Total outcomes = 10

$$\therefore \quad P(E) = \frac{n(E)}{n} = \frac{4}{10} = \frac{2}{5}$$

(b) Favourable outcomes = 5

Total outcomes = 10

$$\therefore \quad P(E) = \frac{n(E)}{n} = \frac{5}{10} = \frac{1}{2}$$

(c) Favourable outcomes = 3

Total outcomes = 10

$$\therefore \quad P(E) = \frac{n(E)}{n} = \frac{3}{10}$$

6. (a) We have,

Favourable outcomes = 26

Total outcomes = 52

$$\therefore \quad P(E) = \frac{n(E)}{n} = \frac{26}{52} = \frac{1}{2}$$

(b) Favourable outcomes = 26

Total outcomes = 52

$\therefore \quad P(E) = \frac{n(E)}{n} = \frac{26}{52} = \frac{1}{2}$

(c) Favourable outcomes $= 13$

Total outcomes $= 52$

$\therefore \quad P(E) = \frac{n(E)}{n} = \frac{13}{52} = \frac{1}{4}$

(d) Favourable outcomes $= 9 + 9 = 18$

Total outcomes $= 52$

$\therefore \quad P(E) = \frac{n(E)}{n} = \frac{18}{52} = \frac{9}{26}$

(e) Favourable outcomes $= 12$

Total outcomes $= 52$

$\therefore \quad P(E) = \frac{n(E)}{n} = \frac{12}{52} = \frac{3}{13}$

(f) Favourable outcomes $= 1$

Total outcomes $= 52$

$\therefore \quad P(E) = \frac{n(E)}{n} = \frac{1}{52}$

(g) Favourable outcomes $= 16$

Total outcomes $= 52$

$\therefore \quad P(E) = \frac{n(E)}{n} = \frac{16}{52} = \frac{4}{13}$

7. We have,

Total number of bolts $= 900$

Number of defective bolts $= 25$

$\therefore$ Number of non-defective bolts $= 900 - 25 = 875$

So, Probability of non-defective bolt,

$$P(E) = \frac{n(E)}{n}$$

$$= \frac{875}{900} = \frac{35}{36}$$

Hence, the requried probability is $\frac{35}{36}$.

8. (a) We have,

Favourable outcomes $= 4$

Total outcomes $= 18$

$\therefore \quad P(E) = \dfrac{n(E)}{n} = \dfrac{4}{18} = \dfrac{2}{9}$

(b) Favourable outcomes $= 15$

Total outcomes $= 18$

$\therefore \quad P(E) = \dfrac{n(E)}{n} = \dfrac{15}{18} = \dfrac{5}{6}$

(c) Favourable outcomes $= 5 + \ = 11$

Total outcomes $= 18$

$\therefore \quad P(E) = \dfrac{n(E)}{n} = \dfrac{11}{18}$

(d) Favourable outcomes $= 6$

Total outcomes $= 18$

$\therefore \quad P(E) = \dfrac{n(E)}{n} = \dfrac{6}{18} = \dfrac{1}{3}$

Mental Ability

A. Multiple Choice Questions :

1. (d) **2.** (b) **3.** (d) **4.** (b) **5.** (d) **6.** (a) **7.** (c) **8.** (a) **9.** (a) **10.** (a) $\rightarrow$ (i), (b) $\rightarrow$ (ii), (c) $\rightarrow$ (iv), (d) $\rightarrow$ (iii), (e) $\rightarrow$ (ii)

B. Fill in the banks :

1. The mid-value of each class interval is called its **class mark**.

2. for any events, $P(A) + P(\overline{A}) = \mathbf{1}$.

3. The difference between the two limits of any class is called the **class size**.

4. If you rolled a dice then, P (not a 6) $= \dfrac{\mathbf{5}}{\mathbf{6}}$.

5. The probability of drawing a black card form a pack of 52 cards is $\dfrac{\mathbf{1}}{\mathbf{4}}$.

C. State True (T) or False (F) :

1. False **2.** False **3.** True **4.** True **5.** True

Higher Order Thinking Skills

1. Let required number of students who opted commerce stream be 'x'.

We have,

Central angle of the sector representing commerce $= 9°$

Total strength of students $= 3300$

According to question,

$$\frac{x}{3300} \times 360 = 960°$$

$$\Rightarrow \quad x = \frac{96°}{360°} \times 3300$$

$$\Rightarrow \quad x = 880$$

Hence, the required number of students in commerce stream are 880.

2. We have,

Number of black marbles $= 6$

Number of blue marks $= 17$

Number of yellow marbles $= 11$

Number of green marbles $= 20$

$\therefore$ Total number of marbles $= 54$

Here,

Favourable outcomes $= 6 + 17 + 11 = 34$

Total outcomes $= 54$

So, The required probability

$$P(E) = \frac{n(E)}{n} = \frac{34}{54} = \frac{17}{27}$$

Hence, the required probability is $\frac{17}{27}$.