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PRACTICE

MATHEMATICS 8

Answer Key

DNA education
New Delhi-110002

Chapter
01 Rational Numbers

WORKSHEET 1: INTRODUCTION TO RATIONAL NUMBERS AND ITS PROPERTIES

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

2. (a) natural
   (b) addition and multiplication
   (c) subtraction and division
   (d) ab + ac
   (e) a

3. (a) $-\frac{4}{3}\times\frac{3}{5}-\frac{3}{5}\times\frac{2}{3}+\frac{4}{7}$
   (by commutative property)
   $= \frac{3}{5}\left(-\frac{4}{3}-\frac{2}{3}\right)+\frac{4}{7}$
   $= \frac{3}{5}\left(-\frac{6}{3}\right)+\frac{4}{7}$
   $= -\frac{6}{5}+\frac{4}{7}=\frac{-42+20}{35}=\frac{-22}{35}$

   (b) $\frac{2}{7}\times\left(-\frac{3}{5}\right)+\frac{1}{21}\times\frac{2}{7}-\frac{1}{7}\times\frac{5}{3}$
   (By commutative property)
   $= \frac{2}{7}\times\left(-\frac{3}{5}+\frac{1}{21}\right)-\frac{5}{21}$
   (By associative property)
   $= \frac{2}{7}\left(-\frac{63+5}{105}\right)-\frac{5}{21}=\frac{2}{7}\left(\frac{-58}{105}\right)-\frac{5}{21}$
   $= \frac{-116}{735}-\frac{5}{21}=\frac{-116-175}{735}=\frac{-291}{735}$

4. (a) $\frac{8}{9}$
   (b) $\frac{3}{10}$
   (c) $\frac{-19}{4}$
   (d) $\frac{-4}{16}$

5. (a) $\frac{-5}{9}\times\frac{-2}{7}=\frac{10}{63}$
   Multiplicative inverse is $\frac{63}{10}$
   (b) $\frac{30}{-23}$
   (c) $-1\times\frac{-8}{11}=\frac{8}{11}$
   Multiplicative inverse is $\frac{11}{8}$

6. (a) $\frac{-25}{27}\times\frac{-3}{9}=\frac{-3}{9}\times\frac{-25}{27}$
   (commutative law)
   (b) $\frac{-71}{75}\times\frac{75}{-71}=1$
   (existence of multiplicative inverse)

7. $\frac{7}{15}\times\frac{30}{-8}$
   $= \frac{7\times2}{-8}=\frac{-7}{4}$

8. Associative property
   $\text{LHS}=\frac{9}{11}\times\left(11\times\frac{5}{7}\right)=\frac{9}{11}\times\frac{55}{7}=\frac{9\times5}{7}=\frac{45}{7}$
   $\text{RHS}=\left(\frac{9}{11}\times11\right)\times\frac{5}{7}=9\times\frac{5}{7}=\frac{45}{7}$

$\therefore$ LHS = RHS

9. $\because \quad \frac{15}{7} \times 2\frac{1}{7} = \frac{15}{7} \times \frac{15}{7} = \frac{225}{49} \neq 1$

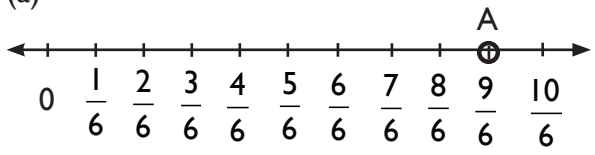
$\therefore \quad \frac{15}{7}$ is not the multiplicative inverse of $2\frac{1}{7}$.

WORKSHEET 2: REPRESENTATION OF RATIONAL NUMBERS ON THE NUMBER LINE

1. (a) (iv)
   (b) (iii)
   (c) (ii)
   (d) (i)
2. (a) denominator
   (b) numerator
   (c) left
   (d) right
3. (a) $P = \frac{2}{4}, Q = \frac{5}{4}, R = \frac{6}{4}, S = \frac{9}{4}, T = \frac{10}{4}, U = \frac{13}{4}$

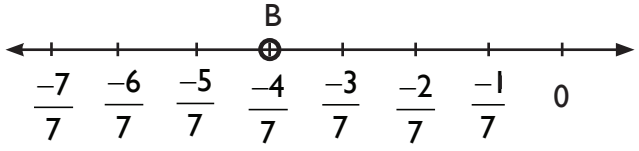
   (b) $L = \frac{-10}{7}, M = \frac{-7}{7}, N = \frac{-6}{7}, O = \frac{-3}{7}, P = \frac{-2}{7}$

4. (a)



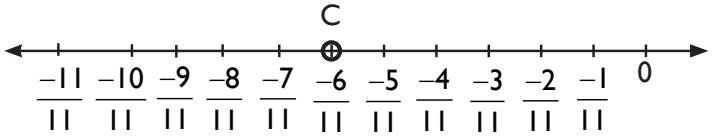
Point A represents 9/6

(b)



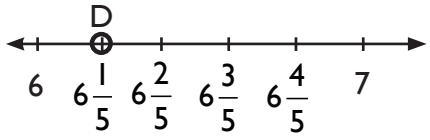
Point B represents $\frac{-4}{7}$

(c)



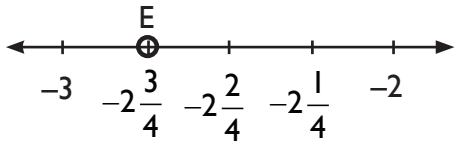
Point C represents $\frac{-6}{11}$

(d) $6\frac{1}{5} = \frac{31}{5} = 6.2$



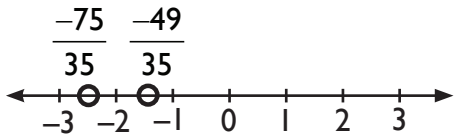
Point D represents $6\frac{1}{5}$

(e) $-2\frac{3}{4} = \frac{-11}{4} = -2.7$



Point E represents –2.7

5. $\frac{-7}{5}$ and $\frac{-15}{7}$



$\frac{-7}{5}$ is greater.

6. Two rational numbers less than $\frac{-7}{9}$ are $\frac{-8}{7}, -1$

WORKSHEET 3: RATIONAL NUMBERS BETWEEN TWO RATIONAL NUMBERS

1. (a) (ii)
   (b) (iii)
   (c) F (ii) T (iii) F
   (d) (ii)
2. (a) –5, –4, –3 –2, –1, 0
   (b) –2
   (c) 14
   (d) Infinite
   (e) Infinite
   (f) $\frac{-1}{12}$
   (g) $\frac{-12}{7}$ and $\frac{-10}{7}$

3. -7 and $\frac{1}{3}$

Rational number is $\left(-7+\frac{1}{3}\right)\div 2$

$$=\frac{-21+1}{3}\times\frac{1}{2}=\frac{-20}{6}$$

4. $\frac{-11}{4}$ and $\frac{6}{5}$, LCM of 4 and 5 is 20

$$\frac{-11}{4}=\frac{-11\times5}{4\times5}=\frac{-55}{20} \text{ and } \frac{6}{5}=\frac{6\times4}{5\times4}=\frac{24}{20}$$

Now, three rational numbers between –55 and 24 are –50, –45, 12

So, required rational numbers are

$$\frac{-50}{20},\frac{-45}{20},\frac{12}{20}$$

5. $\frac{8}{19}$ and $\frac{-7}{19}$

Denominator are same

$\therefore$ Rational numbers are

$$\frac{7}{19},\frac{6}{19},\frac{5}{19},\frac{4}{19},\frac{3}{19},\frac{2}{19},\frac{1}{19},0,\frac{-1}{19},\frac{-2}{19}$$

6. $$\frac{-6}{7}=\frac{-6\times2}{7\times2}=\frac{-6\times3}{7\times3}=\frac{-6\times4}{7\times4}$$

$$\frac{-12}{14}=\frac{-18}{21}=\frac{-24}{28}$$

7. Five rational numbers smaller than 3 are

$$1,\frac{1}{3},0,-1,\frac{-1}{3}$$

8. Five rational numbers greater than $\frac{-6}{7}$ are

$$0,\frac{1}{7},\frac{2}{7},\frac{3}{7},1$$

WORKSHEET (BASED ON COMPLETE CHAPTER)

1. (a) (ii)
   (b) (i), (ii)
   (c) (i)
2. (a) T
   (b) F
   (c) F
   (d) F
   (e) T
3. (a) LHS = a (b + c)

$$=\frac{-2}{5}\left(\frac{2}{3}-\frac{1}{7}\right)=\frac{-2}{5}\left(\frac{14-3}{21}\right)=\frac{-2}{5}\times\frac{11}{21}$$

$$=\frac{-22}{105}$$

RHS = ab + ac

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

$$=\frac{-4}{15}+\frac{2}{35}$$

$$=\frac{-28+6}{105}=\frac{-22}{105} \quad \therefore \text{ LHS= RHS}$$

4. $\frac{3}{9}\left(\frac{-4}{7}+\frac{8}{11}\right)$

$$=\frac{3}{9}\left(\frac{-44+56}{77}\right)=\frac{3}{9}\times\frac{12}{77}=\frac{3\times4}{3\times77}=\frac{4}{77}$$

5. LHS = $x\times y=\frac{-15}{9}\times\frac{-9}{30}=\frac{1}{2}$

RHS = $y\times x=\frac{-9}{30}\times\frac{-15}{9}=\frac{1}{2}$

$\therefore$ LHS = RHS

6. (a) $\left(\frac{1}{3}\div\frac{1}{2}\right)+\frac{5}{6}=\left(\frac{1}{3}\times\frac{2}{1}\right)+\frac{5}{6}$

$$=\frac{2}{3}+\frac{5}{6}=\frac{4+5}{6}=\frac{9}{6}=\frac{3}{2}$$

(b) $\frac{2}{5}\div\left[\frac{-4}{5}\div\frac{3}{10}\right]$

$$=\frac{2}{5}\div\left[\frac{-4}{5}\times\frac{10}{3}\right]=\frac{2}{5}\div\left[\frac{-8}{3}\right]=\frac{2}{5}\times\frac{3}{-8}=\frac{3}{-20}$$

(c) $\left(\frac{6}{11}\times\frac{4}{7}\right)-\left(\frac{9}{12}\times\frac{4}{3}\right)+\left(\frac{7^{1}}{8}\times\frac{64^{8}}{21_{3}}\right)$

$$=\frac{24}{77}-\frac{36}{36}+\frac{8}{3}$$

$$=\frac{24}{77}-1+\frac{8}{3}$$

$$\Rightarrow \quad \frac{72-231+616}{231}=\frac{688-231}{231}$$

$$=\frac{457}{231}$$

7. Let x be subtracted from $\frac{-7}{9}$

$\therefore \quad \frac{-7}{9} - x = \frac{-20}{7}$

$\Rightarrow \quad \frac{-7}{9} + \frac{20}{7} = x$

$\Rightarrow \quad \frac{-49+180}{63} = x$

$\Rightarrow \quad x = \frac{131}{63}$

8. Let x be added to $\left(\frac{1}{4} + \frac{3}{8}\right)$

$\left(\frac{1}{4} + \frac{3}{8}\right) + x = \frac{-7}{25}$

$\Rightarrow \quad \left(\frac{2+3}{8}\right) + x = \frac{-7}{25} \Rightarrow \frac{5}{8} + x = \frac{-7}{25}$

$\Rightarrow \quad x = \frac{-7}{25} - \frac{5}{8} \Rightarrow x = \frac{-56-125}{200} = \frac{-181}{200}$

9. Sum of two rational numbers = $\frac{-6}{13}$

One number $= \frac{4}{15}$

Other number = $\frac{-6}{13} - \left(\frac{4}{15}\right) = \frac{-6}{13} - \frac{4}{15}$

$= \frac{-90-52}{195} = \frac{-142}{195}$

10. Let x be subtracted from $\left(\frac{8}{9} - \frac{3}{6}\right)$

$\left(\frac{8}{9} - \frac{3}{6}\right) - x = \frac{-9}{21}$

$\Rightarrow \quad \left(\frac{16-9}{18}\right) - x = \frac{-9}{21}$

$\Rightarrow \quad \frac{7}{18} + \frac{9}{21} = x$

$\Rightarrow \quad \frac{49+54}{126} = x$

$\Rightarrow \quad \frac{103}{126} = x$

11. Let x be the no.

$\Rightarrow \quad \frac{6}{32} = \frac{-3}{8} \times x$

$\Rightarrow \quad x = \frac{6}{32} \times \frac{8}{-3} = \frac{2 \times 1}{4 \times (-1)} = \frac{-1}{2}$

12. Let x be the no.

$\Rightarrow \quad \frac{-1}{6} \times x = \frac{-17}{9} \Rightarrow x = \frac{-17}{9} \times (-6)$

$\Rightarrow \quad x = \frac{-17 \times 6}{-9} = \frac{17 \times 2}{3} = \frac{34}{3}$

13. $\left(\frac{1}{5} + \frac{1}{6} - 1\right) \div \left(2 + \frac{3}{7} - \frac{1}{2}\right)$

$= \quad \left(\frac{6+5-30}{30}\right) \div \left(\frac{28+6-7}{14}\right) = \frac{-19}{30} \times \frac{14}{27}$

$= \quad \frac{-19 \times 14}{30 \times 27} = \frac{-19 \times 7}{15 \times 27} = \frac{-133}{405}$

14. Water required by each plant

$= \quad \frac{9\frac{1}{2}}{30}$

$= \quad \frac{19}{2 \times 30}$

$= \quad \frac{19}{60}$ litres

15. Time taken by container of capacity $5\frac{1}{2}l$

$\Rightarrow \quad 5\frac{1}{2}l \quad \left(= \frac{11}{2}l\right) = 20\frac{1}{3}$ seconds

$= \frac{61}{3}$ seconds

Time taken by container of capacity 1 l

$= \frac{61}{3} \times \frac{2}{11} = \frac{122}{33}$ seconds

Time taken by container of capacity $17\frac{1}{2}l$

$\Rightarrow 17\frac{1}{2}l \left(= \frac{35}{2}l\right) = \frac{122}{33} \times \frac{35}{2}$

$= \frac{2135}{33}$ seconds

16. Cost of tomatoes on Tuesday

$= \$\left(25\frac{1}{4}+4\frac{3}{4}\right)$

$= \$\left(\frac{101}{4}+\frac{19}{4}\right)$

$= \$\left(\frac{101+19}{4}\right)$

$= \$\ \frac{120}{4}$

$= \$\ 30$ per Kg

17. Length of wood $= 12\frac{1}{4}$

Length of each piece $= 12\frac{1}{4}\div 4$

$= \frac{49}{4}\times\frac{1}{4}=\frac{49}{16}$

18. $\frac{-3}{11}$ and $\frac{-5}{12}$

$\frac{-3}{11}=\frac{-3\times12}{11\times12}=\frac{-36}{132}$ and $\frac{-5}{12}=\frac{-5\times11}{12\times11}=\frac{-55}{132}$

Twenty rational numbers are:

$\frac{-37}{132},\frac{-38}{132},\frac{-39}{132},\ldots..,\frac{-54}{132}$

19. LCM of 3 and 6 = 6

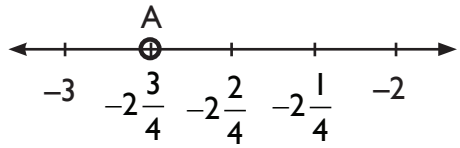
$-2=\frac{-12}{6},\frac{8}{3}=\frac{8\times2}{3\times2}=\frac{16}{6},\frac{-13}{6}$

and $\frac{1}{3}=\frac{1\times2}{3\times2}=\frac{2}{6}$

$\frac{-13}{6}<\frac{-12}{6}<\frac{2}{6}<\frac{16}{6}$

$\therefore\quad \frac{-13}{6}<-2<\frac{1}{3}<\frac{8}{3}$

20. $-2\frac{3}{4}=\frac{-11}{4}$



$\therefore$ The point A represents $-2\frac{3}{4}$

21. $T=\frac{-16}{9},S=\frac{-13}{9},R=\frac{-10}{9},P=\frac{13}{9},Q=\frac{16}{9}$

22. Perimeter = 64 cm

Let breadth = x, length = $\frac{5}{3}x$

P = 2 (l + b)

$\Rightarrow\quad 64=2\left(x+\frac{5}{3}x\right)$

$\Rightarrow\quad 32=\frac{8}{3}x$

$\Rightarrow\quad x=32\times\frac{3}{8}=12$

$\therefore$ Breadth = 12 cm

$\therefore$ Length $=\frac{5}{3}\times12=20$ cm

Area = l × b = (20 × 12) cm^2 = 240 cm^2

23. Cloth required for 1 participant $=\frac{63}{20}$ m

Cloth actually used $=\frac{63}{20}-\frac{3}{20}=\frac{60}{20}=3$m

$\therefore$ Cloth used on 220 children = 3 × 220

= 660 m

Cloth wasted $=\frac{3}{20}\times220$ = 33 m

Chapter 02 Linear Equations in one Variable

WORKSHEET 1: SOLVING EQUATIONS HAVING LINEAR EXPRESSIONS ON ONE SIDE

1. (a) same

(b) same

(c) Transposition

(d) linear equation

(e) $x = 8 + 5 = 13$

2. (a) $3x + 4 = 22$

$\Rightarrow 3x = 22 - 4$ [Transposing 4 to RHS]

$\Rightarrow 3x = 18$

$\Rightarrow \frac{3x}{3} = \frac{18}{3}$ ◇Dividing both sides by 3)

$\Rightarrow x = 6$

LHS = $3x + 4$

$= 3(6) + 4 = 18 + 4 = 22 = RHS$

(b) $2(4x - 1) = 20$

$\Rightarrow 4x - 1 = \frac{20}{2} = 10$

$\Rightarrow 4x = 10 + 1$ [Transposing 1 to RHS]

$\Rightarrow 4x = 11$

$\Rightarrow \frac{4x}{4} = \frac{11}{4}$ ◇Dividing both sides by 4)

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

LHS = $2(4x - 1)$

$= 2\left(4 \times \frac{11}{4} - 1\right) = 2(11 - 1)$

$= 2(10) = 20 = RHS$

(c) $15 \times 5x = 95$

$\Rightarrow 5x = \frac{95}{15}$

$\Rightarrow \frac{5x}{5} = \frac{95}{15 \times 5}$ ◇Dividing both sides by 5)

$\Rightarrow x = \frac{19}{15}$

LHS = $15 \times 5x = 15 \times 5 \times \frac{19}{15}$

$= 5 \times 19 = 95 = RHS$

(d) $\frac{7x}{8} = 0$

$\Rightarrow 7x = 0 \times 8 = 0$ [cross-multiply]

$\Rightarrow x = \frac{0}{7} = 0$

LHS $= \frac{7x}{8} = \frac{7 \times 0}{8} = \frac{0}{8}$

$= 0 = RHS$

(e) $7 = y + 9$

$\Rightarrow y + 9 = 7$

$\Rightarrow y = 7 - 9 = -2$ [Transposing 9 to RHS]

RHS = $y + 9 = -2 + 9$

$= 7 = LHS$

(f) $15 = \frac{y}{15}$

$\Rightarrow y = 15 \times 15 = 225$ [cross multiply]

RHS = $\frac{y}{15} = \frac{225}{15} = 15 = LHS$

(g) $8x - 9 = -15$

$\Rightarrow 8x = -15 + 9$ [Transposing 9 to RHS]

$\Rightarrow 8x = -6$

$\Rightarrow \frac{8x}{8} = \frac{-6}{8}$ [Dividing both side by 8]

$\Rightarrow \quad x = -\frac{3}{4}$

LHS = 8x – 9

$= 8\left(-\frac{3}{4}\right) - 9 = 2(-3) - 9$

$= -6 - 9 = -15 = RHS$

(h) $\frac{3x-4}{2} = 7$

$\Rightarrow \quad 3x - 4 = 7 \times 2 = 14$

$\Rightarrow \quad 3x = 14 + 4$ [Transposing 4 to RHS]

$\Rightarrow \quad 3x = 18$

$\Rightarrow \quad \frac{3x}{3} = \frac{18}{3}$ [Dividing both sides by 3]

$\Rightarrow \quad x = 6$

LHS $= \frac{3x-4}{2} = \frac{3(6)-4}{2}$

$= \frac{18-4}{2} = \frac{14}{2}$

$= 7 = RHS$

3. $\frac{0.3+0.7y}{y} = 0.85$

$\Rightarrow 0.3 + 0.7y = 0.85y$

$\Rightarrow 0.3 = 0.85y - 0.7y$

$\Rightarrow 0.3 = 0.15y$

$\Rightarrow y = \frac{0.3}{0.15} = \frac{30}{15} = 2$

4. (a) $4 \times \frac{1}{5}(x + 1) = \frac{1}{30}$

$\Rightarrow \quad \frac{4}{5}(x + 1) = \frac{1}{30}$

$\Rightarrow \quad x + 1 = \frac{1}{30} \times \frac{5}{4} = \frac{1 \times 1}{6 \times 4} = \frac{1}{24}$

$\Rightarrow \quad x + 1 = \frac{1}{24}$

$\Rightarrow \quad x = \frac{1}{24} - 1 = \frac{1-24}{24} = \frac{-23}{24}$

5. Let three consecutive odd numbers be x + 1, x + 3, x + 5

According to question

$\Rightarrow \quad x + 1 + x + 3 + x + 5 = 51$

$\Rightarrow \quad 3x + 9 = 51$ [Transposing 9 to RHS]

$\Rightarrow \quad 3x = 51 - 9 = 42$

$\Rightarrow \quad \frac{3x}{3} = \frac{42}{3}$ [Dividing both sides by 3]

$\Rightarrow \quad x = 14$

$\therefore$ Consecutive odd numbers are:

14 + 1, 14 + 3, 14 + 5 i.e. 15, 17, 19

6. Let the two positive integers be x and 3x

A.T.Q.

3x – x = 50

$\Rightarrow \quad 2x = 50$

$\Rightarrow \quad \frac{2x}{2} = \frac{50}{2}$ [Dividing both sides by 2]

$\Rightarrow \quad x = 25$

Hence, integers are: 25, 25 × 3 = 75

7. Let the three consecutive multiples of 6 be x, x + 6 and x + 12

A.T.Q

x + x + 6 + x + 12 = 666

$\Rightarrow \quad 3x + 18 = 666$

$\Rightarrow \quad 3x = 666 - 18$ [Transposing 18 to RHS]

$\Rightarrow \quad 3x = 648$ [Dividing both sides by 3]

$\Rightarrow \quad \frac{3x}{3} = \frac{648}{3}$

$\Rightarrow \quad x = 216$

Hence, three multiples are 216, 216 + 6 and 216 +12

i.e. x = 216, 222 and 228

8. Let breadth be x

$\therefore$ length = x + 6

Perimeter = 20 units

$\Rightarrow \quad 2 (l + b) = 20$

$\Rightarrow \quad 2 [x + 6 + x] = 20$

$\Rightarrow \quad 2x + 6 = 10$

$\Rightarrow \quad 2x = 10 - 6 = 4$ [Transposing 6 to RHS]

$\Rightarrow \frac{2x}{2} = \frac{4}{2}$ [Dividing both sides by 2]

$\Rightarrow x = 2$

Hence, length and breadth are 2 + 6, 2

i.e. 8, 2.

9. Let Sania's age be x years

$\therefore$ Meera's age = x + 10 years

A.T.Q

$\Rightarrow$ x + (x + 10) = 40

$\Rightarrow$ 2x + 10 = 40

$\Rightarrow$ 2x = 40 – 10 = 30

$\Rightarrow x = \frac{30}{2} = 15$

Hence, Sania's age = 15 years

Meera's age = (15 + 10) yrs = 25 yrs

10. Let the angles be x and 2x

$\therefore$ Third angle = x + 2x

we know that sum of the angles of triangle = 180°

$\Rightarrow$ x + 2x + (x + 2x) = 180°

$\Rightarrow$ 6x = 180°

$\Rightarrow \frac{6x}{6} = \frac{180^\circ}{6}$ [Dividing both sides by 6]

$\Rightarrow$ x = 30°

$\therefore$ angles of triangle are, 30°, 2 × 30° = 60°, 30° + 60° = 90°

WORKSHEET 2: SOLVING EQUATIONS HAVING THE VARIABLE ON BOTH SIDES

1. (a) 0.3 (6 + t) = 0.4 (8 – t)

$\Rightarrow$ 1.8 + 0.3t = 3.2 – 0.4t

$\Rightarrow$ 1.8 – 3.2 = – 0.4t – 0.3t

$\Rightarrow$ – 1.4 = – 0.7t

$\Rightarrow$ 1.4 = 0.7t

$\Rightarrow t = \frac{1.4}{0.7}$

$\therefore$ t = 2

(b) $3x + \frac{2}{3} = 2x + 1$

$\Rightarrow 3x - 2x = 1 - \frac{2}{3}$

$\Rightarrow 1x = \frac{3-2}{3} = \frac{1}{3}$

$\therefore x = \frac{1}{3}$

(c) $\frac{3x-15}{30} = 4$

$\Rightarrow$ 3x – 15 = 4 × 30 = 120

$\Rightarrow$ 3x = 120 + 15 = 135

$\Rightarrow$ 3x = 135

$\Rightarrow \frac{3x}{3} = \frac{135}{3}$ [Dividing both sides by 3]

$\therefore$ x = 45

(d) $\left(1 + \frac{1}{x}\right) \times 2 = \left(1 - \frac{1}{x}\right) \times 4$

$\Rightarrow 2 + \frac{2}{x} = 4 - \frac{4}{x}$

$\Rightarrow \frac{2}{x} + \frac{4}{x} = 4 - 2$

$\Rightarrow \frac{6}{x} = 2$

$\Rightarrow$ 6 = 2x

$\Rightarrow \frac{6}{2} = \frac{2x}{2}$ [Dividing both sides by 2]

$\therefore$ x $\subset \asymp$

(e) 1 + x = 6 (–3 + x)

$\Rightarrow$ 1 + x = – 18 + 6x

$\Rightarrow$ 1 + 18 = 6x –x

$\Rightarrow$ 19 = 5x

$\therefore x = \frac{19}{5}$

(f) $\frac{x+1}{2} + \frac{x+2}{3} + \frac{x-6}{6} = \frac{x}{18}$

LCM of 2, 3 and 6 is 6

$\Rightarrow \frac{3(x+1) + 2(x+2) + x - 6}{6} = \frac{x}{18}$

$\Rightarrow \quad \frac{3x+3+2x+4+x-6}{6} = \frac{x}{18}$

$\Rightarrow \quad \frac{6x+1}{6} = \frac{x}{18}$

$\Rightarrow$ 18(6x + 1) = 6x (cross multiply)

$\Rightarrow$ 108x + 18 = 6x

$\Rightarrow$ 108x – 6x = – 18

$\Rightarrow$ 102x = – 18

$\therefore \quad x = \frac{-18}{102} = \frac{-9}{51} = \frac{-3}{17}$

(g) 0.5y – 5 = 0.4y – 4

$\Rightarrow$ 0.5y – 0.4y = – 4 + 5

$\Rightarrow$ 0.1y = 1

$\Rightarrow \quad y = \frac{1}{0.1} = \frac{10}{1} = 10$

(h) $3x - (8 - 6x) = 10 \times \frac{8}{9}(4 + 5x)$

$\Rightarrow \quad 3x - 8 + 6x = \frac{80}{9}(4 + 5x)$

$\Rightarrow \quad \diamond 9x - 8) = \frac{80}{9}(4 + 5x)$

$\Rightarrow$ 9 ◇9x – 8) = 80 (4 + 5x)

$\Rightarrow$ 81x – 72 = 320 + 400x

$\Rightarrow$ 81x – 400x = 320 + 72

$\Rightarrow$ – 319x = 392

$\Rightarrow \quad x = \frac{-392}{319}$

(i) (x + 1) = – (x + 2)

$\Rightarrow$ x + 1 = – x – 2

$\Rightarrow$ x + x = – 2 – 1

$\Rightarrow$ 2x = – 3

$\therefore$ x = – 3/2

(j) 3x – 4(4x + 6) = 6x + 2(2x + 6)

$\Rightarrow$ 3x – 16x – 24 = 6x + 4x + 12

$\Rightarrow$ –13x –24 = 10x + 12

$\Rightarrow$ –13x –10x = 12 + 24

$\Rightarrow$ –23x = 36

$\therefore \quad x = -\frac{36}{23}$

2. Let the number = x

Four times a number = 4x

A.T.Q

$\Rightarrow$ 4x – 15 = 9

$\Rightarrow$ 4x = 15 + 9

$\Rightarrow$ 4x = 24

$\Rightarrow \quad x = \frac{24}{4}$

$\therefore$ x = 6

3. Let the number be x

3 times the number = 3x

A.T.Q

x – 3x = 14 – 30

$\Rightarrow$ –2x = –16

$\Rightarrow \quad x = \frac{-16}{-2} = 8$

4. Let the three consecutive odd numbers be x + 1, x + 3, x + 5

A.T.Q.

x + 1 + x + 3 + x + 5 = 57

$\Rightarrow$ 3x + 9 = 57

$\Rightarrow$ 3x = 57 – 9 = 48

$\Rightarrow \quad \frac{3x}{3} = \frac{48}{3}$ [Dividing both sides by 3]

$\Rightarrow$ x = 16

$\therefore$ Three consecutive odd numbers are 16 + 1, 16 + 3, 16 + 5, i.e. 17, 19, 21

5. Suppose that age of the son becomes half the age of man in t years.

Age of son after t years = (12 + t) years

Age of father after t years = (42 + t) years

A.T.Q.

12 + t = ½ (42 + t)

24 + 2t = 42 + t

$2t - t = 42 - 24$

$t = 18$

6. Let the second part be x

$\therefore$ the first part $= 2x - 8$

A.T.Q.

$x + 2x - 8 = 178$

$\Rightarrow 3x - 8 = 178$

$\Rightarrow 3x = 178 + 8 = 186$

$\Rightarrow x = \frac{186}{3} = 62$

So, first part is $2(62) - 8 = 124 - 8$

$= 116$

and second part is 62

7. Let Aman's salary be x

$\therefore$ Radhika's salary $= 4x$

A.T. Q

$x + 4x = 10752$

$\Rightarrow 5x = 10752$

$\therefore x = \frac{10752}{5} = 2150.4$

$\therefore$ Aman's salary = ₹ 2150.4

Radhika's salary $= 4 \times (2150.4)$

= ₹ 8601.6

8. Let the trip covered at 18 Km/hr be x km

So, part of the trip covered at 15 Km/h is $(136 - x)$ km

A.T.Q.

$\frac{136-x}{15} + \frac{x}{18} = 8$ (given)

$\Rightarrow 2448 - 18x + 15x = 8 \times 18 \times 15$

$\Rightarrow 2448 - 3x = 2160$

$\Rightarrow 3x = 2448 - 2160 = 288$

$\Rightarrow x = \frac{288}{3} = 96$ Km

WORKSHEET 3: REDUCING EQUATIONS TO SIMPLER FORM

1. (a) $\frac{3x}{x+6} - \frac{x}{x+5} = 2$

$\Rightarrow \frac{3x(x+5) - x(x+6)}{(x+5)(x+6)} = 2$

$\Rightarrow 3x^2 + 15x - x^2 - 6x = 2(x^2 + 6x + 5x + 30)$

$\Rightarrow 2x^2 + 9x = 2x^2 + 12x + 10x + 60$

$\Rightarrow 9x - 22x = 60$

$\Rightarrow -13x = 60$

$\Rightarrow x = -\frac{60}{13}$

(b) $\frac{x-2}{8x-16} = \frac{x-4}{8x-28}$

$\Rightarrow (x - 2)(8x - 28) = (x - 4)(8x - 16)$

$\Rightarrow 8x^2 - 28x - 16x + 56 = 8x^2 - 16x - 32x + 64$

$\Rightarrow 8x^2 - 44x + 56 = 8x^2 - 48x + 64$

$\Rightarrow 8x^2 - 44x + 56 - 8x^2 + 48x - 64 = 0$

$\Rightarrow -44x + 48x = 64 - 56$

$\Rightarrow 4x = 8$

$\Rightarrow \frac{4x}{4} = \frac{8}{4}$ [Divide both sides by 4]

$\therefore x = 2$

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

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

$\Rightarrow \frac{x-x+1}{x^2-x} = \frac{x+4-x-3}{x^2+7x+12}$

$\Rightarrow \frac{1}{x^2-x} = \frac{1}{x^2+7x+12}$

$\Rightarrow x^2 + 7x + 12 = x^2 - x$

$\Rightarrow 7x + x = -12$

$\Rightarrow 8x = -12$

$\Rightarrow \quad x = \frac{-12}{8} = \frac{-3}{2}$

(d) $\frac{\frac{3}{2}y - 7}{\frac{2}{5}y - 7} = \frac{4}{5}$

$\Rightarrow \quad 5\left(\frac{3}{2}y - 7\right) = 4\left(\frac{2}{5}y - 7\right)$

$\Rightarrow \quad \frac{15}{2}y - 35 = \frac{8}{5}y - 28$

$\Rightarrow \quad \frac{15}{2}y - \frac{8}{5}y = -28 + 35$

$\Rightarrow \quad \frac{75y - 16y}{10} = 7$

$\Rightarrow \quad 59y = 7 \times 10 = 70$

$\Rightarrow \quad y = \frac{70}{59}$

2. $\frac{2x}{3} - \frac{x-1}{6} + \frac{7x-1}{4} = 2\frac{1}{6}$

$\Rightarrow \quad \frac{2x}{3} - \frac{x-1}{6} + \frac{7x-1}{4} = \frac{13}{6}$

LCM of 3, 6, 4 is 12

$\Rightarrow \quad \frac{4(2x) - 2(x-1) + 3(7x-1)}{12} = \frac{13}{6}$

$\Rightarrow \quad \frac{8x - 2x + 2 + 21x - 3}{12} = \frac{13}{6}$

$\Rightarrow \quad \frac{27x - 1}{12} = \frac{13}{6}$

$\Rightarrow \quad \frac{27x - 1}{2} = \frac{13}{1}$

$\Rightarrow \quad 27x - 1 = 26$

$\Rightarrow \quad 27x = 26 + 1 = 27$

$\Rightarrow \quad x = \frac{27}{27} = 1$

$\therefore \quad x = 1$

Now, $\frac{1}{a} + 5x = 8$

$\Rightarrow \quad \frac{1}{a} + 5(1) = 8$

$\Rightarrow \quad \frac{1}{a} = 8 - 5 = 3$

$\Rightarrow \quad a = \frac{1}{3}$

3. $\frac{4-3x}{5} + \frac{7-x}{3} + 4\frac{1}{3} = 0$

LCM of 5 and 3 is 15

$\Rightarrow \quad \frac{3(4-3x) + 5(7-x) + 5 \times 13}{15} = 0$

$\Rightarrow \quad 12 - 9x + 35 - 5x + 65 = 0$

$\Rightarrow \quad -14x + 112 = 0$

$\Rightarrow \quad -14x = -112$

$\Rightarrow \quad \frac{112}{14} = x$

$\therefore \quad x = 8$

Now, $3p - 2x + 1 = 0$

$\Rightarrow \quad 3p - 2(8) + 1 = 0$

$\Rightarrow \quad 3p - 16 + 1 = 0$

$\Rightarrow \quad 3p = 15$

$\therefore \quad p = \frac{15}{3} = 5$

4. $\frac{2x+1}{10} - \frac{3-2x}{15} = \frac{x-2}{6}$

LCM of 10 and 15 is 30

$\Rightarrow \quad \frac{3(2x+1) - 2(3-2x)}{30} = \frac{x-2}{6}$

$\Rightarrow \quad \frac{6x + 3 - 6 + 4x}{30} = \frac{x-2}{6}$

$\Rightarrow \quad \frac{10x - 3}{30} = \frac{x-2}{6}$

$\Rightarrow \quad \frac{10x - 3}{5} = \frac{x-2}{1}$

$\Rightarrow \quad 10x - 3 = 5(x - 2)$

$\Rightarrow \quad 10x - 3 = 5x - 10$

$\Rightarrow \quad 10x - 5x = -10 + 3$

$\Rightarrow \quad 5x = -7$

$\therefore \quad x = \frac{-7}{5}$

Now, $\frac{1}{p} + \frac{1}{x} = 3$

$\Rightarrow \quad \frac{1}{p} + \frac{1}{\left(\frac{-7}{5}\right)} = 3$

$\Rightarrow \quad \frac{1}{p} - \frac{5}{7} = 3$

$\Rightarrow \quad \frac{1}{p} = 3 + \frac{5}{7} = \frac{21+5}{7} = \frac{26}{7}$

$\therefore \quad p = \frac{7}{26}$

5. Suppose the worker works for x days.

$\therefore$ workers remains absent on $(40 - x)$ day

A.T.Q.

$250x - 75\,(40 - x) = 8900$

$\Rightarrow \quad 250x + 75x - 3000 = 8900$

$\Rightarrow \quad 325x = 11900$

$\Rightarrow \quad x = \frac{11900}{325}$

$= \frac{476}{13}$ days

6. Let the number be x

A.T. Q

$\frac{5+x}{11+x} = \frac{15+x}{31+x}$ [$\because$ numbers are in proportion]

$\Rightarrow \quad (5 + x)\,(31 + x) = (15 + x)\,(11 + x)$

$\Rightarrow \quad 155 + 5x + 31x + x^2 = 165 + 15x + 11x + x^2$

$\Rightarrow \quad 155 + 36x + x^2 = 165 + 26x + x^2$

$\Rightarrow \quad 36x - 26x = 165 - 155$

$\Rightarrow \quad 10x = 10$

$\Rightarrow \quad x = \frac{10}{10} = 1$

7. Let the number be x

A.T.Q.

$5x - 5 = 2x + 4$

$\Rightarrow \quad 5x - 2x = 4 + 5$

$\Rightarrow \quad 3x = 9$

$\Rightarrow \quad x = \frac{9}{3} = 3$

Thus, the number is 3

8. Let the numbers be x, $6500 - x$

A.T.Q

$\frac{10x}{100} = \frac{125}{1000}(6500 - x)$

$100x = 812500 - 125x$

$225x = 812500$

$x = \frac{812500}{225} = \frac{32500}{9}$

Other no. is $6500 - \frac{32500}{9}$

$= \frac{26000}{9}$

9. Let denominator be x

$\therefore$ Numerator $= x - 6$

fraction $= \frac{N}{D} = \frac{x-6}{x}$

A.T.Q

$\frac{x-6+3}{x} = \frac{2}{3}$

$\Rightarrow \quad \frac{x-3}{x} = \frac{2}{3}$

$\Rightarrow \quad 3x - 9 = 2x$

$\Rightarrow \quad 3x - 2x = 9$

$\Rightarrow \quad x = 9$

Denominator = $x = 9$

Numerator = $x - 6 = 9 - 6 = 3$

Fraction = $\frac{N}{D} = \frac{3}{9} = \frac{1}{3}$

10. It is given that the ratio of the ages of Suman and Sahil is 7 : 5

Let present ages of Suman and Sahil be 7x and 5x years

After ten years,

Age of Suman = 7x + 10 yrs

Age of Sahil = 5x + 10 yrs

A.T.Q

$\frac{7x+10}{5x+10} = \frac{9}{7}$

$\Rightarrow$ $7(7x + 10) = 9(5x + 10)$

$\Rightarrow$ $49x + 70 = 45x + 90$

$\Rightarrow$ $49x - 45x = 90 - 70$

$\Rightarrow$ $4x = 20$

$\Rightarrow$ $x = \frac{20}{4} = 5$

$\therefore$ Present age of Suman = $7 \times 5 = 35$ yrs

Present age of Sahil = $5 \times 5 = 25$ yrs

11. Let digit at ten's place be x

$\therefore$ digit at unit's place = $7 - x$

So, original number = $10x + 7 - x$

$= 9x + 7$

Number obtained on interchanging the digits = $10 (7 - x) + x$

$= 70 - 10x + x$

$= 70 - 9x$

A.T.Q.

$70 - 9x = 9x + 7 + 27$

$\Rightarrow$ $70 - 9x = 34 + 9x$

$\Rightarrow$ $70 - 34 = 9x + 9x$

$\Rightarrow$ $36 = 18x$

$\Rightarrow$ $x = 2$

So, digit at ten's place = 2

Digit at unit's place = $7 - 2 = 5$

$\therefore$ original no. = $9x + 7$

$= 9(2) + 7 = 25$

12. Let the numerator of the fraction = x

Denominator = $x + 4$

$\therefore$ fraction = $\frac{x}{x+4} = \frac{N}{D}$

A.T.Q

$x + x + 4 = 20$

$\Rightarrow$ $2x = 20 - 4 = 16$

$\therefore$ $x = \frac{16}{2} = 8$

$\therefore$ Numerator = $x = 8$

Denominator = $x + 4 = 8 + 4 = 12$

Fraction = $\frac{8}{12}$

13. Let the two angles of triangle be x and 2x

$\therefore$ Third angle = $x + 2x = 3x$

We know, sum of the angles of a triangle = 180°

$\Rightarrow$ $x + 2x + 3x = 180°$

$\Rightarrow$ $6x = 180°$

$\Rightarrow$ $x = \frac{180°}{6} = 30°$

$\therefore$ Angles of triangle are 30°, $2 \times 30°$, $3 \times 30°$ i.e. 30°, 60°, 90°

14. Let the speed of the first motor cycle = x km/h

Then the speed of the other motor cycle = (x – 10) km/hr

After 4 hours,

Distance of the first motor cycle from the starting point = 4x km

Distance of the second motor cycle from the starting point = 4(x – 10) km

A.T.Q

$4(x - 10) + 4x + 30 = 310$

$\Rightarrow \quad 4x - 40 + 4x + 30 = 310$

$\Rightarrow \quad 8x - 10 = 310$

$\Rightarrow \quad 8x = 310 + 10 = 320$

$\Rightarrow \quad x = \frac{320}{8} = 40$

$\therefore$ Speed of first motor cycle = 40 km/h

Speed of second motor cycle = (40 – 10) km/h = 30 km/h

WORKSHEET (BASED ON COMPLETE CHAPTER)

1. (a) (ii)

(b) (iii)

(c) (ii) $\frac{3}{x} = -3 - 8 = -11$

$\Rightarrow \quad 8x = 310 + 10 = 320$

$\Rightarrow \quad x = \frac{3}{-11}$

(d) (iii)

(e) (ii) $5a = -6$

$\Rightarrow \quad a = \frac{-6}{5}$

2. (a) False, $3x - 15 = 4x - 5$

$\Rightarrow \quad 3x - 4x = -5 + 15$

$\Rightarrow \quad -x = 10$

$\Rightarrow \quad x = -10$

(b) True

(c) False

(d) True

(e) False

3. (a) Transposition

(b) Subtract, add

(c) one

(d) same number

(e) No

4. $x - 15 = 35$

$\Rightarrow \quad x = 35 + 15$

$\therefore \quad x = 50$

5. $\frac{x}{-5} = \frac{1}{15}$

$\Rightarrow \quad 15x = -5$

$\Rightarrow \quad x = \frac{-5}{15} = \frac{-1}{3}$

6. $6p - \frac{1}{3}(p + 1) = 8\left(p + \frac{1}{32}\right)$

$\Rightarrow \quad 6p - \frac{p}{3} - \frac{1}{3} = 8p + \frac{1}{4}$

$\Rightarrow \quad 6p - \frac{p}{3} - 8p = \frac{1}{4} + \frac{1}{3}$

$\Rightarrow \quad -2p - \frac{p}{3} = \frac{3+4}{12}$

$\Rightarrow \quad \frac{-6p - p}{3} = \frac{7}{12}$

$\Rightarrow \quad \frac{-7p}{3} = \frac{7}{12}$

$\Rightarrow \quad \frac{-p}{3} = \frac{1}{12}$

$\Rightarrow \quad -12p = 3$

$\Rightarrow \quad p = \frac{3}{12} = \frac{1}{4}$

7. $\frac{3a+7}{4a+3} = \frac{3a+4}{4a+8}$

$\Rightarrow \quad (3a + 7)(4a + 8) = (3a + 4)(4a + 3)$

$\Rightarrow \quad 12a^2 + 24a + 28a + 56 = 12a^2 + 9a + 16a + 12$

$\Rightarrow \quad 12a^2 + 52a + 56 = 12a^2 + 25a + 12$

$\Rightarrow \quad 12a^2 + 52a - 12a^2 - 25a = 12 - 56$

$\Rightarrow \quad 52a - 25a = -44$

$\Rightarrow \quad 27a = -44$

$\Rightarrow \quad a = \frac{-44}{27}$

8. Let Aman's pocket money be $\$ x$

$\therefore \quad \frac{4}{5}x = 100$

$x = \frac{100 \times 5}{4} = \$ 125$

9. Let x be the number of bags of price ₹ 50 per kg

cost price of x bags of price ₹ 50 each = ₹ 50x

selling price of (35 + x) bags at ₹ 57 each

= ₹ 57(35 + x)

cost price of 35 bags of price ₹ 60 each = ₹ 35 × 60 = ₹ 2100

As there is no gain or loss,

Cost Price = Selling Price

$\Rightarrow$ 2100 + 50x = 57(35 + x)

$\Rightarrow$ 2100 + 50x = 1995 + 57x

$\Rightarrow$ 7x = 105

$\Rightarrow$ $x = \frac{105}{7} = 15$

10. Let the two numbers be x and 5000 – x

A.T.Q.

$\frac{20}{100}x = \frac{30}{100}(5000 - x)$

$\frac{x}{5} = \frac{3}{10}(5000 - x)$

$\frac{10x}{5} = 15000 - 3x$

$2x = 15000 - 3x$

$5x = 15000$

$x = 3000$

$\therefore$ The two no.'s are 3000, 5000 – 3000 = 2000

11. Let the speed of first train be x km/h

$\therefore$ the speed of other train is (x + 22) km/h

After 2 hours

Distance of the first train from starting point = 2x km/h

Distance of the second train from starting point = 2(x + 22) km/h

A.T.Q

2(x + 22) + 2x + 20 = 300

$\Rightarrow$ 2x + 44 + 2x + 20 = 300

$\Rightarrow$ 4x + 64 = 300

$\Rightarrow$ 4x = 300 – 64 = 236

$\Rightarrow$ $x = \frac{236}{4} = 59$

$\therefore$ Speed of first train = 59km/h

Speed of second train = (59 + 22) km/h

= 81 km/h

Chapter 03

Understanding Quadrilaterals

WORKSHEET 1: POLYGONS

1. (a) No
   (b) No
   (c) Yes, Concave
   (d) No
   (e) No
2. Open curve: A curve which is not closed is called open curve.
3. Closed curve: A curve which starts and ends at the same point is called a closed curve
4. Three parts.
5.

Convex	Concave
Polygons that are convex have no portions of their diagonals in their exterior.	Polygons that are concave have at least one of their diagonals in their exterior.

6. Measure of each angle of a polygon
   $= \frac{(n-2)180°}{n}$
   where n denotes no. of sides
   For octagon, n = 8
   ∴ Measure of each angle of a octagon
   $= \frac{(8-2)180}{8}$
   $= 135°$
7. We know that sum of angles of a polygon is 180° (n – 2) where n denotes no. of sides.
   (a) $(10 - 2) \times 180° = 8 \times 180° = 1440°$
   (b) $(12 - 2) \times 180° = 10 \times 180° = 1800°$
   (c) $(20 - 2) \times 180° = 18 \times 180° = 3240°$
8. (a) Sum of interior angles = 870°
   $\Rightarrow (n - 2) \times 180° = 870°$
   $\Rightarrow n - 2 = \frac{870}{180} \Rightarrow n = \frac{87}{18} + 2 = \frac{87 + 36}{18} = \frac{123}{18}$
   which is not a natural number.
   So, it's is not possible to have a polygon.
   (b) $(n - 2) \times 180° = 2340°$
   $\Rightarrow (n-2) = \frac{2340}{180} \Rightarrow n - 2 = 13 \Rightarrow n = 15$
   So, it's possible to have a polygon whose sum of interior angles is 2340°
   (c) $(n - 2) \times 180° = 7 \times 90°$
   $\Rightarrow (n-2) = \frac{630}{180} = \frac{7}{2}$ which is not a natural number.
   So, it's not possible to have a polygon whose sum of interior angles is 7 right angles.
9. (a) $(n - 2) \times 180° = 900$
   $\Rightarrow (n-2) = \frac{900}{180} \Rightarrow n - 2 = 5$
   $\Rightarrow n = 5 + 2 = 7$ sides
   (b) $(n - 2) \times 180° = 1620$
   $\Rightarrow (n-2) = \frac{1620}{180°} = 9 \Rightarrow n - 2 = 9$
   $\Rightarrow n = 9 + 2 = 11$
   (c) $(n - 2) \times 180° = 18 \times 90° = 1620$
   $\Rightarrow (n-2) = \frac{1620}{180°} = 9 \therefore n = 11$
10. Let the angle = x
    Sum of the angles of hexagon = 720°
    $\Rightarrow x + x + x + x + x + x = 720°$
    $\Rightarrow 6x = 720°$
    $\Rightarrow x = \frac{720°}{6} = 120°$
    ∴ each angle = 120°

11. Let n be the no. of sides.
Sum of angles of a polygon
$= 90° + 90° + 120° (n – 2)$
$= 180° + 120°n – 240°$
$= 120°n – 60°$
We know that sum of a polygon is $180° (n – 2)$
So,
$120°n – 60° = 180°(n – 2)$
$120°n – 60° = 180°n – 360°$
$360° – 60° = 180°n – 120°n$
$300° = 60°n$
$\therefore \quad n = 5$

12. Sum of interior angles of pentagon = 540°
Let angles of a pentagon be 4x, 5x, 6x, 7x and 5x
$\therefore \quad 4x + 5x + 6x + 7x + 5x = 540°$
$\Rightarrow \quad 27x = 540°$
$\therefore \quad x = \frac{540°}{27} = 20°$
$\therefore$ Each angle = $4 \times 20°, 5 \times 20°, 6 \times 20°, 7 \times 20°$ and $5 \times 20°$
$= 80°, 100°, 120°, 140°$ and $100°$

13. Sum of angles of hexagon = 720°
$\Rightarrow \quad x + 10° + 2x + 20° + 2x – 20° + 3x – 50° + x + 40° + x + 20° = 720°$
$\Rightarrow \quad (x + 2x + 2x + 3x + x + x) +$
$\left(10° + \cancel{20°} - \cancel{20°} - 50° + 40° + 20°\right) = 720°$
$\Rightarrow \quad 10x + 20 = 720°$
$\Rightarrow \quad 10x = 720° – 20° = 700°$
$\therefore \quad x = \frac{700°}{10} = 70°$
Hence, angles are $70° + 10, 140° + 20°, 140° – 20°, 210° – 50°, 70° + 40°, 70 + 20°$
i.e. 80°, 160°, 120°, 160°, 110°, 90°

14. Given angles of hexagon = 130° and 170°
and let each of the remaining angle be x
Sum of angles of hexagon = 720°
$\Rightarrow \quad 130° + 170° + x + x + x + x = 720°$
$\Rightarrow \quad 4x = 720° – 300° = 420°$
$\Rightarrow \quad x = \frac{420}{4} = 105°$
$\Rightarrow \quad x = 105°$

15. (a) No. of sides of a pentagon = 5
Sum of interior angles of a pentagon
$= 180° (5 – 2)$
$= 540°$
$\therefore$ Measure of each angle $= \frac{540°}{5}$
$= 108°$
(b) $\angle A + \angle E = 108° + 108° = 216°$
(c) Measure of each of angle B, C and D is 108°

16. Angle = 114°
Sum of angles of seven sided polygon
$= (7 – 2) \times 180°$
$= 5 \times 180° = 900$
$\Rightarrow \quad x + x + x + x + x + x + 114° = 900°$
$\Rightarrow \quad 6x = 900° – 114° = 786°$
$\Rightarrow \quad x = \frac{786°}{6} = 131°$

WORKSHEET 2: REGULAR POLYGON

1. (a) Each exterior angle $= \frac{360°}{12} = 30°$
Each interior angle $= 180° – 30° = 150°$
(b) Each exterior angle $= \frac{360°}{8} = 45°$
Each interior angle $= 180° – 45° = 135°$
(c) Let no. of sides be n
$\Rightarrow \quad 82° = \frac{360°}{n}$
$\Rightarrow \quad n = \frac{360°}{82°} = \frac{180}{41}$
which is not a natural no.
So, there is no polygon with exterior angle as 82°.
(d) No. of sides $= \frac{360°}{45°} = 8$
Interior angle $= 180° – 45° = 135°$
(e) Each exterior angle $= 180° – 150° = 30°$
No. of sides $= \frac{360°}{30°} = 12$

2. (a) Interior angle = 171°
$\Rightarrow$ Exterior angle $= 180° – 171° = 9°$

Number of sides $= \frac{360°}{9} = 40$

(b) Interior angle = 60°

$\Rightarrow$ Exterior angle = 180° – 60° = 120°

No. of sides $= \frac{360°}{120°} = 3$

3. (a) Exterior angle = 45°

No. of sides $= \frac{360°}{45°} = 8$

(b) Number of sides $= \frac{360°}{60°} = 6$

(c) Exterior angle $= \frac{1}{3} \times 90° = 30°$

No. of sides $= \frac{360°}{30°} = 12$

4. Let measure of each exterior angle be x.

$\therefore$ Measure of each interior angle = 4x.

We know that interior angle + exterior angle = 180°

$\Rightarrow$ 4x + x = 180°

$\Rightarrow$ 5x = 180°

$\Rightarrow$ x = 36°

(a) Measure of each interior angle = 4 × 36° = 144°

(b) Measure of each exterior angle = 36°

(c) No. of sides $= \frac{360°}{36°} = 10$

5. Let no. of sides of two polygons be 3x and 4x.

Let sum of interior angles of two polygons be 2y and 3y.

We know that sum of interior angles of a polygon having n sides = 180° (n – 2)

So, we get

$2y = 180° (3x – 2)$ and

$3y = 180° (4x – 2)$

i.e., $y = 90° (3x – 2)$ (i) and

$y = 60° (4x – 2)$ (ii)

From equations (i) and (ii), we get

$90° (3x – 2) = 60° (4x – 2)$

$3 (3x – 2) = 2 (4x – 2)$

$9x – 6 = 8x – 4$

$x = 2$

So, no. of sides of two polygons are 3 × 2 and 4 × 2 i.e. 6 and 8.

6. Sum of exterior angles of a polygon = 360°

Measure of each exterior angle

$= \frac{\text{sum of exterior angles}}{\text{no. of sides}}$

$\Rightarrow 120° = \frac{360°}{\text{No. of sides}}$

$\Rightarrow$ No. of sides $= \frac{360°}{120°}$

$= 3.$

7. Let the exterior and interior angle be 7x and 2x.

$\therefore$ $7x + 2x = 180°$

$9x = 180°$

$x = 20°$

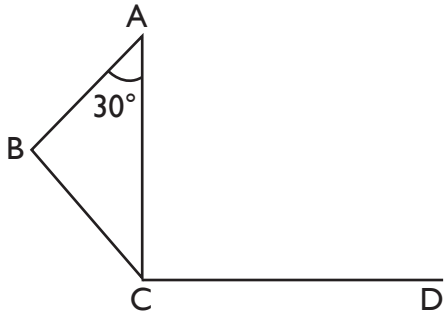
So, measure of each exterior angle = 7 × 20° = 140°

$\therefore$ No of sides $= \frac{360°}{140°}$

$= \frac{18}{7}$ which is not a natural no.

So, such kind of polygon is not possible.

8.



(a) As AB, BC, CD are sides of a regular polygon,

AB = BC

$\Rightarrow \angle BCA = \angle BAC = 30°$

[Angles opposite to equal sides are equal]

In ΔABC,

$\angle B + \angle BCA + \angle BAC = 180°$

$\angle B + 30° + 30° = 180°$

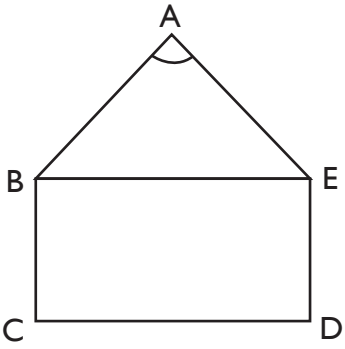
$\angle B = 180° – 60° = 120°$

Measure of each interior angle = 120°

(b) Measure of each exterior angle = 180° – 120° = 60°

(c) No. of sides $= \frac{\text{Sum of exterior angles}}{\text{Measure of each exterior angle}}$

$= \frac{360°}{60°} = 6$

9. 

(a) Interior angle of a pentagon

$$= \frac{(5-2)180^\circ}{5}$$

$$= \frac{3\times 180^\circ}{5}$$

$$= 108^\circ$$

$\therefore \quad \angle BAE = 108^\circ$

(b) In ΔABE, $AB = AE$

$\Rightarrow \quad \angle ABE = \angle AEB = x$

$\angle A + \angle ABE + \angle AEB = 180^\circ$

$108^\circ + 2x = 180^\circ$

$2x = 180^\circ - 108^\circ$

$= 72^\circ$

$\Rightarrow \quad x = 36^\circ$

$\therefore \quad \angle ABE = 36^\circ$

(c) $\angle AEB = \angle ABE = 36^\circ$

Also, $\angle AED = 108^\circ$

[$\because$ Measure of each interior angle is 108°]

$\therefore \quad \angle BED = 108^\circ - 36^\circ$

$= 72^\circ$

10. (a) Let the number of sides be n

Exterior angle of the polygon = $\frac{360^\circ}{n}$

Interior angle $= \frac{2n-4}{n}\times 90^\circ$

Since interior angle = 5 × exterior angle

$$\Rightarrow \frac{2n-4}{n}\times 90^\circ = 5\times\frac{360^\circ}{n}$$

$\Rightarrow 90^\circ (2n - 4) = 5 \times 360^\circ$

$$\Rightarrow (2n-4) = \frac{5\times 360^\circ}{90^\circ}$$

$\Rightarrow 2n - 4 = 5 \times 4$

$\Rightarrow 2n = 20 + 4 = 24$

$\Rightarrow n = 12$

$\therefore$ Number of sides = 12

(b) $$\frac{2n-4}{n}\times 90^\circ = \frac{360^\circ}{n} + 60^\circ$$

$\Rightarrow 90^\circ (2n - 4) = 360^\circ + 60^\circ n$

$\Rightarrow 180^\circ n - 360^\circ = 360^\circ + 60^\circ n$

$\Rightarrow 180^\circ n - 60n = 360^\circ + 360^\circ$

$\Rightarrow \quad 120^\circ n = 720^\circ$

$$\Rightarrow n = \frac{720^\circ}{120^\circ} = 6$$

(c) $$\frac{360^\circ}{n} : \frac{2n-4}{n}\times 90^\circ = \frac{5}{7}$$

$$\Rightarrow \frac{360}{\cancel{n}}\times\frac{\cancel{n}}{(2n-4)\times 90^\circ} = \frac{5}{7}$$

$$\Rightarrow \frac{4}{2n-4} = \frac{5}{7}$$

$\Rightarrow 28 = 10n - 20$

$\Rightarrow \quad 48 = 10n$

$\Rightarrow$ n = 4.8 which is not a natural no. So, such a polygon is not possible.

11. A.T.Q.

$40^\circ + 51^\circ + 86^\circ + x + x + x = 720^\circ$

$\Rightarrow 177^\circ + 3x = 720^\circ$

$\Rightarrow 3x = 720^\circ - 177^\circ$

$\Rightarrow 3x = 543^\circ$

$$\Rightarrow x = \frac{543^\circ}{3} = 181^\circ$$

Hence, $x = 181^\circ$

12. A.T.Q.

$$\frac{360^\circ}{n-1} - \frac{360^\circ}{n+1} = 9^\circ$$

$$\Rightarrow \frac{360^\circ(n+1) - 360^\circ(n-1)}{n^2-1} = 9^\circ$$

$\Rightarrow 360^\circ n + 360^\circ - 360^\circ n + 360^\circ = 9^\circ n^2 - 9^\circ$

$\Rightarrow 720^\circ + 9^\circ = 9^\circ n^2$

$\Rightarrow 9^\circ n^2 = 729^\circ$

$$\Rightarrow n^2 = \frac{729^\circ}{9^\circ} = 81$$

$\therefore \quad n = \sqrt{81} = 9$

13. Number of sides $= \frac{360^\circ}{180^\circ} = 2$

14. (a) $70° = \frac{360°}{n} \Rightarrow n = \frac{360°}{70°}$, No

(b) $120° = \frac{360°}{n}$

$\Rightarrow n = \frac{360°}{120°} = 3$, yes

WORKSHEET 3: QUADRILATERAL

1. (a) Sum of angles of quadrilateral = 360°

$\Rightarrow 4x + 5(x + 2) + 7x - 20 + 6(x + 3) = 360°$

$\Rightarrow 4x + 5x + 10 + 7x - 20 + 6x + 18 = 360°$

$\Rightarrow 22x + 8 = 360°$

$\Rightarrow 22x = 360 - 8 = 352°$

$\Rightarrow x = \frac{352°}{22} = 16$

(b) each angle = $4 \times 16, 5(16 + 2), 7(16) - 20, 6(16 + 3)$

$= 64°, 90°, 92°, 114°$

2. Let each of the equal angle be x.

A.T.Q

$x + x + x + 30° = 360°$

$3x = 360° - 30° = 330°$

$\Rightarrow x = \frac{330°}{3} = 110°$

3. $\angle a + \angle b + \angle c = 180°$ [Angle sum property]

$\Rightarrow \angle a + 3\angle a + 25° + 3\angle a + 15° = 180°$

$\Rightarrow 7\angle a + 40° = 180°$

$\Rightarrow 7\angle a = 180° - 40°$

$= 140°$

$\Rightarrow \angle a = \frac{140°}{7}$

$= 20°$

$\therefore \angle b = 3\angle a + 25°$

$= 3(20°) + 25°$

$= 85°$

$\angle c = 3\angle a + 15°$

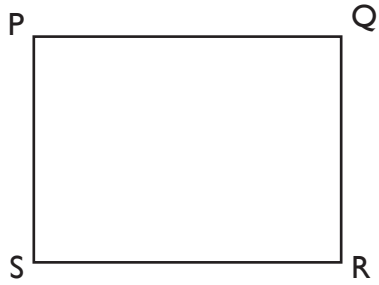
$= 3(20°) + 15° = 75°$

4. Sum of exterior angles = 360°

$\Rightarrow 125 + p + 125° = 360°$

$\Rightarrow p = 360° - 250 = 110°$

5. Let angles of quadrilateral be 3x, 4x, 5x and 6x.



$\Rightarrow 3x + 4x + 5x + 6x = 360°$

$\Rightarrow 18x = 360°$

$\Rightarrow x = \frac{360°}{18} = 20°$

So, angles of quadrilateral are 60°, 80°, 100°, 120°.

(a) Since $\angle P + \angle S = 60° + 120$

$= 180°$

$\therefore$ PQ || RS

[As sum of interior angles is 180°]

(b) Trapezium

6. (a) $\angle P + \angle Q + \angle R + \angle S = 360°$

$\Rightarrow 90 + 2t + 4 + 3t - 5 + 8t - 15 = 360°$

$\Rightarrow 13t + 94 - 20 = 360°$

$\Rightarrow 13t = 360° - 74° = 286°$

$\therefore t = \frac{286}{13} = 22$

$t = 22$

(b) $\angle Q = 2t + 4 = 2 \times 22 + 4 = 44 + 4 = 48$

$\angle R = 3t - 5 = 3 \times 22 - 5 = 66 - 5 = 61$

7. The sum of interior angle of quadrilateral = 360°

$a + 3a + 18° + 5a + 10° + 62° = 360°$

$\Rightarrow 9a + 90° = 360°$

$\Rightarrow 9a = 360° - 90° = 270°$

$\Rightarrow a = \frac{270°}{9} = 30°$

$b = 3 \times 30° + 18° = 90° + 18° = 108°$

$c = 5 \times 30° + 10° = 150° + 10 = 160°$

8. $\angle B + \angle C = 180°$

$\Rightarrow 2x + 15° + 5x + 25° = 180°$

$\Rightarrow 7x = 180° - 40° = 140°$

$\Rightarrow x = \frac{140}{7} = 20°$

$\therefore \angle B = 2 \times 20° + 15° = 55°$

$\angle C = 5 \times 20° + 25° = 125°$

$\angle A + \angle D = 180°$

$\therefore x + 2x = 180°$

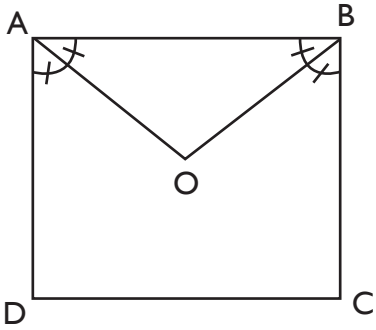
$3x = 180°$

$x = \frac{180°}{3} = 60°$

$\therefore \angle A = x = 60°$,

$\angle D = 2x = 2(60°) = 120°$

9.



$\angle A + \angle B + \angle C + \angle D = 360°$

$\angle A + \angle B = 360° - \angle C - \angle D$ ...(i)

In ΔAOB,

$\angle AOB + \angle OAB + \angle OBA = 180°$

$\angle AOB + \frac{1}{2}\angle A + \frac{1}{2}\angle B = 180°$

$\frac{1}{2}(\angle A + \angle B) = 180° - \angle AOB$ ...(ii)

From (i), (ii), we get

$\frac{1}{2}(360° - \angle C - \angle D) = 180° - \angle AOB$

$180° - \frac{1}{2}(\angle C + \angle D) = 180° - \angle AOB$

$\frac{1}{2}(\angle C + \angle D) = \angle AOB$

10. (a) Given, : $x + (180° - 80°) + (180° - 60°) + (100° - 90°) = 360°$

$\therefore x + 100° + 120° + 90° = 360°$

$x = 360° - 310° = 50°$

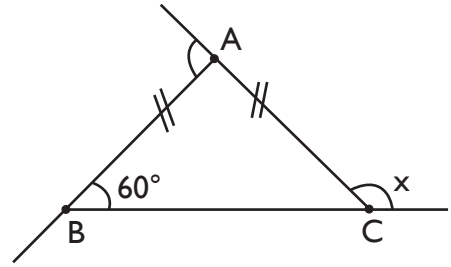
(b) We know that sum of exterior angles is 360°

$x + 40° + 30° + 80° + 45° = 360°$

$\Rightarrow x + 195° = 360°$

$\Rightarrow x = 360° - 195° = 165°$

(c)



$\angle ACB = 180° - x$ (linear pair)

As $AB = AC$

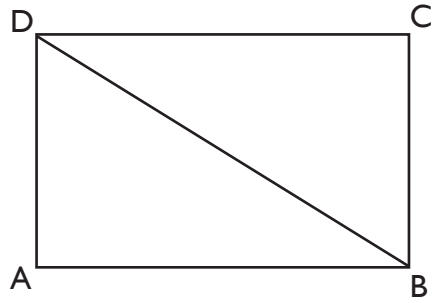
$\therefore \angle B = \angle C$

$\Rightarrow 60° = 180° - x$

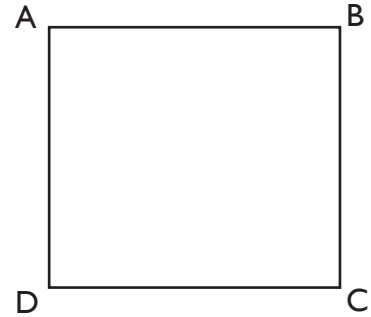
$\Rightarrow x = 180° - 60° = 120°$

WORKSHEET 4: KINDS OF QUADRILATERALS AND SOME PARALLELOGRAMS

1. (a) T
   (b) F
   (c) T
   (d) T
   (e) T
   (f) F
2. (a) F
   (b) T
   (c) F
   (d) F
   (e) F
3. (a) AD = BC ($\because$ opposite sides are equal)



   (b) DC = AB (opposite sides are equal)
   (c) BD = DB (common)
   (d) $\therefore \Delta ABD \cong \Delta CBD$ (By SSS)
4.



$\angle A + \angle C = 140°$

$\angle A + \angle A = 140°$

[Opposite angles of parallelogram are equal]

$2\angle A = 140°$

$\angle A = 70°$

$\therefore \angle A = \angle C = 70°$

Also, $\angle A + \angle B = 180°$

(sum of interior angles an same side of transversal is 180°)

$70° + \angle B = 180°$

$\angle B = 110°$

$\therefore \quad \angle D = \angle B = 110°$

(opposite angles of parallelogram are equal)

5. (a) QTSU is a parallelogram such that TU is a diagonal.

$\therefore \quad \Delta TQU \cong \Delta TUS$

[Diagonal of a parallelogram divides it into two congruent triangles]

$\therefore$ TS = QU (CPCT) ...(i)

(b) RSTU is a parallelogram such that SU is a diagonal

$\therefore \quad \Delta SUR \cong \Delta TSU$

[Diagonal of a parallelogram divides it into two congruent triangles]

$\therefore$ TS = UR (CPCT) ...(ii)

(c) By (i) and (ii)

TS = QU = UR

$\Rightarrow$ QU = UR

6. Quadrilateral is a square otherwise rhombus.

7. Let the angle be x

Other angle = x + 30°

x + x + 30° = 180° (sum of adjacent angles)

$\Rightarrow$ 2x = 180° – 30° = 150°

$\Rightarrow \quad x = \frac{150°}{2} = 75°$

8. Let the angle be x

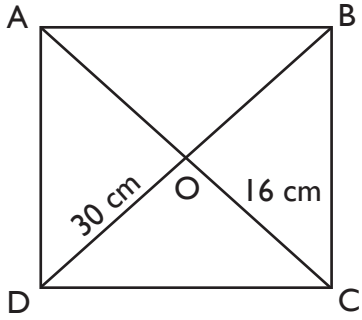
80° + 80° + x + x = 360° (opposite angles of rhombus are equal)

$\Rightarrow$ 160° + 2x = 360°

$\Rightarrow$ 2x = 360° – 160° = 200°

$x = \frac{200°}{2} = 100°$

Hence, measure of remaining angle = 100°

9. 

We know that diagonals of rhombus bisect each other

$\therefore \quad AO = OC = \frac{1}{2}AC$

$= \frac{1}{2}(16)$

$= 8$ cm

$BO = OD = \frac{1}{2}BD$

$= \frac{1}{2}(30)$

$= 15$ cm.

In ΔAOB,

$\angle AOB = 90°$

[Diagonals of rhombus bisect each other at 90°]

$\therefore \quad AB^2 = AO^2 + BO^2$

$= 8^2 + 15^2$

$= 64 + 225$

$= 289$

$\therefore \quad AB = \sqrt{289}$

$= 17$ cm

Hence,

AB = BC = CD = AD = 17 cm

[Since all sides of rhombus are equal].

10. Perimeter of parallelogram = 180 cm

Let one side = x

Other side = x + 6

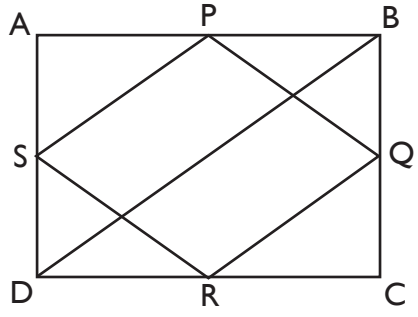
$\therefore$ perimeter = x + x + 6 + x + x + 6

$\Rightarrow$ 180 = 4x + 12

$\Rightarrow$ 4x = 180 – 12

$\Rightarrow \quad x = \frac{168}{4} = 42$

$\therefore$ Sides are 42, 42 + 6 = 48 cm

11. 

Join BD

In ΔABD,

P and S are midpoints of AB and AD respectively

$\Rightarrow$ PS || BD and $PS = \frac{1}{2}BD$ ...(i)

[By midpoint theroem]

Also, in ΔBCD,

Q and R are midpoints of BC and CD respectively.

$\therefore$ QR || BD and $QR = \frac{1}{2} BD$ ...(ii)

From (i) and (ii)

PS || RQ and PS = RQ

$\therefore$ PQRS is a parallelogram

[A quadrilateral in which a pair of sides is equal and parallel is a parallelogram].

12. Let two sides of 11 gm be 4x and 5x

Perimeter = 180

$\Rightarrow$ 4x + 5x + 4x + 5x = 180

$\Rightarrow$ 18x = 180

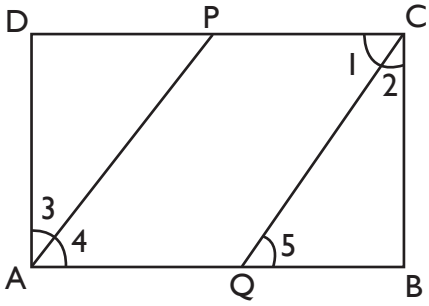
$\therefore$ x = 10

Sides of parallelogram are

4x = 4(10) = 40m

5x = 5(10) = 50m

13.



To prove: AP || CQ

ABCD is a parallelogram

$\Rightarrow$ AB || CD

$\Rightarrow$ PC || AQ

$\Rightarrow$ $\angle 1 = \angle 5$ ...(i) (Alternate interior angles)

Also, $\angle A = \angle C$ (opposite angles of parallelogram)

$\Rightarrow$ $\frac{1}{2} \angle A = \frac{1}{2} \angle C$

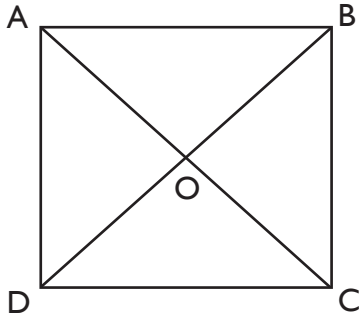
$\Rightarrow$ $\angle 4 = \angle 1$ ...(ii)

From (i), (ii), $\angle 4 = \angle 5$

$\Rightarrow$ AP || CQ

[$\because$ Corresponding angles are equal]

14.



ABCD is a square.

Consider ΔAOD and ΔAOB

AD = AB (All sides of square are equal)

AO = AO (Common)

OD = OB (Diagonals of square bisect each other)

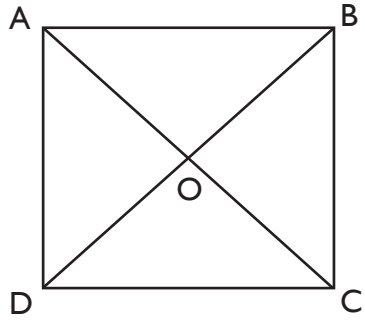
$\therefore$ $\Delta AOD \cong \Delta AOB$ (SSS)

$\Rightarrow$ $\angle AOD = \angle AOB$ (CPCT)

Also, $\angle AOD + \angle AOB = 180°$ (linear pair)

$\therefore$ $\angle AOD = \angle AOB = 90°$

15.



In ΔCOD and ΔBOC

CD = BC (All sides of square are equal)

OC = CO (Common)

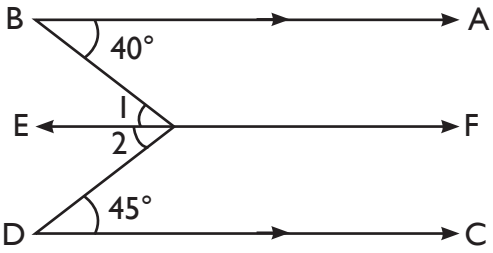
OD = OB (Diagonals of square bisect each other)

$\therefore$ $\Delta COD \cong \Delta BOC$ (SSS)

$\angle DOC = \angle BOC = 90°$ (CPCT and linear pair)

WORKSHEET (BASED ON COMPLETE CHAPTER)

1. (a) (ii)
   (b) (ii)
   (c) (ii)
   (d) (iii)
   (e) (ii)
2. (a) F
   (b) T
   (c) T
   (d) T
   (e) T
3. (a) Square
   (b) Kite
   (c) Rectangle
   (d) Not equal
   (e) equal

4. 

Draw EF || AB

Also, AB || CD

∴ EF || CD (Lines parallel to same line are parallel to each other)

As AB || EF

∴ $\angle 1 = \angle B = 40°$ (Alternate interior angles)

EF|| CD

∴ $\angle 2 = \angle D = 45°$ (Alternate interior angles)

So, $\angle BOD = \angle 1 + \angle 2$

$= 40° + 45°$

$= 85°$

5. Perimeter of ΔABC

$= AB + BC + AC$

$= 2AP + 2BQ + 2CR$

$= 2(AP + BQ + CR)$ ...(i)

[As P, Q, R are midpoints of AB, BC, AC respectively]

In ΔABC, Q and R are midpoints of BC and AC respectively.

∴ $RQ \parallel AB$ and $RQ = \frac{1}{2}AB$ [Midpoint therorem]

So, $RQ = \frac{1}{2}AB = AP$ ...(ii)

Similarly, $BQ = PR$ ...(iiii)

$CR = PQ$ ...(iv)

From (i), (ii), (iii) and (iv)

Perimeter of ΔABC

$= 2 (AP + BQ + CR)$

$= 2 (QR + PR + PQ)$

$= 2$ (Perimeter of ΔPQR)

6. $x + 50° = 180°$ (linear pair)

∴ $x = 180° - 50°$

$= 130°$

$w + 45° = 180°$ (linear pair)

$w = 180° - 45°$

$= 135°$

7. As $l_1 \parallel l_2$

$x + 120° = 180°$ (Interior angle)

∴ $x = 180° - 120° = 60°$

As $l_2 \parallel l_3$

$y = 120°$ (corresponding angles)

Also, $y + z = 180°$

$120° + z = 180°$

$z = 180° - 120° = 60°$

As $l_2 \parallel l_3$

∴ $u = 120°$ (corresponding angles)

8. (a) In ΔACD,

P and S are midpoints of AD and CD respectively

∴ PS || AC ...(i) (Midpoint theorem)

Also, In ΔABC,

Q and R are midpoints of AB and BC respectively.

∴ QR || AC ...(ii) (midpoint theorem)

So, AC || QR || PS [From (i) and (ii)]

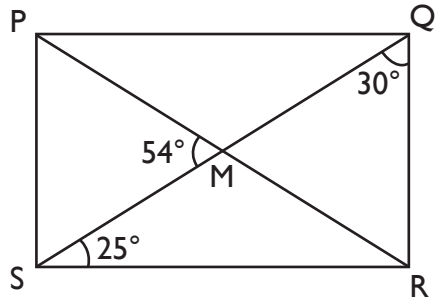
(b) In ΔBCD, S and R are midpoints of CD and BC respectively.

∴ SR || BD ...(iii) (midpoint theorem)

In ΔABD, P and Q are midpoints of AD and AB respectively.

∴ PQ || BD ...(iv) (midpoint theorem)

So, BP || PQ || SR [by (iii) and (iv)]

9. 

(a) In ΔSQR,

$\angle R + \angle SQR + \angle QSR = 180°$

$\Rightarrow \angle R + 30° + 25° = 180°$

$\Rightarrow \angle R = 180° - 30° - 25°$

$= 125°$

∴ $\angle P = \angle R = 125°$

(opposite angles of parallelogram)

(b) $\angle SMR + \angle PMS = 180°$ (linear pair)

$\angle SMR + 54° = 180°$

$\angle SMR = 180° - 54°$

$= 126°$

In ΔSMR,

$\angle SMR + \angle MSR + \angle MRS = 180°$

$126° + 25° + \angle MRS = 180°$

$\therefore \quad \angle MRS = 180° - 126° - 25° = 29°$

As PQ || RS

$\angle P + \angle S = 180°$ (interior angles)

$\therefore \quad 125° + \angle S = 180°$

$\angle S = 180° - 125° = 55°$

$\therefore \quad \angle PSR = 55°$.

10. (a) Rhombus

(b) Square

(c) Rectangle

11. (a) As diagonals of a rectangle are equal and bisect each other

$\therefore \quad AP = CP = \frac{1}{2} AC$ ...(i)

$BP = PD = \frac{1}{2} BD$ ...(ii)

In ΔBPC, BP = CP [From (i) and (ii)]

$\Rightarrow \quad \angle PBC = \angle PCB$

In ΔBPC, $\angle BPC + \angle PBC + \angle PCB = 180°$

$124° + \angle PBC + \angle PCB = 180°$

$\angle PBC + \angle PBC = 180° - 124°$

$(\because \quad \angle PBC = \angle PCB)$

$= 56°$

$\Rightarrow \quad \angle PBC = \frac{56°}{2} = 28°$

$\therefore \quad \angle PBC = \angle PCB = 28°$

Also, $\angle B = 90°$

[Each angle of rectangle is a right angle]

$\Rightarrow \quad \angle PBC + \angle ABP = 90°$

$\Rightarrow \quad 28° + \angle ABP = 90°$

$\Rightarrow \quad \angle ABP = 90° - 28°$

$= 62°$

Also, $\angle APB + \angle BPC = 180°$ (linear pair)

$\Rightarrow \quad \angle APB + 124° = 180°$

$\Rightarrow \quad \angle APB = 180° - 124°$

$= 56°$

In ΔAPB,

$\angle ABP + \angle APB + \angle BAP = 180°$

$\Rightarrow \quad 62° + 56° + \angle BAP = 180°$

$\Rightarrow \quad \angle BAP = 180° - 62° - 56°$

$= 62°$

(b) $\angle ABP = 62°$ (Solved above).

12. (a) AB = BC (All sides of rhombus are equal)

$\Rightarrow \quad \angle BAC = \angle BCA = 72°$

(Angles opposite to equal sides are equal)

(b) $\angle DAC = \angle ACB$

$= 72°$ (Alternate interior angles)

(c) In ΔABC,

$\angle B + \angle BAC + \angle BCA = 180°$

$\Rightarrow \quad \angle B + 72° + 72° = 180°$

$\Rightarrow \quad \angle B + 144° = 180°$

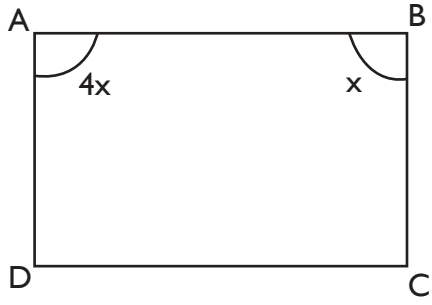
$\Rightarrow \quad \angle B = 180° - 144°$

$= 36°$

$\angle ADC = \angle B = 36°$

(opposite angles of rhombus are equal)

13.



Let $\angle B = x$

$\Rightarrow \quad \angle A = 4x$

$\angle D = \angle B = x$ (opposite angles of parallelogram)

$\angle C = \angle A = 4x$

$\angle A + \angle B = 180°$ (interior angles)

$4x + x = 180°$

$5x = 180°$

$\Rightarrow \quad x = 36°$

$\therefore \quad \angle D = \angle B = 36°$

$\angle C = \angle A = 4(36°) = 144°$

AB = CD (opposite sides of parallelogram are equal)

$\Rightarrow \quad 5x - 7 = 3x + 1$

$\Rightarrow \quad 2x = 8$

$\Rightarrow \quad x = 4$

$\therefore \quad CD = 3x + 1$

$= 3(4) + 1$

$= 13$

14. (i) Consider ΔDMC and ΔBNA

$DM = BN$ (given)

$CD = AB$

(opposite sides of parallelogram are equal)

$\angle CDM = \angle ABN$

(Alternate interior angles)

$\therefore$ $\Delta DMC \cong \Delta BNA$ (SAS)

$MC = AN$ (CPCT) ...(1)

(ii) In ΔAMD and ΔCNB

$AD = BC$

(opposite sides of parallelogram are equal)

$DM = BN$ (given)

$\angle ADM = \angle CBN$

(Alternate interior angles)

$\therefore$ $\Delta AMB \cong \Delta CNB$ (SAS)

$AM = CN$ (CPCT) ...(2)

(iii) From (1), (2) we get

$MC = AN$

$AM = CN$

$\therefore$ ANCM is a parallelogram

(as opposite sides are equal)

Chapter
04 Data Handling

WORKSHEET 1: DATA HANDLING

1. (a) Data
   (b) Raw data
   (c) Frequency
   (d) an array
   (e) 5
   (f) 16
   (g) 40
2. (a) 5, 7, 10, 11, 12, 15, 16
   (b) 3.8, 6.5, 6.9, 7.3, 8.9, 13.4
3. (a) 12.6, 9.8, 9.3, 7.3, 4.9, 4.5
   (b) 6, 5, 4, 4, 3, 3, 2, 0
4. Frequency table is:

Class Interval	Tally Marks	Frequency
0–10	III	3
10–20	𝍸 II	7
20–30	𝍸 IIII	9
30–40	𝍸 I	6
40–50	𝍸	5
Total		20

5. (a) 50
   (b) 100
   (c) 250
   (d) $\frac{250+300}{2} = 225$
   (e) 8, 14
6. (a) 10
   (b) 10
   (c) 60
   (d) $\frac{50+60}{2} = \frac{110}{2} = 55$
   (e) 6
7.

Class Size	Tally Marks	Frequency
0–10	III	3
10–20	𝍸 II	7
20–30	𝍸 𝍸 IIII	14
30–40	𝍸 IIII	9
40–50	𝍸 II	7
Total		40

8.

Class Size	Tally Marks	Frequency
400–500	I	1
500–600	𝍸	5
600–700	III	3
700–800	III	3
800–900	III	3
Total		15

9. Decreasing order:-

   190, 188, 181, 176, 171, 164, 161, 160, 155, 152, 150, 144, 140, 137, 133, 130, 124, 117, 114, 110

Class size	Tally marks	Frequency
100–110	–	–
110–120	III	3
120–130	I	I
130–140	III	3
140–150	II	2
150–160	III	3
160–170	III	3
170–180	II	2
180–190	II	2
190–200	I	I
Total		20

10.

Weights	Tally marks	Frequency
100–200	𝍸 I	6
200–300	𝍸 𝍸 II	12
300–400	𝍸 𝍸 𝍸	15
400–500	𝍸 III	8
500–600	III	3
600–700	IIII	4
Total		48

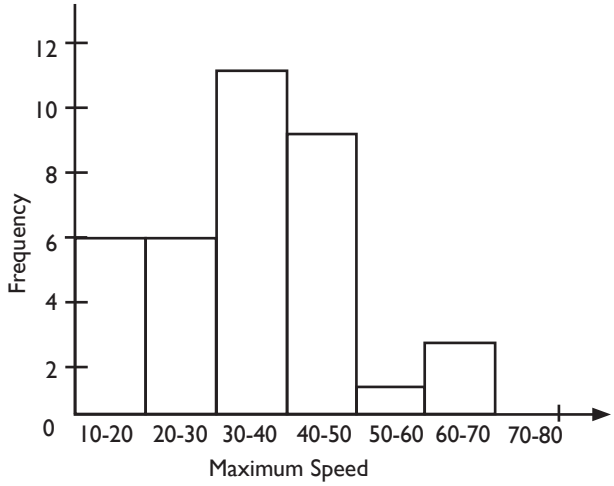
11.

Class Interval	Tally marks	Frequency
30–35	I	I
35–40	IIII	4
40–45	III	3
45–50	IIII	4
50–55	𝍸	5
55–60	III	3
Total		20

(a) 30–35

(b) 50–55

WORKSHEET 2: PICTOGRAPH, BAR GRAPH, DOUBLE BAR GRAPH, PIE CHART AND HISTOGRAM

1. (a) (iv)
   (b) (i)
   (c) (i)
   (d) (ii)
   (e) (iv)
   (f) (iv)
2. (a) Total number of people
   = 8 + 14 + 6 + 7 + 4 = 28 + 11 = 39
   (b) 7 + 4 = 11
   (c) 8 + 14 = 22
   (d) 14
3. 

4. (a) 4% of 350
   $= \frac{4}{100} \times 350 = \frac{4}{10} \times 35 = \frac{2}{5} \times 35$
   = 2 × 7 = 14 children
   (b) (32% + 36% + 4%) of 350
   = 72% of 350
   $= \frac{72}{100} \times 350 = 252$ children
   (c) (4% + 10% + 32%) of 350
   = 46% of 350
   $= \frac{46}{100} \times 350 = 161$ children

(d) Number of children who spend 2 hours or more per day = (10% + 36% + 32% + 4%) = 82% of 350

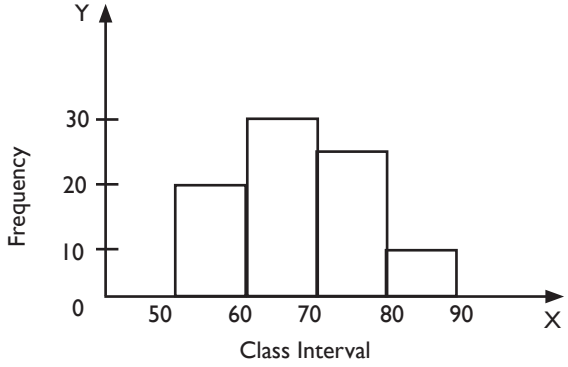
$= \frac{82}{100} \times 350 = \frac{82 \times 35}{10}$

$= \frac{41 \times 35}{5} = 41 \times 7 = 287$ students

Number of children who spend less than one hour = 14% of 350 $= \frac{14}{100} \times 350 = \frac{14 \times 35}{10} = 49$

∴ Number of children who spend 2 hours or more per day is greater than number of children who spend one hour per day.

5.



6. Total monthly income = ₹ 8000

Money spent on rent = ₹ 2500

Money spent on food = ₹ 1700

Money spent on education = ₹ 800

Money spent on others = ₹ 2100

Monthly Savings = ₹ 8000 – (₹ 2500 + ₹ 1700 + ₹ 800 + ₹ 2100)

= ₹ 8000 – ₹ 7100

= ₹ 900

Central Angle:

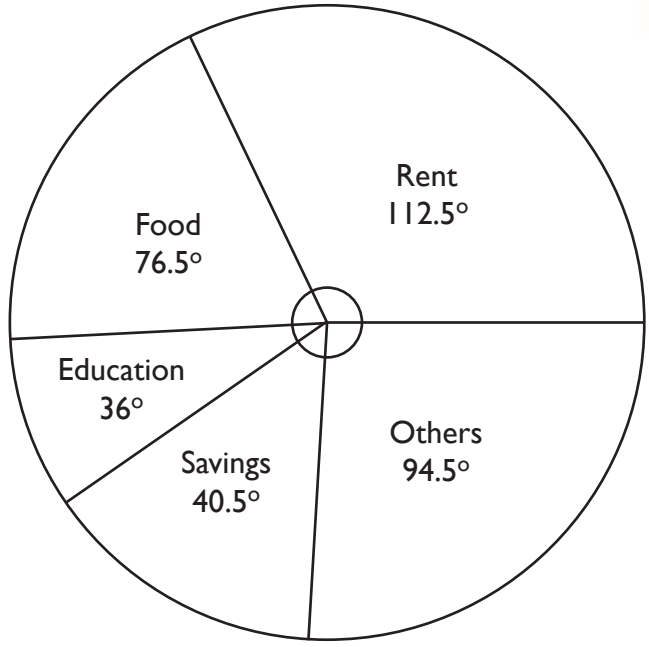
Rent = $\frac{2500}{8000} \times 360 = 112.5°$

Food = $\frac{1700}{8000} \times 360 = 76.5°$

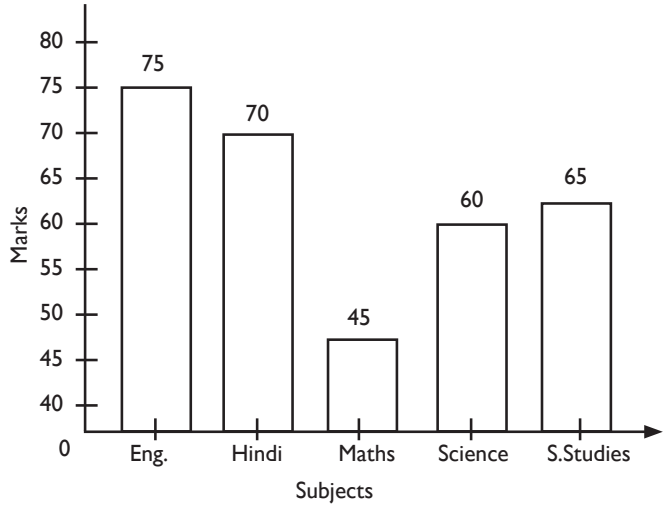
Education = $\frac{800}{8000} \times 360 = 36°$

Others = $\frac{2100}{8000} \times 360 = 94.5°$

Savings = $\frac{900}{8000} \times 360 = 40.5°$



7.



8. (a) 16 workers

(b) 8 + 12 + 16 = 36 workers

(c) Number of workers with wages less than ₹ 110 = 12 + 8 + 4 = 24 workers

Number of workers with wages more than ₹ 100 = 12 + 16 + 15 + 11 = 54 workers

Percentage = $\frac{24}{54} \times 100 = 44.4\%$

WORKSHEET 3: CHANCE AND PROBABILITY

1. (a) likely event

(b) impossible

(c) certain

(d) random

(e) 1

(f) 1

2. (a) (ii)
(b) (i)
(c) (iii)
(d) (iii)

3. When a dice is thrown once, the possible outcomes are 1, 2, 3, 4, 5 and 6

∴ Total outcomes = 6

(a) Odd numbers = 1, 3, 5

P (an odd number) = $\frac{3}{6} = \frac{1}{2}$

(b) P (number less than 5) = $\frac{4}{6} = \frac{2}{3}$

(c) P (a composite number) = $\frac{2}{6} = \frac{1}{3}$

(d) P (divisible by 6) = $\frac{1}{6}$

4. Total balls = 16

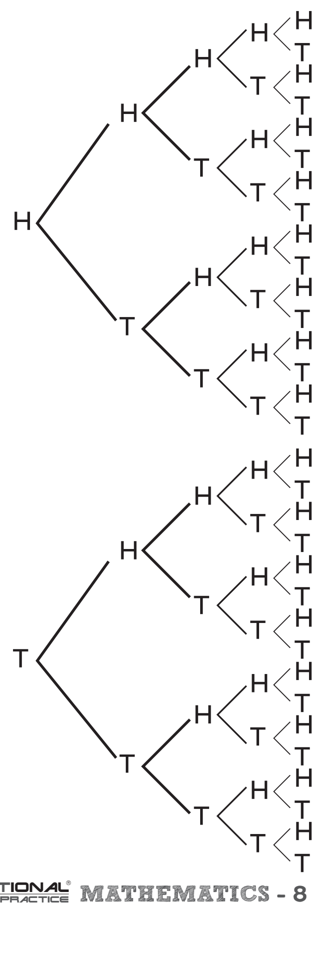
Black balls = 7

White balls = 16 – 7 = 9

(a) P (a black ball) = $\frac{7}{16}$

(b) P (a white ball) = $\frac{9}{16}$

5. When five coins are tossed simultaneously, outcomes are:



(a) P (three heads) = $\frac{10}{32} = \frac{5}{16}$

(b) P (atleast two heads) = $\frac{26}{32} = \frac{13}{16}$

(c) P (only tails) = $\frac{1}{32}$

(d) P (atleast one tail) = $\frac{31}{32}$

(e) P (exactly two tails) = $\frac{10}{32}$

6. Total tickets = 850

Total prizes to be won = 17

P (Akash winning a prize) = $\frac{17}{850} = \frac{1}{50}$

7. Total number of blue marbles = 11

Total number of green marbles = 13

Total number of red marbles = 6

Total number of marbles = 11 + 13 + 6 = 30

(a) P (a red marble) = $\frac{6}{30} = \frac{1}{5}$

(b) P (a blue marble) = $\frac{11}{30}$

(c) P (a green marble) = $\frac{13}{30}$

8. (a) Total number of cards = 12

Odd numbered cards = 1, 3, 5, 7, 9, 11
= 6 cards

P (an odd number) = $\frac{6}{12} = \frac{1}{2}$

(b) Factors of 12 = 1, 2, 3, 4, 6, 12 = 6 cards

P (a factor of 12) = $\frac{6}{12} = \frac{1}{2}$

(c) Numbers divisible by 3 = 3, 6, 9, 12
= 4 cards

P (a number divisible by 3) = $\frac{4}{12} = \frac{1}{3}$

(d) Multiples of 2 = 2, 4, 6, 8, 10, 12 = 6 cards

P (a multiple of 2) = $\frac{6}{12} = \frac{1}{2}$

WORKSHEET (BASED ON COMPLETE CHAPTER)

1. Students do not like any game
= 2500 – (100 + 650 + 450 + 150)
= 2500 – 2250 = 250

Central Angle:

Students who like cricket = $\frac{1000}{2500} \times 360 = 144°$

Students who like football = $\frac{650}{2500} \times 360 = 93.6°$

Students who like tennis = $\frac{450}{2500} \times 360 = 64.8°$

Students who like basketball = $\frac{150}{2500} \times 360 = 21.6°$

Students who do not like any game = $\frac{250}{2500} \times 360$
$= 36°$

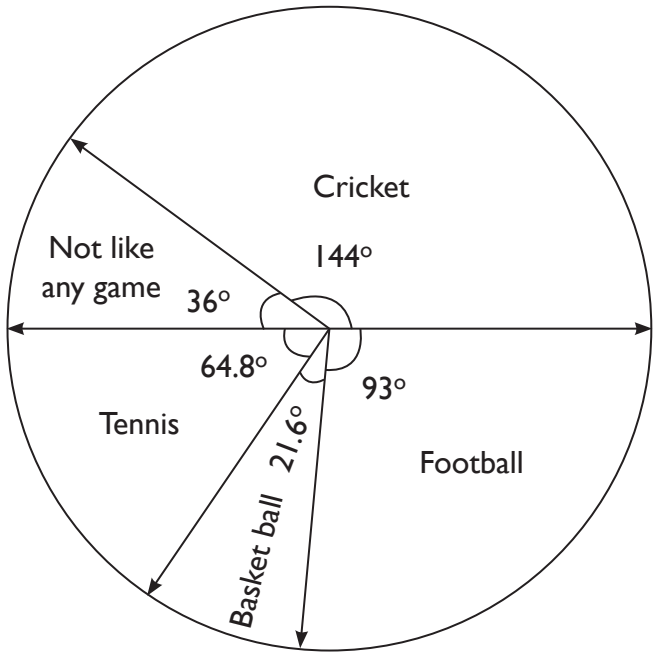
2. Total pages = 92
   Sum of the digits is 9 = (0, 9) (2, 7) (4, 5) (3, 6) (7, 2) (5, 4) (6, 3) (1, 8) (8, 1) (9, 0)
   P (sum of the digits is 9) = $\frac{10}{92} = \frac{5}{46}$

3. The possible outcomes = 1, 2, 3, 4, 5 and 6
   Even numbers = 2, 4, 6
   Odd numbers = 1, 3, 5
   (a) P (an even number) = $\frac{3}{6} = \frac{1}{2}$
   (b) P (an odd number) = $\frac{3}{6} = \frac{1}{2}$
   (c) P (not an even number) = $\frac{3}{6} = \frac{1}{2}$

4. The possible outcomes = HH, HT, TH and TT
   (a) P (atleast one head) = $\frac{3}{4}$
   (b) P (both heads or both tails) = $\frac{1}{4}$

5. Total letters in word 'PENCIL' = 6
   Total vowels in word 'PENCIL' = E, I = 2
   Total consonants in word 'PENCIL' = 6 – 2 = 4
   P (a consonant) = $\frac{4}{6} = \frac{2}{3}$

6. Total letters in word 'TRIANGLE' = 8
   Total vowels in word 'TRIANGLE' = T, R, N, G, L
   = 5
   P (a vowel) = $\frac{5}{8}$



Chapter 05 Squares and Square Roots

WORKSHEET 1: PERFECT SQUARE

1. (a) square
   (b) square root, x
   (c) perfect square
   (d) $300 \times 300 = 90,000$
   (e) p
   (f) like

2. (a) $(58)^2 = 58 \times 58 = 3364$
   (b) $(9.6)^2 = 9.6 \times 9.6 = 92.16$
   (c) $\left(17\frac{2}{3}\right)^2 = \left(\frac{53}{3}\right)^2 = \frac{53}{3} \times \frac{53}{3} = \frac{2809}{9}$

3. (a) $11025 = \sqrt{\underline{5\times5}\times\underline{3\times3}\times\underline{7\times7}}$
   $= 5 \times 3 \times 7$
   $= 105$

5	11025
5	2205
3	441
3	147
7	49
7	7
	1

   (b) 396900
   $= \sqrt{\underline{2\times2}\times\underline{5\times5}\times\underline{3\times3}\times\underline{3\times3}\times\underline{7\times7}}$
   $= 2 \times 5 \times 3 \times 3 \times 7$
   $= 90 \times 7 = 630$

2	396900
2	198450
5	99225
5	19845
3	3969
3	1323
3	441
3	147
7	49
7	7
	1

   (c) 194481
   $= \sqrt{\underline{3\times3}\times\underline{3\times3}\times\underline{7\times7}\times\underline{7\times7}}$
   $= 3 \times 3 \times 7 \times 7$
   $= 9 \times 49 = 441$

3	194481
3	64827
3	21609
3	7203
7	2401
7	343
7	49
7	7
	1

4. We have, 2592
   $= \sqrt{\underline{2\times2}\times\underline{2\times2}\times2\times\underline{3\times3}\times\underline{3\times3}}$
   As the prime factor 2 has no pair, 2592 is not a perfect square.
   If 2 gets a pair then the number will become a perfect square. So, 2 should be multiplied to make 2592 a perfect square.
   2592×2
   $= \underline{2\times2}\times\underline{2\times2}\times\underline{2\times2}\times\underline{3\times3}\times\underline{3\times3}$
   Now, each prime factor is in pair.
   $\therefore$ $2592 \times 2 = 5184$ is a perfect square

2	2592
2	1296
2	648
2	324
2	162
3	81
3	27
3	9
3	3
	1

5. We have, 10368
   $= \underline{2\times2}\times\underline{2\times2}\times\underline{2\times2}\times\underline{3\times3}\times\underline{3\times3}\times2$
   As the prime factor 2 has no pair.
   10368 is not a perfect square
   If 2 gets a pair then the number will become a perfect square so multiply 10368 by 2 to get 10368×2
   $= \underline{2\times2}\times\underline{2\times2}\times\underline{2\times2}\times\underline{2\times2}\times\underline{3\times3}\times\underline{3\times3}$
   Now, each prime factor is in pair.
   $\therefore$ $10368 \times 2 = 20736$ is a perfect square

2	10368
2	5184
2	2592
2	1296
2	648
2	324
2	162
3	81
3	27
3	9
3	3
	1

And $\sqrt{20736} = 2 \times 2 \times 2 \times 2 \times 3 \times 3$

$= 16 \times 9 = 144$

6. (a) $\sqrt{0.1764} = 0.42$

	0.42
4	0.1764
	16
82	164
	164
	×

(b) $\sqrt{0.0169} = 0.13$

	0.13
1	0.0169
	-1
23	69
	-69
	×

(c) $96\frac{1}{25} = \frac{2401}{25} = \sqrt{\frac{2401}{25}} = \frac{49}{5}$

7. (a) $\sqrt{\underline{3\times3}\times\underline{6\times6}\times6\times\underline{2\times2}\times\underline{2\times2}}$

$= 3 \times 6 \times 2 \times 2 \times \sqrt{6}$

$= 72 \times 2.45 = 176.4$

(b) $\sqrt{\underline{0.5\times0.5}\times0.5\times\underline{6\times6}\times6\times\underline{3\times3}\times\underline{3\times3}\times3}$

$= 0.5 \times 6 \times 3 \times 3\ \sqrt{0.5\times6\times3}$

$= 27\times\sqrt{9} = 27 \times 3 = 81$

(c) $\sqrt{\frac{14.4}{22.5}} = \frac{12}{15} = \frac{4}{5}$

(d) $\sqrt{\frac{25}{32}\times\frac{0.25}{2}} = \sqrt{\frac{6.25}{64}} = \frac{2.5}{8}$

(e) $\sqrt{81\times16\times32\times242}$

$= \sqrt{\underline{9\times9}\times\underline{4\times4}\times\underline{4\times4}\times\underline{2\times2}\times\underline{11\times11}}$

$= 9 \times 4 \times 4 \times 2 \times 11 = 3168$

8. LCM of 3, 4, 5 and 6 $= 3 \times \underline{2 \times 2} \times 5 = 60$

We see that prime factors 3 and 5 are not in pairs
$\therefore$ 60 is not a perfect square.

Hence the required square number is $60 \times 3 \times 5 = 900$

3	3,4,5,6
2	1,4,5,2
2	1,2,5,1
5	1,1,5,1
	1,1,1,1

9. 12 and 21 is a strange pair of numbers such that square of 12 is 144 and 21 is 441.

10. (a) $\sqrt{7.84} + \sqrt{78400} = 2.8 + 280 = 282.8$

(b) $\sqrt{0.0784} + \sqrt{0.000784} = 0.28 + 0.028$

$= 0.308$

11. Total students = 745

Students left out = 16

$\therefore$ Remaining students = 745 – 16 = 729

A.T.Q

$x \times x = 729$

$\Rightarrow x^2 = 729$

$\Rightarrow x = \sqrt{729} = 27$

$\therefore$ The number of rows for P.T. display in the school field after 16 students being left out is 27.

12. (a) $(36)^2 - (35)^2 = (36 + 35)(36 - 35)$

$= 71 \times 1 = 71$

(b) $(98)^2 - (97)^2 = (98 + 97)(98 - 97)$

$= 195 \times 1 = 195$

(c) $(147)^2 - (146)^2 = (147 + 146)(147 - 146)$

$= 293 \times 1 = 293$

(d) $(105)^2 - (104)^2 = (105 + 104)(105 - 104)$

$= 209 \times 1 = 209$

13. (a) $(15)^2 + (85)^2 = 225 + 7225 = 7450$

$(87)^2 = 7569 \neq 7450$

$\therefore (15)^2 + (85)^2 \neq (87)^2$

So, this is not a Pythagorean Triplet.

(b) $(30)^2 + (224)^2 = 900 + 50176$

$= 51076$

$(226)^2 = 51076$

$\therefore (30)^2 + (224)^2 = (226)^2$

Yes, it is a Pythagorean Triplet.

(c) $(42)^2 + (440)^2 = 1764 + 193600$

$= 195364$

$(442)^2 = 195364 = 195364$

So, this is a Pythagorean Triplet.

(d) $(10)^2 + (24)^2 = 100 + 576 = 676$

$(26)^2 = 576$

$\therefore (10)^2 + (24)^2 = (26)^2$

Yes, it is a Pythagorean Triplet

(e) $(9)^2 + (81)^2 = 81 + 6561 = 6642$

$(82)^2 = 6724 \neq 6642$

$\therefore (9)^2 + (81)^2 \neq (82)^2$

So, this is not a Pythagorean Triplet.

14. (a) 9 (b) 11

(c) 13 (d) 15

WORKSHEET 2: SQUARE ROOT AND PROPERTIES OF SQUARE NUMBERS

1. (a) $\sqrt{245} = 15.65$ (b) $\sqrt{496} = 22.271$

(c) $\sqrt{0.065} = 0.255$ (d) $\sqrt{5.2005} = 2.28$

2. (a) $\sqrt{4761} = 69$

	69
6	4761
	36
129	1161
	1161
	×

(b) $\sqrt{7744} = 88$

	88
8	7744
	64
168	1344
	1344
	×

(c) $\sqrt{15129} = 123$

	123
1	15129
	1
22	51
	44
243	729
	729
	×

(d) $\sqrt{0.001225} = 0.035$

	0.035
3	0.001225
	9
65	325
	325
	×

(e) $\sqrt{0.023104} = 0.152$

	0.152
1	0.023104
	1
25	131
	125
302	604
	604
	×

3. (a) $3\frac{4}{5} = \frac{19}{5} \therefore \sqrt{\frac{19}{5}} = \sqrt{3.8} = 1.95$

(b) $6\frac{7}{8} = \frac{55}{8} \therefore \sqrt{\frac{55}{8}} = \sqrt{6.875} = 2.62$

4. (a) 796

Here, we get a remainder 12
Thus, the number to be subtracted so as to make it a perfect square is 12.

	28
2	796
	4
48	396
	384
	12

$\therefore$ Required perfect square

$= 796 - 12$

$= 784$

and $\sqrt{784} = 28$

(b) 1886

Here, we get a remainder 37
Thus, the number to be subtracted so as to make it a perfect square is 37.

	43
4	1886
	16
83	286
	249
	37

$\therefore$ Required perfect square

$= 1886 - 37 = 1849$

$\sqrt{1849} = 43$

(c) 23497

Here, we get a remainder 88
Thus, the number to be subtracted so as to make it a perfect square is 88.

$\therefore$ Required perfect square
$= 23497 - 88$

$= 23409$

$\sqrt{23409} = 153$

	153
1	23497
	1
25	134
	125
303	997
	909
	88

5. (a) 511

Here, we get a remainder = 27

As $511 > (22)^2$

But the next square number is 23

Hence, the required number to be added = $(23)^2 - 511 = 529 - 511 = 18$

Thus, $511 + 18 = 529$

$\therefore \sqrt{529} = 23$

	22
2	5 11
	4
42	111
	84
	27

(b) 7172

Here, we get a remainder = 116

As $7172 > (84)^2$

But the next square number is 85

Hence, the required number to be added

$= (85)^2 - 7172 = 7225 - 7172 = 53$

Thus, $7172 + 53 = 7225$

$\sqrt{55225} = 85$

	84
8	71 72
	64
164	772
	656
	116

(c) 55078

Here, we get a remainder = 322

$55078 > (234)^2$

But the next square number is 235

$\therefore$ Hence, the required number to be added

$= (235)^2 - 55078 = 55225 - 55078 = 147$

Thus, $55078 + 147 = 55225$

$\therefore \sqrt{55225} = 235$

	234
2	55078
	4
43	150
	129
464	2178
	1856
	322

6. Square root of $7 = \sqrt{7} = 2.64$

$$\therefore \frac{4+\sqrt{7}}{4-\sqrt{7}} = \frac{4+2.64}{4-2.64}$$

$$= \frac{6.64}{1.36}$$

$= 4.882$

	2.64
2	70000
	4
46	300
	276
524	2400
	2096
	304

7. Square root of $5 = \sqrt{5} = 2.23$

$$\therefore \frac{3-\sqrt{5}}{3+\sqrt{5}} = \frac{3-2.23}{3+2.23}$$

$$= \frac{0.77}{5.23} = \frac{77}{523} = 0.15$$

	2.23
2	50000
	4
42	100
	84
443	1600
	1329
	271

8. (a) 57^2

As $(7)^2 = 49$, unit's place digit = 9

$\therefore (57)^2$ will not have unit's digit as 1.

(b) 69^2

As $(9)^2 = 81$, unit's place digit = 1

$(69)^2$ will have 1 at their unit's place.

(c) $(321)^2$

As $(1)^2 = 1$, unit's place digit = 1

$\therefore (321)^2$ will have 1 at their unit's place.

9. (a) 3051

The unit digit of 3051 = 1

So, it can be a square of a number.

(b) 6908

The unit digit of 6908 = 8. So, it cannot be a square of a number.

(c) 50699

$\therefore$ The unit's digit of 50699 = 9. So, it can be a square of a number.

(d) 5684

The unit digit of 5684 = 4. So, it can be a square of a number.

10. (a) 35^2 : unit's place digit = 5

As $5^2 = 25$

$\therefore 35^2$ will not have unit's digit as 6.

(b) 23^2 : unit's place digit = 3

As $3^2 = 9$

$\therefore 23^2$ will not have unit's digit as 6

(c) 64^2 : unit's place digit = 4

As $4^2 = 16$

$\therefore 64^2$ will have unit's digit as 6.

(d) 98^2 : unit's place digit = 8

As $8^2 = 64$

$\therefore$ 98^2 will not have unit's digit as 6.

11. No, because 5 is an odd number.

12. The number will have six zeroes.

13. (a) 43^2 : unit's place digit = 3

As $3^2 = 9$

$\therefore$ 43^2 will not have unit's digit as 6

(b) 34^2 : unit's place digit = 4.

As $4^2 = 16$

$\therefore$ 34^2 will have unit's digit as 6.

(c) 244^2 : unit's place digit = 4

As $4^2 = 16$

$\therefore$ 244^2 will have unit digit as 6.

(d) 49^2 : unit's place digit = 9

As $9^2 = 81$

$\therefore 49^2$ will not have unit's digit as 6.

14. (a) The unit place of 2162 is 2. It cannot be a perfect square as the number having 2, 3, 7 or 8 at the unit place is never a perfect square.

(b) The unit place of 6598 is 8. It cannot be a perfect square as the number having 2, 3, 7 or 8 at the unit place is never a perfect square.

15. The number ending with odd number of zeroes can never be a perfect square. As the given numbers 640,81000 and 3600000 have odd number of zeroes in the end, none of the given numbers can be a perfect square.

16. (a) odd number.

(b) even number.

(c) even number.

(d) odd number.

17. Let the side of square field = x

Area of square field = 15625 m^2 (given)

$\Rightarrow$ $x \times x = 15625$

$\Rightarrow$ $x^2 = 15625$

$\Rightarrow$ $x^2 = \left(\underline{5\times5}\times\underline{5\times5}\times\underline{5\times5}\right)$

$\Rightarrow$ $x^2 = (5 \times 5 \times 5)^2$

$\Rightarrow$ $x = 125m$

Cost of fencing the field = $4 \times 125 \times 17 = ₹\ 8500$

18. We have $338 = 2 \times \underline{13\times13}$

If we multiply 338 by 2, then

$338 \times 2 = \underline{2\times2}\times\underline{13\times13}$

2	338
13	169
13	13
	1

Thus, the least number is 2, which must be multiplied to make it a perfect square.

$\sqrt{338\times2} = 13 \times 2$

$\sqrt{676} = 26$

19. Let the no. of rows be x.

Also, number of columns = x

A.T.Q.

$x \times x = 2500$

$\Rightarrow$ $x^2 = 2500$

$\Rightarrow$ $x^2 = \underline{5\times5}\times\underline{5\times5}\times\underline{2\times2}$

$\Rightarrow$ $x^2 = (5 \times 5 \times 2)^2$

$\Rightarrow$ $x = 50$

5	2500
5	500
5	100
5	20
2	4
2	2
	1

$\therefore$ The number of rows and the number of columns is 50.

Number of plants in each row and in each column $= \frac{2500}{50} = 50$

20. We have

$1575 = \underline{3\times3}\times\underline{5\times5}\times7$

If we divide the number by 7, then

$1575 \div 7 = \frac{3\times3\times5\times5\times7}{7}$, which is a perfect square.

3	1575
3	525
5	175
5	35
7	7
	1

$\sqrt{225} = \sqrt{\underline{3\times3}\times\underline{5\times5}} = 3 \times 5 = 15.$

21. $11^2 = 121$

$101^2 = 10201$

$1001^2 = 1002001$

$10001^2 = 100020001$

$100001^2 = 10000200001$

$1000001^2 = 1000002000001$

WORKSHEET (BASED ON COMPLETE CHAPTER)

1. (a) (ii) (b) (ii)
   (c) (ii) (d) (ii)
   (e) (ii)
2. (a) perfect square (b) Pythagorean Triplet
   (c) p (d) odd
   (e) rational
3. (a) False (b) True
   (c) True (d) True
4. (a) 27556

2	27556
2	13778
83	6889
83	83
	1

$27556 = \underline{2\times 2}\times\underline{83\times 83}$

$= 2 \times 83 = 166$

(b) 30625

5	30625
5	6125
5	1225
5	245
7	49
7	7
	1

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

$= 5 \times 5 \times 7$

$= 175$

5. Given, length (l) = 8 cm

   breadth (b) = 6 cm

   Diagonal of rectangular field = $\sqrt{l^2 + b^2}$

   $= \sqrt{8^2 + 6^2}$

   $= \sqrt{64 + 36}$

   $= \sqrt{100}$

   = 10 cm

6. Area of square field = 627.5025 cm^2

   side × side = 627.5025

   $\Rightarrow$ $(side)^2 = 627.5025$

   $\Rightarrow$ $side = \sqrt{627.5025} = 25.05$ cm.

7. $\dfrac{\sqrt{867.3025}}{\sqrt{241.8025}} = \dfrac{29.45}{15.55} = \dfrac{2945}{1555} = 1.894$

8. We have, $\sqrt{25921} = 161$

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

$= 16.1 - 1.61 = 14.49$

	161
1	25921
	1
26	159
	156
321	321
	321
	×

9. We have, $\sqrt{18496} = 136$

$13.6 \times 1.36 = 18.496$

	136
1	18496
	1
23	84
	69
266	1596
	1596
	×

10. We have, $\sqrt{19044} = 138$

$\sqrt{190.44} \div \sqrt{1.9044}$

$= 13.8 \div 1.38 = 10$

	138
1	19044
	1
23	90
	69
266	2144
	2144
	×

11. Let the number be x

    A.T.Q.

    $x \times x = 20.25 \Rightarrow x^2 = 20.25$

    $\Rightarrow x = 4.5$

12. Area of square field = 3136 m^2

2	3136
2	1568
2	784
2	392
2	196
2	98
7	49
7	7
	1

    side × side = 3136

    $\Rightarrow$ $(side)^2 = 3136$

    $\Rightarrow$ $(side)^2 = (\underline{2\times 2}\times\underline{2\times 2}\times\underline{2\times 2}\times 7\times 7)$

    $\Rightarrow$ $(side)^2 = (2 \times 2 \times 2 \times 7)^2$

    $\Rightarrow$ side = 56 m

13. (a) $\sqrt{20.8849} = 4.57$

    (b) $\sqrt{0.00011025} = 0.0105$

    (c) $\sqrt{\dfrac{2916}{2209}} = \dfrac{54}{47}$

    (d) $1\dfrac{120}{169} = \sqrt{\dfrac{289}{169}} = \dfrac{17}{13}$

    (e) $\sqrt{65.79} = 8.111$

Chapter

06 Cubes and Cube Roots

WORKSHEET 1: PERFECT CUBE

1. (a) x^3 (b) 8, 2
   (c) 3, 7 (d) same
   (e) 3

2. (a) (ii) (b) (ii)
   (c) (ii) (d) (iii)
   (e) (ii)

3. (a) $(7)^3 = 7 \times 7 \times 7 = 343$
   (b) $(31)^3 = 31 \times 31 \times 31 = 29791$
   (c) $(42)^3 = 42 \times 42 \times 42 = 74088$
   (d) $(54)^3 = 54 \times 54 \times 54 = 157464$

4. (a) $(2.1)^3 = 2.1 \times 2.1 \times 2.1 = 9.261$
   (b) $(0.4)^3 = 0.4 \times 0.4 \times 0.4 = 0.064$
   (c) $(1.6)^3 = 1.6 \times 1.6 \times 1.6 = 4.096$
   (d) $(0.02)^3 = 0.02 \times 0.02 \times 0.02 = 0.000008$

5. (a) $\left(\frac{3}{7}\right)^3 = \frac{3}{7} \times \frac{3}{7} \times \frac{3}{7} = \frac{27}{343}$
   (b) $\left(\frac{8}{9}\right)^3 = \frac{8}{9} \times \frac{8}{9} \times \frac{8}{9} = \frac{512}{729}$
   (c) $\left(\frac{10}{3}\right)^3 = \frac{10}{3} \times \frac{10}{3} \times \frac{10}{3} = \frac{1000}{27}$
   (d) $\left(2\frac{1}{2}\right)^3 = \left(\frac{5}{2}\right)^3 = \frac{5}{2} \times \frac{5}{2} \times \frac{5}{2} = \frac{125}{8}$

6. (a) $(-18)^3 = -18 \times -18 \times -18 = -5832$
   (b) $(-25)^3 = -25 \times -25 \times -25 = -15625$
   (c) $(-8)^3 = -8 \times -8 \times -8 = -512$
   (d) $(-12)^3 = -12 \times -12 \times -12 = -1728$

7. (a) 864

   $864 = 2 \times 2 \times \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3}$

   $\therefore$ In the factorization, 2×2 remains after grouping in triplets

   $\therefore$ 864 is not a perfect cube.

2	864
2	432
2	216
2	108
2	54
3	27
3	9
3	3
	1

   (b) 2197

   $2197 = \underline{13 \times 13 \times 13}$

   $2197 = (13)^3$

   $\sqrt[3]{2197} = 13$

   $\therefore$ 2197 is a perfect cube

13	2197
13	169
13	13
	1

   (c) 5400

   $5400 = \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3} \times 5 \times 5$

   $\therefore$ In the factorisation, 5×5 remains after grouping in triplets.

   $\therefore$ 5400 is not a perfect cube.

2	5400
2	2700
2	1350
3	675
3	225
3	75
5	25
5	5
	1

   (d) 6750

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

   $\therefore$ In the factorisation, 2 remains after grouping in triplets

   $\therefore$ 6750 is not a perfect cube.

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

8. (a) $9 = 3 \times 3$

$\Rightarrow 9 \times 3 = \underline{3 \times 3 \times 3}$

$\therefore$ Smallest number = 3

27 is a perfect cube.

3	9
3	3
	1

(b) $72 = \underline{2 \times 2 \times 2} \times 3 \times 3$

$\therefore 72 \times 3 = \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3}$

$\therefore$ Smallest number = 3

216 is a perfect cube.

2	72
2	36
2	18
3	9
3	3
	1

(c) $576 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times 3 \times 3$

$\therefore$ Smallest number = 3

$\therefore 576 \times 3$

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

1728 is a perfect cube.

2	576
2	288
2	144
2	72
2	36
2	18
3	9
3	3
	1

(d) $\frac{1}{36} = \frac{1}{2 \times 2 \times 3 \times 3}$

Smallest number is $\frac{1}{2 \times 3}$

$\therefore \frac{1}{36 \times 2 \times 3} = \frac{1}{\underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3}}$

$\Rightarrow \frac{1}{216}$ is a perfect cube

2	36
2	18
3	9
3	3
	1

9. (a) $54 = 2 \times \underline{3 \times 3 \times 3}$

Hence, 2 is the smallest number by which 54 must be divided, so that it is a perfect cube

$\Rightarrow 54 \div 2 = [2 \times 3 \times 3 \times 3] \div 2$

$\therefore$ 27 is a perfect cube.

2	54
3	27
3	9
3	3
	1

(b) $\frac{1}{81} = \frac{1}{\underline{3 \times 3 \times 3} \times 3}$

Hence, $\frac{1}{3}$ is the smallest number by which $\frac{1}{81}$ must be divided, so that it is a perfect cube.

$\frac{1}{81} \div \frac{1}{3} = \frac{1}{3 \times 3 \times 3 \times 3} \div \frac{1}{3}$

$\therefore \frac{1}{27}$ is a perfect cube.

(c) $128 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times 2$

Hence, 2 is the smallest number by which 128 must be divided, so that it is a perfect cube.

$\Rightarrow (128 \div 2) = \left(\underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times 2\right) \div 2$

$\therefore$ 64 is a perfect cube.

(d) $0.128 = \frac{128}{1000} = \frac{\underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times 2}{\underline{10 \times 10 \times 10}}$

Hence, 2 is the smallest number by which 0.128 must be divided so that the quotient is a perfect cube.

$\Rightarrow \frac{2 \times 2 \times 2 \times 2 \times 2 \times 2}{10 \times 10 \times 10} = \frac{64}{1000} = 0.064$

$\therefore 0.064$ is a perfect cube.

10. (a) Volume of cube = $(30)^3$

$= 30 \times 30 \times 30 = 27000 \text{ mm}^3$

(b) Volume of cube = $(15.6)^3$

$= 15.6 \times 15.6 \times 15.6 = 3796.416 \text{ cm}^3$

(c) Volume of cube = $(4.5)^3$

$= 4.5 \times 4.5 \times 4.5 = 91.125 \text{ dm}^3$

(d) Volume of cube = $(1)^3$

$= 1 \times 1 \times 1 = 1 \text{ m}^3$

11. (a) 8000, 4096, 216

(b) 125, 343, 729, 9261, 3375

12. 77175

$77175 = 3 \times 3 \times 5 \times 5 \times \underline{7 \times 7 \times 7}$

Hence 3×5 is the smallest number by which 77175 must be multiplied so that the product is a perfect cube.

$\Rightarrow 77175 \times 3 \times 5$

3	77175
3	25725
5	8575
5	1715
7	343
7	49
7	7
	1

$= \underline{3\times3\times3}\times\underline{5\times5\times5}\times\underline{7\times7\times7}$

$\therefore$ 1157625 is a perfect cube.

13. 8768

$8768 = \underline{2\times2\times2}\times\underline{2\times2\times2}\times137$

Hence, 137 is the smallest number by which 8768 must be divided so that the quotient is a perfect cube.

2	8768
2	4384
2	2192
2	1096
2	548
2	274
137	137
	1

14. $1323 = \underline{3\times3\times3}\times7\times7$

Hence, 7 is the smallest number by which 1323 must be multiplied so that the product is a perfect cube.

3	1323
3	441
3	147
7	49
7	7
	1

WORKSHEET 2: FINDING CUBE ROOTS

1. (a) $\sqrt[3]{4096}$

$= \sqrt[3]{\underline{2\times2\times2}\times\underline{2\times2\times2}\times\underline{2\times2\times2}\times\underline{2\times2\times2}}$

$= 2\times2\times2\times2 = 16$

(b) $\sqrt[3]{8000}$

$= \sqrt[3]{\underline{2\times2\times2}\times\underline{2\times2\times2}\times\underline{5\times5\times5}}$

$= 2\times2\times5 = 4\times5 = 20$

(c) $\sqrt[3]{1728}$

$= \sqrt[3]{\underline{2\times2\times2}\times\underline{2\times2\times2}\times\underline{3\times3\times3}}$

$= 2\times2\times3 = 12$

(d) $\sqrt[3]{658503}$

$= \sqrt[3]{3\times3\times3\times29\times29\times29}$

$= 3\times29 = 87$

2. (a) $\sqrt[3]{512}$

$= \sqrt[3]{\underline{2\times2\times2}\times\underline{2\times2\times2}\times\underline{2\times2\times2}}$

$= 2\times2\times2 = 8$

(b) $\sqrt[3]{2744} = \sqrt[3]{\underline{2\times2\times2}\times\underline{7\times7\times7}}$

$= 2\times7 = 14$

(c) $\sqrt[3]{1331} = \sqrt[3]{11\times11\times11} = 11$

3. $\sqrt[3]{-5832} = \sqrt[3]{\underline{(-2)\times(-2)\times(-2)}\times\underline{3\times3\times3}\times\underline{3\times3\times3}}$

$= -2\times3\times3 = -18$

4. (a) $\sqrt[3]{125\times729}$

$= \sqrt[3]{\underline{5\times5\times5}\times\underline{9\times9\times9}} = 5\times9 = 45$

(b) $\sqrt[3]{512\times(34)^3}$

$= \sqrt[3]{\underline{2\times2\times2}\times\underline{2\times2\times2}\times\underline{2\times2\times2}\times\underline{34\times34\times34}}$

$= 2\times2\times2\times34 = 8\times34 = 272$

(c) $\sqrt[3]{(-6)^3\times(-3)^3\times(-4)^3}$

$= \sqrt[3]{\underline{(-6)\times(-6)\times(-6)}\times\underline{(-3)\times(-3)\times(-3)}\times\underline{(-4)\times(-4)\times(-4)}}$

$= (-6)\times(-3)\times(-4) = -72$

5. (a) $\sqrt[3]{\frac{216}{1331}} = \sqrt[3]{\frac{6\times6\times6}{11\times11\times11}} = \frac{6}{11}$

(b) $4\frac{459}{729} = \frac{3375}{729} = \sqrt[3]{\frac{3375}{729}}$

$= \sqrt[3]{\frac{15\times15\times15}{9\times9\times9}} = \frac{15}{9} = \frac{5}{3}$

(c) $\sqrt[3]{\frac{-343}{1728}} = \sqrt[3]{\frac{(-7)\times(-7)\times(-7)}{\underline{2\times2\times2}\times\underline{6\times6\times6}}}$

$= \frac{-7}{2\times6} = \frac{-7}{12}$

(d) $\sqrt[3]{\frac{64}{27\times729}} = \sqrt[3]{\frac{4\times4\times4}{3\times3\times3\times9\times9\times9}}$

$= \frac{4}{3\times9} = \frac{4}{27}$

6. (a) $\sqrt[3]{0.001} = \sqrt[3]{\frac{1}{10}\times\frac{1}{10}\times\frac{1}{10}} = \sqrt[3]{\left(\frac{1}{10}\right)^3}$

$= \frac{1}{10} = 0.1$

(b) $\sqrt[3]{0.085184} = \sqrt[3]{\frac{85184}{1000000}}$

$= \sqrt[3]{\frac{44\times44\times44}{100\times100\times100}} = \frac{44}{100} = 0.44$

(c) $\sqrt[3]{2.197} = \sqrt[3]{1.3\times1.3\times1.3} = 1.3$

7. (a) LHS = $\sqrt[3]{0.001}\times\sqrt[3]{27} = 0.1 \times 3 = 0.3$

RHS = $\sqrt[3]{0.027} = 0.3$

$\therefore$ LHS = RHS

(b) LHS = $\sqrt[3]{\frac{1}{192}}$

RHS = $\sqrt[3]{\frac{1}{192}}$ $\therefore$ LHS = RHS

(c) $\sqrt[3]{-2744}+\sqrt[3]{(6)^3} = -14 + 6 = -8$

RHS = –8 $\therefore$ LHS = RHS.

8. $59400 = \underline{2\times2\times2}\times5\times5\times\underline{3\times3\times3}\times11$

The numbers 5 and 11 should be multiplied once and twice respectively so that the product is a perfect cube.

$\therefore$ The smallest number by which 59400 must be multiplied by

$5 \times 11 \times 11$

The required product

$= 59400 \times 5 \times 11 \times 11$

2	59400
2	29700
2	14850
5	7425
5	1485
3	297
3	99
3	33
11	11
	1

$= \underline{2\times2\times2}\times\underline{5\times5\times5}\times\underline{3\times3\times3}\times\underline{11\times11\times11}$

$\therefore \sqrt[3]{59400\times5\times11\times11} = 2 \times 5 \times 3 \times 11 = 330$

9. $4394 = 2\times\underline{13\times13\times13}$

$\therefore$ 2 is the smallest number by which 4394 must be divided so that the quotient is a perfect cube.

$\Rightarrow 4394 \div 2 = (2 \times 13 \times 13 \times 13) \div 2$

$\therefore$ 2197 is a perfect cube.

$\sqrt[3]{2197} = \sqrt[3]{13\times13\times13} = 13$

2	4394
13	2197
13	169
13	13
	1

10. Volume of cubical box = 4096 m^3

$(side)^3 = 4096$

side = $\sqrt[3]{4096} = \sqrt[3]{16\times16\times16} = 16$

$\therefore$ side = 16 m.

11. (a) $\sqrt[3]{345} = 7.0$

(b) $\sqrt[3]{1275} = 10.8$

(c) $\sqrt[3]{8998} = 20.7$

(d) $\sqrt[3]{4379} = 16.3$

12. (a) $\sqrt[3]{700\times2\times49\times5}$

$= \sqrt[3]{7\times2\times2\times5\times5\times2\times7\times7\times5}$

$= \sqrt[3]{\underline{7\times7\times7}\times\underline{2\times2\times2}\times\underline{5\times5\times5}}$

$= 7 \times 2 \times 5 = 70$

(b) $\sqrt[3]{-216\times1728}$

$= \sqrt[3]{\underline{(-6)\times(-6)\times(-6)}\times\underline{12\times12\times12}}$

$= -6 \times 12 = -72$

(c) $\sqrt[3]{-175616}$

$= \sqrt[3]{\underline{7\times7\times7}\times\underline{8\times8\times8}} = 7 \times 8 = 56$

(d) $\sqrt[3]{-250.047} = \sqrt[3]{\frac{-250047}{1000}}$

$= \sqrt[3]{\frac{\underline{(-9)\times(-9)\times(-9)}\times\underline{7\times7\times7}}{\underline{10\times10\times10}}} = \frac{-9\times7}{10}$

$= \frac{-63}{10} = -6.3$

13.

Number	Cube Roots
2	$\sqrt[3]{8} = \sqrt[3]{2^3} = 2$
3	$\sqrt[3]{27} = \sqrt[3]{3^3} = 3$
4	$\sqrt[3]{64} = \sqrt[3]{4^3} = 4$
5	$\sqrt[3]{125} = \sqrt[3]{5^3} = 5$
6	$\sqrt[3]{216} = \sqrt[3]{6^3} = 6$
7	$\sqrt[3]{343} = \sqrt[3]{7^3} = 7$
8	$\sqrt[3]{512} = \sqrt[3]{8^3} = 8$
9	$\sqrt[3]{729} = \sqrt[3]{9^3} = 9$

WORKSHEET (BASED ON COMPLETE CHAPTER)

1. (a) (iii) (b) (ii)
(c) (i) (d) (ii)
(e) (ii)

2. (a) odd (b) (–m)
(c) $3(mn)^{\frac{3}{2}}$ (d) cube root
(e) rational

3. (a) False (b) True
(c) False (d) True
(e) True

4. (a) $\left(\frac{3}{5}\right)^3 = \frac{3}{5}\times\frac{3}{5}\times\frac{3}{5} = \frac{27}{125}$

(b) $\left(\frac{4}{8}\right)^3 = \frac{4}{8}\times\frac{4}{8}\times\frac{4}{8} = \frac{64}{512}$

(c) $\left(\frac{6}{7}\right)^3 = \frac{6}{7}\times\frac{6}{7}\times\frac{6}{7} = \frac{216}{343}$

(d) $\left(\frac{9}{5}\right)^3 = \frac{9}{5}\times\frac{9}{5}\times\frac{9}{5} = \frac{729}{125}$

5. $2888 = \underline{2\times2\times2}\times19\times19$

2	2888
2	1444
2	722
19	361
19	19
	1

The number that must be multiplied to the number so that the above product is a perfect cube is 19.

$2888 \times 19 = \underline{2\times2\times2}\times\underline{19\times19\times19}$

$\therefore \sqrt[3]{2888\times19} = 2 \times 19 = 38$

6. $(5)^3 = 5 \times 5 \times 5 = 125$

$(10)^3 = 10 \times 10 \times 10 = 1000$

$(15)^3 = 15 \times 15 \times 15 = 3375$

7. Let the two numbers be x and y

A.T.Q.

$x^3 - y^3 = 189$ (i)

Let y be the smaller number and the cube of the smaller number y is 3.

So, $y^3 = 3^3 = 27$

$x^3 - 27 = 189$

$x^3 = 189 + 27$

$x^3 = 216$

$x = \sqrt[3]{216}$

$x = 6$

$\therefore$ The larger number x = 6 and the smaller number y = 3.

8. Let the numbers be 2x, 3x, 4x

A.T. Q.

$(2x)^3 + (3x)^3 + (4x)^3 = 9000$

$8x^3 + 27x^2 + 64x^3 = 9000$

$99x^3 = 9000$

$x^3 = \frac{9000}{99}$

$x^3 = \frac{1000}{11}$

$x = \sqrt[3]{\frac{1000}{11}}$

$x = \frac{10}{\sqrt[3]{11}}$

$\therefore$ Numbers are $\frac{20}{\sqrt[3]{11}}, \frac{30}{\sqrt[3]{11}}$ and $\frac{4}{\sqrt[3]{11}}$.

9. $\left[\left(5^2+(12)^2\right)^{\frac{1}{2}}\right]^3 = \left[(25+144)^{\frac{1}{2}}\right]^3$

$= \left[(169)^{\frac{1}{2}}\right]^3 = \left[\left((13)^2\right)^{\frac{1}{2}}\right]^3$

$= (13)^3 = 2197$

10. $\left[(6)^2+(8^2)^{\frac{1}{2}}\right]^3 = \left[36+8\right]^3 = \left[44\right]^3$

$= 44 \times 44 \times 44 = 85184$

11. Let the numbers be 2x, 3x, 4x

A.T.Q.

$(2x)^3 + (3x)^3 + (4x)^3 = 0.334125$

$\Rightarrow 8x^3 + 27x^3 + 64x^3 = 0.334125$

$\Rightarrow 99x^3 = 0.334125$

$x^3 = \frac{0.334125}{99} = \frac{334125}{99\times1000000}$

$= \frac{111375}{33\times1000000} = \frac{3375}{1000000}$

$x = \sqrt[3]{\frac{3375}{1000000}}$

$x = \frac{15}{100}$

$x = 0.15$

Chapter 07

Comparing Quantities

WORKSHEET 1: RECALLING RATIOS AND PERCENTAGE

1. (a) $27:36 = \frac{27}{36} = \frac{27 \div 9}{36 \div 9} = \frac{3}{4}$

(b) $6.5:13 = \frac{6.5}{13} = \frac{65}{130} = \frac{65 \div 13}{130 \div 13} = \frac{5}{10} = \frac{1}{2}$

(c) $\frac{1}{7} : \frac{1}{21} : \frac{1}{49}$

LCM $(7, 21, 49) = 7 \times 3 \times 7$

$= 147$

$\frac{1}{7} = \frac{1 \times 21}{7 \times 21} = \frac{21}{147}$

$\frac{1}{21} = \frac{1 \times 7}{21 \times 7} = \frac{7}{147}$

$\frac{1}{49} = \frac{1 \times 3}{49 \times 3} = \frac{3}{147}$

So, $\frac{1}{7} : \frac{1}{21} : \frac{1}{49} = \frac{21}{147} : \frac{7}{147} : \frac{3}{147}$

$= 21 : 7 : 3$

(d) $4\frac{2}{3} : 5\frac{3}{5} : 7\frac{1}{7} = \frac{14}{3} : \frac{28}{5} : \frac{50}{7}$

LCM of 3, 5 and 7 = 105

$\frac{14}{3} = \frac{14 \times 35}{3 \times 35} = \frac{490}{105}, \frac{28}{5} = \frac{28 \times 21}{5 \times 21} = \frac{588}{105}$

and $\frac{50}{7} = \frac{50 \times 15}{7 \times 15} = \frac{750}{105}$

$\therefore 4\frac{2}{3} : 5\frac{3}{5} : 7\frac{1}{7} = \frac{490}{105} : \frac{588}{105} : \frac{750}{105}$

$= 490 : 588 : 750$

2. (a) 1 rupee = 100 paise

$\Rightarrow$ 75p : ₹4 = 75p : 400p $= \frac{75}{400} = \frac{3}{16}$

(b) 108 cm : 72 cm $= \frac{108}{72}$ [1m 8 cm = 108cm]

$= \frac{9}{6} = \frac{3}{2}$.

(c) 1hr 45 min = 1 × 60min + 45min = 105min

$\Rightarrow$ 105 min : 30 min $= \frac{105}{30} = \frac{7}{2}$.

(d) 5 kg 450 g = 5450 g

$\therefore 5450g : 5000g = \frac{5450}{5000} = \frac{545}{500} = \frac{109}{100}$

(e) 1 year 9 months = 1 × 12 months + 9 months = 21 months

2 years 4 months = 2 × 12 months + 4 months = 28 months

$\therefore$ 21 months : 28 months $= \frac{21}{28} = \frac{3}{4}$

3. $\frac{1}{3} : \frac{1}{4} : \frac{1}{6}$

LCM $(3, 4, 6) = 12$

$\frac{1}{3} = \frac{1 \times 4}{3 \times 4} = \frac{4}{12}$

$\frac{1}{4} = \frac{1 \times 3}{4 \times 3} = \frac{3}{12}$

$\frac{1}{6} = \frac{1 \times 2}{6 \times 2} = \frac{2}{12}$

so, $\frac{1}{3} : \frac{1}{4} : \frac{1}{6}$ in simplest form is 4:3:2

Let share of Radha, Palak and Swati in ₹ 4420 be 4x, 3x and 2x respectively

so, $4x + 3x + 2x = 4420$

$9x = 4420$

$x = \frac{4420}{9}$

$\therefore$ Radha's share $= 4x = 4 \times \frac{4420}{9}$

$= ₹ \frac{17680}{9} = ₹ 1964.44$

Palak's share $= 3x = 3 \times \frac{4420}{9} = ₹ \frac{4420}{3}$

$= ₹ 1473.33$

Swati's share $= 2x = 2 \times \frac{4420}{9} = ₹ \frac{8840}{9}$

$= ₹ 982.22$

4. Let $4A = 5B = 7C = K$

$A + B + C = 747$

$\Rightarrow \frac{K}{4} + \frac{K}{5} + \frac{K}{7} = 747$

$\Rightarrow \frac{35K + 28K + 20K}{140} = 747$

$\Rightarrow 83\ K = 747 \times 140$

$\Rightarrow K = \frac{747 \times 140}{83} = 1260$

$\therefore A = \frac{1260}{4} = ₹ 315$

$B = \frac{1260}{5} = ₹ 252$ and $C = \frac{1260}{7} = ₹ 180$

5. Two numbers are in the ratio 6:11

Let the two numbers be 6k and 11k

A.T.Q.

$(6x + 2) : (11x + 7) = 8 : 15$

$\Rightarrow \frac{6x+2}{11x+7} = \frac{8}{15}$

$\Rightarrow 15\ (6x + 2) = 8(11x + 7)$

$\Rightarrow 90x + 30 = 88x + 56$

$\Rightarrow 2x = 26 \Rightarrow x = \frac{26}{2} = 13$

Hence, the numbers are $6x = 6 \times 13 = 78$

and $11x = 11 \times 13 = 143$.

6. (a) $68\% = \frac{68}{100} = \frac{34}{50} = \frac{17}{25}$

(b) $72\% = \frac{72}{100} = \frac{36}{50} = \frac{18}{25} = 18:25$

(c) $15\% = \frac{15}{100} = 0.15$.

7. (a) 5% of $x = 20 \Rightarrow \frac{5}{100} \times x = 20$

$\Rightarrow x = 20 \times \frac{100}{5} = 4 \times 100 = 400$

(b) 61% of $x = 122 \Rightarrow \frac{61}{100} \times x = 122$

$\Rightarrow x = \frac{122 \times 100}{61} = 200$

(c) 8.5% of $x = 102$

$\Rightarrow \frac{8.5}{100} \times x = 102 \Rightarrow \frac{85}{1000} \times x = 102$

$\Rightarrow x = \frac{102 \times 1000}{85} = 1200$.

8. Let the maximum marks be x

$\Rightarrow$ 85% of $x = 420$

$\Rightarrow \frac{85}{100} \times x = 420 \Rightarrow x = \frac{420 \times 100}{85}$

$\Rightarrow x = \frac{420 \times 20}{17} = \frac{8400}{17} = 494$ marks.

9. Let the number of days on which the school was open be x

$\therefore$ 80% of $x = 260$

$\Rightarrow \frac{80}{100} \times x = 260$

$x = \frac{260 \times 100}{80} = \frac{26 \times 100}{8}$

$x = \frac{2600}{8} = 325$ days

10. Mr. Rohan's income is 27% less than that of Mr. Grover's income.

Let the income of Mr. Grover = 100

$\Rightarrow$ 27% of $100 = \frac{27}{100} \times 100 = 27$

So, income of Rohan = 100 – 27 = 73

Percentage by which Mr. Grover's income is more than that of Mr. Rohan $= \frac{27}{73} \times 100$

$= 36.99\%$

11. Money spent on rent = 14%

Money spent on other things = 54%

$\therefore$ Money saved every month

$= 100\% – (14 + 54)\ \%$

= 100% – 68% = 32%

A.T.Q.

32% of 18000 = $\frac{32}{100} \times 18000$

= 32 × 180

= ₹ 5760

Money saved every month = ₹ 5760.

12. We have,

Copper in the alloy = 72%

Zinc in the alloy = 24%

Nickel in the alloy = [100 – (72 + 24)]%

= (100 – 96) % = 4%

∴ Quantity of Nickel in the alloy

= 4% of 5kg

= $\frac{4}{100} \times 5000g$

= 4 × 50g = 200 grams.

13. Let the total no. of students be x

No. of girls = 700

$\Rightarrow \frac{28}{100} x = 700$

$\Rightarrow x = \frac{700 \times 100}{28}$

= 2500

Percentage of boys in school

= (100 – 28)% = 72%

∴ No. of boys = $\frac{72}{100} \times 2500$

= 1800

14. Let the maximum marks be x
Then, 66% of x = 99

$\Rightarrow \frac{66}{100} \times x = 99$

$\Rightarrow x = \frac{99 \times 100}{66} = \frac{9 \times 100}{6} = \frac{3 \times 100}{2}$

= 3 × 50 = 150.

Hence, the maximum marks are 150

15. Milk : Water = 8:2 = 4:1

Percentage of milk in the mixture

= $\frac{4}{5} \times 100$

= 80%

Percentage of water in the mixture

= $\frac{1}{5} \times 100$

= 20%

16. Let the previous salary be ₹ x

Increased salary = $x + \frac{8}{100} x$

= $\frac{108}{100} x$

$\Rightarrow \frac{108}{100} x = 13500$

$\Rightarrow x = \frac{13500 \times 100}{108}$

x = ₹12,500

17. Let the consumption of petrol initially be 100 l and its price be ₹100. Then,

New price of 100 l petrol = ₹105

₹105 can fetch 100 l petrol

₹100 can fetch $\frac{100}{105} \times 100l = \frac{100 \times 20}{21} l$

= $\frac{2000}{21} l$

∴ Reduction in consumption = $\left(100 - \frac{2000}{21}\right) l$

= $\frac{2100 - 2000}{21} = \frac{100}{21} = 4\frac{16}{21}$

Percentage by which consumption reduces

= $\frac{\frac{100}{21}}{100} \times 100$

= $\frac{100}{21}\%$

= $4\frac{16}{21}\%$

18. Value of Car = ₹ 3,50,000

Reduction in price = $\frac{20}{100} \times 3,50,000$

$= ₹\ 70,000$

Price of car after 1 year

$= 3,50,000 - 70,000$

$= ₹\ 2,80,000$

Reduction in price $= \frac{20}{100} \times 2,80,000$

$= ₹\ 56,000$

Price of car after 2 years

$= 2,80,000 - 56,000$

$= ₹\ 2,24,000$

19. Increase $= (150 - 125) = 25$

Increase % $= \frac{25}{125} \times 100 = 20\%$

20. Decrease $= 125 - 100$

$= 25$

Decrease % $= \frac{25}{125} \times 100 = 20\%$

WORKSHEET 2: DISCOUNT, PROFIT / LOSS AND TAX

1. (a) CP = ₹ 750, gain% = 8%

$SP = CP\left(\frac{100 + gain\%}{100}\right)$

$= 750\left(\frac{100+8}{100}\right) = 750 \times \frac{108}{100}$

$= \frac{75 \times 108}{10} = ₹\ 810$

(b) CP = ₹1110, loss% = 5%

$SP = CP\left(\frac{100 - loss\%}{100}\right)$

$= 1110\left(\frac{100-5}{100}\right) = 111 \times \frac{95}{10}$

$= ₹1054.5$

2. (a) SP = ₹ 2575, gain% = 15%

$CP = SP\left(\frac{100}{100 + gain\%}\right) = ₹\ 2575 \times \frac{100}{115}$

$= ₹\frac{2575 \times 100}{115} = ₹\ 2239.13$

(b) S.P = ₹ 768, loss% = 8%

$C.P = S.P \times \left(\frac{100}{100 - loss\%}\right)$

$= 768 \times \frac{100}{100-8}$

$= 768 \times \frac{ü}{92} = \frac{76800}{92} = ₹\ 834.78$

3. Let C.P of 5 articles be x

$\therefore$ C.P of 1 article $= \frac{x}{5}$

Also, S.P. of 4 articles = C.P. of 5 articles = x

$\therefore$ S. P of 1 article $= \frac{x}{4}$

Since, S. P > C. P means Gain

Gain = S.P – C.P $= \frac{x}{4} - \frac{x}{5} = \frac{x}{20}$

$G\% = \frac{G}{C.P} \times 100$

$= \frac{\frac{x}{20}}{\frac{x}{5}} \times 100$

$= \frac{5}{20} \times 100 = 25\%$

4. Let S.P of 1 orange = x

S.P of 100 oranges = 100x

S.P of 25 oranges = 25x

i.e. Gain = 25x

$\Rightarrow$ C. P of 100 oranges = 100x – 25x

$= 75x$

$G\% = \frac{Gain}{C.P} \times 100$

$= \frac{25x}{75x} \times 100$

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

5. S.P of an article = ₹ 92

Loss% = 4%

C.P of an article = $S.P\left(\frac{100}{100 - L\%}\right)$

$= 92 \times \left(\frac{100}{100-4}\right) = 92 \times \frac{100}{96}$

= ₹ 95.83

C.P of an article = ₹ 95.83

Profit = 20%

S.P of an article = $CP \times \left(\frac{100+P\%}{100}\right)$

$= 95.83 \left(\frac{100+20}{100}\right)$

$= 95.83 \left(\frac{120}{100}\right) = ₹115$

$\therefore$ S.P = ₹115

6. Let CP of 16 tables = S.P of 12 tables = x

$\Rightarrow$ S. P of 1 table = $\frac{x}{12}$

and C. P of 1 table = $\frac{x}{16}$

As CP < SP ; Gain

Gain = $\frac{x}{12} - \frac{x}{16} = \frac{x}{48}$

$G\% = \frac{G}{C.P} \times 100$

$= \frac{\frac{x}{48}}{\frac{x}{16}} \times 100$

$= \frac{16}{48} \times 100 = \frac{100}{3}\%$

7. Cost price of 8 dozen eggs

= S. P of 5 (8 – 3) dozen eggs

Gain in sale of 8 dozen eggs

= SP of 3 dozen eggs

$Gain\% = \frac{Gain}{CP} \times 100\%$

$= \frac{3}{5} \times 100\% = 60\%$

8. C.P = ₹4800

Transportation charges = ₹ 1200

Total C.P = 4800 + 1200 = ₹ 6000

S.P = ₹ 5820

Loss = C.P – S.P = ₹(6000 – 5820) = ₹180

$Loss\% = \frac{Loss}{C.P} \times 100 = \frac{180}{6000} \times 100$

= 3%

9. (a) Let C.P of the bicycle = ₹ x

$S.P = x - \frac{x}{10} = \frac{10x - x}{10} = \frac{9}{10}x$

$\Rightarrow 405 = \frac{9}{10}x$ [$\therefore$ SP = ₹ 405 given]

$\Rightarrow x = 405 \times \frac{10}{9} = \frac{4050}{9} = 450$

$\therefore$ C.P = ₹ 450

$Loss = \frac{x}{10} = \frac{450}{10} = ₹ 45$

(b) Loss percent = $\frac{Loss}{CP} \times 100 = \frac{45}{450} \times 100$

= 10%

10. (a) S.P = ₹ 250

Let the cost price be x

Gain = $\frac{1}{9}$ of cost price = $\frac{1}{9}x$.

Gain = S.P – C.P = 250 – x

$\Rightarrow \frac{x}{9} + x = 250$

$\Rightarrow \frac{10x}{9} = 250 \Rightarrow x = 250 \times \frac{9}{10} = 225$

$\therefore$ C.P = ₹ 225

(b) Profit = $\frac{1}{9}C.P = \frac{1}{9}(225)$

= ₹ 25

Profit % = $\frac{Profit}{CP} \times 100$

= $\frac{25}{225} \times 100 = 11.11\%$

11. (a) Loss incurred = $\frac{1}{10}$ (5500)

= ₹ 550

(b) Cost price = Selling price + Loss

= 5500 + 550

= ₹ 6050

(c) Loss % $= \frac{Loss}{C.P} \times 100$

$= \frac{550}{6050} \times 100$

$= 9\frac{1}{11}\%$

12. No. of eggs bought by the shopkeeper = 300

Rate of eggs = ₹ 5

C.P = 300 × 5

= ₹1500

Now, the loss of eggs in transit

= 300 – 30 = 270 eggs

S.P = 270 × ₹ 8 = ₹ 2160

$\because$ S.P > C.P, there is a gain

Gain = S.P – C.P

= 2160 – 1500

= ₹ 660

So, Gain % $= \frac{\text{Gain}}{\text{C.P}} \times 100 = \frac{660}{1500} \times 100 = \frac{660}{15}\%$

= 44%

13. Let the C.P = x

S.P $= \frac{4}{5}$ of x $= \frac{4}{5}x$

Since, C.P is greater than S.P., there is Loss

Loss = CP – SP $= x - \frac{4x}{5} = \frac{x}{5}$

Loss% $= \frac{\text{Loss}}{\text{CP}} \times 100$

$= \frac{\frac{x}{5}}{x} \times 100 = \frac{100}{5}\% = 20\%$

14. Given, C.P for Prem = ₹14490

(a) Let C.P for Rahim be ₹ x

S.P for Rahim + Gain = 14490

$\Rightarrow x + \frac{5x}{100} = 14490$

$\Rightarrow \frac{105}{100}x = 14490 \Rightarrow x = 14490 \times \frac{100}{105}$

= ₹13800

C.P for Rahim = ₹13800 = S.P for Rajesh

(b) Let C.P for Rajesh = y

$\therefore y - \frac{8y}{100} = 13800$

$\Rightarrow y = 13{,}800 \times \frac{100}{92} =$ ₹ 15000

For Rahim, C.P = ₹13800 and S.P = ₹14490

For Rajesh, C.P = ₹15000 and S.P = ₹13800

15. (a) Let MP = x, CP = ₹1440

SP = 1440 + 25% of 1440

$= 1440 + \frac{25}{100} \times 1440 =$ ₹1800

(b) SP = MP – 25% of MP

1800 = x – 25% of MP

1800 = x – 0.25x

$\Rightarrow 1800 = 0.75x \Rightarrow x = \frac{1800}{0.75}$

$\Rightarrow$ x = ₹ 2400

$\therefore$ MP = ₹ 2400.

16. (a) M.P = ₹ 2250

Discount = 12%

S.P = M.P $\times \frac{(100 - D\%)}{100}$

$= 2250 \times \frac{(100 - 12)}{100}$

S.P $= 2250 \times \frac{88}{100}$

= ₹ 1980

(b) S.P = ₹ 1980, Profit = 10%

$\therefore$ CP of the article $= \frac{100}{110} \times 1980$

= 100 × 18 = ₹ 1800

17. Let the CP be ₹ 100

MP = 100 + (30% of 100) = 100 + 30 = ₹ 130

Discount = 10% of 130

$= \frac{10}{100} \times 130 =$ ₹ 13

SP = MP–D = 130 – 13 = ₹ 117

Profit = S.P – CP = ₹ (117–100)

= ₹ 17

$P\% = \frac{P}{CP}\times 100 = \frac{17}{100}\times 100 = 17\%$

18. (a) Let MP be ₹ x

Cost is 25% less than MP

and CP = ₹ 2400

$\therefore x - \frac{25}{100}x = 2400$

$\Rightarrow x - \frac{x}{4} = 2400 \Rightarrow \frac{3x}{4} = 2400$

$\Rightarrow x = 2400 \times \frac{4}{3} = ₹\ 3200$

$\therefore$ MP = ₹ 3200

(b) Discount = 15%

MP = ₹ 3200

So, $SP = 3200 - 3200 \times \frac{15}{100}$

$= 3200 - 480 = ₹\ 2720$

$\therefore$ SP = ₹ 2720

(c) P = SP – CP

= ₹ (2720 – 2400) = ₹ 320

$P\% = \frac{P}{CP}\times 100 = \frac{320}{2400}\times 100$

= 13.33%

19. M.P = ₹ 800

$S.P = \frac{(100-15)\%}{100}\times 800 = \frac{85}{100}\times 800$

= ₹ 680

Now, there is a profit of 25%

$C.P = \frac{100\times S.P}{100+P\%} = \frac{100\times 680}{100+25}$

$= \frac{100\times 680}{125} = ₹\ 544$

Now, Profit = S.P – C.P

= ₹ (680 – 544) = ₹ 136

20. $M.P \times \left(1-\frac{d_1}{100}\right)\times\left(1-\frac{d_2}{100}\right) = S.P$

Given, d_1 = 20%, d_2 = 5%, S.P = ₹ 3420

$\Rightarrow M.P \times \left(1-\frac{20}{100}\right)\left(1-\frac{5}{100}\right) = ₹\ 3420$

$\Rightarrow M.P \times \frac{80}{100}\times\frac{95}{100} = ₹\ 3420$

$\Rightarrow M.P = \frac{3420\times 100\times 100}{80\times 95} = ₹\ 4500.$

21. S.P = ₹ 1880

D = 6%, M.P = ?

$S.P = M.P\left(1-\frac{D\%}{100}\right)$

$\Rightarrow 1880 = MP\left(1-\frac{6}{100}\right)$

$\Rightarrow 1880 = MP\left(\frac{94}{100}\right) \Rightarrow MP = 1880\times\frac{100}{94}$

$\therefore MP = \frac{188000}{94} = ₹\ 2000$

22. S.P = ?, MP = ₹ 850, D = 5%

$SP = MP\left(1-\frac{D\%}{100}\right)$

$SP = 850\left(1-\frac{5}{100}\right) = ₹\ 850\left(1-\frac{1}{20}\right)$

$= ₹\ 850 \times \frac{19}{20} = ₹\ 807.50$

23. MP = ₹ 950, SP = ₹ 760

D% = ?

$D\% = \frac{MP-S.P}{MP}\times 100$

$= \frac{950-760}{950}\times 100$

$= \frac{190\times 100}{950} = \frac{1900}{95} = 20\%$

Hence, D% = 20%

24. M.P = 100

Ist discount = 10% of 100 $= \frac{10}{100}\times 100 = 10$

S.P = (after Ist discount) = 100 – 10 = 90

2nd discount = 8% of 90

$$= \frac{8}{100} \times 90 = \frac{720}{100}$$

$$= 7.2$$

S.P = 90 – 7.2 = 82.8

Single equivalent discount = MP – S.P

= 100 – 82.8 = 17.2

$$\text{Discount \%} = \frac{Discount}{MP} \times 100$$

$$= \frac{17.2}{100} \times 100$$

$$= 17.2\%$$

25. Let the price of the article be x

$$x + \frac{12}{100}x = 2016$$

$$\Rightarrow \frac{112}{100}x = ₹\ 2016$$

$$\Rightarrow x = ₹\ 2016 \times \frac{100}{112} = \frac{201600}{112}$$

= ₹ 1800

If tax is reduced to 7%

Price of an article inclusive of tax

$$= 1800 + \frac{7}{100}(1800)$$

$$= 1800\left(1 + \frac{7}{100}\right)$$

$$= 1800^{\frac{10}{100} \times 15000}$$

= 18 × 107

= ₹ 1926

Difference in prices at different tax rates

= 2016 – 1926

= ₹ 90

26. C.P of goods for A = ₹ 4000

C.P of goods for B = ₹ 5000

and C.P of goods for C = ₹ 6000

∴ VAT collected by seller from A

$$= ₹\ 4000 \times \frac{5}{100} = ₹\ 200$$

VAT collected by A from B

$$= ₹\ 5000 \times \frac{5}{100} = ₹\ 250$$

VAT collected by B from C

$$= ₹\ 6000 \times \frac{5}{100} = ₹\ 300$$

(a) Now,VAT Paid by A = ₹ (250 – 200) = ₹ 50

(b) Now,VAT Paid by B = ₹ (300 – 250) = ₹ 50

27. C.P of article for distributor = ₹ 15,000

tax collected by seller from distributor

= 10% of 15000

$$= \frac{10}{100} \times 15000$$

= ₹ 1500

C.P for trader = ₹ 20,000

tax collected by distributor from trader

= 10% of 20000

$$= \frac{10}{100} \times 20000$$

= ₹ 2000

C.P for Retailer = ₹ 22,000

tax collected by trader from retailer

= 10% of 22000

$$= \frac{10}{100} \times 20000$$

= ₹ 2200

So, tax paid by distributor = 2000 – 1500

= ₹ 500

tax paid by trader = 2200 – 2000 = ₹ 200

WORKSHEET 3: SIMPLE AND COMPOUND INTEREST

1. Rate for each conversion period

$= \frac{1}{2}(10)$

$= 5\%$

2. Rate for each conversion period

$= \frac{1}{4}(12)$

$= 3\%$

3. No. of half years

$= 2 \times 2$

$= 4$

4. No. of quarter years

$= 4 \times 3$

$= 12$

5. $R = 8\%, n = 3\frac{1}{2}$ years $= \frac{7}{2}$ years.

Half yearly $R = \frac{8}{2}\% = 4\%$

Time = 2 × n (half years)

$= 2 \times \frac{7}{2} = 7$ half years

6. Conversion period

$= 4\left(\frac{3}{2}\right) = 6$ quarter years

Rate for each conversion period

$= \frac{6}{4} = 1.5\%$

7. $SI = \frac{P \times R \times T}{100}$

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

$= ₹ 10$

$CI = A - P$

$= P\left(1+\frac{R}{100}\right)^n - P$

$= P\left[\left(1+\frac{R}{100}\right)^n - 1\right]$

$= 100\left[1+\frac{10}{100} - 1\right]$

$= 100\left(\frac{10}{100}\right)$

$= ₹ 10$

So, Difference = ₹ 10 – ₹ 10 = 0

8. $S.I = \frac{P \times R \times T}{100}$

$= \frac{1000 \times 10 \times 1}{100}$

$= ₹ 100$

$CI = P\left(1+\frac{R}{100}\right)^n - P$

$= 1000\left(1+\frac{10}{100}\right)^1 - 1000$

$= 1000\left(\frac{110}{100}\right) - 1000$

$= ₹ 100$

$\therefore$ Sum = ₹ 100 + ₹ 100

= ₹ 200

9. (a) (iii) (b) (ii) (c) (i)

(d) (iii) (e) (ii)

10. P = ₹ 10, 000

R = 12%

$n = 3\frac{1}{2} = \frac{7}{2}$ years

$A = P\left(1+\frac{R}{200}\right)^{2n}$

$= 10000\left(1+\frac{12}{200}\right)^{2\left(\frac{7}{2}\right)} = 10000\left(1+\frac{6}{100}\right)^7$

$= 10,000\left(\frac{106}{100}\right)^7 = 10,000\ (1.06)^7$

$= 15036$

CI = A – P

= ₹ 15036 – ₹ 10,000

= ₹ 5036

11. P = ₹ 15000, R = 15% p.a.

$$n = 9 \text{ months} = \frac{9}{12} \text{ years.}$$

$$\text{Amount} = P\left(1+\frac{R}{400}\right)^{4\times n}$$

$$= 15000\left(1+\frac{15}{400}\right)^{4\times\frac{9}{12}}$$

$$= 15000\left(1+\frac{3}{80}\right)^{3}$$

$$= 15000 \times \frac{83}{80}\times\frac{83}{80}\times\frac{83}{80}$$

$$= \frac{15\times83\times83\times83}{512} = ₹\ 16751.57$$

$\therefore$ Compound Interest = ₹ 16751.57 – 15000

= ₹ 1751.57

12. Here, P = ₹ 10000, n = 3 years,

R_1 = 10%, R_2 = 12% and R_3 = 18%

Amount after 3 years

$$= P\left(1+\frac{R_1}{100}\right)\left(1+\frac{R_2}{100}\right)\left(1+\frac{R_3}{100}\right)$$

$$= ₹\ 10000\left(1+\frac{10}{100}\right)\left(1+\frac{12}{100}\right)\left(1+\frac{18}{100}\right)$$

$$= ₹\ 10000\left(1+\frac{1}{10}\right)\left(1+\frac{3}{25}\right)\left(1+\frac{9}{50}\right)$$

$$= ₹\ 10000 \times \frac{11}{10}\times\frac{28}{25}\times\frac{59}{50}$$

$$= ₹\ 1000 \times 11 \times \frac{28}{25}\times\frac{59}{50}$$

$$= ₹\ \frac{11000\times1652}{1250} = ₹\frac{18172000}{1250}$$

= ₹ 14537.6

13. P = 2, 66, 200, R = 10%

$$A = P\left(1-\frac{R}{100}\right)^{n}$$

$$= 266200\left(1-\frac{10}{100}\right)^{3}$$

$$= 266200\left(\frac{90}{100}\right)^{3}$$

$$= 266200 \times \left(\frac{9}{10}\right)^{3}$$

$$= 266200 \times \frac{9}{10}\times\frac{9}{10}\times\frac{9}{10}$$

$$= \frac{2662\times729}{10} = 194060$$

14. P = ₹ 150000

R_1 = 20%

R_2 = 10%

$$\text{Amount} = P\left(1+\frac{R_1}{100}\right)\left(1-\frac{R_2}{100}\right)$$

$$= 150000\left(1+\frac{20}{100}\right)\left(1-\frac{10}{100}\right)$$

$$= 150000\left(1+\frac{1}{5}\right)\left(1-\frac{1}{10}\right)$$

$$= 150000 \times \frac{6}{5}\times\frac{9}{10}$$

$$= \frac{15000\times54}{5} = ₹\ 162000$$

15. Let P be the principal

$$A = \frac{216}{125}P$$

n = 3 years

We know that

$$A = P\left(1+\frac{R}{100}\right)^n$$

$$\frac{216}{125} = P\left(1+\frac{R}{100}\right)^3$$

$$\left(\frac{216}{125}\right)^{\frac{1}{3}} = 1+\frac{R}{100}$$

$$\frac{6}{5} = 1+\frac{R}{100}$$

$$\frac{6}{5} - 1 = \frac{R}{100}$$

$$\frac{1}{5} = \frac{R}{100}$$

$$R = \frac{100}{5}$$

= 20%

16. P = ₹ 31250

n = 9 months = $\frac{9}{12}$ years.

R = 16%

$$A = \left(1+\frac{R}{400}\right)^{4n}$$

$$= 31250\left(1+\frac{16}{400}\right)^{4\times\frac{9}{12}}$$

$$= 31250\left(1+\frac{1}{25}\right)^3 = 31250\left(\frac{26}{25}\right)^3$$

$$= 31250\times\frac{26}{25}\times\frac{26}{25}\times\frac{26}{25}$$

= ₹ 2 × 26 × 26 × 26 = ₹ 35152

C.I = ₹ (35152 – 31250) = ₹ 3902

17. A = ₹ 12167, n = 3 years, R = 15%

P = ?

$$A = P\left(1+\frac{R}{100}\right)^n$$

$$\Rightarrow 12167 = P\left(1+\frac{15}{100}\right)^3$$

$$= 12167 = P\left(1+\frac{3}{20}\right)^3 \Rightarrow 12167 = P\left(\frac{23}{20}\right)^3$$

$$\Rightarrow P = 12167 \times \frac{20}{23}\times\frac{20}{23}\times\frac{20}{23}$$

= ₹ 8000

Hence, P = ₹ 8000

18. Let the sum be P

$$SI = \frac{P\times R\times T}{100} = \frac{P\times 3\times 15}{100} = \frac{45}{100}P$$

$$CI = A - P = P\left(1+\frac{15}{100}\right)^3 - P$$

$$= P\left(\frac{115}{100}\right)^3 - P = P\left(\frac{23}{20}\right)^3 - P$$

A.T.Q.

CI – SI = ₹ 283.50

$$\Rightarrow P\left[\left(\frac{23}{20}\right)^3 - 1\right] - \frac{45}{100}P = ₹\ 283.50$$

$$\Rightarrow P\left[\frac{12167-8000}{8000}\right] - \frac{45}{100}P = ₹\ 283.50$$

$$\Rightarrow P\left[\frac{4167}{8000} - \frac{45}{100}\right] = ₹\ 283.50$$

$$\Rightarrow P\left[\frac{4167-45\times 80}{8000}\right] = ₹\ 283.50$$

$$\Rightarrow P\left[\frac{4167-3600}{8000}\right] = ₹\ 283.50$$

$$\Rightarrow P = 283.50 \times \frac{8000}{567}$$

$$\Rightarrow P = \frac{28350}{100}\times\frac{8000}{567} = \frac{28350\times 80}{567}$$

P = ₹ 4000.

19. P = ₹ 70000

Depreciated value after 2 years

$$= P\left(1-\frac{R_1}{100}\right)\left(1-\frac{R_2}{100}\right)$$

$$= 70000\left(1-\frac{5}{100}\right)\left(1-\frac{10}{100}\right)$$

$$= 70000\left(1-\frac{1}{20}\right)\left(1-\frac{1}{10}\right)$$

$$= 70000 \times \frac{19}{20}\times\frac{9}{10} = \frac{700\times19\times9}{2}$$

$$= 350 \times 19 \times 9$$

$$= ₹\ 59850$$

WORKSHEET (BASED ON COMPLETE CHAPTER)

1. (a) (i) (b) (ii)

(c) (ii) $SI = \frac{P\times R\times T}{100}$

$$\Rightarrow 36 = \frac{P\times3\times3}{100}$$

$$\Rightarrow P = \frac{36\times100}{9} = ₹\ 400$$

(d) (iii) (e) (iii)

2. (a) Interest

(b) labour burden, direct material, repairs, overhead

(c) Interest (d) MP

(e) Principal

3. (a) False, as 25% of 1000 $= \frac{25}{100}\times1000 = 250$

(b) False (c) False

(d) True (e) True

4. 10% of x is 20

$$\Rightarrow \frac{10}{100}\times x = 20 \Rightarrow x = 20 \times \frac{100}{10}$$

$\therefore$ x = 200

5. Let the no. be x

According to question,

$$x = 130 - 50\% \text{ of } 130$$

$$= 130 - \frac{50}{100}(130)$$

$$= 130 - 65$$

$$= 65$$

6. Let the no. be x

According to question,

$$x = 180 + \frac{60}{100}(180)$$

$$= 180 + 108$$

$$= 288$$

7. Let total number of students = x

% of boys = 30%

No. of boys = 120

$\therefore$ 30% of x = 120

$$\Rightarrow \frac{30}{100}\times x = 120$$

$$\Rightarrow x = 120 \times \frac{100}{30} = 4 \times 100 = 400$$

8. Let ₹ x be the CP and ₹ y be the original S.P of the article.

We know that, gain % $= \frac{\text{Gain}}{CP}\times100$

$$\therefore\ 5\ \% = \frac{y-x}{x}\times100$$

$$\Rightarrow x = 20\ (y-x) = 20y - 20x$$

$$\Rightarrow 21\ x = 20y \Rightarrow y = \frac{21}{20}x$$

When the S.P of the article is reduced by ₹ 50 then the new S.P = ₹ $\left(\frac{21}{20}x - 50\right)$

$$CP = \frac{100\ SP}{100 - L\%}$$

$$x = \frac{100\left(\frac{21x}{20}-50\right)}{100-5}$$

$$x = \frac{5(21x-1000)}{95}$$

$$x = \frac{1}{19}(21x-1000)$$

$19x = 21x - 1000$

$2x = 1000$

$x = 500$

So, original selling price = $y = \frac{21}{20}x$

$= \frac{21}{20}(500) = ₹\ 525$

9. $P = ₹\ 10{,}800,\ R = 12\frac{1}{2}\% = \frac{25}{2}\%$

$n = 3$ years

$A = P\left(1+\frac{R}{100}\right)^n = 10800\left(1+\frac{25}{200}\right)^3$

$= 10800\left(1+\frac{1}{8}\right)^3 = 10800\left(\frac{9}{8}\right)^3$

$= 10800 \times \frac{9}{8}\times\frac{9}{8}\times\frac{9}{8} = ₹\ 15377.34$

$CI = A - P = ₹\ (15377.34 - 10,800)$

$= ₹\ 4577.34$

10. Single equivalent discount

$= 50 + 50 - \left(\frac{50\times 50}{100}\right)$

$= 100 - 25 = 75\%$

11. Let amount x be lent at 5%

$\therefore$ Amount lent at 8% = ₹ (1550 – x)

Total interest = ₹ 300

$\frac{x\times 5\times 3}{100} + \frac{(1550-x)\times 8\times 3}{100} = 300$

$\Rightarrow 15x + 24\ (1550 - x) = 30000$

$\Rightarrow 15x - 24x + 37200 = 30000$

$\Rightarrow 37200 - 30000 = 9x$

$\Rightarrow 7200 = 9x$

$\Rightarrow 800 = x$

$\therefore$ Amount lent at 5% = 800

Amount lent at 8% = ₹ 1550 – 800 = ₹ 750

So, $\frac{\text{Amount lent at 5\%}}{\text{Amount lent at 8\%}} = \frac{800}{750}$

$= \frac{16}{15}$

Chapter 08 Algebraic Expressions and Identities

WORKSHEET 1: SOLVING EQUATIONS HAVING LINEAR EXPRESSIONS ON ONE SIDE

1. Constants: $\sqrt{7}$

   Variables : $8 + x, 9x + yz, \sqrt{pq}, \frac{3}{7}pq, 3.5y - 2x$

   $8y - 7, 7 - 4x, 7x - 3y + z, 4p^2 q - 3r$

2. (a) binomial (b) trinomial
   (c) trinomial (d) polynomial
   (e) polynomial

3. (a) 2 (b) 3
   (c) 12

4. (a) $\frac{1}{7}xy^2 \times z^3$ (b) xy^2z^3
   (c) $\frac{1}{7}y^2z^3$ (d) $\frac{5}{7}z^3$
   (e) $\frac{5}{7}xy^2$ (f) $\frac{5}{7}y^2$
   (g) $\frac{1}{7}z^3$ (h) $5xyz^2$
   (i) $\frac{5}{7}xy^2z^2$ (j) $\frac{5}{7}xyz$
   (k) $\frac{1}{7}y^2$

5. (a) $3xy, -8yx \rightarrow$ like terms

   $\Rightarrow -4yx^2, -2.5x^2y, x^2y, \rightarrow$ like terms

   $-3.2y^2x, 2xy^2 \rightarrow$ like terms

   (b) $y^2 z^3, 2z^3y^2, -4y^2z^3 \rightarrow$ like terms

   and $xy^2z^3, -8xz^3y^2 \rightarrow$ like terms

   $-5x^2yz, 3x^2yz \rightarrow$ like terms

6. (a) $b^2y - 9b^2y + 2b^2y - 5b^2 y$

   $= b^2y (1 - 9 + 2 - 5)$

   $= b^2y (3 - 14) = -11b^2y$

   (b) $3x^2 + x^2 - 4y^2 - 5y^2 + 5xy - 8xy$

   $= 4x^2 - 9y^2 - 3xy$

   (c) $abx - 15abx - 10abx + 32abx$

   $= abx (1 - 15 - 10 + 32)$

   $= abx (33 - 25)$

   $= abx (8)$

   $= 8\ abx$

7. (a) $a - 3b + 3 + 2a + 5 - 3c + 6c - 15 + 6b$

   $= a + 2a - 3b + 6b + 3 + 5 - 15 - 3c + 6c$

   $= 3a + 3b + 3c - 7$

   (b) $13\ ab - 9cd - xy + 5xy + 15cd - 7ab + 6xy - 3cd$

   $= 13ab - 7ab - 9cd + 15cd - 3cd - xy + 5xy + 6xy$

   $= ab(13 - 7) + cd (-9 + 15 - 3) + xy (-1 + 5 + 6)$

   $= 6ab + 3cd + 10xy$

   (c) $x^2 - x^2y + 5xy^2 + y^3 - x^3 - 9xy^2 + y^3 + 3x^2y + 9xy^2$

   $= x^2 + x^2y (-1 + 3) + xy^2 (5 - 9 + 9) - x^3 + 2y^3$

   $= x^2 + 2x^2y + 5xy^2 - x^3 + 2y^3$

8. $(4x - 6y) + (6x + 2y) + (4y - x) + (y - 2x)$

   $= 4x + 6x - x - 2x - 6y + 2y + 4y + y$

   $= 10x - 3x - 6y + 7y$

   $= 7x + y.$

9. (a) $2xy^2 - 4xy^2 = xy^2 (2-4) = -2xy^2$

   (b) $9x^2y - (-3x^2y + 4xy^2)$

   $= 9x^2y + 3x^2y - 4xy^2 = 12x^2y - 4xy^2$

   (c) $5x^3 - 2x^2 + 8 - (x^3 - 4x - 1)$

   $= 5x^3 - 2x^2 + 8 - x^3 + 4x + 1$

   $= 4x^3 - 2x^2 + 4x + 9$

(d) $a^3 - 3a^2 + 4a + 1 - (6a + 3)$

$= a^3 - 3a^2 + 4a + 1 - 6a - 3$

$= a^3 - 3a^2 - 2a - 2$

(e) $3abc + 5bcd - cda - (cab - 4cad - cbd)$

$= 3abc + 5bcd - cda - cab + 4cad + cbd$

$= 3abc + 6bcd + 3cad - cab$

10. $3x^3 - 4x^2 + 5x - 6 - (-3x^3 + 4x^2 - 5x + 6)$

$= 3x^3 - 4x^2 + 5x - 6 + 3x^3 - 4x^2 + 5x - 6$

$= 6x^3 - 8x^2 + 10x - 12$

11. The given expression

$(x^4 + x^2 - 1) - (x^4 - x^3 + x^2 + x + 3)$

$= x^4 + x^2 - 1 - x^4 + x^3 - x^2 - x - 3$

$= x^3 - x - 4$

12. The given expression $(5a^2 - 8) - (3a^2 + 2)$

$= 5a^2 - 8 - 3a^2 - 2$

$= 2a^2 - 10$

13. The given expression is

$9x^2 + 11xy - 5y^2 - (5x^2 + 6xy + 3y^2)$

$= 9x^2 + 11xy - 5y^2 - 6xy - 3y^2 - 5x^2$

$= 4x^2 + 5xy - 8y^2$

14. The given expression

$(20x^4 + 3x^3 + 31x - 38) - (9x^4 + 23x^3 - 8x - 61)$

$= 20x^4 + 3x^3 + 31x - 38 - 9x^4 - 23x^3 + 8x + 61$

$= 11x^4 - 20x^3 + 39x + 23$

15. Perimeter of triangle = sum of three sides

$\Rightarrow 10y^2 - 8y + 5 = 4y^2 - 6y + 5y^2 + 13 +$ Third side

$\Rightarrow 10y^2 - 8y + 5 = 9y^2 - 6y + 13 +$ Third side

$\Rightarrow$ Third side $= 10y^2 - 8y + 5 - (9y^2 - 6y + 13)$

$= 10y^2 - 8y + 5 - 9y^2 + 6y - 13$

$= y^2 - 2y - 8$

$\therefore$ Third side $= y^2 - 2y - 8$

16. $x = 6a + 8b + 9c$, $y = 3b - 5a - 7c$ and $z = 2c - 3b + 5a$

(a) $x + y + z$

$= 6a + 8b + 9c + 3b - 5a - 7c + 2c - 3b + 5a$

$= 6a + 8b + 4c$

(b) $x - y + z$

$= 6a + 8b + 9c - (3b - 5a - 7c) + 2c - 3b + 5a$

$= 6a + 8b + 9c - 3b + 5a + 7c + 2c - 3b + 5a$

$= 6a + 5a + 5a + 8b - 3b - 3b + 9c + 7c + 2c$

$= 16a + 2b + 18c$

(c) $2x - y + 3z$

$= 2(6a + 8b + 9c) - (3b - 5a - 7c) + 3(2c - 3b + 5a)$

$= 12a + 16b + 18c - 3b + 5a + 7c + 6c - 9b + 15a$

$= 12a + 5a + 15a + 16b - 3b - 9b + 18c + 7c + 6c$

$= 32a + 4b + 31c$

WORKSHEET 2: MULTIPLICATION OF ALGEBRAIC EXPRESSIONS

1. (a) $8xy^2 \times (-3x^3 y^4)$

$= 8 \times (-3)(x \times x^3) \times (y^2 \times y^4)$

$= -24x^4y^6$

(b) $(6p - 1)(7p - 5) = 6p(7p - 5) - 1(7p - 5)$

$= 42p^2 - 30p - 7p + 5$

$= 42p^2 - 37p + 5$

(c) $(18a + 7b)(4a - 3b) = 18a(4a - 3b) + 7b(4a - 3b)$

$= 72a^2 - 54ab + 28ab - 21b^2$

$= 72a^2 - 26ab - 21b^2$

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

(e) $\frac{-1}{2}ab^2(2a^3 - 3a^2b)$

$= -a^4b^2 + \frac{3}{2}a^3b^3$

(f) $\left(2x + \frac{1}{2}y\right)\left(2x - \frac{1}{2}y\right)$

$= (2x)^2 - \left(\frac{1}{2}y\right)^2$ $[\because (a + b)(a - b) = a^2 - b^2]$

$= 4x^2 - \frac{1}{4}y^2$

(g) $(5x^2 - 8xy + 6y^2 - 3) \times (-3xy)$

$= -15x^3y + 24x^2y^2 - 18xy^3 + 9xy$

(h) $(2y - 4y^3 + 6y^5) \times (y^2 + y - 3)$

$= 2y^3 - 4y^5 + 6y^7 + 2y^2 - 4y^4 + 6y^6 - 6y + 12y^3 - 18y^5$

$= 6y^7 + 6y^6 - 22y^5 - 4y^4 + 14y^3 + 2y^2 - 6y$

(i) $\left(3 - \frac{2}{3}xy + \frac{5}{7}xy^2 - \frac{16}{21}x^2y\right) \times (-21x^2y^2)$

$\Rightarrow 3 \times (-21x^2y^2) - \frac{2}{3}xy\ (-21x^2y^2) + \frac{5}{7}xy^2$

$(-21x^2y^2) - \frac{16}{21}x^2y\ (-21x^2y^2)$

$= -63x^2y^2 + 14x^3y^3 - 15x^3y^4 + 16x^4y^3$

$= 16x^4y^3 - 15x^3y^4 + 14x^3y^3 - 63x^2y^2$

(j) $(6x^3 - 5x + 10)(4x + 1)$

$= 24x^4 - 20x^2 + 40x + 6x^3 - 5x + 10$

$= 24x^4 + 6x^3 - 20x^2 + 35x + 10.$

2. (a) $(4x - 5y)(5x - 4y)$

$= 4x(5x - 4y) - 5y(5x - 4y)$

$= 20x^2 - 16xy - 25xy + 20y^2$

$= 20x^2 - 41xy + 20y^2$

(b) $(xy - z)(xy + z)$ $[(a + b)(a - b) = a^2 - b^2)]$

$= (xy)^2 - (z)^2 = x^2y^2 - z^2$

(c) $(6a + 6b - c)(3b - 5c)$

$= 3b(6a + 6b - c) - 5c(6a + 6b - c)$

$= 18ab + 18b^2 - 3bc - 30ac - 30bc + 5c^2$

$= 18b^2 + 5c^2 + 18ab - 33bc - 30ac$

3. Area of triangle $= \frac{1}{2} \times$ Base $\times$ Altitude

$= \frac{1}{2}(3x - 4y) \times (6x + 9y)$

$= \frac{1}{2}[3x(6x + 9y) - 4y(6x + 9y)]$

$= \frac{1}{2}[18x^2 + 27xy - 24xy - 36y^2]$

$= \frac{1}{2}(18x^2 + 3xy - 36y^2)$

$= 9x^2 + \frac{3}{2}xy - 18y^2$

4. Area $= (x^2 - 4xy + 7y^2) \times (x^3 - 5xy^2)$

$= x^3(x^2 - 4xy + 7y^2) - 5xy^2(x^2 - 4xy + 7y^2)$

$= x^5 - 4x^4y + 7x^3y^2 - 5x^3y^2 + 20x^2y^3 - 35xy^4$

$= x^5 - 4x^4y + 2x^3y^2 + 20x^2y^3 - 35xy^4$

5. $(ax - 2) \times (1 - 2ax)$

$= ax(1 - 2ax) - 2(1 - 2ax) = ax - 2a^2x^2 - 2 + 4ax$

$= 5ax - 2a^2x^2 - 2$

6. $(3x^3) \times (-5xy^2) \times (2x^2yz^3)$

$= (3x(-5) \times 2)(x^3 \times x \times x^2)(y^2 \times y) \times z^3$

$= -30 \times x^6y^3z^3$

$= -30(1)^6(2)^3(3)^3$ [when $x = 1, y = 2, z = 3$]

$= -30 \times 1 \times 8 \times 27 = -6480$

7. (a) $(3x - 6y)(3x + 6y)$

$= (3x)^2 - (6y)^2 = 9x^2 - 36y^2$

$= 9(2)^2 - 36(3)^2$ [When $x = 2, y = 3$]

$= 9(4) - 36(9) = 36 - 324 = -288$

(b) $xz(x^2 + y^2) = (2)(1)[4 + 1] = 2 \times 5 = 10$

(c) $2x(3x - 5) - 5(x - 2) - 18$

$= 2(2)(6 - 5) - 5(2 - 2) - 18$

$= 4(1) - 0 - 18 = 4 - 18 = -14$

(d) $-3x^2y^2 = -3(1)^2(2)^2 = -12$

and $(x - 2y) = (1 - 2(2)) = 1 - 4 = -3$

8. $(6 - x)(7 - 4x)(3 - x)$

$= (42 - 24x - 7x + 4x^2)(3 - x)$

$= (42 - 31x + 4x^2)(3 - x)$

$= 126 - 93x + 12x^2 - 42x + 31x^2 - 4x^3$

$= 126 - 135x + 43x^2 - 4x^3$

9. $(-4x^2y^3) \times (-5x^2y^5)$

$= 20x^4y^8$

$= 20(2)^4(1)^8 = 20 \times 16 \times 1$ (When $x = 2, y = 1$)

$= 320$

10. $(3x^2 y)(-2xy^2)$

$= -6x^3 y^3$

$= -6(1)^3 (2)^3 = -6 \times 8 = -48$ [when $x = 1, y = 2$]

11. (a) $(a^2 - 3a + 5)(2a - 3) - (5a^2 + 3a - 3)(a - 1)$

$= 2a^3 - 6a^2 + 10a - 3a^2 + 9a - 15 - (5a^3 + 3a^2 - 3a - 5a^2 - 3a + 3)$

$= -3a^3 - 7a^2 + 25a - 18$

(b) $(3p + 2)(p - 2) - (7p + 3)(p - 4)$

$= (3p^2 - 6p + 2p - 4) - (7p^2 - 28p + 3p - 12)$

$= 3p^2 - 4p - 4 - 7p^2 + 25p + 12$

$= -4p^2 + 21p + 8$

WORKSHEET 3: STANDARD IDENTITIES

1. (a) $(2a + b)(2a + b) = (2a + b)^2$

$= (2a)^2 + 2(2a)(b) + (b)^2 = 4a^2 + 4ab + b^2$

(b) $(-a + 4c)^2 = (-a)^2 + (4c)^2 + 2(-a)(4c)$

$= a^2 - 8ac + 16c^2$

(c) $\left(\frac{7}{9}x + y\right)^2 = \left(\frac{7}{9}x\right)^2 + 2\left(\frac{7}{9}x\right)(y) + (y)^2$

$= \frac{49}{81}x^2 + \frac{14}{9}xy + y^2$

(d) $(x + 3)^2 = (x)^2 + 2(x)(3) + (3)^2 = x^2 + 6x + 9$

(e) $\left(a + \frac{1}{5a}\right)^2 = (a)^2 + 2(a)\left(\frac{1}{5a}\right) + \left(\frac{1}{5a}\right)^2$

$= a^2 + \frac{2}{5} + \frac{1}{25a^2}$

2. (a) $(2x - 5y)^2 = (2x)^2 - 2(2x)(5y) + (5y)^2$

$= 4x^2 - 20xy + 25y^2$

(b) $(x^2 - 5)^2 = (x^2)^2 - 2(x^2)(5) + (5)^2$

$= x^4 - 10x^2 + 25$

(c) $\left(\frac{3}{4}x - \frac{5}{6}y\right)^2$

$= \left(\frac{3}{4}x\right)^2 - 2\left(\frac{3}{4}x\right)\left(\frac{5}{6}y\right) + \left(\frac{5}{6}y\right)^2$

$= \frac{9}{16}x^2 - \frac{5}{4}xy + \frac{25}{36}y^2$

(d) $\left(\frac{2}{3}x - y\right)^2 = \left(\frac{2}{3}x\right)^2 - 2\left(\frac{2}{3}x\right)(y) + (y)^2$

$= \frac{4}{9}x^2 - \frac{4}{3}xy + y^2$

3. (a) $(x^3)^2 - (y^2)^2 = x^6 - y^4$

(b) $(5x)^2 - (9)^2 = 25x^2 - 81$

(c) $(x)^2 - \left(\frac{1}{x}\right)^2 = x^2 - \frac{1}{x^2}$

4. (a) $(102)^2 = (100 + 2)^2$

$= (100)^2 + 2(100)(2) + (2)^2$

$= 10000 + 400 + 4 = 10404$

(b) $(311)^2 = (300 + 11)^2$

$= (300)^2 + 2(300)(11) + (11)^2$

$= 90000 + 6600 + 121$

$= 96721$

(c) $(11)^4 = 11 \times 11 \times 11 \times 11 = 14641$

(d) $(89)^3 = (80 + 9)^3$

$= (80)^3 + (9)^3 + 3(80)^2 9 + 3(80) 9^2$

$= 512000 + 729 + 2160 (80 + 9)$

$= 512000 + 729 + 172800 + 19440$

$= 7,04,969$

(e) $108 \times 91 = (100 + 8)(100 - 9)$

$= 100 (100 - 9) + 8 (100 - 9)$

$= 10000 - 900 + 800 - 72$

$= 9828$

(f) $105 \times 95 = (100 + 5)(100 - 5)$

$= (100)^2 - (5)^2$

$= 10000 - 25 = 9975$

5. (a) $x^4 - y^4 = (4)^4 - (7)^4 = 256 - 2401$

$= -2145$

(b) $49x^2 + 126xy + 81y^2$

$= 49(4)^2 + 126(4)(7) + 81(7)^2$

$= 49(16) + 126(28) + 81(49)$

$= 784 + 3528 + 3969$

$= 8281$

(c) $4x^2 - 12xy + 9y^2 = 4(4)^2 - 12(4)(7) + 9(7)^2$

$= 4(16) - 48(7) + 9(49)$

$= 64 - 336 + 441 = 505 - 336 = 169$

6. $64a^2 - 112ab + 49ab^2$

$= 64\left(\frac{1}{2}\right)^2 - 112\left(\frac{1}{2}\right)\left(\frac{-3}{2}\right) + 49\left(\frac{1}{2}\right)\left(\frac{-3}{2}\right)^2$

$= \frac{64}{4} + \frac{336}{4} + \frac{49}{2} \times \frac{9}{4} = 16 + 84 + \frac{441}{8}$

$= 100 + \frac{441}{8} = \frac{800+441}{8} = \frac{1241}{8} = 155.125$

7. (a) $(355)^2 - (231)^2 = (355 + 231)(355 - 231)$

$= 586 \times 124 = 72664$

(b) $(4.67)^2 - (0.32)^2 = (4.67 + 0.32)(4.67 - 0.32)$

$= (4.99)(4.35) = 21.7065$

(c) $\frac{(69)^2 - (3)^2}{77} = \frac{(69+3)(69-3)}{77}$

$= \frac{72 \times 66}{77} = \frac{72 \times 6}{7} = \frac{432}{7} = 61.71$

(d) $\frac{(6.38)^2 - (0.19)^2}{4.15}$

$= \frac{(6.38 + 0.19)(6.38 - 0.19)}{4.15}$

$= \frac{(6.57)(6.19)}{4.15} = \frac{40.6683}{4.15} = 9.8$

8. $\left(x + \frac{1}{x}\right) = 3$, squaring both sides

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

$\Rightarrow x^2 + \frac{1}{x^2} = 9 - 2 = 7$

9. $x + \frac{1}{x} = 8$, squaring both sides

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

$\Rightarrow x^2 + \frac{1}{x^2} + 2 = 64 \Rightarrow x^2 + \frac{1}{x^2} = 64 - 2$

$\Rightarrow x^2 + \frac{1}{x^2} = 62$

Again squaring both sides

$\Rightarrow x^4 + \frac{1}{x^4} + 2 = 3844$

$\Rightarrow x^4 + \frac{1}{x^4} = 3844 - 2 = 3842$

10. $x - \frac{1}{x} = 5$, squaring both sides

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

$\Rightarrow x^2 + \frac{1}{x^2} - 2 = 25$

$\Rightarrow x^2 + \frac{1}{x^2} = 25 + 2 = 27$

11. $x - \frac{1}{x} = 9$, squaring both sides

$\Rightarrow \left(x - \frac{1}{x}\right)^2 = (9)^2 \Rightarrow x^2 + \frac{1}{x^2} - 2 = 81$

$\Rightarrow x^2 + \frac{1}{x^2} = 81 + 2 = 83$, Again squaring both sides

$\left(x^2 + \frac{1}{x^2}\right)^2 = (83)^2 = 6889$

$\Rightarrow x^4 + \frac{1}{x^4} = 6889 - 2 = 6887$

12. $x - y = 7$ (given)

Squaring both sides

$(x - y)^2 = (7)^2$

$\Rightarrow x^2 + y^2 - 2xy = 49$

$\Rightarrow x^2 + y^2 - 2(3) = 49 \Rightarrow x^2 + y^2 = 49 + 6$

$\Rightarrow x^2 + y^2 = 55.$

13. $x + 5y = 9$ (given)

Squaring both sides

$(x + 5y)^2 = (9)^2 \Rightarrow x^2 + 25y^2 + 10xy = 81$

$\Rightarrow x^2 + 25y^2 + 10(4) = 81$

$\Rightarrow x^2 + 25y^2 = 81 - 40 = 41$

$\therefore x^2 + 25y^2 = 41.$

14. (a) $(x + 2)(x - 2)(x^2 + 4)$

$= (x^2 - 4)(x^2 + 4)$ [$\because (a + b)(a - b) = a^2 - b^2$]

$= (x^4 - 16)$

(b) $(x + 1)(x - 1)(x^2 + 1)(x^4 + 1)$

$= (x^2 - 1)(x^2 + 1)(x^4 + 1)$

$= (x^4 - 1)(x^4 + 1)$

$= x^8 - 1$

15. (a) $(a^2 - 3a + 5)(2a - 3) - (5a^2 + 3a - 3)(a - 1)$

$= (2a^3 - 6a^2 + 10a - 3a^2 + 9a - 15) - (5a^3 + 3a^2 - 3a - 5a^2 - 3a + 3)$

$= 2a^3 - 9a^2 + 19a - 15 - 5a^3 + 2a^2 + 6a - 3$

$= -3a^3 - 7a^2 + 25a - 18$

(b) $(2x - 3y)(x + y) - (5x + 2y)(x - y)$

$= 2x^2 + 2xy - 3xy - 3y^2 - 5x^2 + 5xy - 2xy + 2y^2$

$= -3x^2 + 2xy - y^2$

(c) $x^2 + (3x - y)(3x + y + y^2)$

$= x^2 + 9x^2 + 3xy + 3xy^2 - 3xy - y^2 - y^3$

$= 10x^2 + 3xy^2 - y^2 - y^3$

WORKSHEET (BASED ON COMPLETE CHAPTER)

1. (a) (ii)

(b) (ii) $2x^2 - 3xy + 5y^2$

$= 2(2)^2 - 3(2)(3) + 5(3)^2$

$= 8 - 18 + 45 = 35$

(c) (i) $3x - 2y = 8$, Squaring both sides

$(3x - 2y)^2 = (8)^2 \Rightarrow 9x^2 + 4y^2 - 12xy$

$= 64$

$\Rightarrow 9x^2 + 4y^2 - 12(5) = 64$

$\Rightarrow 9x^2 + 4y^2 = 64 + 60 = 124$

(d) (i) $4x^2 + 2x + 1$ (when $x = -2$)

$= 4(-2)^2 + 2(-2) + 1 = 16 - 4 + 1 = 13$

(e) (ii) $x + \frac{1}{x} = 4$, squaring both sides

$\Rightarrow x^2 + \frac{1}{x^2} + 2 = 16 \Rightarrow x^2 + \frac{1}{x^2} = 14$

2. (a) Monomial

(b) Monomial

(c) $a^2b\left(3 + 5 - \frac{1}{8}\right) = a^2b\left(8 - \frac{1}{8}\right)$

$= a^2b\left(\frac{64 - 1}{8}\right) = \frac{63}{8}a^2b$

(d) $(a - b)$

(e) $3a(a - 3) = 3a^2 - 9a.$

3. $12.5x^2 - 15x + 7 + 2.25x^2 - 6x - 3 + 5.6x^2 - 2.5x + 13$

$= x^2(12.5 + 2.25 + 5.6) + x(-15 - 6 - 2.5) + 17$

$= 20.35x^2 - 23.5x + 17$

4. $(4x^2 + 8y^2 - 9z^2) - (5x^2 + 9y^2 - z^2)$

$= 4x^2 + 8y^2 - 9z^2 - 5x^2 - 9y^2 + z^2$

$= -x^2 - y^2 - 8z^2$

5. Total no. of students in a school $= 5x^2 + 3x + 7$

No. of Girls $= 3x^2 - 4x + 3$

$\therefore$ No. of Boys $= (5x^2 + 3x + 7) - (3x^2 - 4x + 3)$

$= 5x^2 + 3x + 7 - 3x^2 + 4x - 3$

$= 2x^2 + 7x + 4$

6. The given expression

$$\left[\left(-3ab + 6b^2 + 17c^2\right) + \left(3c^2 - 16b^2 - \frac{1}{4}ab\right)\right] - \left[\left(\frac{-1}{3}b^2 + c^2 - 7ab\right) + \left(\frac{2}{7}b^2 + \frac{1}{5}c^2 - 2ab\right)\right]$$

$$= \left[-3ab + 6b^2 + 17c^2 + 3c^2 - 16b^2 - \frac{1}{4}ab\right] - \left[-\frac{1}{3}b^2 + c^2 - 7ab + \frac{2}{7}b^2 + \frac{1}{5}c^2 - 2ab\right]$$

$$= \left(-10b^2 + 20c^2 - \frac{13}{4}ab\right) - \left(\frac{-1}{21}b^2 + \frac{6}{5}c^2 - 9ab\right)$$

$$= -10b^2 + 20c^2 - \frac{13}{4}ab + \frac{1}{21}b^2 - \frac{6}{5}c^2 + 9ab$$

$= \frac{-209}{21}b^2 + \frac{94}{5}c^2 + \frac{23}{4}ab$

7. $\left(\frac{1}{2} \times 4 \times \frac{1}{8}\right) \times (a^2 \times a) \times (b \times b^2) \times (c^3 \times c)$

$= \frac{1}{4}\ a^3 b^3 c^4$

8. The given expression

$-3x^2 + 7x - 5 - (6x^2 + 9x + 18)$

$= -3x^2 + 7x - 5 - 6x^2 - 9x - 18$

$= -9x^2 - 2x - 23.$

9. $7x^2 - 5x - 13 - (-7x^2 + 9)$

$= 7x^2 - 5x - 13 + 7x^2 - 9$

$= 14x^2 - 5x - 22.$

10. $3x^2y\ (6x^2 + 4y^2) = 18x^4y + 12x^2y^3$

11. When $x = 2, y = -1$

$3x^2 + 9xy + 9y^2$

$= 3(2)^2 + 9(2)\ (-1) + 9\ (-1)^2$

$= 12 - 18 + 9 = 21 - 18 = 3$

12. $\left(a^2 - \frac{1}{a^2}\right)^2 = a^2 - 2(a^2)\left(\frac{1}{a_2}\right) + \left(\frac{1}{a^2}\right)^2$

$= a^4 - 2 + \frac{1}{a^4}$

13. Area of the paper = $(5 - x)\ (5 - x)$ sq. units

$= 25 - 10\ x + x^2$

14. (a) $(188)^2$

$= (200 - 12)^2$

$= (200)^2 + (12)^2 - 2\ (200)\ (12)$

$= 40000 + 144 - 4800$

$= 35344$

(b) $(20.7)^2$

$= (20 + 0.7)^2$

$= (20)^2 + (0.7)^2 + 2\ (20)\ (0.7)$

$= 400 + 0.49 + 28$

$= 428.49$

15. $3x + \frac{1}{3x} = 3$, squaring both sides

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

$= 9$

$\Rightarrow 9x^2 + \frac{1}{9x^2} = 9 - 2 = 7$

16. (a) $x^2 + y^2 = 13, xy = 6$

$(x + y)^2 = x^2 + y^2 + 2xy$

$= 13 + 12 = 25$

$\Rightarrow x + y = 5$

(b) We know that $(x - y)^2 = x^2 + y^2 - 2xy$

$= 13 - 12 = 1$

$\Rightarrow x - y = 1$

17. (a) $(a - b)^2 = a^2 + b^2 - 2ab = (41) - 2(4)$

$= 41 - 8 = 33$

$\therefore a - b = \sqrt{33}$

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

$= 41 + 8 = 49$

$\therefore a - b = 7$

18. $3x - \frac{1}{3x} = 5$, squaring both sides

$9x^2 + \frac{1}{9x^2} = 25 + 2 = 27$

Again, squaring both sides

$\left(9x^2\right)^2 + \left(\frac{1}{9x^2}\right)^2 + 2(9x^2) \times \frac{1}{9x^2} = 729$

$\Rightarrow 81x^4 + \frac{1}{81}\ x^4 + 2 = 729$

$\therefore 81x^4 + \frac{1}{81x^4} = 729 - 2 = 727$

Chapter
09 Mensuration

WORKSHEET 1 PERIMETER AND AREA

1. Area of an equilateral triangle

$= \frac{\sqrt{3}}{4} \times (\text{side})^2$

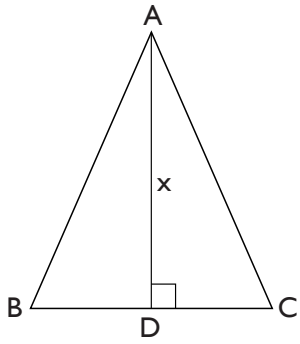
$= \frac{\sqrt{3}}{4} \times 8 \times 8 \text{ cm}^2$

$= \sqrt{3} \times 16 \text{ cm}^2 = 16\sqrt{3} \text{ cm}^2$

$= 16 \times 1.7321 \text{ cm}^2$

$= 27.714 \text{ cm}^2$

2. Let x be the height



Let AB = AC = a

BC = 12 cm

AB + BC + AC = 32

$\Rightarrow$ a + 12 + a = 32

$\Rightarrow$ 2a = 20

$\Rightarrow$ a = 10

$\therefore$ AB = AC = 10 cm

In Δ ABC, BD = DC $= \frac{1}{2}$ BC

$= \frac{1}{2}$ (12)

= 6 cm

By Pythagoras theorem,

$AC^2 = AD^2 + CD^2$

$10^2 = x^2 + 36$

$100 = x^2 + 36$

$x^2 = 100 - 36$

$= 64$

$\therefore x = 8$

Area of the triangle = ½ × b × h

= ½ × 12 × 8 = 48 cm^2

3. (a) Let sides of triangle be a = 18, b = 24, c = 30

$s = \frac{a+b+c}{2}$

$= \frac{18+24+30}{2}$

$= \frac{72}{2}$

= 36

Area of triangle = $\sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{36(36-18)(36-24)(36-30)}$

$= \sqrt{36 \times 18 \times 12 \times 6}$

$= 18 \times 2 \times 6 = 216 \text{ mm}^2$

(b) a = 10 cm, b = 24 cm, c = 26 cm

$s = \frac{a+b+c}{2} = \frac{10+24+26}{2} = \frac{60}{2}$ = 30 cm

Area = $\sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{30(30-10)(30-24)(30-26)}$

$= \sqrt{30 \times 20 \times 6 \times 4}$ cm^2

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

$= 5 \times 2 \times 2 \times 3 \times 2 = 120 \text{ cm}^2$

4. (a) a = 16 cm, b = 12 cm, c = 20 cm

$s = \frac{a+b+c}{2} = \frac{16+12+20}{2} = \frac{48}{2}$ = 24 cm

Area of triangle = $\sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{24(24-16)(24-12)(24-20)}$

$= \sqrt{24 \times 8 \times 12 \times 4}$

$= 12 \times 4 \times 2 = 96 \text{ cm}^2$

(b) ½ × 20 × h = 96

$\Rightarrow$ 10 h = 96

$\Rightarrow h = \frac{96}{10}$ = 9.6 cm

(c) $\frac{1}{2} \times 12 \times h = 96$

$\Rightarrow 6h = 96$

$\Rightarrow h = \frac{96}{6} = 16$ cm

5. (a) Perimeter of rectangle = 46 m

$\Rightarrow 2(l + b) = 46$

$\Rightarrow 2(15 + b) = 46$

$\Rightarrow 15 + b = 23$

$\Rightarrow b = 23 - 15 = 8$ m

Hence, breadth = 8 m

(b) Area = $l \times b$

$= 15 \times 8 = 120$ m^2

(c) $H^2 = P^2 + B^2$

$\Rightarrow H^2 = 15^2 + 8^2$

$H^2 = 225 + 64 = 289$

$\therefore H = 17$ cm

Hence, diagonal = 17 cm

6. Let the side of square be 'a' units.

Perimeter of square = 4a

Area of square = a^2

A.T.Q.

$4a = a^2 \Rightarrow a = 4$.

$\therefore$ Area of square = $4^2 = 16$ sq. units

7. Length = $3\frac{5}{2}m = \frac{11}{2}m$, breadth = 4m

Area of rectangle = $l \times b$

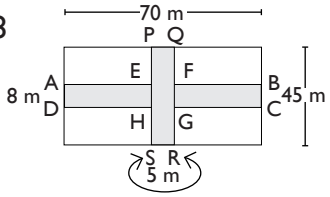
$= \frac{11}{2} \times 4$ m$^2 = 11 \times 2$ m$^2 = 22$ m^2

8. Area of ABCD = 70×8

$= 560$ m^2

Area of PQRS = 45×5

$= 225$ m^2



Area of EFGH = $8 \times 5 = 40$ m^2

Hence, area $(560 + 225 - 40)$ m^2 = $(785 - 40)$

$= 745$ m^2

Cost of levelling the road at the safe of ₹ 180 per sqm. = ₹ 180×745

= ₹ 134100

9. (a) Area of square ABCD = $(\text{side})^2 = (6)^2$

$= 36$ m^2

Area of rectangle PQRS = $l \times b$

$= 3.6 \times 4.8$ m^2

$= 17.28$ m^2

Area of shaded portion = $(36 - 17.28)$ m^2

$= 18.72$ m^2

(b) Area of rectangle PQRS = 3.2 m $\times$ 1.8 m

$= 5.76$ m^2

Area of square ABCD = $(1.4)^2 = 1.96$m^2

Area of shaded portion = $(5.76 - 1.96)$m^2

$= 3.8$ m^2

10. Let base of a triangle $= 5x$

height of a triangle $= 3x$

Area of triangle $= 67.5$ m^2

$\Rightarrow \frac{1}{2} \times 5x \times 3x = 67.5$

$\Rightarrow 15x^2 = 67.5 \times 2$

$\Rightarrow x^2 = \frac{67.5 \times 2}{15} = 9$

$\therefore x = 3$ m

Base = $5x = 5 \times 3 = 15$ m

and Height = $3x = 3 \times 3 = 9$ m

11. Let length = $7x$

Breadth = $4x$

Perimeter = 110 m (given)

$\Rightarrow 2(l + b) = 110$ m

$\Rightarrow 7x + 4x = \frac{110}{2} = 55$

$\Rightarrow 11x = 55$

$\therefore x = \frac{55}{11} = 5$ m

Length = $7x = 7 \times 5 = 35$ m

and breadth = $4x = 4 \times 5 = 20$ m

(a) Area = $l \times b$

$= 35$ m $\times 20$ m

$= 700$ m^2

(b) 1 tile's size = 25 cm $\times$ 20 cm

$= 0.25$ m $\times 0.20$ m

$= 0.05$ m^2

$\therefore$ No. of tiles = $\frac{700\ m^2}{0.05\ m^2} = 14000$

(c) Cost of 100 tiles = ₹ 1400

$\therefore$ 14000 tiles = (?)

$$= \frac{1400 \times 14000}{100}$$

$= 14 \times 14000 = ₹\ 196000$

12. Area of rectangle $= 120\ cm^2$

$l \times b = 120$

$\Rightarrow$ $l \times 8 = 120$

$\Rightarrow$ $l = \frac{120}{8} = 15\ m$

Perimeter $= 2\ (l + b)$

$= 2\ (15 + 8)$

$= 2\ (23)\ m = 46\ m$

13. Let the sides of the first rectangle be l and b.

Let the sides of the second rectangle be 2l and 2b

Perimeter of the original rectangle is 2(l + b) and resulting rectangle is 2(2l + 2b)

(a) Ratio of Perimeter $= \frac{2(l+b)}{2(2l+2b)} = \frac{2(l+b)}{4(l+b)}$

$= \frac{1}{2} = 1 : 2$

(b) Area of original rectangle is lb and resulting rectangle is 2l × 2b

Ratio of area $= \frac{lb}{2l \times 2b} = \frac{lb}{4lb} = \frac{1}{4}$

$= 1 : 4$

WORKSHEET 2 AREA OF TRAPEZIUM, QUADRILATERAL AND POLYGON

1. B = 20 cm, H = 15 cm

Area of ll gm = B × H

$= 20 \times 15\ cm^2$

$= 300\ cm^2$

2. (a) Area of rectangle = l × b

$= (20 \times 15)\ cm^2 = 300\ cm^2$

(b) Area of rectangle = l × b

$= (7 \times 19)\ cm^2 = 133\ cm^2$

(c) Area of square = $(side)^2 = (11)^2 m^2$

$= 121\ m^2$

(d) Area of rectangle = l × b

$= 74 \times 126\ m^2 = 9324\ m^2$

(e) Area = ½ × (sum of ll sides) × height

$= ½ \times (26 + 29) \times 21\ cm^2$

$= ½ \times 55 \times 21\ cm^2 = \frac{1155}{2}\ cm^2$

$= 577.5\ cm^2$

3. Sides of trapezium are 26 cm and 30 cm

height = 21 cm

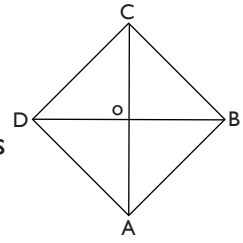
Area of trapezium = ½ (sum of parallel sides) × (height)

$= ½ \times 56 \times 21\ cm^2$

$= (28 \times 21)\ cm^2$

$= 588\ cm^2$

4. Area of Rhombus $= 384\ cm^2$



Let the diagonals be 4x and 3x

½ × d_1 × d_2 = area of rhombus

$\Rightarrow$ ½ × 4x × 3x = 384

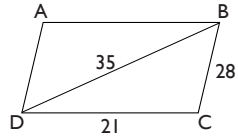
$\Rightarrow 6x^2 = 384 \Rightarrow x^2 = \frac{384}{6} = 64$

$\therefore$ x = 8 cm

$\therefore$ sides are 4x = 4 × 8 = 32 cm

and 3x = 3 × 8 = 24 cm

5. $s = \frac{35 + 28 + 21}{2} = \frac{84}{2} = 42\ cm$



Area of ΔBCD

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{42(42-35)(42-28)(42-21)}$

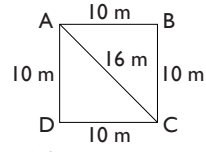
$= \sqrt{42 \times 7 \times 14 \times 21}$

$= \sqrt{7 \times 3 \times 2 \times 7 \times 2 \times 7 \times 3 \times 7}$

$= 7 \times 7 \times 3 \times 2 = 49 \times 6 = 294\ cm^2$

Area of the 11 gm = $2 \times 294\ cm^2 = 588\ cm^2$

6. Each side of the rhombus = 10 m



let the rhombus be ABCD and

d_1 = 16m, d_2 = ?

In ΔADC, a = 10m = AD, b = AC = 16m

and c = DC = 10 m

$s = \frac{a+b+c}{2} = \frac{10+16+10}{2} = \frac{36}{2} = 18$

Area $= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{18(18-10)(18-16)(18-10)}$

$= \sqrt{18 \times 8 \times 2 \times 8} = \sqrt{2304} = 48\ m^2$

Area of one side = 48 m^2 + 48 m^2 = 96 m^2

Area of rhombus = ½ × d_1 × d_2

$\Rightarrow$ 96 = ½ ×16 × d_2

$\Rightarrow d_2 = \frac{96 \times 2}{16}$ = 12 m

Cost of painting both sides of the rhombus

= ₹ 6 per m^2

Area of both the sides of the rhombus

= 96 × 2 = 192 m^2

Total cost of painting both the sides of the rhombus

= ₹ 192 × 6 = ₹ 1152

7. Area of the cross-section = Area of trapezium ABCD

$= \frac{1}{2}$ (sum of parallel sides) × height

$= \frac{1}{2}$ (0.8 + 2.4) × 6.4 [80 cm = 0.8 m]

$= \frac{1}{2} \times 3.2 \times 6.4 = 1.6 \times 6.4$

= 10.24 m^2

8. Area of Rhombus = area of triangle

Area of triangle = ½ × b × h

= ½ × 24 × 16 cm^2

= 12 × 16 cm^2 = 192 cm^2

Area of Rhombus = ½ × d_1 × d_2

= ½ × 19.2 × d_2

$\Rightarrow \frac{19.2}{2} \times d_2$ = 192 (given)

$\Rightarrow d_2 = \frac{192 \times 2}{19.2}$ = 20 cm

$\therefore$ other diagonal = 20 cm

WORKSHEET 3 SURFACE AREA OF CUBE, CUBOID AND CYLINDER

1. (a) 2 (lb + bh + hl) (b) 4 $(side)^2$
   (c) 2 × h × (l + b) (d) $2\pi r$ (r + h)
   (e) $2\pi rh$ (f) total surface area

2. Perimeter of the rectangle = 2(l + b)

   $\Rightarrow$ 10 = 2(l + b) (given)

   Height = 10 m (given)

   Area of four walls = 2h (l + b) = 10 × 10 = 100 m^2

   $\therefore$ Area of the four walls = 100 m^2

3. Let edge = x

   $\therefore$ New edge = 2x

   Surface area of a cube = 6 $(edge)^2$

   = 6 $(2x)^2$ = 6$(4x^2)$

   = 24 x^2

   = 4 $(6x^2)$

   $\therefore$ The surface area of cube becomes 4 times.

4. Side = 3m

   Surface area of the given cube

   = 6 × $(3)^2$ cm^2 = 6 × 9 cm^2

   = 54 cm^2

5. Length = 3 m

   breadth = 2.5 m

   and height = 1.5 m

   Total surface area of cuboid = 2 (lb + bh + hl)

   = 2 (3 × 2.5 + 2.5 × 1.5 + 1.5 × 3) m^2

   = 2 (7.5 + 3.75 + 4.5) m^2

   = 2 × 15.75 m^2 = 31.5 m^2

   Lateral surface area = 2h (l + b)

   = 2 (1.5) (3 + 2.5)

   = 3 (5.5)

   = 16.5 m^2

6. Side = 5 cm

   Total surface area of cube = 6 $(side)^2$

   = 6$(5)^2$ = 6 × 25

   = 150 cm^2

   Lateral surface area

   = 4 $(side)^2$

   = 4 $(5)^2$

   = 100 cm^2

7. Dimensions are

   2 m 50 cm, 1 m 25 cm, 75 cm

   i.e. 2.5 m, 1.25 m, 0.75 m

   (a) Area of canvas

   = 2 (lb + bh + hl)

   = 2 [2.5(1.25) + 1.25(0.75) + 0.75(2.5)]

= 2 [3.125 + 0.9375 + 1.875)

= 11.875 m^2

(b) Cost of canvas = 60 × 11.875

= ₹ 712.5

8. Lateral surface area of a cube = 256 cm^2

$\Rightarrow 4a^2 = 256$

$\Rightarrow a^2 = \frac{256}{4} = 64$

$\therefore a = 8$

Total surface area = $6a^2$

= 6 × 8 × 8 = 384 cm^2

9. We have, l = length of the brick = 22.5 cm

b = breadth of the brick = 10 cm

h = height of the brick = 7.5 cm

Surface area of the brick = 2 (lb + bh + hl)

= 2 (22.5 × 10 + 10 × 7.5 + 7.5 × 22.5) cm^2

= 2 (225 + 75 + 168.75) cm^2 = 937.5 cm^2

The paint in the container is sufficient to paint area = 9375 cm^2

$\therefore$ Number of bricks which can be painted

$= \frac{9375}{937.5} = 10$

10. Length of the tank = 30 m

Width of the tank = 24 m

Depth of the tank = 4.5 m

Area of four walls of the tank = 2h (l + b)

= 2 × 4.5 (30 + 24)

= 2 × 4.5 × 54 m^2

= 486 m^2

Area of the floor of the tank = l × b

= 30 × 24 = 720 m^2

Area of iron sheet required to make the tank = area of four walls + area of floor.

= 486 + 720 = 1206 m^2

Cost of iron sheet required @ 65 per m^2

= ₹ 65 × 1206

= ₹ 78390

11. Length of the dinning hall of a hotel = 75 m

Breadth of the dinning hall of a hotel = 60 m

Height of the dinning hall of a hotel = 16 m

(a) Area of four walls = 2 × h × (l + b)

= 2 × 16 (75 + 60) m^2

= 32 × 135 m^2 = 4320 m^2

Area of one door = 4 × 3 m^2 = 12 m^2

Area of five doors = 12 × 5 m^2 = 60 m^2

Area of one window = 3 × 1.6 m^2 = 4.8 m^2

Area of four windows = 4.8 × 4 m^2 = 19.2 m^2

Area of the walls to be painted

= 4320 – (60 + 19.2)

= 4320 – 79.2 = 4240.8 m^2

Cost of papering the walls at the rate of ₹ 12 per m^2

= ₹ 12 × 4240.8

= ₹ 50889.60

(b) Area of floor = l × b = 75 × 60 = 4500 m^2

Cost of carpeting the floor at the rate of ₹ 25 per m^2

= ₹ 25 × 4500 = ₹ 112500

12. l = 6 m, b = 5.2 m, h = 4.5

CSA of room = 2h (l + b)

= 2 (4.5) (6 + 5.2)

= 9 (11.2) cm^2

= 100.8 m^2

Area of 2 doors = 2 × 1.2 × 2

= 4.8 m^2

Area of 3 windows = 3 × 1 × 0.80

= 2.4

So, area to be whitewashed = 100.8 – 4.8 – 2.4

= 93.6 m^2

Cost of white washing = 93.6 × 18

= 1684.8

13. Let l, b, h be the dimensions of the cuboid

l = 8 + 8 + 8 = 24 cm

b = 8 cm and h = 8 cm

Total surface area = 2 (lb + bh + hl)

= 2(24 × 8 + 8 × 8 + 8 × 24)

= 2(192 + 64 + 192) = 2(448)

= 896 cm^2

14. Edge of cube = 9 cm

Length of the cuboid = 9 × 4 = 36 cm

Breadth (b) = 9 cm

and Height (h) = 9 cm

Total surface area of the cuboid = 2(lb + bh + hl)

$=2(36 \times 9 + 9 \times 9 + 9 \times 36)\ cm^2$

$=2(324 + 81 + 324)\ cm^2$

$= 2 \times 729\ cm = 1458\ cm^2$

WORKSHEET 4: VOLUME OF CUBE, CUBOID AND CYLINDER

1. l = 13 cm, b = 9 cm and h = 5 cm

Volume of cuboid = l × b × h cm^3

$= 13 \times 9 \times 5\ cm^3 = 585\ cm^3$

2. Volume of cuboidal block = 300 cm^3

Length = 20 cm

Breadth = 6 cm

Height of a cuboidal block $= \frac{\text{Volume}}{\text{length} \times \text{breadth}}$

$= \frac{300}{20 \times 6} = \frac{300}{120} = 2.5$ cm

3. We have,

Volume of rectangle block of ice = l × b × h cm^3

$= 42 \times 25 \times 18\ cm^3$

$= 18900\ cm^3$

Now, weight of 1 cm^3 = 0.9 grams

$\therefore$ weight of the rectangular ice = 0.9 × 18900

= 17010 g = 17.010 kg.

4. Let breadth of the cuboid be x

Length = 2x

and height = $\frac{x}{2}$

Volume of the cuboid = l × b × h $unit^3$

$= 2x \times x \times \frac{x}{2}\ unit^3$

$= x^3\ unit^3$

5. Length of one side of the cube = 4 cm

Its volume = $(side)^3\ cm^3$

$= (4)^3\ cm^3 = 64\ cm^3$

Volume of the cuboid = l × b × h

= 24 cm × 20 cm × 12 cm

$= 5760\ cm^3$

$\therefore$ Number of cubes $= \frac{\text{Volume of the cuboid}}{\text{Volume of the cube}}$

$= \frac{5760}{64} = 90$

6. Area of the field = 4 hectares

$= 4 \times 10000\ m^2 = 40000\ m^2$

Depth of the water on the field = 4 cm

$= \frac{4}{100} m = \frac{1}{25} m$

Volume of water = Area of the field × Depth of the water

$= 40000 \times \frac{1}{25} m^3 = 1600\ m^3$

= 1600 × 1000 litres = 1600000 litres

[$\because$ 1 m^3 = 1000 lit]

7. Volume of cube = $(side)^3$

$\Rightarrow 64 = (side)^3$

$\Rightarrow$ Side = edge = 4 cm

8. Let the length of the cuboid = 5x

Breadth of the cuboid = 3x

Height of the cuboid = 2x

Volume of cuboid = l × b × h m^3

$\Rightarrow 3750 = 5x \times 3x \times 2x$

$\Rightarrow 3750 = 30x^3$

$\Rightarrow \frac{3750}{30} = x^3 \Rightarrow x^3 = 125 = (5)^3$

$\Rightarrow x = 5$ cm

$\therefore$ length of cuboid = 5x = 5 × 5 = 25 cm

breadth of cuboid = 3x = 3 × 5 = 15 cm

height of cuboid = 2x = 2 × 5 = 10 cm

9. Volume of the Pit = l × b × h

$= (6 \times 5 \times 4)\ m^3 = 120\ m^3 = 120000000\ cm^3$

Labour charges per 1000 cm^3 = $ 15

So, labour charges per $cm^3 = \frac{15}{1000} =$ ₹ 0.015

$\therefore$ Total labour charges = ₹ 0.015 × 120000000

= ₹ 1800000

10. Given, h = 21 cm

r = 14 cm

Volume of cylinder = $\pi r^2 h$ cm^3

$= \frac{22}{7} \times (14)^2 \times 21$ cm^3

$= 22 \times 14 \times 14 \times 3$ cm^3

$= 12936$ cm^3

Surface area of cylinder = $2\pi r\,(r + h)$

$= 2 \times \frac{22}{7} \times 14\,(14 + 21)$

$= 4 \times 22 \times 35$

$= 3080$ cm^2

11. Let r be the radius and h be the height of the cylinder. Then,

$2\pi rh = 200$ m^2 (given)

$\Rightarrow 2 \times \frac{22}{7} \times r \times 12 = 200$

$\Rightarrow r = \frac{200 \times 7}{24 \times 22} = 2.65$ m

Volume of the cylinder = $\pi r^2 h$

$= \frac{22}{7} \times (2.65)^2 \times 12$ m^3

$= 264.85$ cm^3

12. Let r be the radius of the cylinder.

Circumference = 176 cm

$\Rightarrow 2\pi r = 176$

$\Rightarrow 2 \times \frac{22}{7} \times r = 176 \Rightarrow r = \frac{176 \times 7}{44}$

$\Rightarrow r = \frac{1232}{44} = 28$ cm

and h = 60 cm

Volume of the cylinder = $\pi r^2 h$

$= \frac{22}{7} \times (28)^2 \times 60$ cm^3

$= \frac{22}{7} \times 28 \times 28 \times 60$ cm^3

$= 22 \times 4 \times 28 \times 60$ cm^3

$= 147840$ cm^3

13. Let r cm be the radius of the base and h cm be the height. Then, h = 12 cm.

Now, circumference of the base = length of the sheet

$\Rightarrow$ circumference = 44 cm

$\Rightarrow 2\pi r = 44$ cm

$\Rightarrow 2 \times \frac{22}{7} \times r = 44$

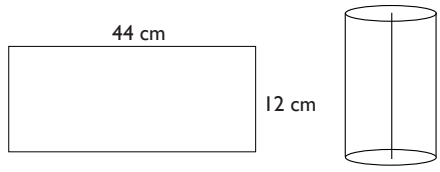
$\Rightarrow r = \frac{44 \times 7}{44} = 7$ cm

Volume of the cylinder = $\pi r^2 h$ cm^3

$= \frac{22}{7} \times (7)^2 \times 12$ cm^3

$= 22 \times 7 \times 12$ cm^3

$= 1848$ cm^3



14. Diameter = 56 cm, R = $\frac{56}{2} = 28$ cm

Circumference = $2\pi r = 2 \times \frac{22}{7} \times 28$ cm

$= 176$ cm

length of pipe = 20 m = 2000 cm

Area of pipe = $2\pi rh = 2000 \times 176$

$= 3,52,000$ cm^2 $= 35.2$ m^2

Cost of painting at the rate of ₹ 85/m^2

$= 85 \times 35.2$

$=$ ₹ 2992

15. Given, radius of cylinder (r) = 3.5 m

length of cylinder (h) = 21 m

Volume of cylinder = $\pi r^2 h$

$= [\pi\,(3.5)^2 \times 21]$ m^3

$= [\frac{22}{7} \times 3.5 \times 3.5 \times 21]$m^3

$= 808.5$ m^3

$= 808500$ litres

16. Given that,

External diameter = 8 cm

External radius (R) = 4 cm

Thickness = 1 cm

So, Internal Radius (r) = (4 – 1) cm = 3 cm

Volume of iron = $\pi(R^2 - r^2)\,h$

$= \frac{22}{7}\,(4^2 - 3^2)\,21$

$= \frac{22}{7} (4 + 3) (4 - 3) 21$

$= \frac{22}{7} (7) (1) 21$

$= 462 \text{ cm}^3$

Weight of iron $= 462 \times 8 = 3696 \text{ g}$

17. Given D = 84 cm

$R = \frac{84}{2} = 42 \text{ cm}$

Length (h) = 120 cm

CSA of cylinder = $2\pi rh$

$= 2 \times \frac{22}{7} \times 42 \times 120 = 31680 \text{ cm}^2$

Area of playground = $1000 \times 31680 \text{ cm}^2$

$= 31680000 \text{ cm}^2$

$= 3168 \text{ m}^2$

18. Length of hall = 40 m

Breadth of hall = 25 m

Height of hall = 15 m

Volume of the hall = $l \times b \times h \text{ m}^3$

$= 40 \times 25 \times 15 \text{ m}^3$

$= 15000 \text{ m}^3$

Volume occupied by each person $= \frac{15000}{5} \text{ m}^3$

$= 3000 \text{ m}^3$.

19. Let the radii of two cylinders be 4r and 3r respectively and their heights be 5h and 6h respectively. Let S_1 and S_2 be the curved surfaces area.

$S_1 = 2\pi \times 4r \times 5h = 40\pi \text{ rh}$ sq. unit.

$S_2 = 2\pi \times 3r \times 6h = 36\pi \text{ rh}$ sq. unit.

$\therefore \frac{S_1}{S_2} = \frac{40\pi rh}{36\pi rh} = \frac{40}{36} = \frac{10}{9}$

$\therefore S_1 : S_2 = 10 : 9.$

20. Let r and h be the radius and height of the cylinder respectively.

Sum of radius and height = 37

$\Rightarrow r + h = 37 \text{ cm}$

Total surface area of cylinder = 1628 cm^2

$\Rightarrow 2\pi r (r + h) = 1628$

$\Rightarrow 2\pi r (37) = 1628$

$\Rightarrow 2\pi r = \frac{1628}{37} = 44$

$\Rightarrow 2 \times \frac{22}{7} \times r = 44$

$\Rightarrow r = 44 \times \frac{7}{22} \times \frac{1}{2}$

$r = 7 \text{ cm}$

$\Rightarrow 7 + h = 37$

$\Rightarrow h = 37 - 7 = 30 \text{ cm}$

Volume of the cylinder = $\pi r^2 h$

$= \frac{22}{7} \times (7)^2 \times 30 \text{ cm}^3$

$= \frac{22}{7} \times 7 \times 7 \times 30 \text{ cm}^3$

$= 22 \times 210 \text{ cm}^3$

$= 4620 \text{ cm}^3$

WORKSHEET (BASED ON COMPLETE CHAPTER)

1. (a) ii (b) ii (c) iii (d) ii

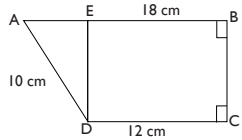
2. (a) total surface area (b) 1000 dm^3
(c) $2\pi r (h + r)$ (d) $(\text{edge})^3$
(e) $l \times b \times h$

3. (a) True (b) False
(c) True (d) False
(e) False

4. Given, l = 80 cm

b = 50 cm

h = ?



Volume = $l \times b \times h$

$\Rightarrow 120 \text{ dm}^3 = 80 \times 50 \times h \text{ cm}^3$

$\therefore 120000 = 4000 \text{ h cm}^3$

$\Rightarrow h = \frac{120000}{4000} = 30 \text{ cm}$

5. Let the thickness be t. Now, we will spread it over a large area, the volume remains the same.

$t \times 500 \text{ dm}^2 = 1 \text{ m}^3$

$t \times 5 \text{ m}^2 = 1 \text{ m}^3$ [$1 \text{ m}^2 = 100 \text{ dm}^2$]

$t = \frac{1}{5} \text{ m} = 0.20 \text{ m}$

Thus, the thickness of the iron sheet obtained is 0.20 m

6. Volume of cube = $(\text{side})^3$

$\Rightarrow 8000 = (\text{side})^3$

$\therefore$ side = 20 cm

Total surface area = $6 \times (\text{side})^2$

$= 6 \times (20)^2 \text{ cm}^2$

$= 2400 \text{ cm}^2$

7. Side of cube = 5 cm

Volume of cube = $(\text{side})^3 \text{ cm}^3$

$= (5)^3 = 125 \text{ cm}^3$

Volume of cuboid = $(25 \times 19 \times 10) \text{ cm}^3$

$= 4750 \text{ cm}^3$

Total no. of cubes = $\frac{4750}{125}$ cm = 38 cubes

8. Internal diameter = 28 cm

Radius = 14 cm

and height = 20 cm

volume = $\pi r^2 h \text{ cm}^3$

$= \frac{22}{7} \times 14 \times 14 \times 20 \text{ cm}^3$

$= 22 \times 28 \times 20 \text{ cm}^3 = 12320 \text{ cm}^3$

$1 \text{ cm}^3 = \frac{1}{1000} l$

$\therefore 12320 \text{ cm}^3 = \frac{12320}{1000} l = 12.32 \text{ l}$

9. (a) Let length of the cuboid = 4x

Breadth of the cuboid = 3x

Height of the cuboid = 2x

Surface area = 2548 cm^2

$\Rightarrow 2 (lb + bh + hl) = 2548$

$\Rightarrow 2 (4x \times 3x + 3x \times 2x + 2x \times 4x) = 2548$

$\Rightarrow (12x^2 + 6x^2 + 8x^2) = 1274$

$\Rightarrow 26x^2 = 1274$

$\Rightarrow x^2 = \frac{1274}{26} = 49$

$\therefore x = 7$ cm

Length of the cuboid = $4x = 4 \times 7 = 28$ cm

breadth = $3x = 3 \times 7 = 21$ cm

and height = $2x = 2 \times 7 = 14$ cm

Volume = $l \times b \times h \text{ cm}^3$

$= 28 \times 21 \times 14 \text{ cm}^3$

$= 8232 \text{ cm}^3$

(b) Volume = 3000 m^3

$\Rightarrow 4x \times 3x \times 2x = 3000$

$\Rightarrow 24x^3 = 3000$

$x^3 = \frac{3000}{24} = 125$

$\Rightarrow x = 5$ cm

$\therefore l = 4x = 4 \times 5 = 20$ cm

$b = 3x = 3 \times 5 = 15$ cm

and $h = 2x = 2 \times 5 = 10$ cm

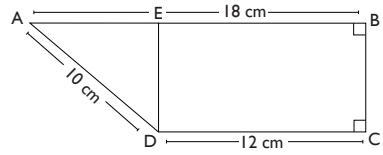
Surface area = $2 (lb + bh + hl) \text{ cm}^2$

$= 2 (20 \times 15 + 15 \times 10 + 10 \times 20) \text{ cm}^2$

$= 2 (300 + 150 + 200) \text{ cm}^2$

$= 2 \times 650 \text{ cm}^2$

$= 1300 \text{ cm}^2$



10. Circumference of semicircular arc + diameter = Total length of wire

$\Rightarrow \pi r + 2r = 108$ cm

$\Rightarrow r\left(\frac{22}{7} + 2\right) = 108 \Rightarrow r\left(\frac{22+14}{7}\right) = 108$

$\Rightarrow r = \frac{108 \times 7}{36} = 21$ cm

Now, area = $\frac{1}{2} \times \frac{22}{7} \times 21 \times 21 \, cm$

$= 11 \times 3 \times 21 \text{ cm}^2 = 693 \text{ cm}^2$

11. Given, AB = 18 cm,

AD = 10

$\angle B = \angle C = 90^\circ$

Draw a line segment from D to AB at point E.

BE = CD = 12 cm

AE = AB – BE = 18 – 12 = 6 cm

In ΔADE, $AD^2 = DE^2 + AE^2$

$\Rightarrow (10)^2 = DE^2 + (6)^2$

$\Rightarrow 100 - 36 = DE^2$

$\Rightarrow 64 = DE^2$

$\Rightarrow$ DE = 8 cm = height of the trapezium

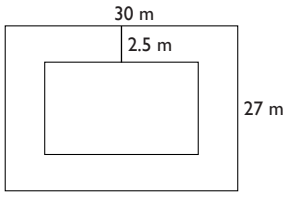
Area of trapezium = ½ × sum of parallel sides × height

$= ½ \times (12 + 18) \times 8 \text{ cm}^2$

$= 30 \times 4 = 120\ cm^2$

12. Area of outer rectangular field $= l \times b$

$= 30 \times 27 = 810\ m^2$



length of inner rectangular field $= 30 - 5 = 25$ m

breadth of inner rectangular field

$= 27 - 5 = 22$ m

Area of inner rectangular field

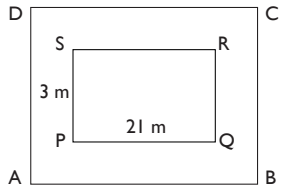
$= 25 \times 22$

$= 550\ m^2$

$\therefore$ Area of the path $= (810 - 550)\ m^2$

$= 260\ m^2$

13. According to the given information, length of the inner square field = 21 m



$\therefore$ Area $= 21 \times 21\ m^2$

$= 441\ m^2$

Again, length of the outer square field

$= 21 + 3 + 3 = 27$m

Area $= 27 \times 27 = 729\ m^2$

Area of the path $= (729 - 441)\ m^2$

$= 288\ m^2$

Chapter
10 Exponents and Powers

WORKSHEET 1: POWERS WITH NEGATIVE EXPONENTS AND LAWS OF EXPONENT

1. (a) $\frac{9}{11}\times\frac{9}{11}\times\frac{9}{11}\times\frac{9}{11} = \left(\frac{9}{11}\right)^4$

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

2. (a) $\left(\frac{4}{7}\right)^3 = \frac{4}{7}\times\frac{4}{7}\times\frac{4}{7} = \frac{4\times4\times4}{7\times7\times7} = \frac{64}{343}$

(b) $\left(\frac{-4}{5}\right)^4 = \frac{-4}{5}\times\frac{-4}{5}\times\frac{-4}{5}\times\frac{-4}{5} = \frac{256}{625}$

(c) $\left(\frac{-1}{3}\right)^7 = \frac{-1}{3}\times\frac{-1}{3}\times\frac{-1}{3}\times\frac{-1}{3}\times\frac{-1}{3}\times\frac{-1}{3}\times\frac{-1}{3}$

$= \frac{-1}{2187}$

3. (a) $\frac{49}{25} = \frac{7\times7}{5\times5} = \left(\frac{7}{5}\right)^2$

(b) $\frac{256}{289} = \frac{16\times16}{17\times17} = \left(\frac{16}{17}\right)^2$

(c) $\frac{-27}{512} = \frac{(-3)\times(-3)\times(-3)}{8\times8\times8} = \left(\frac{-3}{8}\right)^3$

(d) $\frac{-1}{125} = \frac{-1}{5}\times\frac{-1}{5}\times\frac{-1}{5} = \left(\frac{-1}{5}\right)^3$

4. (a) Reciprocal of $\left(\frac{17}{-15}\right)^3$ is $\left(\frac{-15}{17}\right)^3$

$= \frac{-15}{17}\times\frac{-15}{17}\times\frac{-15}{17} = \frac{-3375}{4913}$

(b) $\left(\frac{1}{13}\right)^4 = \frac{1}{13}\times\frac{1}{13}\times\frac{1}{13}\times\frac{1}{13} = \frac{1}{28561}$

$\therefore$ Reciprocal is 28561.

(c) Reciprocal of $\left(\frac{-19}{7}\right)^2$ is $\left(\frac{7}{-19}\right)^2$

$= \frac{7}{-19}\times\frac{7}{-19} = \frac{49}{361}$

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

$= \frac{-1}{3}\times\frac{-1}{3}\times\frac{-1}{3}\times\frac{-1}{3}\times2\times2\times2\times\frac{3}{4}\times\frac{3}{4}\times\frac{3}{4}\times\frac{3}{4}$

$= \frac{4\times2}{4\times4\times4\times4} = \frac{1}{32}$

(b) $\left(\frac{-4}{7}\right)^2\times\left(\frac{3}{4}\right)^3\times\left(\frac{7}{5}\right)^8$

$= \frac{-\cancel{4}}{\cancel{7}}\times\frac{-\cancel{4}}{\cancel{7}}\times\frac{3}{\cancel{4}}\times\frac{3}{\cancel{4}}\times\frac{3}{4}\times\frac{\cancel{7}}{5}\times\frac{\cancel{7}}{5}$

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

$= \frac{3\times3\times3\times7\times7\times7\times7\times7}{4\times5\times5\times5\times5\times5\times5\times5}$

$= \frac{27\times117649}{4\times15625\times25} = \frac{3176523}{1562500}$

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

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

$= \frac{125\times25}{9\times64} = \frac{3125}{576}$

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

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

$= \frac{3}{-2}\times\frac{3}{-2}\times\frac{3}{-2}\times\frac{3}{-2}\times\frac{-3}{5}\times\frac{-3}{5}$

$= \frac{81\times 9}{16\times 25} = \frac{729}{400}$

(c) $\left(6^{-1}-7^{-1}\right)^{-1} = \left(\frac{1}{6}-\frac{1}{7}\right)^{-1} = \left(\frac{7-6}{42}\right)^{-1}$

$= \left(\frac{1}{42}\right)^{-1} = 42$

7. $\left(\frac{2}{5}\right)^{3}\times\left(\frac{2}{5}\right)^{-6} = \left(\frac{2}{5}\right)^{2a-1}$

$\Rightarrow \left(\frac{2}{5}\right)^{3-6} = \left(\frac{2}{5}\right)^{2a-1}$

$\Rightarrow \left(\frac{2}{5}\right)^{-3} = \left(\frac{2}{5}\right)^{2a-1}$

$\Rightarrow -3 = 2a - 1 \Rightarrow -3 + 1 = 2a$

$\Rightarrow 2a = -2 \therefore a = \frac{-2}{2} = -1$

Hence, $a = -1$

8. $\left[\left(\frac{1}{4}\right)^{-3}-\left(\frac{1}{3}\right)^{-3}\right]\div\left(\frac{1}{6}\right)^{-3}$

$= \left[(4)^3 - (3)^3\right]\div 6^3$

$= [4\times4\times4 - 3\times3\times3] \div (6\times6\times6)$

$= [64 - 27] \div 216 = 37 \div 216 = \frac{37}{216}$

9. $1125 = 3^m \times 5^n$

$\Rightarrow 3\times3\times5\times5\times5 = 3^m \times 5^n$

$\Rightarrow 3^2 \times 5^3 = 3^m \times 5^n$

$\Rightarrow m = 2$ and $n = 3$

3	1125
3	375
5	125
5	25
5	5
	1

10. $9 \times 3^x = (27)^{2x-3}$

$\Rightarrow (3 \times 3) \times 3^x = (27)^{2x-3}$

$\Rightarrow (3)^2 \times 3^x = (27)^{2x-3}$

$\Rightarrow (3)^{2+x} = (3\times3\times3)^{2x-3}$

$\Rightarrow (3)^{2+x} = (3)^{6x-9}$

$\Rightarrow 2 + x = 6x - 9$

$\Rightarrow 2 + 9 = 6x - x \Rightarrow 11 = 5x \therefore x = \frac{11}{5}$

11. $\left(3^{-1}\times9^{-1}\right)\div(3)^{-2}$

$= \left(\frac{1}{3}\times\frac{1}{9}\right)\div\left(\frac{1}{3}\right)^2 = \frac{1}{27}\times\frac{9}{1} = \frac{1}{3}.$

12. $\left(5^2-3^2\right)\times\left(\frac{2}{3}\right)^{-3}$

$= (25-9)\times\left(\frac{3}{2}\right)^3$

$= 16\times\frac{3}{2}\times\frac{3}{2}\times\frac{3}{2} = 2 \times 27 = 54.$

13. $\left\{\left(\frac{3}{5}\right)^{-2}\right\}^{-2} = \left\{\left(\frac{5}{3}\right)^2\right\}^{-2}$

$\Rightarrow \left[\frac{5}{3}\times\frac{5}{3}\right]^{-2} = \left[\frac{25}{9}\right]^{-2} = \left(\frac{9}{25}\right)^2$

$= \frac{9\times9}{25\times25} = \frac{81}{625}$

14. (a) $(243)^{\frac{2}{5}}\div(32)^{\frac{2}{5}}$

$= (3\times3\times3\times3\times3)^{\frac{2}{5}}\div(2\times2\times2\times2\times2)^{\frac{2}{5}}$

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

$= 9 \div 4 = \frac{9}{4}.$

(b) $\left(\frac{27}{64}\right)^{\frac{-2}{3}} = \left(\frac{3\times3\times3}{4\times4\times4}\right)^{\frac{-2}{3}} = \left(\frac{3}{4}\right)^{3\times\frac{-2}{3}}$

$= \left(\frac{3}{4}\right)^{-2} = \left(\frac{4}{3}\right)^2 = \frac{4\times4}{3\times3} = \frac{16}{9}.$

(c) $(125)^{\frac{-2}{3}}\div(8)^{\frac{2}{3}}$

$= (5\times5\times5)^{\frac{-2}{3}}\div(2\times2\times2)^{\frac{2}{3}}$

$= (5)^{3\times\frac{-2}{3}}\div(2)^{3\times\frac{2}{3}}$

$= (5)^{-2}\div(2)^2 = \left(\frac{1}{5}\right)^2\div4$

$= \frac{1}{25}\div4 = \frac{1}{25}\times\frac{1}{4} = \frac{1}{100}$

(d) $(-3)^4 - \left(\sqrt[4]{3}\right)^0 \times (-2)^5 \div (64)^{\frac{2}{3}}$

$= (-3)\times(-3)\times(-3)\times(-3) - 1\times(-32) \div (4\times4\times4)^{\frac{2}{3}}$

$= 81 + 32 \div (4)^2$

$= 81 + 32 \div (16) = 81 + \frac{32}{16} = 81 + 2 = 83.$

15. (a) $(8 + 4 + 2)^0 = (14)^0 = 1$

(b) $8^0 + 4^0 + 2^0 = 1 + 1 + 1 = 3$

(c) $9^0 + 9^{-1} - 9^{-2} + 9^{\frac{1}{2}} - 9^{\frac{1}{2}}$

$= 1 + \frac{1}{9} - \frac{1}{81} = \frac{81+9-1}{81} = \frac{90-1}{81} = \frac{89}{81}.$

(d) $[(10^3)^0]^5 = [10^0]^5 = 1^5 = 1$

16. $x^{10}\, y^6 \div x^3\, y^{-2}$

$= \frac{x^{10}y^6}{x^3y^{-2}}$

$= x^{10-3}\, y^{6+2}$

$= x^7 \,.\, y^8$

17. $\left(27\, x^{-3}\, y^6\right)^{\frac{2}{3}}$

$= \left(3\times3\times3\times x^{-3}\times y^6\right)^{\frac{2}{3}}$

$= \left(3^3\right)^{\frac{2}{3}} \cdot \left(x^{-3}\right)^{\frac{2}{3}} \cdot \left(y^6\right)^{\frac{2}{3}}$

$= (3)^2 \cdot (x)^{-2} \cdot (y)^4$

$= 9\, x^{-2}\, y^4.$

18. $(x^{a+b})^{a-b} \,.\, (x^{b+c})^{b-c} \,.\, (x^{c+a})^{c-a}$

$= x^{a^2-b^2}\, x^{b^2-c^2}\, x^{c^2-a^2}$

$= x^{a^2-b^2+b^2-c^2+c^2-a^2}$

$= x^0$

$= 1$

19. $\sqrt[5]{x^{20}\times y^{-10}\times z^5} \div \frac{x^3}{y^3}$

$= \left(x^{20} \cdot y^{-10} \cdot z^5\right)^{\frac{1}{5}} \div \frac{x^3}{y^3}$

$= \left(x^{20}\right)^{\frac{1}{5}} \times \left(y^{-10}\right)^{\frac{1}{5}} \times \left(z^5\right)^{\frac{1}{5}} \div \frac{x^3}{y^3}$

$= x^4 \cdot y^{-2} \cdot z^1 \div \frac{x^3}{y^3}$

$= x^4 \times y^{-2} \times z \times \frac{y^3}{x^3} = x.\, y^1.\, z = xyz.$

20. $\left(\frac{256\, a^{16}}{81\, b^4}\right)^{\frac{-3}{4}}$

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

$= \left(\frac{4}{3}\cdot\frac{a^4}{b}\right)^{-3} = \left(\frac{3b}{4a^4}\right)^3 = \frac{27b^3}{64\, a^{12}}$

21. (a) $(a^{-2}\, b)^{-2} \cdot (ab)^{-3}$

$= \left(\frac{1}{a^{-2}\, b}\right)^2 \cdot \left(\frac{1}{ab}\right)^3$

$= \left(\frac{a^2}{b}\right)^2 \cdot \left(\frac{1}{ab}\right)^3$

$= \frac{a^4}{b^2} \times \frac{1}{a^3\, b^3} = \frac{a}{b^5}$

(b) $\left(\frac{512\, a^{-3}}{a^6}\right)^{\frac{-1}{3}}$

$= \left(\frac{512}{a^9}\right)^{\frac{-1}{3}} = \left(\frac{a^9}{512}\right)^{\frac{1}{3}} = \left(\frac{a^9}{2^9}\right)^{\frac{1}{3}}$

$= \left(\frac{a}{2}\right)^{\frac{1}{3}\times9} = \left(\frac{a}{2}\right)^3 = \frac{a^3}{8}$

(c) $\left[\left(\frac{64}{729}\right)^{-6}\right]^{\frac{-1}{6}} = \left(\frac{64}{729}\right)^{-6\times\frac{-1}{6}} = \left(\frac{64}{729}\right)^1$

$= \frac{64}{729}.$

WORKSHEET 2: USE OF EXPONENTS TO EXPRESS SMALL NUMBERS IN STANDARD FORM

1. (a) $9134500000 = 9.1345 \times 10^9$

(b) $0.000000055 = 5.5 \times 10^{-8}$

(c) $49.9 = 4.99 \times 10^{1}$

(d) $2600000 = 2.6 \times 10^{6}$

(e) $0.95 = 9.5 \times 10^{-1}$

2. (a) 6.5×10^{-4}

(b) 4.0015×1

(c) 1.000×10^{-4}

(d) 8.7849×10^{-2}

3. (a) $3.51 \times 10^{-4} = 0.000351$

(b) $7.0004 \times 10^{7} = 70004000$

(c) $0.5612 \times 10^{-5} = 0.000005612$

(d) $4.3678 \times 10^{7} = 43678000$

(e) $1.00025 \times 10^{2} = 100.025$

4. Speed of an aircraft = 2.012×10^{3} Km/h.

Distance covered in 3 hours 30 min.

$= 3.5 \times 2.012 \times 10^{3}$

$= 7.042 \times 10^{3}$

5. 0.000 000 000 000 000 000 000 000 000 001675

$= 1.675 \times 10^{-30}$

WORKSHEET (BASED ON COMPLETE CHAPTER)

1. (a) (ii) (b) (iii) (c) (ii)
(d) (ii) (e) (ii)

2. (a) $\left(\frac{1}{6}\right)^{4-10} = \left(\frac{1}{6}\right)^{-6} = (6)^{6}$

(b) $\left(\frac{-9}{10}\right)^{-12} \div \left(\frac{9}{-10}\right)^{8} = \left(\frac{-9}{10}\right)^{-12-8} = \left(\frac{-9}{10}\right)^{-20}$

(c) $(7^0 + 6^0) + 5^0 = (1 + 1) + 1 = 2 + 1 = 3$

(d) $\left(\frac{-1}{4}\right)^{3} = \frac{-1}{4} \times \frac{-1}{4} \times \frac{-1}{4} = \frac{-1}{64}$

(e) $0.0000096 = 9.6 \times 10^{-6}$

3. (a) False (b) True (c) True (d) True

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

(b) $\frac{x^3 + 1}{x^3 + 1 + 1} = \frac{x^3 + 1}{x^3 + 2}$

(c) $\left(\frac{1+1}{1-1+1}\right)^{2} = \left(\frac{2}{1}\right)^{2} = 2 \times 2 = 4.$

5. (a) $\left(\frac{6}{11}\right)^{6} \times \left(\frac{6}{11}\right)^{-14} = \left(\frac{6}{11}\right)^{2x}$

$\Rightarrow \left(\frac{6}{11}\right)^{6-14} = \left(\frac{6}{11}\right)^{2x}$

$\Rightarrow \left(\frac{6}{11}\right)^{-8} = \left(\frac{6}{11}\right)^{2x}$

$\Rightarrow -8 = 2x \Rightarrow x = \frac{-8}{2} = -4$

(b) $\left(\frac{-5}{9}\right)^{11} \times \left(\frac{-5}{9}\right)^{7} = \left(\frac{-5}{9}\right)^{3x+2}$

$\Rightarrow \left(\frac{-5}{9}\right)^{11+7} = \left(\frac{-5}{9}\right)^{3x+2}$

$\Rightarrow 18 = 3x + 2 \Rightarrow 18 - 2 = 3x$

$\Rightarrow 16 = 3x$

$\therefore x = \frac{16}{3}$

6. (a) $\left(\frac{-9}{13}\right)^{-2} = \left(\frac{13}{-9}\right)^{2}$

(b) $\left(\frac{-16}{25}\right)^{-14} = \left(\frac{25}{-16}\right)^{14}.$

7. Let the number be x

$(-49)^{-1} \div x = (-7)^{-1}$

$\Rightarrow \left(\frac{-1}{49}\right) \div x = \left(\frac{1}{-7}\right)$

$\Rightarrow \frac{-1}{49} \times \frac{1}{x} = \frac{1}{-7}$

$\Rightarrow 49x = 7 \Rightarrow x = \frac{7}{49} = \frac{1}{7}.$

8. (a) $7500 = 7.5 \times 10^{3}$

(b) $135000000 = 1.35 \times 10^{8}$

(c) $0.872 = 8.72 \times 10^{-1}$

(d) $0.509000000 = 5.09 \times 10^{-1}$

Chapter 11 Direct and Inverse Proportions

WORKSHEET 1: DIRECT PROPORTION

1. $\frac{x}{y}=\frac{6}{18}=\frac{10}{30}=\frac{14}{42}=\frac{18}{54}=\frac{24}{72}=\frac{1}{3}$

Since, each ratio is same, x and y are in direct proportion.

2. $\frac{x}{y}=\frac{6}{72}=\frac{u}{60}=\frac{v}{96}=\frac{30}{w}$

$\therefore \frac{6}{72}=\frac{u}{60}$

$\Rightarrow 6 \times 60 = 72 \times u$

$\Rightarrow u = \frac{6\times 60}{72}$

$\Rightarrow u = 5$

Also, $\frac{6}{72}=\frac{v}{96}$

$\Rightarrow 6 \times 96 = v \times 72 \quad \Rightarrow v = \frac{6\times 96}{72}$

$\Rightarrow v = 8$

and $\frac{6}{72}=\frac{30}{w}$

$\Rightarrow 6 \times w = 30 \times 72 \quad \Rightarrow w = \frac{30\times 72}{6} = 360$

Hence, u = 5, v = 8 and w = 360

3. $\frac{x}{y}=\frac{5}{10}=\frac{a}{16}=\frac{b}{48}=\frac{42}{c}$

$\frac{5}{10}=\frac{a}{16} \Rightarrow 10a = 5 \times 16 \Rightarrow a = \frac{80}{10} = 8$

$\frac{5}{10}=\frac{b}{48} \Rightarrow 10b = 48 \times 5 \Rightarrow a = \frac{240}{10} = 24$

$\frac{5}{10}=\frac{42}{c} \Rightarrow 420 = 5c \Rightarrow c = \frac{420}{5} = 84$

4.

Distance (km)	240	x
Cost (₹)	4080	7344

$\Rightarrow \frac{240}{4080}=\frac{x}{7344} \Rightarrow 4080\,x = 240 \times 7344$

$\Rightarrow x = \frac{240 \times 7344}{4080} = 432$

$\therefore$ Distance = 432 km

5. Let the cost of 54 note books be x

Notebook	6	54
Cost (₹)	156	x

$\Rightarrow \frac{6}{156} = \frac{54}{x} \Rightarrow 6x = 54 \times 156$

$\Rightarrow x = \frac{54\times 156}{6}$

$\Rightarrow x = 9 \times 156 = ₹1404$

$\therefore$ The cost of 54 notebooks is ₹ 1404.

6. (a) Speed of train = 120 km/hr

Time taken = 36 minutes

$= \frac{36}{60}$ hours

$= \frac{3}{5}$ hours

$\therefore$ Distance covered = $120 \times \frac{3}{5}$

= 72 km

(b)

Distance (km)	72	210
Time (hrs)	$\frac{3}{5}$	x

$$\frac{72}{\frac{3}{5}} = \frac{210}{x}$$

$$\frac{72\times5}{3} = \frac{210}{x}$$

$$x = \frac{210\times3}{72\times5}$$

$$= \frac{7}{4} \text{ hours} = 1.75 \text{ hours}$$

7. Let x articles be bought for ₹ 1750

Identical articles	27	x
Cost (₹)	1890	1750

$$\Rightarrow \frac{27}{1890} = \frac{x}{1750} \Rightarrow 1890x = 1750 \times 27$$

$$\Rightarrow x = \frac{1750 \times 27}{1890} = 25 \text{ articles}$$

8. Let x be the no. of working days.

Amount paid to worker (₹)	880	2860
Working days	8	x

$$\Rightarrow \frac{880}{8} = \frac{2860}{x} \Rightarrow 880x = 8 \times 2860$$

$$\Rightarrow x = \frac{8\times2860}{880} = 26 \text{ days}$$

$\therefore$ The worker worked for 26 days in a month.

9. Let the motorcar covers 180 km distance in 'x' minutes.

Distance (km)	48	180
Time (min)	60	x

$$\Rightarrow \frac{48}{60} = \frac{180}{x} \Rightarrow 48x = 60 \times 180$$

$$\Rightarrow x = \frac{60\times180}{48} = 225 \text{ minutes}$$

$\therefore$ a motor car will take 225 minutes to cover 180 km.

10. Let 'x' articles weight 224 kg.

Identical articles	11	x
Weight (kg)	77	224

$$\Rightarrow \frac{11}{77} = \frac{x}{224} \Rightarrow 77x = 11 \times 224$$

$$\Rightarrow x = \frac{11\times224}{77} = 32$$

$\therefore$ 32 identical articles will weight 224 kg.

WORKSHEET 2: INVERSE PROPORTION

1. (a) $x_1 = 4$ and $y_1 = 6, x_2 = 3$ and $y_2 = 8$

$x_3 = 12$ and $y_3 = 2, x_4 = 1$ and $y_4 = 24$

$x_1y_1 = 4 \times 6 = 24$

$x_2y_2 = 3 \times 8 = 24$

$x_3y_3 = 12 \times 2 = 24$

$x_4y_4 = 1 \times 24 = 24$

As $x_1y_1 = x_2y_2 = x_3y_3 = x_4y_4$

$\therefore$ x and y are in inverse proportion.

(b) $x_1 = 4$ and $y_1 = 20, x_2 = 2$ and $y_2 = 40,$

$x_3 = 1$ and $y_3 = 80, x_4 = 10$ and $y_4 = 8,$

$x_5 = 5$ and $y_5 = 16$

$x_1y_1 = 4 \times 20 = 80$

$x_2y_2 = 2 \times 40 = 80$

$x_3y_3 = 1 \times 80 = 80$

$x_4y_4 = 10 \times 8 = 80$

$x_5y_5 = 5 \times 16 = 80$

As $x_1y_1 = x_2y_2 = x_3y_3 = x_4y_4 = x_5y_5$

$\therefore$ x and y are in inverse proportion.

2. (a) $p_1 = 12$ and $q_1 = 10; p_2 = 3$ and $q_2 = t;$

$p_3 = m$ and $q_3 = 20; p_4 = 15$ and $q_4 = n;$

$p_5 = s$ and $q_5 = 5$

As p and q vary inversely,

$\Rightarrow \quad p_1q_1 = p_2q_2$

$12 \times 10 = 3 \times t$

$$t = \frac{12 \times 10}{3} = 40$$

$p_1q_1 = p_3q_3$

$\Rightarrow \quad 12 \times 10 = m \times 20$

$$\Rightarrow \quad m = \frac{12 \times 10}{20} = 6$$

$p_1q_1 = p_4q_4$

$\Rightarrow \quad 12 \times 10 = 15 \times n$

$$\Rightarrow \quad n = \frac{12 \times 10}{15} = 8$$

$p_1q_1 = p_5q_5$

$\Rightarrow \quad 12 \times 10 = s \times 5$

$$\Rightarrow \quad s = \frac{12 \times 10}{5} = 24$$

(b) $x_1 = 24$ and $y_1 = p$; $x_2 = 32$ and $y_2 = 12$;

$x_3 = q$ and $y_3 = 8$; $x_4 = 16$ and $y_4 = r$

As x and y vary inversely,

$\Rightarrow \quad x_1y_1 = x_2y_2$

$24 \times p = 32 \times 12$

$$p = \frac{32 \times 12}{24} = 16$$

$x_2y_2 = x_3y_3$

$\Rightarrow \quad 32 \times 12 = q \times 8$

$$q = \frac{32 \times 12}{8} = 48$$

$x_2y_2 = x_4y_4$

$\Rightarrow \quad 32 \times 12 = 16 \times r$

$$r = \frac{32 \times 12}{16} = 24$$

3. Let x men can complete the same work in 42 days.

Men	36	x
Days	7	42

$$\Rightarrow 36 \times 7 = x \times 42 \Rightarrow x = \frac{36 \times 7}{42} = 6$$

Hence, 6 men can complete the same work in 42 days.

4. Let the time taken by 56 pumps to empty the tank be x hours.

Pumps	21	56
Time (Hrs)	36	x

$\Rightarrow 36 \times 21 = x \times 56$

$$x = \frac{36 \times 21}{56} = 13.5$$

Hence, 56 pumps will empty the water tank in 13.5 hours.

5. Let x hours be needed per day to complete the book in 8 hours.

Days	10	8
Hours	5	x

$5 \times 10 = 8 \times x$

$$x = \frac{50}{8} = 6.25 \text{ hours}$$

Hence, 6.25 hours will be required by Ritika per day to finish the book in 8 days.

6. Let the average speed be x km/hr for reaching school in 10 minutes.

We know, 1 hour = 60 min

So, 20 minutes = $\frac{1}{3}$ hour

10 minutes = $\frac{1}{6}$ hour

Average speed (km/h)	14	x
Time (hr)	$\frac{1}{3}$	$\frac{1}{6}$

$$\Rightarrow 14 \times \frac{1}{3} = \frac{1}{6} \times x$$

$$\Rightarrow \quad x = \frac{14 \times 6}{3} = 28$$

Hence, Chahak needs to travel at speed of 28 km/hr to reach the school in 10 minutes.

7. Let the food stock for 525 people last for x days.

People	350	525
Days	15	x

$\Rightarrow 350 \times 15 = 525 \times x$

$\Rightarrow x = \frac{350 \times 15}{525} = 10$

Hence, the food stock will last for 10 days if consumed by 525 people.

8. Given, 150 men had provisions for 45 days.

A.T.Q.

150 men used provisions for 10 days but after 10 days, 25 men left.

Remaining men after 10 days = 150–25 = 125 men

Remaining days = 35 days.

Total men	150	125
Days	35	x

$\Rightarrow 150 \times 35 = 125 \times x \Rightarrow x = \frac{150 \times 35}{125} = 42$

Hence, the food will last for 42 days.

9. Let the car takes 'x' hours if the car travels at speed of 75 km/hr.

Total time (hrs)	6	x
Speed (km/h)	50	75

$\Rightarrow 6 \times 50 = x \times 75 \Rightarrow x = \frac{6 \times 50}{75} = 4$ hours

Hence, the car will take 4 hours to complete the journey at 75 km/hr.

WORKSHEET (BASED ON COMPLETE CHAPTER)

1. (a) (ii) (b) (iii)
   (c) (ii) (d) (iii)
2. (a) inverse (b) 9 days
   (c) inversely (d) compound
   (e) subtracted

3. Work completed by A and B in 12 days

(A + B) = 12 days

Work completed by B and C in 18 days

(B + C) = 18 days

Work completed by C and A in 36 days

(C + A) = 36 days

Work completed in 1 day,

$\frac{1}{A}+\frac{1}{B}=\frac{1}{12}$ ...(i)

$\frac{1}{B}+\frac{1}{C}=\frac{1}{18}$ ...(ii)

$\frac{1}{C}+\frac{1}{A}=\frac{1}{36}$ ...(iii)

$2\left(\frac{1}{A}+\frac{1}{B}+\frac{1}{C}\right)=\frac{1}{12}+\frac{1}{18}+\frac{1}{36}$

$\frac{1}{A}+\frac{1}{B}+\frac{1}{C}=\frac{1}{12}$ ...(iv)

From (i) and (iv)

$\frac{1}{A}+\frac{1}{B}+\frac{1}{C}=\frac{1}{12}$ and $\frac{1}{A}+\frac{1}{B}=\frac{1}{12}$

$\frac{1}{12}+\frac{1}{C}=\frac{1}{12}$

$\therefore C = 0$

This case occurs as C may have not done any work.

From (ii) and (iv)

So, A will complete the work alone in 36 days.

B will complete the work alone in 18 days.

4. Length of train are 225 m and 150 m.

$\therefore$ Total distance the latter train needs to pass the former = 225 + 150 = 375 m

Relative speed = 75 – 50 = 25 km/hr

$= \frac{25 \times 1000}{3600}$

$= \frac{125}{18} m/s$

$\therefore$ Time $= \frac{\text{Distance}}{\text{Speed}} = \frac{375 \times 18}{125} = 54$ seconds

5. Let the cost of 20 books be x.

Books	16	20
Cost (₹)	480	x

$\Rightarrow \frac{16}{480} = \frac{20}{x} \Rightarrow 16x = 480 \times 20$

$\Rightarrow x = \frac{480 \times 20}{16} = 600$

$\therefore$ Cost of 20 books = ₹600

6. Let x men can complete the work in 12 days.

Men	8	x
Days	72	12

$\Rightarrow 8 \times 72 = 12 \times x$

$\Rightarrow x = \frac{8 \times 72}{12} = x = 48$

$\therefore$ 48 men can complete the work in 12 days.

7. Given, distance = 540 km

Time = 10 hours

We know,

1 km = 1000 m

540 km = 540 × 1000 = 540000 m

1 hour = 3600 seconds

10 hours = 10 × 3600 = 36000 seconds

Also, Speed $= \frac{\text{Distance}}{\text{Time}} = \frac{540000}{36000} = 15$ m/sec.

8. Let the cost of 1 quintal of wheat be ₹ x.

Weight (kg)	36	100
Cost (₹)	216	x

[$\therefore$ 1 quintal = 100 kg]

$\frac{36}{216} = \frac{100}{x} \Rightarrow 36 \times x = 216 \times 100$

$x = \frac{216 \times 100}{36} = 600$

$\therefore$ Cost of 1 quintal of wheat = ₹ 600

9. Length of train = 210 m = 0.210 km

Time = 7 seconds $= \frac{7}{60 \times 60} = \frac{7}{3600}$ hours

$\therefore$ Speed $= \frac{\text{Distance}}{\text{Time}} = \frac{0.210}{\frac{7}{3600}} = \frac{0.210}{7} \times 3600$

$= 108$ km/hr

10.

x	$\frac{3}{5}$	x_1
y	$\frac{5}{9}$	$\frac{3}{4}$

$\frac{3}{5} \times \frac{5}{9} = x_1 \times \frac{3}{4}$

$\frac{1}{3} = x_1 \times \frac{3}{4}$

$x_1 = \frac{4}{9}$

11. Given, 420 men had provisions for 35 days.

A.T.Q.

420 men used provisions for 10 days but after 10 days, 70 men died due to an epidemic.

Remaining men= 420 – 70 = 350 men

Remaining days = 25 days.

Men	420	350
Day	25	y_1

$350 \times y_1 = 420 \times 25$

$\Rightarrow y_1 = \frac{420 \times 25}{350} = 30$

$\therefore$ The food will last for 30 days.

12. Let x_1 cows can graze the field in 7 days.

Cows	30	x_1
Days	6	7

$$\frac{30}{6} = \frac{x_1}{7} \Rightarrow = 30 \times 7 = 6 \times x_1$$

$$\Rightarrow x_1 = \frac{30 \times 7}{6} = 5 \times 7 = 35$$

$\therefore$ 7 cows can graze the field in 35 days.

13. Let the volume of the gas at 400 mm be 'y_1'.

Gas Pressure (mm)	360	400
Volume (cm^3)	760	y_1

$360 \times 760 = 400 \times y_1$

$$\Rightarrow y_1 = \frac{360 \times 760}{400} = 9 \times 76$$

$y_1 = 684$

$\therefore$ The volume at 400 mm is 684 cm^3.

14. Let 'x_1' pens can be bought for ₹ 800.

Pens	15	x_1
Cost (₹)	360	800

$$\frac{15}{360} = \frac{}{800}$$

$\Rightarrow 15 \times 800 = 360 \times x_1$

$$\Rightarrow \frac{15 \times 800}{360} = x_1$$

$$\Rightarrow x_1 = \frac{15 \times 80}{36}$$

$$\therefore x_1 = \frac{15 \times 20}{9} = 33.3 \cong 33.$$

$\therefore$ 33 pens can be bought for ₹ 800.

15. 30 men can build a wall in 50 days

$30 \times 50 = 1$ ...(i)

Let 'x' men can build a wall, double in size, in 75 days.

$x \times 75 = 2$ ...(ii)

Dividing (i) by (ii):

$$\frac{30 \times 50}{x \times 75} = \frac{1}{2}$$

$x = 40$ men

$\therefore$ 40 men can build a wall, double in size, in 75 days.

16. 8 men can dig a field in 14 days, working 6 hours a day.

$8 \times 14 \times 6 = 1$ ...(i)

Let 7 men can dig the same field in 'x' days, working 8 hours a day.

$7 \times x \times 8 = 1$ ...(ii)

Dividing (i) by (ii):

$$\frac{8 \times 14 \times 6}{7 \times x \times 8} = \frac{1}{1}$$

$x = 12$ days

$\therefore$ 7 men can dig the same field in 12 days, working 8 hours a day.

17. The number of days in which 6 men and 1 woman can complete the work cannot be found out with the information provided.

18. Given, 300 men had provisions for 90 days.

A.T.Q.

300 men used provisions for 20 days but after 20 days, 50 men left the fort.

Remaining men = 300 – 50 = 250 men

Remaining days = 70 days

Men (x)	300	250
Days	70	y_1

$300 \times 70 = 250 \times y_1$

$$y_1 = \frac{300 \times 70}{250}$$

$y_1 = 84$

$\therefore$ The food will last for 84 days.

Chapter 12

Factorisation

WORKSHEET 1: FACTORIZATION: INTRODUCTION AND USE OF IDENTITIES

1. (a) $6x$ (b) ab (c) $3x^2 y^2 z^2$

2. (a) $5x + 15 = 5 (x + 3)$

(b) $4a - 16b = 4 (a - 4b)$

(c) $x^5 - x^3 = x^3 (x^2 - 1) = x^3 (x - 1) (x + 1)$

(d) $p^5 q^4 - p^3 q^2 + p^4 q^3$

$= p^3 q^2 (p^2 q^2 - 1 + p q)$

(e) $2 xy - 4x + 18 = 2 (xy - 2x + 9)$

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

(g) $17 a^6 b^8 - 34 a^4 b^6 + 51 a^2 b^4$

$= 17 a^2 b^4 (a^4 b^4 - 2 a^2 b^2 + 3)$

(h) $a^3 b - a^2 b^2 - b^3 = b (a^3 - a^2 b - b^2)$

(i) $6x^2 y + 9 xy^2 + 4 y^3$

$= y (6x^2 + 9xy + 4y^2)$

3. (a) $y(x + 2) + 3 (x + 2) = (y + 3) (x + 2)$

(b) $(3x - 1) (x - 3y)$

(c) $(x - y) [5(x - y) - 3]$

$= (x - y) (5x - 5y - 3)$

(d) $x^4 (a - 2b)^2 + x^2 (a - 2b)^3$

$= x^2 (a - 2b)^2 [x^2 + a - 2b]$

(e) $(a - b) [x^2 - y^2 + z^2]$

(f) $(a + b) (x + y + x - y) = 2x (a + b)$

(g) $(x + y) [(2x + 3) - (x + 5)]$

$= (x + y) [2x + 3 - x - 5] = (x + y) (x - 2)$

4. (a) $ax^2 + ay^2 + bx^2 + by^2$

$= a(x^2 + y^2) + b(x^2 + y^2)$

$= (a + b) (x^2 + y^2)$

(b) $a^2 - ac + ab - bc$

$= a(a - c) + b(a - c)$

$= (a + b) (a - c)$

(c) $2 ap + bp + 2 aq + bq$

$= 2 ap + 2 aq + bp + bq$

$= 2a (p + q) + b(p + q)$

$= (2a + b) (p + q)$

(d) $x^5 - y^3 + x - x^4 y^3$

$= x^5 - x^4 y^3 - y^3 + x$

$= x^5 + x - x^4 y^3 - y^3$

$= x (x^4 + 1) - y^3 (x^4 + 1) = (x - y^3) (x^4 + 1)$

5. (a) $a^2 - 64 = (a)^2 - (8)^2 = (a + 8) (a - 8)$

(b) $x^2 + 2 xy + y^2 - 16$

$= (x + y)^2 - (4)^2 = (x + y + 4) (x + y - 4)$

(c) $(5 + 3p)^2 - 225 = (5 + 3p)^2 - (15)^2$

$= (5 + 3p + 15) (5 + 3p - 15)$

$= (3p + 20) (3p - 10)$

(d) $x^4 - y^4 = (x^2)^2 - (y^2)^2$

$=(x^2 + y^2) (x^2 - y^2)$ $[\because a^2 - b^2 = (a + b) (a - b)]$

$= (x^4 + y^4) (x + y) (x - y)$

(e) $(a + b)^2 - (x - y)^2$

$= (a + b + x - y) (a + b - x + y)$

(f) $1 - 25 (a + b)^2 = (1)^2 - [5 (a + b)]^2$

$= [1 + 5 (a + b)] [1 - 5 (a + b)]$

$= (1 + 5a + 5b) (1 - 5a - 5b)$

(g) $49(x-y)^2 - 9(2x+y)^2$

$= [7(x-y)]^2 - [3(2x+y)]^2$

$= [7(x-y) + 3(2x+y)]\,[7(x-y) - 3(2x+y)]$

$= (7x - 7y + 6x + 3y)\,(7x - 7y - 6x - 3y)$

$= (13x - 4y)\,(x - 10y)$

(h) $\left(7\frac{3}{10}\right)^2 - \left(2\frac{1}{10}\right)^2$

$= \left(\frac{73}{10}\right)^2 - \left(\frac{21}{10}\right)^2 = \left(\frac{73}{10} + \frac{21}{10}\right)\left(\frac{73}{10} - \frac{21}{10}\right)$

$= \left(\frac{73+21}{10}\right)\left(\frac{73-21}{10}\right) = \frac{94}{10} \times \frac{52}{10} = \frac{4888}{100}$

6. (a) $9x^2 - 6x + 1$

$= 9x^2 - 3x - 3x + 1$

$= 3x(3x - 1) - 1(3x - 1)$

$= (3x - 1)(3x - 1)$

$= (3x - 1)^2$

(b) $p^2 + 2pq + q^2 - 4$

$= (p)^2 + 2(p)(q) + (q)^2 - 4$

$= (p + q)^2 - (2)^2$

$= (p + q + 2)(p + q - 2)$

(c) $25 - x^6 + 4x^3y^3 - 4y^6$

$= 25 - (x^6 - 4x^3y^3 + 4y^6)$

$= (5)^2 - (x^3 - 2y^3)^2$

$= (5 + x^3 - 2y^3)(5 - x^3 + 2y^3)$

(d) $a^2 + \frac{1}{2}a + \frac{1}{16}$

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

(e) $9p^4 - 24p^2q^2 + 16q^4 - 256$

$= (3p^2)^2 + (4q^2)^2 - 2(3p^2)(4q^2) - 16^2$

$= (3p^2 - 4q^2)^2 - 16^2$

$= (3p^2 - 4q^2 + 16)(3p^2 + 4q^2 - 16)$

7. (a) $4a^4 - b^4 = (2a^2)^2 - (b^2)^2$

$= (2a^2 + b^2)(2a^2 - b^2)$

(b) $64 - x^2 - y^2 - 2xy = 64 - (x^2 + y^2 + 2xy)$

$= (8)^2 - (x + y)^2$

$= (8 + x + y)(8 - x - y)$

(c) $4a^2 - 12ab + 9b^2 - 16$

$= (2a)^2 - 2(2a)(3b) + (3b)^2 - (4)^2$

$= (2a - 3b)^2 - (4)^2$

$= (2a - 3b + 4)(2a - 3b - 4)$

(d) $x^2 - y^2 + 4x - 4y$

$= (x + y)(x - y) + 4(x - y)$

$= (x - y)[x + y + 4]$

(e) $81 - 4x^2 - 9y^2 + 12xy$

$= (9)^2 - (4x^2 - 12xy + 9y^2)$

$= (9)^2 - (2x - 3y)^2$

$= (9 + 2x - 3y)(9 - 2x + 3y)$

(f) $a^2 + 9b^2 - 6ab - 25x^2$

$= a^2 - 6ab + 9b^2 - 25x^2$

$= (a - 3b)^2 - (5x)^2$

$= (a - 3b + 5x)(a - 3b - 5x)$

WORKSHEET 2: DIVISION OF ALGEBRAIC EXPRESSIONS

1. (a) $\frac{-70a^3}{14a^2} = -5a$

(b) $\frac{-24x^4d^3}{-2x^2d^5} = 12(x)^{4-2}(d)^{3-5}$

$= 12x^2.(d)^{-2}$

(c) $\frac{25a^3b^2x^2}{5a^2bx} = \frac{25}{5} \times \frac{a^3}{a^2} \times \frac{b^2}{b} \times \frac{x^2}{x} = 5abx$

(d) $\frac{-54\left(x^2 + y^2 + z^2\right)}{x^2 + y^2 + z^2} = -54.$

(e) $\frac{64xy^3z^2}{16xyz} = \frac{64}{16} \cdot \frac{x}{x} \times \frac{y^3}{y} \times \frac{z^2}{z} = 4y^2z$

2. (a) $\frac{2x^3+5x^2}{x} = \frac{x(2x^2+5x)}{x} = 2x^2 + 5x$

(b) $\frac{p^4-p^3+5p^2}{p^2} = \frac{p^2(p^2-p+5)}{p^2} = p^2 - p + 5.$

(c) $\frac{6x^3y^2-4x^2y+2xy}{2xy} \times \frac{3}{1}$

$= \frac{2xy(3x^2y-2x+1)}{2xy} \times \frac{3}{1} = 3(3x^2y - 2x + 1)$

$= 9x^2y - 6x + 3$

(d) $\frac{9a^5-6a^2}{3a^2} = \frac{3a^2(3a^3-2)}{3a^2} = 3a^3 - 2$

3. (a)

$$\begin{array}{r|l} x+2 & x^2+4x+4 \\ & x^3+6x^2+12x+8 \\ & \underline{x^3 \pm 2x^2} \\ & 4x^2+12x+8 \\ & \underline{4x^2 \pm 8x} \\ & 4x+8 \\ & \underline{4x+8} \\ & 0 \end{array}$$

$\therefore \frac{x^3+6x^2+12x+8}{x+2}$

$= \frac{(x+2)(x^2+4x+4)}{x+2}$

$= x^2 + 4x + 4$

(b)

$$\begin{array}{r|l} a^2+a+1 & a^2-1 \\ & a^4+a^3-a-1 \\ & \underline{a^4 \pm a^3 \pm a^2} \\ & -a^2-a-1 \\ & \underline{\mp a^2 \mp a \mp 1} \\ & 0 \end{array}$$

$\therefore \frac{a^4+a^3-a-1}{a^2+a+1}$

$= a^2 - 1$

(c) $x^5 + x^4 + x^3 + x^3 + x^2 + x + 1$

$= x^5 + x^4 + 2x^3 + x^2 + x + 1$

$$\begin{array}{r|l} x^3+1 & x^2+x+2 \\ & x^5+x^4+2x^3+x^2+x+1 \\ & \underline{x^5 \qquad \pm x^2} \\ & x^4+2x^3+x+1 \\ & \underline{x^4 \quad \pm x} \\ & 2x^3+1 \\ & \underline{2x^3 \pm 2} \\ & -1 \end{array}$$

(d) $\frac{x^3-1}{x-1} = \frac{(x-1)(x^2+x+1)}{x-1} = x^2 + x + 1$

(e) $\frac{u^3-14u^2+37u-26}{u^2-12u+3}$

$$\begin{array}{r|l} u^2-12u+3 & u-2 \\ & u^3-14u^2+37u-26 \\ & \underline{u^3 \mp 12u^2 \pm 3u} \\ & -2u^2+34u-26 \\ & -2u^2+24u-6 \\ & \underline{+ \quad - \quad +} \\ & 10u-20 \end{array}$$

(f) $\frac{x^6-8}{x^2-2} = \frac{(x^2)^3-(2)^3}{x^2-2}$

$= \frac{(x^2-2)(x^4+2x^2+4)}{x^2-2} = (x^4 + 2x^2 + 4)$

(g) $\frac{x^2+3x-54}{x-6} = \frac{x^2+9x-6x-54}{x-6}$

$= \frac{x(x+9)-6(x+9)}{x-6}$

$= \frac{(x-6)(x+9)}{x-6} = x + 9$

(h)

$$\begin{array}{r|l} 2x^2-x-6 & 3x-5 \\ & 6x^3-13x^2-13x+30 \\ & \underline{6x^3 \mp 3x^2 \mp 18x} \\ & -10x^2+5x+30 \\ & \underline{\mp 10x^2 \pm 5x \mp 30} \\ & 0 \end{array}$$

$\therefore \frac{6x^3-13x^2-13x+30}{2x^2-x-6}$

$= 3x - 5$

4. $2x + 3 \overline{)\ 8x^3 + 36x^2 + 54x + 27\ (\ 4x^2 + 12x + 9}$

$\underline{8x^3 \pm 12x^2}$

$24x^2 + 54x + 27$

$\underline{24x^2 \pm 36x}$

$18x + 27$

$\underline{18x \pm 27}$

0

Hence, $(2x + 3)$ is a factor of $8x^3 + 36x^2 + 54x + 27$

5. $a^4 + a^3 + 8a^2 + a + p$ is divisible by $a + 1$

$a + 1 = 0 \Rightarrow a = -1$

$\Rightarrow (-1)^4 + (-1)^3 + 8(-1)^2 + (-1) + p = 0$

$\Rightarrow 1 - 1 + 8 - 1 + p = 0$

$\Rightarrow 7 + p = 0 \Rightarrow p = -7$

6. $\dfrac{a^3 - 1}{a - 1} = \dfrac{(a-1)(a^2 + a + 1)}{a - 1} = a^2 + a + 1$

7. $x^2 - 2x + 3 \overline{)\ x^4 - 6x^3 + 12x^2 - 17x + 5\ (\ x^2 - 4x + 1}$

$\underline{x^4 \mp 2x^3 \pm 3x^2}$

$-4x^3 + 9x^2 - 17x + 5$

$\underline{-4x^3 + 8x^2 - 12x}$

$x^2 - 5x + 5$

$\underline{x^2 \mp 2x \pm 3}$

$-3x + 2$

So, $-3x + 2$ must be subtracted.

8. Area of rectangle $= x^3 - 8x^2 + 7$

One side $= x - 1$

$\therefore$ Length of adjacent side $= \dfrac{x^3 - 8x^2 + 7}{x - 1}$

$x - 1 \overline{)\ x^3 - 8x^2 + 7\ (\ x^2 - 7x - 7}$

$\underline{x^3 \mp x^2}$

$-7x^2 + 7$

$\underline{-7x^2 + 7x}$

$-7x + 7$

$\underline{-7x \pm 7}$

0

So, the other side is $x^2 - 7x - 7$.

9. $\dfrac{x^6 - y^6}{(x-y)(x^2 + xy + y^2)} = \dfrac{(x^3)^2 - (y^3)^2}{(x-y)(x^2 + xy + y^2)}$

$= \dfrac{(x^3 - y^3)(x^3 + y^3)}{(x-y)(x^2 + xy + y^2)}$

$= \dfrac{(x^3 - y^3)(x^3 + y^3)}{x^3 - y^3}$

$= x^3 + y^3$

$= (x + y)(x^2 - xy + y^2)$

10. Product of two numbers $= 16x^4 - 1$

One number $= 2x - 1$

$\Rightarrow 16x^4 - 1 = (2x - 1) \times$ other number

$\Rightarrow$ Other number $= \dfrac{16x^4 - 1}{2x - 1} = \dfrac{(4x^2)^2 - 1^2}{2x - 1}$

$= \dfrac{(4x^2 + 1)(4x^2 - 1)}{2x - 1}$

$= \dfrac{(4x^2 + 1)(2x - 1)(2x + 1)}{(2x - 1)} = (4x^2 + 1)(2x + 1)$

WORKSHEET 3: FINDING THE ERRORS IN ALGEBRAIC COMPUTATION

1. (a) $3(x - 6) = 3x - 18$

(b) $9x + 6y = 9x + 6y$

(c) $(p + 2)(p + 7) = p^2 + 7p + 2p + 14$

$= p^2 + 9p + 14$

(d) $(3x)^2 + 5(3x) + 8 = 9x^2 + 15x + 8$

(e) $\dfrac{5xy^2}{5xy^2} = 1$

(f) $7x + 4x = 11x$

(g) (i) $x = -2$

$x^2 + 7x + 6$

$= (-2)^2 + 7(-2) + 6 = 4 - 14 + 6$

$= -10 + 6 = -4$

(ii) $7x^2 + 8x - 4$

$= 7(-2)^2 + 8(-2) - 4 = 28 - 16 - 4$

= 28 – 20 = 8

(iii) $x^2 - 9x = (-2)^2 - 9(-2) = 4 + 18 = 22$

(h) $a(x-5)(x-5) = a(x-5)^2$

$= a(x^2 + 25 - 10x)$

(i) $\frac{11x+9}{9} = \frac{11}{9}x + 1.$

(j) $(x+2)(x+2) = (x+2)^2 = x^2 + 4 + 4x$

(k) $\frac{5x^2+2}{5x^2} = \frac{5x^2}{5x^2} + \frac{2}{5x^2} = 1 + \frac{2}{5x^2}$

WORKSHEET (BASED ON COMPLETE CHAPTER)

1. (a) (i) (b) (ii)

(c) (i) $4x^2 + 2x + 1$

$= 4(-2)^2 + 2(-2) + 1 = 16 - 4 + 1 = 13$

2. (a) $6x^2 = 3 \times 2 \times x \times x$

$9x = 3 \times 3 \times x$

Common factor = $3x$

(b) $64x^2 + 16xy + y^2$

$= (8x)^2 + 2(8x)(y) + (y)^2 = (8x + y)^2$

(c) area of square = side × side

$64a^2 = (\text{side})^2$

$\Rightarrow (8a)^2 = (\text{side})^2 \Rightarrow \text{side} = 8a$

(d) $\frac{45x^3y^2z^2}{5xyz} = \frac{5 \times 9 \times x^3 \times y^2 \times z^2}{5 \times x \times y \times z}$

$= 9x^2yz$

(e) $(5 + 9y)(5 - 9y)$

3. (a)

$$x - 4 \overline{)\, 4x^4 + 5x^3 - 8x^2 + 4x - 8}$$

$4x^3 + 21x^2 + 76x + 308$

$4x^4 - 16x^3$

$21x^3 - 8x^2 + 4x - 8$

$21x^3 - 84x^2$

$76x^2 + 4x - 8$

$76x^2 - 304x$

$308x - 8$

$308x - 1232$

1224

$Q = 4x^3 + 21x^2 + 76x + 308$

$R = 1224$

(b)

$$2x^2 - x - 6 \overline{)\, 6x^3 - 13x^2 - 13x + 30}$$

$3x - 5$

$6x^3 - 3x^2 - 18x$

$-10x^2 + 5x + 30$

$-10x^2 + 5x + 30$

0

$\therefore Q = a^2 - 6a + 14$

$R = 1$

(c) $\frac{6x^2+x-15}{3x+5} = \frac{6x^2+10x-9x-15}{3x+5}$

$= \frac{2x(3x+5) - 3(3x+5)}{3x+5}$

$= \frac{(2x-3)(3x+5)}{3x+5} = 2x - 3$

4. $\frac{x^6 - y^6}{x^2 + xy + y^2} = \frac{(x^3)^2 - (y^3)^2}{x^2 + xy + y^2}$

$= \frac{(x^3 + y^3)(x^3 - y^3)}{x^2 + xy + y^2}$

$= \frac{(x^3 + y^3)(x - y)(x^2 + xy + y^2)}{x^2 + xy + y^2}$

$= (x^3 + y^3)(x - y)$

5. $\frac{x^6 - 8}{x^2 - 2} = \frac{(x^2)^3 - (2)^3}{x^2 - 2}$

$= \frac{(x^2 - 2)(x^4 + 2x^2 + 4)}{x^2 - 2} = x^4 + 2x^2 + 4$

6. $\frac{6x^3 - 13x^2 + 13x + 30}{2x^2 - x - 6}$

$$2x^2 - x - 6 \overline{)\, 6x^3 - 13x^2 + 13x + 30}$$

$3x - 5$

$6x^3 - 3x^2 - 18x$

$-10x^2 + 31x + 30$

$-10x^2 + 5x + 30$

$26x$

7. (a) $m^2 - 2mn + n^2 - 16$

$= (m - n)^2 - 4^2$

$= (m - n - 4)\ (m - n + 4)$

(b) $a^2 + 2ab + b^2 = (a + b)^2 = (a + b)\ (a - b)$

(c) $a^2 - b^2 - 2b - 1$

$= a^2 - (b + 1)^2$

$= (a - b - 1)\ (a + b + 1)$

(d) $2x + 4x^2 = 2x\ (1 + 2x)$

(e) $4x^2 - 12x + 9$

$= 4x^2 - 6x - 6x + 9$

$= 2x\ (2x - 3) - 3\ (2x - 3)$

$= (2x - 3)\ (2x - 3)$

(f) $4a^4 - b^4 = (2a^2)^2 - (b^2)^2$

$= (2a^2 + b^2)\ (2a^2 - b^2)$

(g) $a^2 + 9b^2 - 6ab - 25x^2$

$= [(a)^2 - 2(a)\ (3b) + (3b)^2] - (5x)^2$

$= (a - 3b)^2 - (5x)^2 = (a - 3b + 5x)\ (a - 3b - 5x)$

(h) $x^2 - y^2 + 10\ yz - 25z^2$

$= x^2 - (y^2 - 10\ yz + 25z^2)$

$= (x)^2 - (y - 5z)^2 = (x - y + 5z)\ (x + y - 5z)$

(i) $(a + 3)^2 - 10\ (a + 3) + 25$

$= (a + 3)^2 + 5^2 - 2(5)\ (a + 3)$

$= (a + 3 - 5)^2$

$= (a - 2)^2$

$= (a - 2)\ (a - 2)$

Chapter
13 Introduction To Graphs

WORKSHEET (BASED ON COMPLETE CHAPTER)

1. (a) Speed of the object at 20th second = $\frac{14}{20}$
= 0.7 m/s

(b) Speed of the object during 0 – 40 seconds
$= \frac{(28-0)m}{(40-0)s} = \frac{28}{40} = \frac{7}{10}$ = 0.7 m/s

2. (a) Runs scored in 35 overs = 175 runs

(b) Runs scored between 20 to 25 overs
= 150 – 100 = 50 runs

(c) 25 runs were scored during 5th over

3. (a) Distance from C to E = (75 – 60) m = 15 m

(b) Speed of the car between 20 – 40 seconds
$= \frac{(60-20)m}{(40-20)s} = \frac{40}{20}$ = 2 m/s

(c) At point A, the speed of the car is zero.

4. (a) Speed between 0 to 4 hrs
$= \frac{(450-0)km}{(4-0)hr} = \frac{450}{4}$ = 112.5 km/hr
Speed between 14 to 16 hrs
$= \frac{(650-600)km}{(16-14)hr} = \frac{50}{2}$ = 25 km/hr

(b) Speed at 13th hr = $\frac{300}{13}$ = 23.08 km/hr

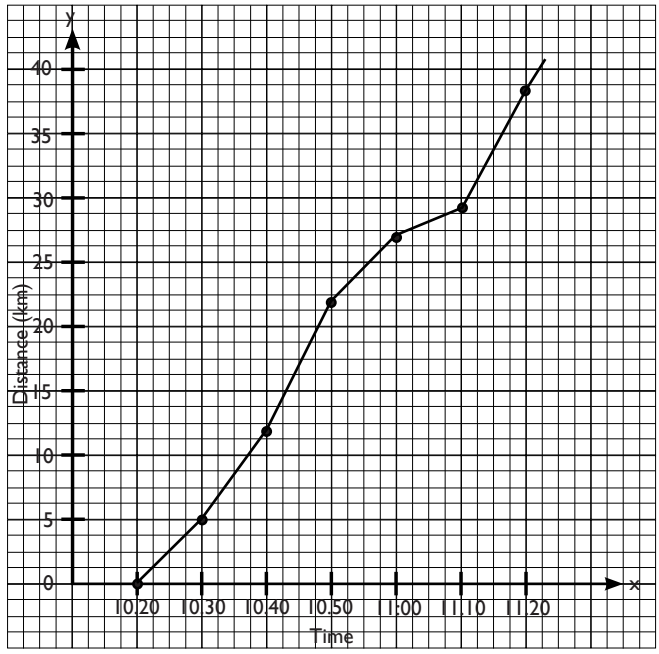
(c) Total distance travelled after 16 hrs. = 0 km

5. (a) Plant's growth from 1st week to 2nd week
= (8 – 3) cm = 5 cm

(b) 1st and 2nd week

(c) Plant's growth from 3rd week to 4th week
= (12 – 10) cm = 2 cm.

6. (a)

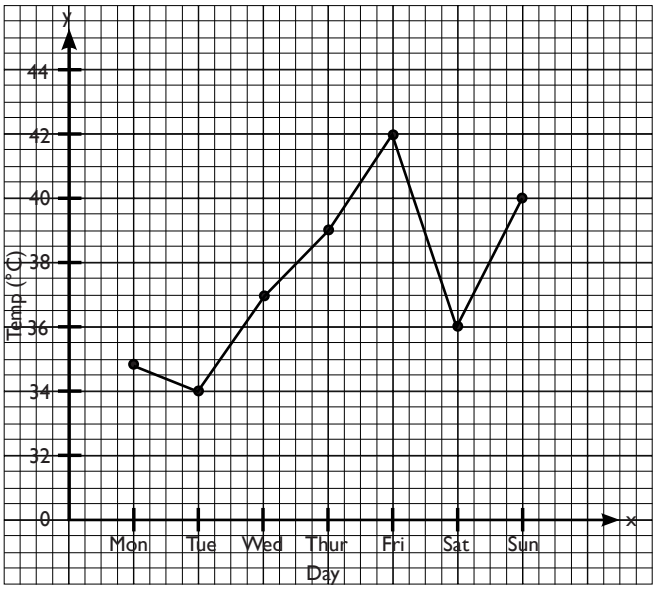


(b) 11 : 20 a.m

(c) Speed between 10 : 40 am to 10.50 a.m
$= \frac{22-12}{10} = \frac{10}{10}$
= 1 km/min

(d) Average speed = $\frac{\text{Total distance}}{\text{Total Time}}$
$= \frac{(0 + 5 + 12 + 22 + 26 + 28 + 38)\text{ km}}{1\text{ hr}}$
= 131 km/hr

7.



8. Coordinates of C = (–2, –3)

   Coordinates of D = (4, –4)

   Coordinates of E = (–6, 2)

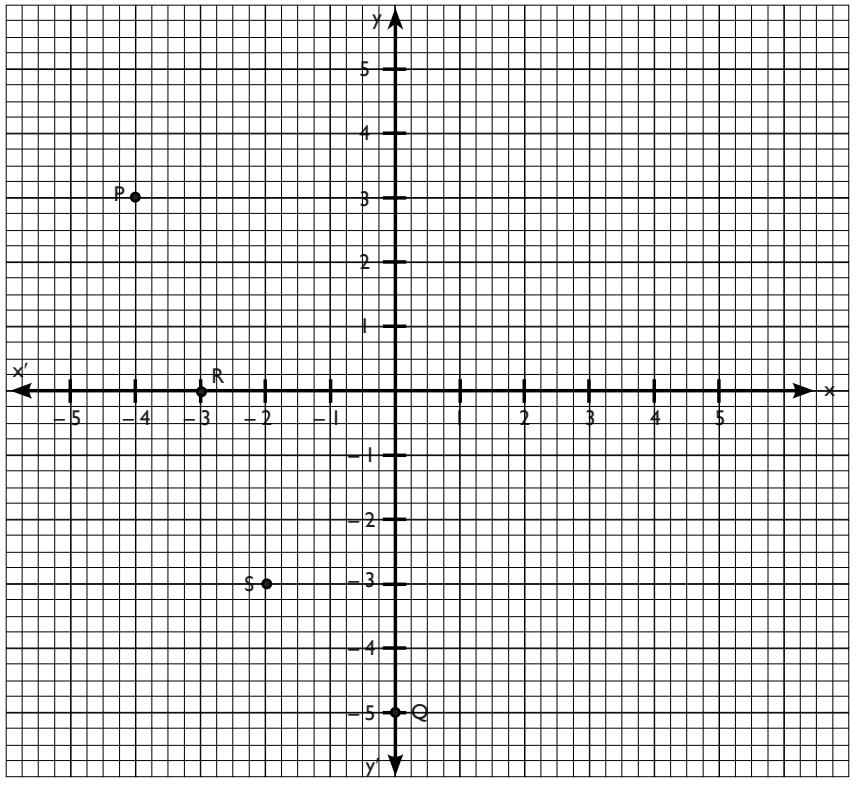
   Coordinates of L = (1, 3)

   Coordinates of M = (5, –2)

9. (a) 2nd quadrant (b) 1st quadrant

   (c) 4th quadrant (d) 3rd quadrant

10.



11. Coordinates of A = (5, 2), 1st quadrant

    Coordinates of R = (–2, 3), 2nd quadrant

    Coordinates of M = (–2, –2), 3rd quadrant

    Coordinates of H = (2, –5), 4th quadrant

    Coordinates of L = (–4, 0), lie on the x-axis.

12. (a) x-axis

    (b) 2nd quadrant

    (c) 3rd quadrant

    (d) y-axis

13. We know,

    Area of square = $(\text{side})^2$

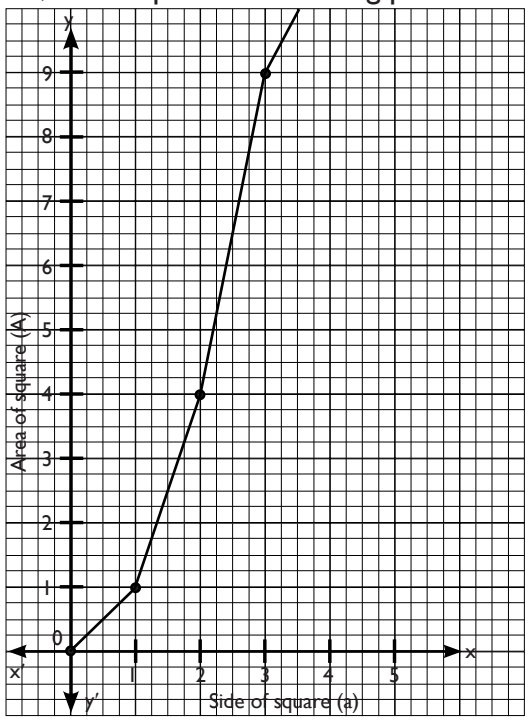
    Let side of square be a,

    So, Area of square = a^2

    $A = a^2$

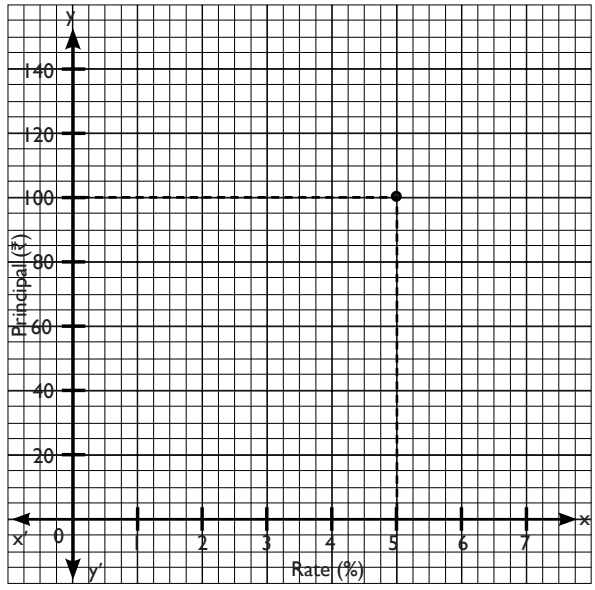
a	0	1	2	3
A	0	1	4	9

Thus, we have the points (0, 0), (1, 1), (2, 4), (3, 9).
Now, we will plot the following points.



We can infer from the graph that it is an increasing function in which the area of square is increasing with increase in side.

14.



15. (a) Temperature after 15 seconds
= (90 – 30)°C = 60°C
(b) The temperature never remained constant.
(c) Temperature at 40 seconds = 0°C. The changed state of matter is water vapour (gas).

16. (a) Speed (b) ordered
(c) origin, 0 (d) Ax + By + C = 0
(e) time (f) Square