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SOLUTION
MAGICAL MATHS

7

Chapter 1 : Integers

Exercise 1.1

1. Find the absolute value of :

(i) -19 Absolute value of $-19 = |-19| = 19$

(ii) -105 Absolute value of $-105 = |-105| = 105$

(iii) 30 Absolute value of $30 = |30| = 30$

2. Arrange in ascending order :

$-73, 105, 30, -21, 45$

Ascending order = $-73, -21, 30, 45, 105$

3. Arrange in descending order :

$-108, 0, -50, 15, -95$

Descending order = $15, 0, -50, -95, -108$

4. Simplify :

(i) $(-65) + (-18)$
$= -65 - 18$
$= -83$

(ii) $50 + (-30)$
$= 50 - 30$
$= 20$

(iii) $6 - (-3 + 8)$
$= 6 - (5)$
$= 6 - 5 = 1$

5. Add the following :

(i) $300 + (-78) + (-22)$
$= 300 - 78 - 22$
$= 222 - 22$
$= 200$

(ii) $150 - (-148) + 2$
$= 150 + 148 + 2$
$= 298 + 2$
$= 300$

(iii) $-392 + (-5) + (-8) + 506$
$= -392 - 5 - 8 + 506$
$= -397 - 8 + 506$
$= -405 + 506 = 101$

6. Use the sign of $<$, $>$ or $=$:

(i) $(-8) + 4 \lessgtr (-6) + 6$
$-8 + 4 \quad < \quad -6 + 6$
$-4 \quad < \quad 0$

(ii) $(-3) + 15 \lessgtr (-1) + 12$
$-3 + 15 \quad > \quad -1 + 12$
$12 \quad > \quad 11$

(iii) $(-9)-(-1)$ $\boxed{=}$ $(-2)+(-6)$

$-9+1$ $-2-6$

-8 $=$ -8

(iv) $(-7)-(-1)$ $\boxed{<}$ $(-10)-(-10)$

$-7+1$ $-10+10$

-6 $<$ 0

7. Subtract :

(i) 1000 from 925

$= 925 - 1000$

$= -75$

(ii) -600 from -210

$= -210-(-600)$

$= -210+600$

$= 390$

(iii) 40 from -30

$= -30-40$

$= -70$

8. Sum of two integers $= -72$

One of them $= -43$

Other integer $= ?$

$(-43) + x = -72$

$x = -72 + 43$

$x = -29$

Hence, other integer is -29.

9. Write down a pair of integers whose :

(i) sum is 0

pair is $\rightarrow (-5, 5)$

$\therefore \quad -5+5=0$

(ii) sum is (-3)

Pair is $\rightarrow (-8+5)$

$\therefore \quad -8+5=-3$

(iii) Difference is (-6)

Pair is $\rightarrow (-12, -6)$

$\therefore \quad -12-(-6) = -12+6 = -6$

10. Sum of -105 and $225 = -105 + 225$

$= 120$

Now, subtract 120 from $-165 = -165 - 120$

$= -285$

11. Distance travelled by car to the East $= +70$ km

Distance travelled by car to the West $= -140$ km

Final distance $= 70 + (-140)$

$= -70$ km

12. Position of submarine below the see level $= -1050$ m

it descends $= -300$ m

$\therefore$ Its new position $= -1050 + (-300)$

$= -1350$ m

13. Temperature on Saturday $= -1°C$

It rose on Sunday $= 3°C$

$\therefore$ Now the temperature on Sunday $= -1°C + 3°C$

$= 2°C$

Exercise 1.2

1. Find the product :

(i) $(-14) \times 5$
$= -70$

(ii) $(-25) \times 10$
$= -250$

(iii) $(-5) \times (-15)$
$= 75$

(iv) $(-5) \times (-10) \times 6$
$= 300$

2. Find each of the following products :

(i) $(-12) \times (-5) \times 5 \times (-1)$
$= 60 \times (-5)$
$= -300$

(ii) $(-2) \times 36 \times (-5) \times (-10)$
$= -72 \times 50$
$= -3600$

(iii) $(-100) \times 11 \times 0 \times 6$
$= -1100 \times 0$
$= 0$

(iv) $(-11) \times (-11) \times (-11)$
$= 121 \times (-11)$
$= -1331$

3. Find the value using suitable properties :

(i) $52 \times (-98) + 52 \times (-2)$
$= 52 \times [-98 + (-2)]$ (by distributive property)
$= 52 \times (-98 - 2)$
$= 52 \times (-100)$
$= -5200$

(ii) $4257 \times 125 + 4257 \times (-25)$
$= 4257 \times [125 + (-25)]$ (by distributive property)
$= 4257 \times [125 - 25]$
$= 4257 \times 100$
$= 425700$

(iii) $872 \times 1001 - 872$
$= 872 \times [1001 - 1]$ (by distributive property)
$= 872 \times 1000$
$= 872000$

(iv) -36×103
$= -36 \times [100 + 3]$ (by distributive property)
$= -36 \times 100 + (-36) \times 3$
$= -3600 - 108$
$= -3708$

4. Verify the following :

(i) $15 \times [12 + (-2)] = 15 \times 12 + 15 \times (-2)$

$15 \times [12 - 2]$	$= 180 + (-30)$
15×10	$= 180 - 30$
150	$= 150$
LHS	= RHS

(ii) $-12) \times [(-7) - (-3)] = (-12) \times (-7) - (-12) \times (-3)$

$-12 \times [-7 + 3] = 84 - 36$

$-12 \times (-4) = 48$

$48 = 48$

LHS = RHS

5. Determine the integers whose product with (–1) is :

(i) 48 — Integer = –48 — $\because$ $(-48) \times (-1) = 48$

(ii) –12 — Integer = 12 — $\because$ $12 \times (-1) = -12$

(iii) 275 — Integer = –275 — $\because$ $(-275) \times (-1) = 275$

6. Total no. of questions = 50

Marks of every correct answer = 5

Marks of incorrect answer = –3

(i) Saurabh attempted questions = 50

No. of of correct answers = 45

then no. of incorrect answers = (50 – 45)

= 5

His total score = $(45 \times 5) + [5 \times (-3)]$

= 225 – 15

= 210

(ii) Deepak attempted questions = 35

No. of correct answers = 30

No. of incorrect answers = 5

His score = $(30 \times 5) + [5 \times (-3)]$

= 150 – 15

= 135

7. Present temperature = 36° C

It decreases every hour = 4° C

Then the temperature after 10 hours

= 36° C + (-4×10)° C

= 36° C – 40° C

= – 4° C

Exercise 1.3

1. Find the quotient :

(i) $144 \div (-12) = \frac{144}{-12} = -12$

(ii) $(-391) \div (-17) = \frac{-391}{-17} = 23$

(iii) $234 \div (-1) = \frac{234}{-1} = -234$

(iv) $(-81) \div 81$

$= \frac{-81}{81}$

$= -1$

(v) $(-576) \div 16$

$= \frac{-576}{16}$

$= -36$

(vi) $0 \div (-15)$

$= \frac{0}{-15}$

$= 0$

2. Fill in the blanks :

(i) $12 \div \ldots\ldots = -6$

$12 \div (-2) = -6$

(ii) $\ldots\ldots \div (-3) = 18$

$(-54) \div (-3) = 18$

(iii) $\ldots\ldots \div (-12) = 0$

$0 \div (-12) = 0$

(iv) $(-98) \div \ldots\ldots = 14$

$(-98) \div (-7) = 14$

(v) $275 \div \ldots\ldots = 1$

$275 \div 275 = 1$

(vi) $(-512) \div 8 = \ldots\ldots$

$(-512) \div 8 = -64$

3. Points for every correct answer = 10

Points for every incorrect answer = 5

(i) The team from St. Joseph School scored points = 125

No. of correct answers attempted by the team = 15

$\therefore$ No. of incorrect answers $= \frac{(15 \times 10) - 125}{5}$

$= \frac{150 - 125}{5}$

$= \frac{25}{5} = 5$

(ii) No. of correct answers attempted by the team Indian Public School = 10

No. of Incorrect answers attempted by the team Indian Public School = 5

$\therefore$ Their score $= (10 \times 10) + 5 \times (-5)$

$= 100 - 25 = 75$

(iii) No. of points scored by the team Government Girls school = 150

No. of correct answers attempted by the team = 18

$\therefore$ No. of incorrect answers $= \frac{(18 \times 10) - 150}{5}$

$= \frac{180 - 150}{5}$

$= \frac{30}{5} = 6$

Now, no. of points scored by St. Joseph School = 125

No. of points scored by Indian Public School = 75

No. of points scored by Government Girls School = 150

Hence, the team from Government Girls school won the competition.

4. Which of the following sttements are true and which are false :

(i) $0 \div 4 = 4$

LHS $= 0 \div 4$

$= \frac{0}{4}$

$= 0 \neq$ RHS

(False)

(ii) $(-15) \div 0 = 0$

LHS $= \frac{-15}{0}$

= not defined

$\neq$ RHS

(False)

(iii) $(-8) \div (-1) = 8$

$\text{LHS} = (-8) \div (-1)$

$= \dfrac{-8}{-1} = 8$

$= \text{RHS}$

(True)

(iv) $0 \div 0 = 0$

$\text{LHS} = \dfrac{0}{0} = \text{Note defined}$

$\neq \text{RHS}$

(False)

(v) True (vi) True (vii) True

Exercise 1.4

1. Simplify :

(i) $18 + [12 \div (-2)]$

$= 18 + (-6)$

$= 18 - 6$

$= 12$

(ii) $7 + (8 - 3 + 2)$

$= 7 + (10 - 3)$

$= 7 + 7$

$= 14$

(iii) $17 - [3 + 2 - \{(4 + \sqrt{2 - 3}\}]$

$= 17 - [5 - (4 + 9)]$

$= 17 - [5 - 13]$

$= 17 - (-8) = 17 + 8 = 25$

(iv) $25 - [25 - \{25 - (25 - \overline{25 - 25}\}]$

$= 25 - [25 - \{25 - 25 - 0)\}]$

$= 25 - [25 - \{25 - 25\}]$

$= 25 - [25 - 0]$

$= 25 - 25 = 0$

(v) $10 - \{13 - 5(4 \text{ of } -4)\}$

$= 10 - \{13 - 5\,(4 \times -4)\}$

$= 10 - \{13 - 5 \times (-16)\}$

$= 10 - \{13 + 80\}$

$= 10 - 93$

$= -83$

2. Solve the following :

(i) $27 - [5 + \{28 - (29 - 7)\}]$

$= 27 - [5 + \{28 - 22\}]$

$= 27 - [5 + 6]$

$= 27 - 11 = 16$

(ii) $17 - [3 \div \{18 - 19 - 2\}] \div \{1 \div (5 - 3 - 1)\}$

$= 17 - [3 \div \{18 - 21\}] \div \{1 \div (5 - 4)\}$

$= 17 - [3 \div (-3)] \div \{1 \div 1\}$

$= 17 - (-1) \div 1$

$= 17 + 1 \div 1$

$= 18 \div 1 = 18$

(iii) $\{48 \div (-6)\} \div [(-24) \div \{(-24) \div (-8)\}]$

$= (-8) \div [(-24) \div (3)]$

$= (-8) \div (-8)$

$= 1$

(iv) $15 - (-3)\{4 - \overline{7 - 3}\} \div 3 \div [\{-15 + (-3) \times (-6)\}]$

$= 15 - (-3)\{4 - 4\} \div 3 \div [\{-15 + 18\}]$

$= 15 - (-3) \times 0 \div 3 \div (3)$

$= 15 - 0 \div 1$

$= 15 \div 0 = 15$

(v) $81 \text{ of } [59 - (2 \times 7) + (15 - 2 \text{ of } 5)]$

$= 81 \times [59 - 14 + (15 - 2 \times 5)]$

$= 81 \times [59 - 14 + (15 - 10)]$

$= 81 \times [59 - 14 + 5]$

$= 81 \times [45 + 5]$

$= 81 \times 50 = 4050$

(vi) $8 + \frac{1}{5}[\{-10 \times (25 - 18 - 3)\} \div (-5)]$

$= 8 + \frac{1}{5}[\{-10 \times (25 - 21)\} \div (-5)]$

$= 8 + \frac{1}{5}[\{-10 \times 4\} \div (-5)]$

$= 8 + \frac{1}{5}[-40 \div (-5)]$

$= 8 + \frac{1}{5} \times 8$

$= \frac{8}{1} + \frac{8}{5} = \frac{40 + 8}{5} = \frac{48}{5} = 9\frac{3}{5}$

Chapter 2 : Fractions

Exercise 2.1

1. Write an equivalent fraction for each :

(i) $\frac{3}{6}$

$= \frac{3 \times 2}{6 \times 2} = \frac{6}{12}$

(ii) $\frac{7}{9}$

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

(iii) $\frac{5}{9}$

$= \frac{5 \times 2}{9 \times 2} = \frac{10}{18}$

2. Compare the fractions :

(i) $\frac{5}{3} \boxed{>} \frac{6}{8}$

$\frac{5}{3} \times \frac{6}{8}$

$8 \times 5 \quad 6 \times 3$

$40 > 18$

(ii) $\frac{3}{4} \boxed{<} \frac{7}{9}$

$\frac{3}{4} \times \frac{7}{9}$

$3 \times 9 \quad 7 \times 4$

$27 < 28$

(iii) $\frac{1}{3} \boxed{>} \frac{2}{7}$

$\frac{1}{3} \times \frac{2}{7}$

$1 \times 7 \quad 2 \times 3$

$7 > 6$

(iv) $\frac{18}{12} \boxed{<} \frac{19}{2}$

$\frac{18}{12} \times \frac{19}{2}$

$18 \times 2 \quad 19 \times 12$

$36 < 228$

3. Evaluate :

(i) $\frac{4}{1} + \frac{7}{8}$

$= \frac{32 + 7}{8}$

$= \frac{39}{8}$

$= 4\frac{7}{8}$

(ii) $8\frac{4}{15} - 5\frac{1}{5}$

$= \frac{124}{15} - \frac{26}{5}$

$= \frac{124 - 78}{15}$

$= \frac{46}{15} = 3\frac{1}{15}$

(iii) $3\frac{3}{4} + 5\frac{1}{2}$

$= \frac{15}{4} + \frac{11}{2}$

$= \frac{15 + 22}{4}$

$= \frac{37}{4} = 9\frac{1}{4}$

(iv) $\frac{8}{9}+\frac{3}{2}+\frac{5}{6}$

$=\frac{16+27+15}{18}$

$=\frac{58}{18}=\frac{29}{9}$

$=3\frac{2}{9}$

(v) $1\frac{7}{8}-1\frac{1}{4}+1\frac{1}{2}$

$=\frac{15}{8}-\frac{5}{4}+\frac{3}{2}$

$=\frac{15-10+12}{8}$

$=\frac{5+12}{8}=\frac{17}{8}=2\frac{1}{8}$

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

$=\frac{11}{4}-\frac{4}{3}+\frac{17}{5}$

$=\frac{165-80+204}{60}$

$=\frac{85+204}{60}$

$=\frac{289}{60}=4\frac{49}{60}$

4. (i) Arrange the following in ascending order :

(i) $\frac{1}{2},\frac{1}{6},\frac{1}{3},\frac{1}{10}$

LCM of 2, 6, 3 and 10 = 30

Now, $\frac{1}{2}=\frac{1\times15}{2\times15}=\frac{15}{30}$

$\frac{1}{6}=\frac{1\times5}{6\times5}=\frac{5}{30}$

$\frac{1}{3}=\frac{1\times10}{3\times10}=\frac{10}{30}$

$\frac{1}{10}=\frac{1\times3}{10\times3}=\frac{3}{30}$

Ascending Order

$\frac{3}{30}<\frac{5}{30}<\frac{10}{30}<\frac{15}{30}$

$\therefore\quad \frac{1}{10}<\frac{1}{6}<\frac{1}{3}<\frac{1}{2}$

(ii) $\frac{2}{9},\frac{2}{3},\frac{8}{21},\frac{5}{9}$

LCM of 9, 3, 21 and 9 = 63

Now, $\frac{2}{9}=\frac{2\times7}{9\times7}=\frac{14}{63}$

$\frac{2}{3}=\frac{2\times21}{3\times21}=\frac{42}{63}$

$\frac{8}{21}=\frac{8\times3}{21\times3}=\frac{24}{63}$

$\frac{5}{9}=\frac{5\times7}{9\times7}=\frac{35}{63}$

Ascending Order

$\frac{14}{63}<\frac{24}{63}<\frac{35}{63}<\frac{42}{63}$

$\therefore\quad \frac{2}{9}<\frac{8}{21}<\frac{5}{9}<\frac{2}{3}$

5. Arrange the following in descending order :

(i) $\frac{1}{5},\frac{3}{7},\frac{7}{10},\frac{4}{5}$

$\therefore$ LCM of 5, 7, 10 and 5 = 70

Now,

$\frac{1}{5}=\frac{1\times14}{5\times14}=\frac{14}{70}$

$\frac{3}{7}=\frac{3\times10}{7\times10}=\frac{30}{70}$

$\frac{7}{10}=\frac{7\times7}{10\times7}=\frac{49}{70}$

$\frac{4}{5}=\frac{4\times14}{5\times14}=\frac{56}{70}$

(ii) $\frac{2}{3},\frac{3}{4},\frac{1}{2},\frac{5}{6}$

$\therefore$ LCM of 3, 4, 2 and 6 = 12

Now,

$\frac{2}{3}=\frac{2\times4}{3\times4}=\frac{8}{12}$

$\frac{3}{4}=\frac{3\times3}{4\times3}=\frac{9}{12}$

$\frac{1}{2}=\frac{1\times6}{2\times6}=\frac{6}{12}$

$\frac{5}{6}=\frac{5\times2}{6\times2}=\frac{10}{12}$

Descending order

$$\frac{56}{70} > \frac{49}{70} > \frac{30}{70} > \frac{14}{70}$$

$$\therefore \quad \frac{4}{5} > \frac{7}{10} > \frac{3}{7} > \frac{1}{5}$$

Descending order

$$\frac{10}{12} > \frac{9}{12} > \frac{8}{12} > \frac{6}{12}$$

$$\therefore \quad \frac{5}{6} > \frac{3}{4} > \frac{2}{3} > \frac{1}{2}$$

6. $\text{Sum of row I} = \frac{16}{43} + \frac{21}{43} + \frac{20}{43} = \frac{57}{43}$

$\text{Sum of row II} = \frac{23}{43} + \frac{19}{43} + \frac{15}{43} = \frac{57}{43}$

$\text{Sum of row III} = \frac{18}{43} + \frac{17}{43} + \frac{22}{43} = \frac{57}{43}$

$\text{Now sum of column I} = \frac{16}{43} + \frac{23}{43} + \frac{18}{43} = \frac{57}{43}$

$\text{sum of column II} = \frac{21}{43} + \frac{19}{43} + \frac{17}{43} = \frac{57}{43}$

$\text{sum of column III} = \frac{20}{43} + \frac{15}{43} + \frac{22}{43} = \frac{57}{43}$

Hence it is a magic square.

7. $\text{Weight of potatoes} = 3\frac{3}{4}\,\text{kg} = \frac{15}{4}\,\text{kg}$

$\text{Weight of onions} = 1\frac{1}{2}\,\text{kg} = \frac{3}{2}\,\text{kg}$

$\text{Weight of cauliflowers} = 1\frac{3}{4}\,\text{kg} = \frac{7}{4}\,\text{kg}$

$$\text{Total weight of vegetables} = \left(\frac{15}{4} + \frac{3}{2} + \frac{7}{4}\right)\text{kg}$$

$$= \left(\frac{15 + 6 + + 7}{4}\right)\text{kg}$$

$$= \frac{28}{4}\,\text{kg} = 7\,\text{kg}$$

Hence, payal purchased 7 kg of vegetables.

8. $\text{Side of square shaped frame} = 17\frac{2}{9}\,\text{cm}$

$$= \frac{155}{9}\,\text{cm}$$

$\therefore \quad \text{Perimeter of frame} = 4 \times \text{side}$

$$= 4 \times \frac{155}{9}$$

$$= \frac{620}{9} = 68\frac{8}{9}\,\text{cm}$$

Hence, its perimeter is $68\frac{8}{9}$ cm.

9. Quantity of milk bought in the morning = 3 litres

Quantity of milk left in the evening = $\frac{5}{8}$ litres

$\therefore$ Used milk = $\left(\frac{3}{1} - \frac{5}{8}\right)$ litres

$= \left(\frac{24 - 5}{8}\right) = \frac{19}{8} = 2\frac{3}{8}$ litres

Hence, $2\frac{3}{8}$ litres of milk was used during the day.

10. Quantity of milk = $\frac{2}{5}$ cup

Quantity of cream = $\frac{1}{3}$ cup

Required more quantity of milk than cream

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

$= \frac{6 - 5}{15} = \frac{1}{15}$

Hence, $\frac{1}{15}$ cup of milk is requried more than cream.

11. Nirmala finishes a work in = $\frac{5}{6}$ hours

Poonam finishes the same work in = $\frac{3}{4}$ hours

Extra time taken by Nirmala = $\frac{5}{6} - \frac{3}{4}$

$= \frac{10 - 9}{12} = \frac{1}{12}$

Hence, Nirmala finished the work in $\frac{1}{12}$ hours more than Poonam.

12. Let x be the required number.

$12\frac{3}{5} - x = 7\frac{1}{5}$

or $\frac{63}{5} - x = \frac{36}{5}$

or $\frac{63}{5} - \frac{36}{5} = x$

or $\frac{27}{5} = x$

$\therefore$ $x = 5\frac{2}{5}$

Hence, the required fraction is $5\frac{2}{5}$.

Exercise 2.2

1. Find :

(i) $\frac{8}{3} \times 5$

$= \frac{40}{3}$

(ii) $12 \times \frac{3}{5}$

$= \frac{36}{5}$

(iii) $20 \times \frac{3}{4}$

$= 5 \times 3$

$= 15$

(iv) $\frac{3}{5} \times 7$

$= \frac{21}{5}$

2. Find $\frac{1}{3}$ of :

(i) 48

$= \frac{1}{3} \times 48 = 16$

(ii) 36

$= \frac{1}{3} \times 36 = 12$

(iii) 102

$= \frac{1}{3} \times 102$

$= 34$

(iv) 15

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

3. Find $\frac{5}{7}$ of :

(i) 35

$= \frac{5}{7} \times 35$

$= 25$

(ii) 154

$= \frac{5}{7} \times 154$

$= 110$

(iii) 105

$= \frac{5}{7} \times 105$

$= 75$

(iv) 175

$= \frac{5}{7} \times 175$

$= 125$

4. Find the products :

(i) $\frac{2}{3} \times 2\frac{2}{3}$

$= \frac{2}{3} \times \frac{8}{3}$

$= \frac{16}{9}$

$= 1\frac{7}{9}$

(ii) $4\frac{1}{3} \times 3\frac{1}{2}$

$= \frac{13}{3} \times \frac{7}{2}$

$= \frac{91}{6}$

$= 15\frac{1}{6}$

(iii) $2\frac{1}{3} \times 1\frac{1}{2} \times 1\frac{1}{6}$

$= \frac{7}{\cancel{3}} \times \frac{\overset{1}{\cancel{2}}}{2} \times \frac{7}{6}$

$= \frac{49}{6}$

$= 4\frac{1}{12}$

(iv) $\frac{1}{7} \times 4\frac{5}{4}$

$= \frac{1}{7} \times 4\frac{5}{4}$

$= \frac{1}{7} \times \frac{21}{4}$

$= \frac{3}{4}$

(v) $\frac{3}{4}$ of a rupee

$= \frac{3}{4} \times 100$ paise

$= 75$ paise

(vi) $\frac{5}{6}$ of a day

$= \frac{5}{6} \times 24$ hours

$= 20$ hours

5. Distance covered in an hour $= 4\frac{3}{5}$ km $= \frac{23}{5}$ km

Distance covered in $2\frac{1}{7}$ hours $= \frac{23}{5} \times 2\frac{1}{7}$ km

$= \frac{23}{5} \times \frac{15}{7}$

$= \frac{69}{7} = 9\frac{6}{7}$ km

Hence, distance covered by the man in $2\frac{1}{7}$ hours is $9\frac{6}{7}$ km.

6. Cost of 1 bread $= ₹\ 16\frac{3}{4} = ₹\ \frac{67}{4}$

Cost of 15 breads $= ₹\ \frac{67}{4} \times 15$

$= ₹\ \frac{1005}{4} = ₹\ 251\frac{1}{4}$

Hence, cost of 15 breads is ₹ $251\frac{1}{4}$.

7. Distance covered by car in an hour $= 70\frac{1}{3}$ km $= \frac{211}{3}$ km

Distance covered by car in 6 hours $= \frac{211}{3} \times 6$ km

$= 422$ km

Hence, Car will cover 422 km distance in 6 hours.

8. Which is greater :

(i) $\frac{1}{3}$ of $\frac{3}{4}$ or $\frac{1}{2}$ of $\frac{4}{5}$

$\frac{1}{3} \times \frac{3}{4}$ $\frac{1}{2} \times \frac{4}{5}$

$\frac{1}{4} \quad \frac{2}{5}$

$5 < 8$

Hence, $\frac{1}{2}$ of $\frac{4}{5}$ is greater.

(ii) $\frac{6}{7}$ of $\frac{49}{5}$ or $\frac{3}{8}$ of $\frac{48}{5}$

$\frac{6}{7} \times \frac{49}{5}$ $\frac{3}{8} \times \frac{48}{5}$

$\frac{42}{5} > \frac{18}{5}$

Hence, $\frac{6}{7}$ of $\frac{49}{5}$ is greater.

9. Cost of 1 kg tomatoes $= ₹\ 19\frac{1}{4} = ₹\ \frac{77}{4}$

Cost of $3\frac{1}{2}$ kg tomatoes $= ₹\ \frac{77}{4} \times 3\frac{1}{2}$

$= ₹\ \frac{77}{4} \times \frac{7}{2}$

$= ₹\ \frac{539}{8} = ₹\ 67\frac{3}{8}$

Hence, cost of $3\frac{1}{2}$ kg tomatoes is ₹ $67\frac{3}{8}$.

10. Side of a square field $= 12\frac{1}{2}$ m $= \frac{25}{2}$ m

Area of field = side × side

$$= \left(\frac{25}{2} \times \frac{25}{2}\right) \text{m}^2$$

$$= \frac{625}{4} \text{m}^2$$

$$= 156\frac{1}{4} \text{m}^2$$

Hence, the required area of field is $156\frac{1}{4}$ m^2.

Exercise 2.3

1. Find :

(i) $16 \div \frac{4}{5}$

$= 16 \times \frac{5}{4}$

$= 20$

(ii) $4 \div 3\frac{1}{5}$

$= 4 \div \frac{16}{5}$

$= 4 \times \frac{5}{16}$

$= \frac{5}{4} = 1\frac{1}{4}$

(iii) $3\frac{5}{7} \div 1\frac{4}{9}$

$= \frac{26}{7} \div \frac{13}{9}$

$= \frac{26}{7} \times \frac{9}{13}$

$= \frac{18}{7} = 2\frac{4}{7}$

(iv) $\frac{7}{3} \div 5\frac{1}{2}$

$= \frac{7}{3} \div \frac{11}{2}$

$= \frac{7}{3} \times \frac{2}{11}$

$= \frac{14}{33}$

(v) $\frac{2}{15} \div 8$

$= \frac{2}{15} \times \frac{1}{8}$

$= \frac{1}{60}$

(vi) $5\frac{3}{7} \div 14$

$= \frac{38}{7} \div 14$

$= \frac{38}{7} \times \frac{1}{14}$

$= \frac{19}{49}$

2. Which one is greater :

$\frac{14}{5} \div 9$ or $\frac{16}{7} \div 8$

$\frac{14}{5} \times \frac{1}{9}$ $\frac{16}{7} \times \frac{1}{8}$

$\frac{14}{45}$ $\frac{2}{7}$

$98 > 90$

Hence, $\frac{14}{5} \div 9$ is greater.

3. Simplify :

$$\left(\frac{3}{2} \div \frac{4}{5}\right) + \left(\frac{9}{5} \times \frac{10}{3}\right)$$

$$= \left(\frac{3}{2} \times \frac{5}{4}\right) + 6$$

$$= \frac{15}{8} + \frac{6}{1} = \frac{15 + 48}{8} = \frac{63}{8} = 7\frac{7}{8}$$

4. Cost of $5\frac{2}{5}$ kg of sugar = ₹ $101\frac{1}{4}$

Cost of per kg of sugar = ₹ $\left(101\frac{1}{4} \div 5\frac{2}{5}\right)$

$$= ₹ \left(\frac{405}{4} \div \frac{27}{5}\right)$$

$$= ₹ \left(\frac{405}{4} \times \frac{5}{27}\right)$$

$$= ₹ \left(\frac{45}{4} \times \frac{5}{3}\right) = ₹ \frac{75}{4} = ₹ 18\frac{3}{4}$$

Hence, cost of 1 kg sugar is ₹ $18\frac{3}{4}$.

5. Let required number be x.

$$\frac{5}{6} \times x = 3\frac{1}{3}$$

$$\frac{5}{6} \times x = \frac{10}{3}$$

or $$x = \frac{10}{3} \div \frac{5}{6}$$

$$= \frac{10}{3} \times \frac{6}{5}$$

$$x = 4$$

Hence, the required number is 4.

6. Length of a rope = $8\frac{1}{3}$ m = $\frac{25}{3}$ m

It is cut into equal pieces = 5

$\therefore$ Length of each piece = $\left(\frac{25}{3} \div 5\right)$ m

$$= \frac{25}{3} \times \frac{1}{5} = \frac{5}{3}$$

$$= 1\frac{2}{3} \text{ m}$$

Hence, length of each piece of rope is $1\frac{2}{3}$ m.

7. Product of two numbers = $87\frac{3}{4} = \frac{351}{4}$

One of them = 18

$\therefore$ Let other number = x

$$x \times 18 = \frac{351}{4}$$

$$\therefore \quad x = \frac{351}{4} \div 8$$

$$= \frac{351}{4} \times \frac{1}{8} = \frac{351}{32} = 10\frac{31}{32}$$

Hence, the required number is $10\frac{31}{32}$.

Chapter 3 : Decimals

Exercise 3.1

1. Express the following in decimal form :

(i) $300 + 40 + \frac{0}{10} + \frac{4}{100} + \frac{6}{1000}$

$= 300 + 40 + 0.0 + 0.04 + 0.006$

$= 340.046$

(ii) $20 + 4 + \frac{3}{10} + \frac{5}{1000}$

$= 20 + 4 + 0.3 + 0.005$

$= 24.305$

2. Express the following decimals in the expanded form :

(i) 18.407

$= 10 + 8 + \frac{4}{10} + \frac{0}{100} + \frac{7}{1000}$

(ii) 125.367

$= 100 + 20 + 5 + \frac{3}{10} + \frac{6}{100} + \frac{7}{1000}$

(iii) 100.03

$= 100 + \frac{0}{10} + \frac{3}{100}$

3. Compare using < , > or = :

(i) 6.093 $\boxed{<}$ 8.99 (ii) 5.09 $\boxed{<}$ 5.9

(iii) 0.5 $\boxed{>}$ 0.15 (iv) 0.76 $\boxed{<}$ 0.80

4. Arrange in ascending order :

(i) 2.24, 3.12, 1.04, 4.01, 0.897

ascending order = 0.897, 1.04, 2.24, 3.12, 4.01

(ii) 8.06, 8.059, 8.013, 8.3, 8.60

ascending order = 8. 013, 8.059, 8.06, 8.3, 8.60

5. Arrange in descending order :

(i) 3.21, 4.03, 5.1, 3.8, 4.5

descending order = 5.1, 4.5, 4.03, 3.8, 3.21

(ii) 6.8, 8.67, 18.4, 6.08

descending order = 18.4, 8.67, 6.8, 6.08

6. Which is greater :

(i) 0.9 or 0.99

$\frac{9}{10}$ $\frac{99}{100}$

$900 < 990$

So, 0.99 is greater.

(ii) 2.35 or 2.36

$\frac{235}{100} < \frac{236}{100}$

So, 2.36 is greater.

(iii) 5.05 or 5.5

$\frac{505}{100}$ $\frac{55}{10}$

$\frac{505}{100} < \frac{550}{100}$

So, 5.5 is greater.

7. Add :

(i) 1.8 + 1.97 + 0.9

$$\begin{array}{rr} & 1.80 \\ = & 1.97 \\ + & 0.90 \\ \hline & 4.67 \end{array}$$

(ii) 58.35 + 22.50 + 35.345

$$\begin{array}{rr} & 58.350 \\ = & 22.500 \\ + & 35.345 \\ \hline & 116.195 \end{array}$$

8. Subtract :

(i) 8.91 from 9.1

$$\begin{array}{rr} = & 9.10 \\ - & 8.91 \\ \hline & 0.19 \end{array}$$

(ii) 61.79 from 80

$$\begin{array}{rr} = & 80.00 \\ - & 61.79 \\ \hline & 18.21 \end{array}$$

9. Cost of a fan = ₹ 795.80

Cost of a watch = ₹ 318.75

Spend money = ₹ 795.80

+ ₹ 318.75

Total money ₹ 1114.55

Hence, Ruchi spent ₹ 1114.55.

10. Distance travelled by car = 5 km 12 m

Distance travelled by autorickshaw = 2 km 156 m

	km	m
	5	012
+	2	156
Total distance =	7	168

Hence, Ankit travelled 7 km 168 m.

11. Height of plant on Friday = 8.5 cm

It grew on Saturday = 0.75 cm

= 8.50 cm

+ 0.75 cm

∴ Total Height of plant = 9.25 cm

Hence, the height of bean plant was 9.25 cm on Saturday.

12. Total money Sita had = ₹ 1000

The cost of medicine = ₹ 689.01

$$= 1000.00$$
$$- \ 689.01$$

Left money = 310.99

Hence, she got back ₹ 310.99 from the chemist.

13.
$$138.8\ \text{km}$$
$$-60.0\ \text{km}$$

Required difference = 78.8 km

14. Simplify :

$65.7 - 34.55 + 76.4$

$$\begin{array}{r} 65 \ . \ 70 \\ -\ 34 \ . \ 55 \\ \hline 31 \ . \ 15 \end{array}$$

Now,
$$\begin{array}{r} 31 \ . \ 15 \\ +\ 76 \ . \ 40 \\ \hline 107 \ . \ 55 \end{array}$$

Exercise 3.2

1. Find the following products :

(i) 28.15×5 = 140.75

(ii) 1.3×2.5 = 3.25

(iii) 0.86×1.3 = 1.118

(iv) 405.08×4.2 = 1701.336

(v) 56.8×0.15 = 8.520

(vi) 20.1×2.05 = 41.205

2. Find :

(i) 2.5×10 = 25.0

(ii) 3.57×10 = 35.70

(iii) 2.397×100 = 239.700

(iv) 57.08×100 = 5708.00

(v) 12.5×1000 = 12500.0

(vi) 0.0062×1000 = 6.2000

3. Find the product :

(i) $1.1 \times 1.2 \times 1.3$ = 1.716

(ii) $2.4 \times 2.5 \times 2.6$ = 15.600

(iii) $0.1 \times 0.01 \times 0.001$ = 0.000001

(iv) $0.8 \times 3.5 \times 0.05$ = 0.1400

4. Side of a square = 2.5 cm

Area of square = side × side

$$= 2.5 \times 2.5\ \text{cm}^2$$
$$= 6.25\ \text{cm}^2$$

Hence, the required area of square is $6.25\ \text{cm}^2$

5. The cost of 1 m of ribbon = ₹ 12.62

The cost of 3.5 m of ribbon = ₹ 12.62×3.5

$$= ₹\ 44.170$$

Hence, the required cost of ribbon is ₹ 44.170

6. Distance covered by a car in 1 litre of petrol = 19.7 km
Distance covered by the car in 20 litres of petrol = 19.7×20 km
$= 394.0$ km

Hence, the required distance is 394 km.

7. The cost of 1 kg of apples = ₹ 15.50
Cost of 4.5 kg of apples = ₹ 15.50×4.5
= ₹ 69.750

Hence, the cost of 4.5 kg of apples is 69.750.

8. The perimeter of field = 348.75 m
$\therefore$ the distance covered in 4 rounds
$= (348.75 \times 4)$ m
= 1395.00 m

Hence, the distance covered by the boys is 1395 m.

9. The cost of petrol per litre = ₹ 72
The cost of petrol 4.2 litres = ₹ 72×4.2
= ₹ 302.4

Hence, my father paid ₹ 302.4 at petrol pump.

Exercise 3.3

1. Find :

(i) $3.7 \div 10$
$= \frac{3.7}{10}$
$= \frac{37}{100} = 0.37$

(ii) $63.7 \div 100$
$= \frac{63.7}{100}$
$= \frac{637}{1000} = 0.637$

(iii) $5.32 \div 1000$
$= \frac{5.32}{1000}$
$= \frac{532}{100000} = 0.00532$

(iv) $32.10 \div 1000$
$= \frac{32.10}{1000}$
$= \frac{321}{10000} = 0.0321$

(v) $0.82 \div 100$
$= \frac{0.82}{100}$
$= \frac{82}{10000} = 0.0082$

(vi) $0.3 \div 1000$
$= \frac{0.3}{1000}$
$= \frac{3}{10000} = 0.0003$

2. Find :

(i) $9.6 \div 4$
$= \frac{96}{40} = 2.4$

(ii) $0.324 \div 9$
$= \frac{324}{9000} = 0.036$

(iii) $16.2 \div 50$
$= \frac{162}{500}$
$= 0.325$

(iv) $1.477 \div 700$
$= \frac{1477}{700000}$
$= 0.00211$

(v) $0.1705 \div 500$
$= \frac{1705}{5000000}$
$= 0.000341$

(vi) $81 \div 0.09$
$= \frac{81}{0.09}$
$= \frac{8100}{9}$
$= 900$

3. Divide :

(i) $4.12 \div 4$

$= \frac{4.12}{400}$

$= 1.03$

(ii) $57.44 \div 8$

$= \frac{5744}{800}$

$= 7.18$

(iii) $10.08 \div 9$

$= \frac{1008}{900}$

$= 1.12$

(iv) $1.56 \div 1.3$

$= \frac{1.56}{1.3}$

$= \frac{156}{130} = 1.2$

(v) $24 \div 0.006$

$= \frac{24000}{0006}$

$= 4000$

(vi) $129 \div 15$

$= \frac{129}{15}$

$= 8.6$

4. Fill in the blanks with correct divisor (10, 100 or 1000) :

(i) $33.7 \div \underline{10} = 3.37$

(ii) $253.9 \div \underline{100} = 2.539$

(iii) $42.53 \div \underline{1000} = 0.04253$

(iv) $329.4 \div \underline{10} = 32.94$

5. Which is greater ?

$0.0048 \div 0.06$ or $0.0714 \div 0.07$

$\frac{48}{10000} \div \frac{6}{100}$ $\quad$ $\frac{714}{10000} \div \frac{7}{100}$

$\frac{48}{10000} \times \frac{100}{6}$ $\quad$ $\frac{714}{10000} \times \frac{100}{7}$

$\frac{8}{100}$ $\quad < \quad$ $\frac{102}{100}$

Hence, $0.0714 \div 0.07$ is greater.

6. The product of two numbers = 128.25

One of the numbers = 9.5

Let other number = x

$\therefore \quad x = 128.25 \div 9.5$

$x \times 9.5 = 128.25$

$= \frac{128.25}{9.5} \times \frac{10}{100}$

$= \frac{12825}{950} = 13.5$

Hence, the required number is 13.5.

7. Charges for the distance per km = ₹ 9.50

Total money paid by passenger = ₹ 80.75

Required distance travelled by the passenger

$= \frac{80.75}{9.50} = 8.5$

Hence, the passenger travelled 8.5 km distance.

8. The cost of 9.5 kg mangoes = ₹ 147.25

The cost of 1 kg mangoes = ₹ $\frac{147.25}{9.5}$

= ₹ 15.5

Hence, the cost of 1 kg of mangoes is ₹ 15.5

9. Total length of cloth = 58.8 m

If it was shared equally by 4 friends then each friend got = $\frac{58.8}{4}$ m

= 14.7 m

Hence, each friend got 14.7 m of cloth.

10. The cost of 14 bottles of orange juice = ₹ 217.00

The cost of 1 bottle of orange juice = ₹ $\frac{217.00}{14}$

= ₹ 15.5

Hence, the cost of 1 bottle is ₹ 15.5

Chapter 4 : Rational Numbers

Exercise 4.1

1. Express each of the following as a rational number with positive denominator :

(i) $\frac{35}{-51}$

$= \frac{35 \times (-1)}{-51 \times (-1)} = \frac{-35}{51}$

(ii) $\frac{12}{-19}$

$= \frac{12 \times (-1)}{-19 \times (-1)} = \frac{-12}{19}$

(iii) $\frac{-68}{-75}$

$= \frac{-68 \times (-1)}{-75 \times (-1)} = \frac{68}{75}$

2. Express $\frac{5}{8}$ as a rational number with numerator :

(i) −20

$= \frac{5 \times (-4)}{8 \times (-4)} = \frac{-20}{\boxed{-32}}$

(ii) 100

$= \frac{5 \times 20}{8 \times 20} = \frac{100}{\boxed{160}}$

3. Express $\frac{7}{9}$ as a rational number with denominator :

(i) −54

$\frac{7 \times (-6)}{9 \times (-6)} = \frac{\boxed{-42}}{-54}$

(ii) 108

$\frac{7 \times 12}{9 \times 12} = \frac{\boxed{84}}{108}$

4. Find equivalent rational numbers having a common denominator :

(i) $\frac{7}{6}$ and $\frac{5}{18}$

LCM of 6 and 18 = 18

Now, $\frac{7 \times 3}{6 \times 3} = \frac{21}{18}$

$\frac{5 \times 1}{18 \times 1} = \frac{5}{18}$

Hence the required rational numbers are = $\frac{21}{18}$ and $\frac{5}{18}$

(ii) $\frac{3}{4}, \frac{5}{24}$ and $\frac{1}{2}$

LCM of 4, 24 and 2 = 24

Now, $\frac{3 \times 6}{4 \times 6} = \frac{18}{24}$

$\frac{5 \times 1}{24 \times 1} = \frac{5}{24}$

$\frac{1 \times 12}{2 \times 12} = \frac{12}{24}$

Hence the required numbers are $\frac{18}{24}, \frac{5}{24}$ and $\frac{12}{24}$

5. Express the following in the standard form :

(i) $\frac{4}{-20} = -\frac{1}{5}$ (ii) $\frac{15}{-30} = -\frac{1}{2}$

(iii) $\frac{-81}{-99} = \frac{81}{99} = \frac{9}{11}$ (iv) $\frac{360}{1080} = \frac{36}{108} = \frac{1}{3}$

6. Find the value of x, if the following pairs of rational numbers are equal :

(i) $\frac{3}{7}, \frac{x}{42}$

We have $\frac{3}{7} = \frac{x}{42}$

$3 \times 42 = 7 \times x$

$x = \frac{3 \times 42}{7}$

$\boxed{x = 18}$

(ii) $\frac{-5}{9}, \frac{10}{x}$

We have $\frac{-5}{9} = \frac{10}{x}$

$-5 \times x = 9 \times 10$

$x = \frac{9 \times 10}{-5}$

$\boxed{x = -18}$

7. Fill in the blanks :

$$\frac{3}{7} = \frac{\square}{-28} = \frac{-15}{\square}$$

$$\frac{3 \times (-4)}{7 \times (-4)} = \frac{\boxed{-12}}{-28} \quad \text{and} \quad \frac{3 \times (-5)}{7 \times (-5)} = \frac{-15}{\boxed{-35}}$$

8. Write the next four rational numbers in the following patterns :

(i) $\frac{-1}{2}, \frac{-2}{4}, \frac{-3}{6}, \ldots$

Next four rational numbers are :

$$\frac{-4}{8}, \frac{-5}{10}, \frac{-6}{12}, \frac{-7}{14}$$

(ii) $\frac{-7}{9}, \frac{-14}{18}, \frac{-21}{27}, \ldots$

Next four rational number are

$$\frac{-28}{36}, \frac{-35}{45}, \frac{-42}{54}, \frac{-49}{63}$$

9. Are the following rational numbers equal ?

(i) $-5\frac{1}{3}$ and $\frac{17}{3}$

$\because \quad \frac{-16}{3} \neq \frac{17}{3}$

Hence $-5\frac{1}{3}$ and $\frac{17}{3}$ are not equal.

(ii) $\frac{-8}{9}$ and $\frac{40}{-45}$

$\frac{-8}{9} \times \frac{40}{-45}$

$(-8) \times (-45) \quad 40 \times 9$

$360 = 360$

Hence $\frac{-8}{9}$ and $\frac{40}{-45}$ are equal.

10. Write $\frac{1}{3}$ with denominator as : -18, 42, -99. Can $\frac{1}{3}$ be written with denominator 5 ?

$$\frac{1\times(-6)}{3\times(-6)}=\frac{\boxed{-6}}{-18}, \qquad \frac{1\times 14}{3\times 14}=\frac{\boxed{14}}{42}$$

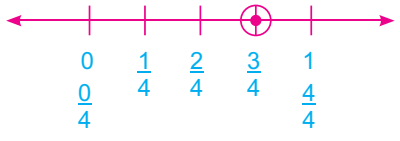
$$\frac{1\times(-33)}{3\times(-33)}=\frac{\boxed{-33}}{-99}$$

But $\frac{1}{3}$ can not be written with denominator as 5 because 5 is not a multiple of 3.

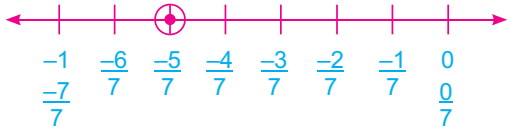
Exercise 4.2

1. Represent the following rational numbers on a number line :

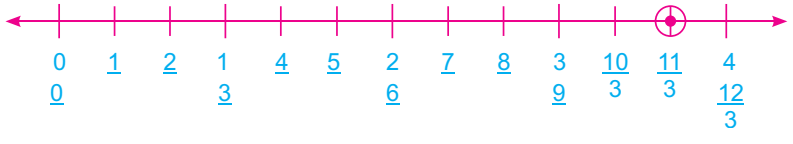
(i) $\frac{3}{4}$



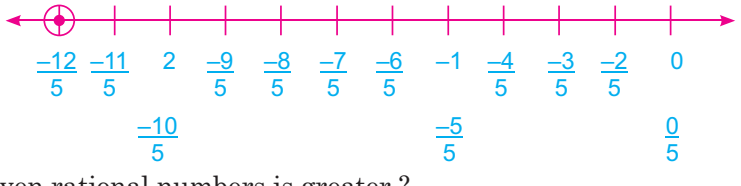
(ii) $\frac{-5}{7}$



(iii) $\frac{11}{3}$



(iv) $\frac{-12}{5}$



2. Which of the given rational numbers is greater ?

(i) $\frac{3}{19}$ or $\frac{7}{8}$

$\frac{3}{19} \times \frac{7}{8}$

(ii) $\frac{-1}{2}$ or $\frac{-3}{4}$

$\frac{-1}{2} \times \frac{-3}{4}$

$3 \times 8 \quad 19 \times 7$

$24 < 133$

$\frac{3}{19} < \frac{7}{8}$

Hence, $\frac{7}{8}$ is greater.

$4 \times (-1) \quad (-3) \times 2$

$-4 > -6$

$\frac{-1}{2} > \frac{-3}{4}$

Hence, $\frac{-1}{2}$ is greater.

(iii) $\frac{-5}{-8}$ or $\frac{6}{7}$

$\Rightarrow \frac{5}{8}$ or $\frac{6}{7}$

$5 \times 7 \quad 8 \times 6$

$35 < 48$

$\frac{5}{8} < \frac{6}{7}$

Hence, $\frac{6}{7}$ is greater.

3. Which of the given rational numbers is smaller ?

(i) $\frac{9}{14}$ or $\frac{17}{21}$

$\frac{9}{14} \times \frac{17}{21}$

$189 < 238$

$\Rightarrow \frac{9}{14} < \frac{17}{21}$

Hence, $\frac{9}{14}$ is smaller.

(ii) $\frac{-5}{6}$ or $\frac{-7}{9}$

$\frac{-5}{6} \times \frac{-7}{9}$

$-45 < -42$

$\frac{-5}{6} < \frac{-7}{9}$

Hence, $\frac{-5}{6}$ is smaller.

(iii) $\frac{-5}{11}$ or $\frac{-7}{12}$

$\frac{-5}{11} \times \frac{-7}{12}$

$-60 > -77$

$\frac{-5}{11} > \frac{-7}{12}$

Hence $\frac{-7}{12}$ is smaller.

4. Fill in the blanks with correct symbols (>, < or =) :

(i) $\frac{-1}{15} < \frac{-1}{30}$

$\because \frac{-1}{15} \boxed{<} \frac{-1}{30}$

$(-1) \times 30 \quad (-1) \times 15$

$-30 < -15$

(ii) $0 \boxed{<} \frac{-4}{-9}$

$\frac{0}{1} \times \frac{4}{9}$

$0 \times 9 \quad 4 \times 1$

$0 < 4$

(iii) $-5 \boxed{<} \frac{6}{17}$

$\frac{-5}{1} \times \frac{6}{17}$

$-85 < 6$

(iv) $\frac{-7}{8} \boxed{>} -\frac{8}{9}$

$(-7) \times 9 \quad 8 \times (-8)$

$-63 > -64$

5. Arrange the following in ascending order :

(i) $\frac{-1}{4}, \frac{11}{5}, \frac{2}{7}, \frac{3}{2}$

LCM of 4, 5, 7 and 2 = 140

Now, $\frac{-1 \times 35}{4 \times 35} = \frac{-35}{120}, \frac{11 \times 28}{5 \times 28} = \frac{308}{140}$

$\frac{2 \times 20}{7 \times 20} = \frac{40}{140}$ and $\frac{3 \times 70}{2 \times 70} = \frac{210}{140}$

Ascending order : $\frac{-35}{120} < \frac{40}{140} < \frac{210}{140} < \frac{308}{140}$

$\therefore \quad \frac{-1}{4} < \frac{2}{7} < \frac{3}{2} < \frac{11}{5}$

(ii) $\frac{4}{3}, \frac{-5}{6}, \frac{-7}{-12}, \frac{11}{-24}$

$= \frac{4}{3}, \frac{-5}{6}, \frac{7}{12}, \frac{-11}{24}$

LCM of 3, 6, 12 and 24 = 24

Now, $\frac{4 \times 8}{3 \times 8} = \frac{32}{24}, \frac{-5 \times 4}{6 \times 4} = \frac{-20}{24}$

$\frac{7 \times 2}{12 \times 2} = \frac{14}{24}$ and $\frac{-11 \times 1}{24 \times 1} = \frac{-11}{24}$

Ascending order : $\frac{-11}{24} < \frac{-20}{24} < \frac{14}{24} < \frac{32}{24}$

$\therefore \quad \frac{-11}{14} < \frac{-5}{6} < \frac{7}{12} < \frac{4}{3}$

6. Arrange the following in descending order :

(i) $\frac{5}{-6}, \frac{-7}{9}, 0, \frac{2}{-3}$

$\frac{-5}{6}, \frac{-7}{9}, \frac{0}{1}, \frac{-2}{3}$

LCM of 6, 9, 1 and 3 = 18

Now, $\frac{-5 \times 3}{6 \times 3} = \frac{-15}{18}, \frac{-7 \times 2}{9 \times 2} = \frac{-14}{18}$

$\frac{0 \times 18}{1 \times 18} = \frac{0}{18}$ and $\frac{-2 \times 6}{3 \times 6} = \frac{-12}{18}$

Descending order : $\frac{0}{18} > \frac{-12}{18} > \frac{-14}{18} > \frac{-15}{18}$

$\therefore \quad 0 > \frac{-2}{3} > \frac{-7}{9} > \frac{-5}{6}$

(ii) $\frac{17}{-20}, \frac{9}{-5}, \frac{-3}{1}, \frac{-1}{10}$

$$\frac{-17}{20}, \frac{-9}{5}, \frac{-3}{1}, \frac{-1}{10}$$

LCM of 20, 5, 1 and 10 = 20

Now, $\frac{-17 \times 1}{20 \times 1} = \frac{-17}{20}, \frac{-9 \times 4}{5 \times 4} = \frac{-36}{20}$

$$\frac{-3 \times 20}{1 \times 20} = \frac{-60}{20} \text{ and } \frac{-1 \times 2}{10 \times 2} = \frac{-2}{20}$$

Descending order :

$$\frac{-2}{20} > \frac{-17}{20} > \frac{-36}{20} > \frac{-60}{20}$$

$\therefore$ $\frac{-1}{10} > \frac{-17}{20} > \frac{-9}{5} > \frac{-3}{1}$

7. Find four rational numbers between :

(i) $\frac{13}{40}$ and $\frac{2}{25}$

First we represent the two integers as rational numbers with common denominator.

$$\frac{13 \times 5}{40 \times 5} = \frac{65}{200} \text{ and } \frac{2 \times 8}{25 \times 8} = \frac{16}{200}$$

Now, any four rational numbers between $\frac{65}{200}$ and $\frac{16}{100}$ are

$$\frac{64}{200}, \frac{63}{200}, \frac{62}{200}, \frac{61}{200} \ldots$$

(ii) $\frac{-3}{4}$ and $\frac{-4}{3}$

First we represent the two integers as rational numbers with common denominator.

$$\frac{-3 \times 3}{4 \times 3} = \frac{-9}{12} \text{ and } \frac{-4 \times 4}{3 \times 4} = \frac{-16}{12}$$

Now, we can take any four national numbers between $\frac{-9}{12}$ and $\frac{-16}{12}$

$$\frac{-12}{12}, \frac{-11}{12}, \frac{-12}{12}, \frac{-13}{12}, \ldots$$

8. Write the absolute value of the following rational numbers :

(i) $\frac{-7}{3}$: absolute value of $\frac{-7}{3} = \left| -\frac{7}{3} \right| = \frac{7}{3}$

(ii) $\frac{3}{5}$: absolute value of $\frac{3}{5} = \left| \frac{3}{5} \right| = \frac{3}{5}$

(iii) $\frac{-5}{-8}$: absolute value of $\frac{-5}{-8} = \left| \frac{-5}{-8} \right| = \frac{5}{8}$

(iv) $\frac{3}{-4}$: absolute value of $\frac{3}{-4} = \left| \frac{3}{-4} \right| = \frac{3}{4}$

Exercise 4.3

1. Add the following rational numbers :

(i) $\frac{8}{9}$ and $\frac{4}{9}$

$= \frac{8}{9} + \frac{4}{9}$

$= \frac{8+4}{9} = \frac{12}{9}$

$= \frac{4}{3}$

(ii) $\frac{7}{-15}$ and $\frac{4}{15}$

$= \frac{-7}{15} + \frac{4}{15}$

$= \frac{-7+4}{15}$

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

(iii) $\frac{-2}{3}$ and $\frac{6}{7}$

$= \frac{-2}{3} + \frac{6}{7}$

$= \frac{-14+18}{21}$

$= \frac{4}{21}$

(iv) $-2\frac{5}{6}$ and $\frac{13}{-6}$

$= \frac{-17}{6} + \left(\frac{-13}{6}\right)$

$= \frac{-17}{6} - \frac{13}{6}$

$= \frac{-17-13}{6}$

$= \frac{-30}{6} = -5$

(v) $\frac{-7}{64}$ and $\frac{3}{-16}$

$= \frac{-7}{64} + \left(\frac{-3}{16}\right)$

$= \frac{-7}{64} - \frac{3}{16}$

$= \frac{-7-12}{64}$

$= \frac{-19}{64}$

(vi) $\frac{8}{-19}$ and $\frac{-2}{3}$

$= \frac{-8}{19} + \left(\frac{-2}{3}\right)$

$= \frac{-8}{19} - \frac{2}{3}$

$= \frac{-24-38}{57}$

$= \frac{-62}{57}$

2. Subtract the following rational numbers :

(i) $\frac{2}{3}$ from $\frac{3}{5}$

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

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

$= \frac{-1}{15}$

(ii) $\frac{5}{63}$ from $\frac{-6}{7}$

$= \frac{-6}{7} - \frac{5}{63}$

$= \frac{-54-5}{63}$

$= \frac{-59}{63}$

(iii) $\frac{3}{-7}$ from $\frac{-4}{-7}$

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

$= \frac{4}{7} + \frac{3}{7}$

$= \frac{4+3}{7}$

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

(iv) -5 from $\frac{12}{25}$

$= \frac{12}{25} - (-5)$

$= \frac{12}{25} + \frac{5}{1}$

$= \frac{12+125}{25}$

$= \frac{137}{25}$

(v) $\frac{-7}{5}$ from $\frac{8}{7}$

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

$= \frac{8}{7} + \frac{7}{5}$

$= \frac{40+49}{35}$

$= \frac{89}{35}$

(vi) $\frac{-9}{24}$ from $\frac{-3}{12}$

$= \frac{-3}{12} - \left(\frac{-9}{24}\right)$

$= \frac{-3}{12} + \frac{9}{24}$

$= \frac{-6+9}{24}$

$= \frac{3}{24} = \frac{1}{8}$

3. Simplify :

(i) $\frac{-3}{11} + \frac{(-2)}{5}$

$= \frac{-3}{11} - \frac{2}{5}$

$= \frac{-15-22}{55}$

$= \frac{-37}{55}$

(ii) $\frac{11}{-12} + \frac{3}{-8} + \frac{2}{3}$

$= \frac{-11}{12} - \frac{3}{8} + \frac{2}{3}$

$= \frac{-22-9+16}{24}$

$= \frac{-15}{24} = \frac{-5}{8}$

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

$= \frac{-3}{1} + \frac{1}{6} - \frac{2}{5}$

$= \frac{-90+5-12}{30}$

$= \frac{-85-12}{30}$

$= \frac{-97}{30}$

(iv) $\frac{-9}{11} + \frac{2}{3} + \left(\frac{-3}{4}\right)$

$= \frac{-9}{11} + \frac{2}{3} - \frac{3}{4}$

$= \frac{-108+88-99}{132}$

$= \frac{-20-99}{132}$

$= \frac{-119}{132}$

(v) $\frac{5}{4} - \frac{7}{6} - \left(\frac{-2}{3}\right)$

$= \frac{5}{4} - \frac{7}{6} + \frac{2}{3}$

$= \frac{15 - 14 + 8}{12}$

$= \frac{1 + 8}{12} = \frac{9}{12}$

$= \frac{3}{4}$

(vi) $5\frac{1}{6} - \frac{2}{3} + \frac{1}{6}$

$= \frac{31}{6} - \frac{2}{3} + \frac{1}{6}$

$= \frac{31 - 4 + 1}{6}$

$= \frac{27 + 1}{6}$

$= \frac{28}{6} = \frac{14}{3} = 4\frac{2}{3}$

4. Sum of two rational numbers $= \frac{11}{5}$

One of them $= \frac{-4}{15}$

Let the other number be x.

$\therefore \quad x + \left(\frac{-4}{15}\right) = \frac{11}{5}$

or $\quad x = \frac{11}{5} + \frac{4}{15}$

$= \frac{33 + 4}{15} = \frac{37}{15}$

Hence, the required rational number is $\frac{37}{15}$.

5. Let the required number be x.

Then $\quad \frac{-3}{4} - x = \frac{5}{6}$

or $\quad \frac{-3}{4} - \frac{5}{6} = x$

or $\quad \frac{-9 - 10}{12} = x$

$\therefore \quad x = \frac{-19}{12}$

Hence, the required rational number is $\frac{-19}{12}$

6. Sum of $\frac{11}{5}$ and $\frac{-3}{10} = \frac{11}{5} + \left(\frac{-3}{10}\right)$

$= \frac{11}{5} - \frac{3}{10}$

$= \frac{22 - 3}{10} = \frac{19}{10}$

Sum of $\frac{-3}{4}$ and $\frac{7}{8} = \frac{-3}{4} + \frac{7}{8}$

$$= \frac{-6+7}{8} = \frac{1}{8}$$

Now, subtract $\frac{19}{20}$ from $\frac{1}{8} = \frac{1}{8} - \frac{19}{20}$

$$= \frac{5-38}{40} = \frac{-33}{40}$$

7. Verify the following for, $x + y = y + x$:

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

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

LHS = $x + y$

$= \frac{-3}{5} + \left(\frac{-4}{3}\right)$

$= \frac{-3}{5} - \frac{4}{3}$

$= \frac{-9 - 20}{15}$

$= \frac{-29}{15}$

RHS = $y + x$

$= \frac{-4}{3} + \left(\frac{-3}{5}\right)$

$= \frac{-4}{3} - \frac{3}{5}$

$= \frac{-20 - 9}{15}$

$= \frac{-29}{15}$

$\therefore$ LHS = RHS

Hence it is verified for $x + y = y + x$.

(ii) -4 and $\frac{7}{6}$

We have, $x = -4$ and $y = \frac{7}{6}$

LHS = $x + y$

$= \frac{-4}{1} + \frac{7}{6}$

$= \frac{-24 + 7}{6}$

$= \frac{-17}{6}$

RHS = $y + x$

$= \frac{7}{6} + (-4)$

$= \frac{7}{6} - \frac{4}{1}$

$= \frac{7 - 24}{6} = \frac{-17}{6}$

$\therefore$ LHS = RHS

Hence it is verified for $x + y = y + x$.

8. Verify the following :

(i) $\left(\frac{-5}{8}\right) + \left(\frac{-3}{6}\right) = \left(\frac{-3}{6}\right) + \left(\frac{-5}{8}\right)$

$$\frac{-5}{8} - \frac{3}{6} = \frac{-3}{6} - \frac{5}{8}$$

$$\frac{-15-12}{24}=\frac{-12-15}{24}$$

$$\frac{-27}{24}=\frac{-27}{24}$$

$$\frac{-9}{8}=\frac{-9}{8}$$

$\therefore$ LHS = RHS (Verified)

(ii) $\left(\frac{-7}{6}+\frac{2}{-5}\right)+\left(\frac{-13}{12}\right)=\frac{-7}{6}+\left[\frac{2}{-5}+\left(\frac{-13}{12}\right)\right]$

$$\left(\frac{-7}{6}-\frac{2}{5}\right)+\left(\frac{-13}{12}\right)=\frac{-7}{6}+\left[\frac{-2}{5}-\frac{13}{12}\right]$$

$$\left(\frac{-35-12}{30}\right)-\frac{13}{12}=\frac{-7}{6}+\left[\frac{-24-65}{60}\right]$$

$$\frac{-47}{30}-\frac{13}{12}=\frac{-7}{6}+\left(\frac{-89}{60}\right)$$

$$\frac{-94-65}{60}=\frac{-7}{6}-\frac{89}{60}$$

$$\frac{-159}{60}=\frac{-70-89}{60}$$

$$\frac{-53}{20}=\frac{-53}{20}$$

$\therefore$ LHS = RHS (Verified)

Exercise 4.4

1. Multiply :

(i) $\frac{23}{5}\times\left(\frac{-25}{11}\right)$

$=\frac{23}{5}\times\frac{(-25)}{11}$

$=\frac{-115}{11}$

(ii) $\frac{11}{7}\times\frac{(-3)}{8}$

$=\frac{-33}{56}$

(iii) $\frac{-3}{12}\times(-48)$

$=\frac{-3}{12}\times(-48)$

$=12$

(iv) $\frac{25}{9}\times\left(\frac{-36}{5}\right)$

$=\frac{25}{9}\times\frac{(-36)}{5}$

$=5\times(-4)$

$=-20$

(v) $\left(\frac{-3}{7}\right)$ by $\frac{7}{5}$

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

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

(vi) $\left(\frac{9}{-11}\right)$ by $\left(\frac{22}{-27}\right)$

$=\frac{9}{-11}\times\frac{22}{-27}$

$=\frac{2}{3}$

2. Find the value of :

(i) $\frac{-45}{16} \div \left(\frac{-15}{8}\right)$

$= \frac{-45}{16} \times \frac{8}{-15}$

$= \frac{2}{3}$

(ii) $\frac{9}{14} \div \left(\frac{-27}{56}\right)$

$= \frac{9}{14} \times \frac{56}{-27}$

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

(iii) $(-10) \div \frac{2}{5}$

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

$= -25$

(iv) $\frac{7}{-19} \div \left(\frac{2}{-7}\right)$

$= \frac{7}{-19} \times \frac{(-7)}{2}$

$= \frac{-49}{-38}$

$= \frac{49}{38}$

(v) $\frac{11}{35} \div \left(\frac{-22}{49}\right)$

$= \frac{11}{35} \times \frac{49}{-22}$

$= \frac{7}{-2}$

$= \frac{-7}{2}$

(vi) $\frac{-48}{49} \div \left(\frac{-72}{35}\right)$

$= \frac{-48}{49} \times \frac{35}{-72}$

$= \frac{-4}{7} \times \frac{5}{-6}$

$= \frac{10}{21}$

3. Simplify :

(i) $\left(\frac{36}{11} \times \frac{88}{18}\right) + \left(\frac{-26}{14} \times \frac{-28}{13}\right)$

$= \left(\frac{36}{11} \times \frac{88}{18}\right) + \left(\frac{-26}{14} \times \frac{-28}{13}\right)$

$= 16 + [(-2) \times (-2)]$

$= 16 + 4 = 20$

(ii) $\left(\frac{-9}{4} \times \frac{2}{3}\right) + \left(\frac{1}{2} \times 0\right) - \left(\frac{5}{-6} \times \frac{18}{25}\right)$

$= \left(\frac{-9}{4} \times \frac{2}{3}\right) + 0 - \left(\frac{5}{-6} \times \frac{18}{25}\right)$

$= \frac{-3}{2} + 0 - \left(\frac{3}{-5}\right)$

$= \frac{-3}{2} + \frac{3}{5} = \frac{-15 + 6}{10} = \frac{-9}{10}$

(iii) $\frac{-55}{21} \div \left(1\frac{3}{8} \times \frac{16}{33}\right)$

$= \frac{-55}{21} \div \left(\frac{11}{8} \times \frac{16}{33}\right)$

$= \frac{-55}{21} \div \frac{2}{3}$

$= \frac{-55}{21} \times \frac{3}{2}$

$= \frac{-55}{14}$

(iv) $\left(\frac{13}{19} \div \frac{65}{12}\right) \times \left(\frac{-4}{15}\right)$

$= \left(\frac{13}{19} \times \frac{12}{65}\right) \times \left(\frac{-4}{15}\right)$

$= \frac{12}{95} \times \frac{(-4)}{15}$

$= \frac{-16}{475}$

4. Product of two rational numbers $= \frac{11}{12}$, If one of the numbers is $\frac{-55}{84}$, find the other.

One of the numbers $= \frac{-55}{84}$

Let the other number be x.

$$\text{Then } x \times \frac{(-55)}{84} = \frac{11}{12}$$

$$\text{or} \qquad x = \frac{11}{12} \times \frac{84}{-55}$$

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

Hence, the required rational no. is $\frac{-7}{5}$.

5. Let the required number be x.

$$\text{Then } x \times \left(\frac{-36}{35}\right) = \frac{-6}{5}$$

$$x = \frac{-6}{5} \times \frac{35}{-36}$$

$$x = \frac{-7}{-6} = \frac{7}{6}$$

Hence, the required rational number is $\frac{7}{6}$.

6. Let the required number be x.

$$\text{Then } x \div \left(\frac{-65}{7}\right) = \frac{-12}{5}$$

$$x \times \frac{7}{-65} = \frac{-12}{5}$$

$$\text{or} \qquad x = \frac{-12 \times (-65)}{5 \times 7}$$

$$x = \frac{156}{7}$$

Hence, the required rational number is $\frac{156}{7}$.

7. Distance covered by a bus in an hour $= 50\frac{2}{5}$ km

Distance covered by the bus in $3\frac{1}{2}$ hours $= 50\frac{2}{5} \times 3\frac{1}{2}$ km

$$= \frac{252}{5} \times \frac{7}{2} \text{ km}$$

$$= \frac{126}{5} \times 7$$

$$= \frac{882}{5} \text{ km}$$

$$= 176\frac{2}{5} \text{ km}$$

Hence, the bus will cover $176\frac{2}{5}$ km distance in $3\frac{1}{2}$ hours.

8. The price of 11 cricket balls = ₹ $32\frac{1}{5}$

The price of 1 cricket ball = ₹ $32\frac{1}{5} \div 11$

$$= \frac{161}{5} \times \frac{1}{11}$$

$$= \frac{161}{55} = 2\frac{51}{55}$$

Hence, the cost of 1 cricket ball is ₹ $2\frac{51}{55}$.

9. Sum of $-1\frac{1}{4}$ and $3\frac{2}{3} = -1\frac{1}{4} + 3\frac{2}{3}$

$$= \frac{-5}{4} + \frac{11}{3}$$

$$= \frac{-15 + 44}{12}$$

$$= \frac{29}{12}$$

Product of $1\frac{1}{2}$ and $1\frac{5}{6} = 1\frac{1}{2} \times 1\frac{5}{6}$

$$= \frac{3}{2} \times \frac{11}{6}$$

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

No, divide $\frac{29}{12}$ by $\frac{11}{4} = \frac{29}{12} \div \frac{11}{4}$

$$= \frac{29}{12} \times \frac{4}{11} = \frac{29}{33}$$

10. Cost of two dozens (24) bananas = ₹ $85\frac{1}{3}$

Cost of 1 banana = ₹ $\left(85\frac{1}{3} \div 24\right)$

$$= ₹ \left(\frac{256}{3} \times \frac{1}{24}\right)$$

$$= ₹ \frac{32}{3 \times 3}$$

$$= ₹ \frac{32}{9} = ₹ 3\frac{5}{9}$$

Hence, the cost of a banana is ₹ $3\frac{5}{9}$.

11. Sum of $\frac{2}{5}$ and $\frac{3}{4} = \frac{2}{5} + \frac{3}{4}$

$$= \frac{8+15}{20} = \frac{23}{20}$$

Difference of $\frac{2}{5}$ and $\frac{3}{4} = \frac{2}{5} - \frac{3}{4}$

$$= \frac{8-15}{20} = \frac{-7}{20}$$

Now, divide $\frac{23}{20}$ by $\left(\frac{-7}{20}\right)$

$$= \frac{23}{20} \div \left(\frac{-7}{20}\right)$$

$$= \frac{23}{20} \times \frac{20}{-7} = \frac{-23}{7}$$

12. Verify whether the following are true or false :

(i) $\frac{5}{7} \times \left(\frac{-28}{25}\right) = \left(\frac{-28}{25}\right) \times \frac{5}{7}$

$$\frac{5}{7} \times \frac{(-28)}{25} = \frac{(-28)}{25} \times \frac{5}{7}$$

$$\frac{-4}{5} = \frac{-4}{5}$$

$\therefore$ LHS = RHS (True)

(ii) $\left(\frac{-7}{3} \times \frac{12}{5}\right) \times \frac{4}{9} = \frac{-7}{3} \times \left(\frac{8}{21} \times \frac{3}{4}\right)$

$$\left(\frac{-7}{1} \times \frac{4}{5}\right) \times \frac{4}{9} = \frac{-1}{3} \times \frac{2}{1}$$

$$\frac{-28}{5} \times \frac{4}{9} = \frac{-2}{3}$$

$$\frac{-112}{45} \neq \frac{-2}{3}$$

$\therefore$ LHS $\neq$ RHS (False)

(iii) $\frac{-9}{35} \div \frac{45}{26} = \frac{45}{26} \div \left(\frac{-9}{35}\right)$

$$-\frac{1}{35} \times \frac{26}{5} = \frac{5}{26} \times \frac{35}{-1}$$

$$\frac{-26}{175} \neq \frac{175}{-26}$$

$\therefore$ LHS $\neq$ RHS (False)

(iv) $\left(\frac{5}{3} \div \frac{1}{3}\right) \div \frac{5}{2} = \frac{5}{3} \div \left(\frac{1}{3} \div \frac{5}{2}\right)$

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

$5 \times \frac{2}{5} = \frac{5}{3} \div \frac{2}{15}$

$2 = \frac{5}{3} \times \frac{15}{2}$

$2 \neq \frac{25}{2}$ (False)

(v) $\left[\left(\frac{-3}{5}\right) \div \frac{12}{35}\right] \div \frac{1}{14} = \left(\frac{-3}{5}\right) \div \left(\frac{12}{35} \div \frac{1}{14}\right)$

$\left[\frac{-3}{5} \times \frac{35}{12}\right] \div \frac{1}{14} = \frac{-3}{5} \div \left(\frac{12}{35} \times \frac{14}{1}\right)$

$\frac{-7}{4} \times 14 = \frac{-3}{5} \div \frac{24}{5}$

$\frac{-49}{2} = \frac{-3}{5} \times \frac{5}{24}$

$\frac{-49}{2} \neq \frac{-1}{8}$ (False)

Chapter 5 : Exponents

Exercise 5.1

1. Express the following in the exponential form :

(i) $a \times a \times a \times a \times a \times a$

$= a^6$

(ii) $\left(\frac{-9}{5}\right) \times \left(\frac{-9}{5}\right) \times \left(\frac{-9}{5}\right) \times \left(\frac{-9}{5}\right)$

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

(iii) $3 \times 3 \times 3 \times 2 \times 2 \times 2 \times 2$

$= 3^3 \times 2^4$

(iv) $(-b) \times (-b) \times (-c) \times (-c) \times (-c)$

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

(v) $p \times p \times (-q) \times (-q) \times (-q)$

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

2. Find the value of :

(i) 3^5

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

$= 243$

(ii) $(10)^3$

$= 10 \times 10 \times 10$

$= 1000$

(iii) $(12)^4$

$= 12 \times 12 \times 12 \times 12$

$= 20736$

(iv) $(-5)^4$

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

$= 625$

3. Identify the greater number in each of the following pairs :

(i) $(2)^5$ or $(5)^2$

$(2)^2 \quad (5)^5$

$32 > 25$

Thus, $(2)^5$ is greater.

(ii) $(2)^{10}$ or $(10)^2$

$(2)^{10} \quad (10)^2$

$1024 > 100$

Thus $(2)^{10}$ is greater.

(iii) $(-7)^3$ or $(-3)^7$

$(-7)^3 \quad (-3)^7$

$-343 > -2187$

Thus, $(-7)^3$ is greater.

4. Evaluate :

(i) $(12)^3$

$= 12 \times 12 \times 12$

$= 1728$

(ii) $(-8)^4$

$= (-8) \times (-8) \times (-8) \times (-8)$

$= 4096$

(iii) $\left(\frac{-4}{5}\right)^3$

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

$= \frac{-64}{125}$

(iv) $\left(\frac{-1}{2}\right)^5$

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

$= \frac{-1}{32}$

5. Express the following in exponential form :

(i) $\frac{64}{729}$

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

$= \left(\frac{2}{3}\right)^6$

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

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

(ii) -1331

$= (-11) \times (-11) \times (-11)$

$= (-11)^3$

11	1331
11	121
11	11
	1

(iii) 648

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

$= 2^3 \times 3^4$

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

(iv) -128

$= (-2) \times (-2) \times (-2) \times (-2) \times (-2) \times (-2) \times (-2)$

$= (-2)^7$

2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

6. Evaluate :

(i) $(-7)^2 \div (-7)^3$

$= \frac{(-7)^2}{(-7)^3} = \frac{1}{(-7)} = -\frac{1}{7}$

(ii) $\left(\frac{-2}{5}\right)^3 \times \left(\frac{-1}{4}\right)^2$

$= \frac{(-2) \times (-2) \times (-2)}{5 \times 5 \times 5} \times \frac{(-1)}{4} \times \frac{(-1)}{4}$

$= \frac{(-1)}{250} = \frac{-1}{250}$

(iii) $(-4)^3 \times (-5)^2$

$= (-4) \times (-4) \times (-4) \times (-5) \times (-5)$

$= (-64) \times 25$

$= -1600$

(iv) $2^3 + 5^2$

$= 8 + 25$

$= 33$

(v) $6^3 - 5^3$

$= 216 - 125$

$= 91$

(vi) $8^3 + (-3)^3$

$= 512 + (-27)$

$= 512 - 27$

$= 485$

7. Find the value of :

(i) $(-1)^{24} \times (-1)^{12} \times (-1)^3$

$= 1 \times 1 \times (-1)$

$= -1$

(ii) $(-1)^{18} + (-1)^{13}$

$= 1 + (-1)$

$= 1 - 1 = 0$

(iii) $(-1)^{31} - (-1)^{50}$

$= (-1) - 1$

$= -1 - 1 = -2$

8. Simplify :

(i) $\left(\frac{3}{7}\right)^2 \times \left(\frac{11}{3}\right)^2 \times \left(\frac{3}{11}\right)^2$

$= \frac{3 \times 3}{7 \times 7} \times \frac{11 \times 11}{3 \times 3} \times \frac{3 \times 3}{11 \times 11}$

$= \frac{9}{49}$

(ii) $\left(\frac{-2}{5}\right)^4 \times (3)^2 \times \left(\frac{1}{2}\right)^3$

$= \frac{(-2) \times (-2) \times (-2) \times (-2)}{5 \times 5 \times 5 \times 5} \times 3 \times 3 \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$

$\Rightarrow \frac{18}{625}$

(iii) $0 \times (12)^2 \times (13)^2$

$= 0 \times 144 \times 169$

$= 0$

(iv) $(5^2 - 3^2) \times (2)^3$

$= (25 - 9) \times 8$

$= 16 \times 8$

$= 128$

(v) $(3^2 - 2^2) \div \frac{1}{25}$

$= (9 - 4) \div \frac{1}{25}$

$= 5 \times \frac{25}{1} = 125$

9. Find the reciprocal of :

(i) $\left(\frac{-3}{5}\right)^2$

Reciprocal $= \left(\frac{5}{-3}\right)^2$

$= \frac{25}{9}$

(ii) $\left(\frac{3}{4}\right)^3$

Reciprocal $= \left(\frac{4}{3}\right)^3$

$= \frac{64}{27}$

(iii) $\left(\frac{-5}{11}\right)^5$

Reciprocal $= \left(\frac{11}{-5}\right)^5$

$= -\frac{161051}{3125}$

(iv) $\left(\frac{-2}{5}\right)^4$

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

$= \frac{625}{16}$

10. Express the following as powers :

(i) 512 as a power of 2

2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

$512 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$

$= 2^9$

(ii) 729 as a power of 3

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

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

$= 3^6$

Exercise 5.2

1. Simplify and express the answer in the exponential form :

(i) $5^6 \times 5^4$

$= 5^{6+4}$

$= 5^{10}$

(ii) $(-2)^7 \times (-2)^3$

$= (-2)^{7+3}$

$= (-2)^{10}$

(iii) $(-8)^{48} \div (-8)^3$

$= (-8)^{48-3}$

$= (-8)^{45}$

(iv) $a^{12} \div a^{10}$

$= a^{12-10}$

$= a^2$

(v) $(5)^4 \times (5)^4 \div (5)^2$

$= (5)^{4+4} \div (5)^2$

$= (5)^8 \div (5)^2$

$= 5^{8-2} = 5^6$

(vi) $\left(\frac{7}{2}\right)^x \div \left(\frac{7}{2}\right)^3$

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

(vii) $\left(\frac{8}{9}\right)^5 \times \left(\frac{8}{9}\right)^3 \div \left(\frac{8}{9}\right)^2$

$= \left(\frac{8}{9}\right)^{5+3} \div \left(\frac{8}{9}\right)^2$

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

$= \left(\frac{8}{9}\right)^{8-2} = \left(\frac{8}{9}\right)^6$

(viii) $(10^2)^3 \div (10)^5$

$= (10)^6 \div (10)^5$

$= (10)^{6-5}$

$= (10)^1 = 10$

(ix) $a^{99} \times a^2 \times a^3 = a^{99+2+3} = a^{104}$

$= a^{(99+2)} \times a^3$

$= a^{101} \times 1^3$

$= a^{101+3} = a^{104}$

(x) $(-7)^0 + 8^0 + 5^0$

$= 1 + 1 + 1$

$= 3$

2. Evaluate :

(i) $(-6)^{-2}$

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

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

$= \frac{1}{36}$

(ii) $\left(\frac{5}{3}\right)^{-1} \times \left(\frac{3}{7}\right)^{-1}$

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

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

(iii) $(2^{-1} - 5^{-1})^{-1}$

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

$= \left(\frac{5-2}{10}\right)^{-1}$

$= \left(\frac{3}{10}\right)^{-1}$

$= \left(\frac{10}{3}\right)^1 = \frac{10}{3}$

(iv) $\left(\frac{-2}{3}\right)^{-2} \times \left(\frac{4}{5}\right)^3$

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

$= \frac{9}{4} \times \frac{4 \times 4 \times 4}{5 \times 5 \times 5}$

$\Rightarrow \frac{144}{125}$

(v) $(5^{-1} \div 6^{-1})^{-2}$

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

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

$= \left(\frac{5}{6}\right)^2 = \frac{25}{36}$

3. Find the value of each of the following :

(i) $(5^0 - 4^0)$

$= (1 - 1)$

$= 0$

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

$= \left(\frac{1}{3}\right)^{6 - 6}$

$= \left(\frac{1}{3}\right)^{0} = 1$

(iii) $\left(\frac{3}{2}\right)^0 - \left(\frac{4}{5}\right)^0 + \left(\frac{7}{8}\right)^0$

$= 1 - 1 + 1$

$= 1$

(iv) $(3^0 - 2^0) \times (3^0 + 2^0)$

$= (1 - 1) \times (1 + 1)$

$= 0 \times 2 = 0$

4. Express the following with negative exponent :

(i) $\left(\frac{1}{4}\right)^3$

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

(ii) $\left(\frac{-5}{3}\right)^4$

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

(iii) $\left[\left(\frac{2}{3}\right)^2\right]^3$

$= \left(\frac{2}{3}\right)^6 = \left(\frac{3}{2}\right)^{-6}$

5. Express the following with positive exponent :

(i) $\left(\frac{7}{8}\right)^{-2}$

$= \left(\frac{8}{7}\right)^2$

(ii) $\left[\left(\frac{4}{3}\right)^{-2}\right]^3$

$= \left(\frac{4}{3}\right)^{-6} = \left(\frac{3}{4}\right)^6$

(iii) $\left[\left(\frac{3}{2}\right)^3\right]^{-2}$

$= \left(\frac{3}{2}\right)^{-6} = \left(\frac{2}{3}\right)^6$

6. Simplify :

(i) $\left(\frac{2}{3}\right)^2 \times \left(\frac{2}{3}\right)^3 \div \left(\frac{2}{3}\right)^5$

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

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

$= \left(\frac{2}{3}\right)^{5-5} = \left(\frac{2}{3}\right)^0 = 1$

(ii) $\left[\left(\frac{4}{5}\right)^{-2} \div \left(\frac{4}{5}\right)^9\right] \times \left(\frac{4}{5}\right)^{11}$

$= \left(\frac{4}{5}\right)^{-2-9} \times \left(\frac{4}{5}\right)^{11}$

$= \left(\frac{4}{5}\right)^{-11} \times \left(\frac{4}{5}\right)^{11}$

$= \left(\frac{4}{5}\right)^{-11+11} = \left(\frac{4}{5}\right)^0 = 1$

(iii) $\frac{6^6 \times 10^3 \times 5}{15^4 \times 8^3}$

$= \frac{(3\times 2)^6 \times (5\times 2)^3 \times 5}{(3\times 5)^4 \times (2^3)^3}$

(iv) $\frac{8 \times 9^2 \times 6^3 \times x^9}{12^2 \times 3^5 \times x^5}$

$= \frac{2^3 \times (3^2)^2 \times (3\times 2)^3 \times x^9}{(2\times 2\times 3)^3 \times 3^5 \times x^5}$

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

$$= \frac{3^6 \times 2^9 \times 5^4}{3^4 \times 5^4 \times 2^9} = 3^{6-4}$$

$$= 3^2 = 9$$

$$= \frac{2^3 \times 3^4 \times 3^3 \times 2^3 \times x^9}{2^3 \times 2^3 \times 3^3 \times 3^5 \times x^5}$$

$$= \frac{2^6 \times 3^7 \times x^9}{2^6 \times 3^8 \times x^5}$$

$$= 3^{7-8} \times x^{9-5}$$

$$= 3^{-1} \times x^4 = \frac{x^4}{3}$$

7. Find x, if :

(i) $2^x = 16$

$2^x = (2)^4$

Equating the powers, $x = 4$

(ii) $4^x = 64$

$4^x = (4)^3$

Equating the powers, $x = 3$

(iii) $(11)^9 \div (11)^4 = (11)^{5x}$

$(11)^{9-4} = (11)^{5x}$

$(11)^5 = (11)^{5x}$

Equating the powers

$5 = 5x$

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

$x = 1$

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

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

$\left(\frac{2}{7}\right)^5 = \left(\frac{2}{7}\right)^{2x-1}$

Equating the powers

$5 = 2x - 1$

$5 + 1 = 2x$

$6 = 2x$

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

$x = 3$

8. Let the required number be x

Then $x \times (-4)^{-1} = (8)^{-1}$

$x \times \left(\frac{-1}{4}\right) = \frac{1}{8}$

$x = \frac{1}{8} \times \frac{4}{(-1)}$

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

Hence, the required number is $\frac{-1}{2}$.

9. State whether true or false :

(i) $3^4 \times 3^2 = 6^6$

$3^{4+2} = 6^6$

$3^6 \neq 6^6$

$\therefore$ LHS $\neq$ RHS (False)

(ii) $7^5 \div 7^5 = 7^0$

$7^{(5-5)} = 7^0$

$7^0 = 7^0$

$\therefore$ LHS = RHS (True)

(iii) $(2^3)^4 = 2^{12}$

$(2)^{3\times 4} = 2^{12}$

$2^{12} = 2^{12}$

$\therefore$ LHS = RHS (True)

(iv) $9^8 \div 9^4 = 9^{12}$

$9^{8-4} = 9^{12}$

$9^4 \neq 9^{12}$

$\therefore$ LHS $\neq$ RHS (False)

10. Simplify :

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

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

$$= 9 + 25 + 49 = 83$$

Exercise 5.3

1. Express the following numbers in scientific notation :

(i) 538000000

$= 5.38 \times 100000000$

$= 5.38 \times 10^8$

(ii) 7860000×10^3

$= 7.86 \times 1000000 \times 10^3$

$= 7.86 \times 10^6 \times 10^3 = 7.86 \times 10^9$

(iii) 0.0000123

$= 1.23 \times \frac{1}{100000}$

$= 1.23 \times 10^{-5}$

(iv) 0.00063×10^{-4}

$= 6.3 \times \frac{1}{10000} \times 10^{-4}$

$= 6.3 \times 10^{-4} \times 10^{-4} = 6.3 \times 10^{-8}$

(v) 14 crores

$= 140000000$

$= 1.4 \times 100000000$

$= 1.4 \times 10^8$

(vi) 35490000

$= 3.549 \times 10000000$

$= 3.548 \times 10^7$

2. Write the following numbers in usual form :

(i) 2.65×10^7

$= 2.65 \times 10000000$

$= \frac{265}{100} \times 10000000$

$= 26500000$

(ii) 28.5×10^{-8}

$= \frac{285}{10} \times 10 \times \frac{1}{100000000}$

$= \frac{285}{10^9}$

$= 0.000000285$

(iii) 8.45×10^5

$= \frac{845}{100} \times 100000$

$= 845000$

3. Express the numbers used in the following in standard form :

(i) The distance of the Earth from the sun

$= 149600000$ km

Standard form $= 1.496 \times 10^8$ km

(ii) 1 micron $= \frac{1}{1000000}$ m

$= \frac{1}{10^6}$ m $= 10^{-6}$ m (in standard form

(iii) Diameter of the Earth = 1,27,56,000 m

Standard form $= 1.2756 \times 10^7$ m

4. The distance of the sun from the centre of the milky way Galaxy

$= 300{,}000{,}000{,}000{,}000{,}000{,}000$ m

$= 3.0 \times 10^{20}$ m

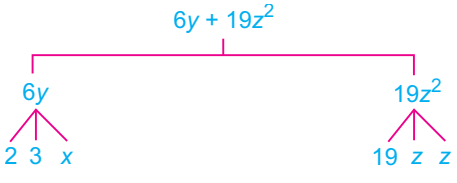
Chapter 6 : Algebraic Expressions

Exercise 6.1

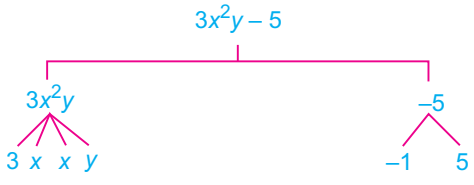
1. A combination of constants and variables connected by any of the symbols +, −, × or ÷ is called an algebraic expression.

2. Draw a tree diagram for the following :

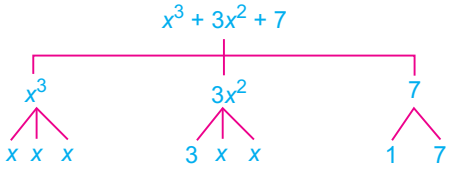
(i)



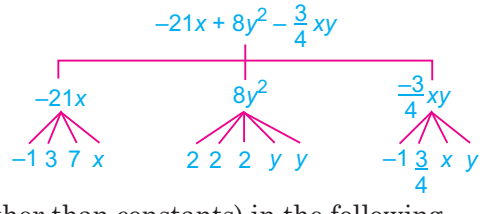
(ii)



(iii)



(iv)



3. Write the numerical coefficient of the all terms (other than constants) in the following algebraic expressions :

(i) $3a + 2b - 3c$

coefficient of $a = 3$

coefficient of $b = 2$

coefficient of $c = -3$

(ii) $6m^2 - 81$

coefficient of $m^2 = 6$

(iii) $2l + 3b^2$

coefficient of $l = 2$

coefficient of $b^2 = 3$

(iv) $\frac{22}{7} p - 3q + 2$

coefficient of $p = \frac{22}{7}$

coefficient of $q = -3$

(v) $-5m^3 + m^2 + 4m - 5$

coefficient of $m^3 = -5$

coefficient of $m^2 = 1$

coefficient of $m = 4$

4. Classify the following as monomials, binomials, trinomials and quadrinomials :

(i) $3f - 2g$

It has two terms, so this expression is binomial.

(ii) $-6g^2 + 5q - 5$

It has 3 terms, so this express is trinomial.

(iii) $3x^2 - 5z$

It has two terms, so this express is binomial.

(iv) 100

It has only one term, so this express is monomial

(v) $\frac{-3}{4} x^2yz + 6a^2b + 5xyz + 8$

It has four terms, so this expression is quadrinomial.

5. Find the like terms from the following :

(i) $16x^4, 5, -3x^4, 2x$

like terms are $16x^4, -3x^4$

(ii) $5xy, \frac{2}{3} x^2y, \quad -23xy, 32x^2$

like terms are $5xy, -23xy$

(iii) $15m, 2t, -2m, -t^2$

like terms are $15m, -2m$

(iv) $-p^2q, pq^2, 3p^2q, 5pq$

like terms are $-p^2q, 3p^2q$

6. Find the coefficient :

(i) of x in $3x^2y$

$= 3xy$

(ii) of y^2 in $-3x^3y^2$

$= -3x^3$

(iii) of c^2 in $-17a^2b^2c^2$

$= -17a^2b^2$

(iv) of xy in $\frac{1}{3} xyz$

$= \frac{1}{3} z$

7. Is $3x^2y + 2y - x^2y$ a trinomial ?

No, this expression $3x^2y + 2y - x^2y$ is not a trinomial, because $3x^2y$ and $-x^2y$ are like terms and on combining it gives a single term. So it is a binomial expression .

Exercise 6.2

1. Add the following :

(i) $3pq + 8, -5pq + 3, 7pq - 9$

$= (3pq + 8) + (-5pq + 3) + (7pq - 9)$

$= 3pq + 8 - 5pq + 3 + 7pq - 9$

$= (3pq - 5pq + 7pq) + (8 + 3 - 9)$

$= (-2pq + 7pq) + (11 - 9)$

$= 5pq + 2$

(ii) $5a + 3b, -3a + 2b, 4a + 9b$

$= (5a + 3b) + (-3a + 2b) + (4a + 9b)$

$= 5a + 3b - 3a + 2b + 4a + 9b$

$= (5a - 3a + 4a) + (3b + 2b + 9b)$

$= (2a + 4a) + (5b + 9b)$

$= 6a + 14b = 2(3a + 7b)$

(iii) $5x^2 - y^2, -4x^2 - 4, -5y^2 + x^2 - 4$

$= (5x^2 - y^2) + (-4x^2 - 4) + (-5y^2 + x^2 - 4)$

$= (5x^2 - 4x^2 + x^2) + (-y^2 - 5y^2) + (-4 - 4)$

$= (x^2 + x^{2)} + (-6y^2) + (-8)$

$= 2x^2 - 6y^2 - 8$

$= 2(x^2 - 3y^2 - 4)$

(iv) $12m^2 - 19m + 8, -4m^2 - 7m + 11$

$= (12m^2 - 19m + 8) + (-4m^2 - 7m + 11)$

$= (12m^2 - 4m^2) + (-19m - 7m) + (8 + 11)$

$= 8m^2 - 26m + 19$

(v) $2xy + yz + zx, 5xy + 2yz - 2zx, xy + 2yz$

$= (2xy + yz + zx) + (5xy + 2yz - 2zx) + (xy + 2yz)$

$= (2xy + 5xy + xy) + (yz + 2yz + 2yz) + (zx - 2zx)$

$= 8xy + 5yz - zx$

(vi) $a^2 + 2a - 3ab, 2a + 13ab, a^2 + 3a$

$= (a^2 + 2a - 3ab) + (2a + 13ab) + (a^2 + 3a)$

$= (a^2 + a^2) + (2a + 2a + 3a) + (-3ab + 13ab)$

$= 2a^2 + 7a + 10ab$

$= a(2a + 7 + 10b)$

2. Subtract the following :

(i) $4ab - 15b^2 - 3a^2$ from $4a^2 + 7b^2 - 6ab$

$= (4a^2 + 7b^2 - 6ab) - (4ab - 15b^2 - 3a^2)$

$= 4a^2 + 7b^2 - 6ab - 4ab + 15b^2 + 3a^2$

$= (4a^2 + 3a^2) + (7b^2 + 15b^2) + (-6ab - 4ab)$

$= 7a^2 + 22b^2 - 10ab$

(ii) $-15a^2 + 10ab - 6b^2$ from $5a^2 + 4ab + 2b^2$

$= (5a^2 + 4ab + 2b^2) - (-15a^2 + 10ab - 6b^2)$

$= 5a^2 + 4ab + 2b^2 + 15a^2 - 10ab + 6b^2$

$= (5a^2 + 15a^2) + (4ab - 10ab) + (2b^2 + 6b^2)$

$= 20a^2 - 6ab + 8b^2$

(iii) $x^2y + y^2x + xyz$ from $3x^2y + 2y^2 + 5xyz$

$= (3x^2y + 2y^2 + 5xyz) - (x^2y + y^2x + xyz)$

$= 3x^2y + 2y^2 + 5xyz - x^2y - y^2x - xyz$

$= (3x^2y - x^2y) + 2y^2 - y^2x + (5xyz - xyz)$

$= 2x^2y + 2y^2 - y^2x + 4xyz$

(iv) $\frac{2}{3}a^2b - \frac{1}{9}ab^2 + \frac{2}{5}ab - 1$ from $-a^2b + 2$

$= (-a^2b + 2) - \left(\frac{2}{3}a^2b - \frac{1}{9}ab^2 + \frac{2}{5}ab - 1\right)$

$= -a^2b + 2 - \frac{2}{3}a^2b + \frac{1}{9}ab^2 - \frac{2}{5}ab + 1$

$= \left(-a^2b - \frac{2}{3}a^2b\right) + \frac{1}{9}ab^2 - \frac{2}{5}ab + (2 + 1)$

$= \frac{-5}{3}a^2b + \frac{1}{9}ab^2 - \frac{2}{5}ab + 3$

(v) $-3m^2 + 6m + 3$ from $10m^2 - 7$

$= (10m^2 - 7) - (-3m^2 + 6m + 3)$

$= 10m^2 - 7 + 3m^2 - 6m - 3$

$= (10m^2 + 3m^2) - 6m + (-7 - 3)$

$= 13m^2 - 6m - 10$

(vi) $4x - 2x^2 - 2$ from $x^2 + 3x + 5$

$= (x^2 + 3x + 5) - (4x - 2x^2 - 2)$

$= x^2 + 3x + 5 - 4x + 2x^2 + 2$

$= (x^2 + 2x^2) + (3x - 4x) + (5 + 2)$

$= 3x^2 - x + 7$

3. Simplify :

(i) $x - [3y - \{4x - (2y - 3z)\}]$

$= x - [3y - \{4x - 2y + 3z\}]$

$= x - [3y - 4x + 2y - 3z]$

$= x - [5y - 4x - 3z]$

$= x - 5y + 4x + 3z$

$= 5x - 5y + 3z$

(ii) $ab^2 + 4a^2b - 6a^2b + ab^2$

$= (ab^2 + ab^2) + (4a^2b - 6a^2b)$

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

$= 2ab^2 - 2a^2b$

$= 2ab\,(b - a)$

(iii) $[5 - 3a + 5b - (a - b)] - [5a - (4a - 5a - 2b)]$

$= [5 - 3a + 5b - a + b] - [5a - (-a - 2b)]$

$= [5 - 4a + 6b] - [5a + a + 2b]$

$= (5 - 4a + 6b) - (6a + 2b)$

$= 5 - 4a + 6b - 6a - 2b$

$= -10a + 4b + 5$

(iv) $\frac{2}{3}m - \frac{4}{5}n + \frac{3}{5}p + \left(\frac{-3}{4}m - \frac{5}{2}n + \frac{2}{3}p\right)$

$= \frac{2}{3}m - \frac{4}{5}n + \frac{3}{5}p - \frac{3}{4}m - \frac{5}{2}n + \frac{2}{3}p$

$= \left(\frac{2}{3}m - \frac{3}{4}m\right) + \left(\frac{-4}{5}n - \frac{5}{2}n\right) + \left(\frac{3}{5}p + \frac{2}{3}p\right)$

$= \left(\frac{8m - 9m}{12}\right) + \left(\frac{-8n - 25n}{10}\right) + \left(\frac{9p + 10p}{15}\right)$

$= \frac{-m}{12} + \left(\frac{-33n}{10}\right) + \frac{19}{15}p$

$= \frac{-m}{12}\,\frac{-33n}{10} + \frac{19}{15}p = -\frac{m}{12} - \frac{33m}{10} + \frac{19}{15}p$

4. Sum of $(2x + 3y - 7z)$ and $(3x - y + 6z)$

$= 2x + 3y - 4z + 3x - y + 6z$

$= 5x + 2y + 2z$

Now, subtract $(x + 2y + z)$ from $(5x + 2y + 2z)$

$= (5x + 2y + 2z) - (x + 2y + z)$

$= 5x + 2y + 2z - x - 2y - z$

$= 4x + 0y + z = 4x + z$

5. Let the required expression be X.

then $(5xy + y^2z - zx) + X = xy + 3y^2z - 5zx$

$X = (xy + 3y^2z - 5zx) - (5xy + y^2z - zx)$

$= xy + 3y^2z - 5zx - 5xy - y^2z + zx$

$= (xy - 5xy) + (3y^2z - y^2z) + (-5zx + zx)$

$= -4xy + 2y^2z - 4zx$

$= 2(-2xy + y^2z - 2zx)$

Hence, the required expression is $2(-2xy + y^2z - 2zx)$

6. Let the required expression be X.

then $(a^3 - 3a^2 + 5a - 5) - X = a^2 + 2a + 7$

$(a^3 - 3a^2 + 5a - 5) - (a^2 + 2a + 7) = X$

$a^3 - 3a^2 + 5a - 5 - a^2 - 2a - 7 = X$

$a^3 - 4a^2 + 4a - 12 = X$

Hence, the required expression is $(a^3 - 4a^2 + 3a - 12)$.

7. Sum of $5x^2 - y^2 + xy$ and $x^2 + y^2 - xy$

$= 5x^2 - y^2 + xy + x^2 + y^2 - xy$

$= 6x^2$

Sum of $2x^2 + 2y^2 - 5xy$ and $3x^2 - y^2 + 4xy$

$= 2x^2 + 2y^2 - 5xy + 3x^2 - y^2 + 4xy$

$= 5x^2 + y^2 - xy$

Now, subtract $6x^2$ from $5x^2 + y^2 - xy$

$= 5x^2 + y^2 - xy - 6x^2$

$= -x^2 + y^2 - xy$

8. Sides of a triangle are

$x^2 + 20$, $2x^2 + 7x + 3$ and $7x^2 - 2x - 15$

$\therefore$ Perimeter of triangle = sum of all sides

$= (x^2 + 20) + (2x^2 + 7x + 3) + (7x^2 - 2x - 15)$

$= (x^2 + 2x^2 + 7x^2) + (7x - 2x) + (20 + 3 - 15)$

$= 10x^2 + 5x + 8$

Hence, the perimeter of triangle is $(10x^2 + 5x + 8)$ unit.

9. The total money Amita had = ₹ $3x - 2y + 5z$

She spent = ₹ $5x + y - 2z$

Left money = ₹ $\{(3x - 2y + 5z) - (5x + y - 2z\})$

= ₹ $(3x - 2y + 5z - 5x - y + 2z)$

= ₹ $(-2x - 3y + 7z)$

Hence, ₹ $(-2x - 3y + 7z)$ is left with her.

10. The total length of wire = $(17x + 5)$ m
Length of wire cut from it = $(5x + 7)$ m

$$\text{Left wire} = (17x + 5)\text{ m} - (5x + 7)\text{ m}$$
$$= (17x + 5 - 5x - 7)\text{ m}$$
$$= (12x - 2)\text{ m}$$
$$= 2(6x - 1)\text{ m}$$

Hence, the length of left wire is $2(6x - 1)$ m.

Exercise 6.3

1. If $x = 3$, find the value of :

(i) $35 + x$
$= 35 + 3$
$= 38$

(ii) $x^2 - 10$
$= (3)^2 - 10$
$= 9 - 10$
$= -1$

(iii) $x^2 - 4x + 4$
$= (3)^2 - 4 \times 3 + 4$
$= 9 - 12 + 4$
$= -3 + 4$
$= 1$

2. If $x = -1$, find the value of each of the following :

(i) $2x^2 - 3x + 5$
$= 2 \times (-1)^2 - 3 \times (-1) + 5$
$= 2 \times 1 + 3 + 5$
$= 2 + 3 + 5 = 10$

(ii) $x^3 - 5$
$= (-1)^3 - 5$
$= -1 - 5$
$= -6$

(iii) $2x^3 + 3x^2 - x + 2$
$= 2 \times (-1)^3 + 3 \times (-1)^2 - (-1) + 2$
$= 2 \times (-1) + 3 \times 1 + 1 + 2$
$= -2 + 3 + 1 + 2$
$= 1 + 1 + 2 = 4$

3. Find the value of each of the following expressions, when $x = 2$ and $y = -2$:

(i) $3x^2 - 2xy + y^2$
$= 3 \times (2)^2 - 2 \times 2 \times (-2) + (-2)^2$
$= 3 \times 4 - (-8) + 4$
$= 12 + 8 + 4 = 24$

(ii) $x^2 + 2xy + y^2$
$= (2)^2 + 2 \times 2 \times (-2) + (-2)^2$
$= 4 + (-8) + 4$
$= 4 - 8 + 4 = -4 + 4 = 0$

(iii) $x^3 - 3xy$
$= (2)^3 - 3 \times 2 \times (-2)$
$= 8 + 12 = 20$

4. If $a = 1$, $b = 0$ and $c = -1$, find the value of :

(i) $c^2 - 2ab\,(b - a)$

$= (-1)^2 - 2 \times 1 \times 0 \times (0 - 1)$

$= 1 - 0\,(-1) = 1 - 0 = 1$

(ii) $(a^2 - 3ac + a - 3b)$

$= [(1)^2 - 3 \times 1 \times (-1) + 1 - 3 \times 0]$

$= [1 + 3 + 1 - 0] = 5$

5. Simplify the expressions and find the value of the following when $m = -3$, $n = 2$:

(i) $3m + 5\,(n - 3) + 4$

$= 3 \times (-3) + 5\,(2 - 3) + 4$

$= -9 + 5 \times (-1) + 4$

$= -9 - 5 + 4$

$= -14 + 4 = -10$

(ii) $19 - 7m + 3n$

$= 19 - 7 \times (-3) + 3 \times 2$

$= 19 + 21 + 6$

$= 40 + 6$

$= 46$

(iii) $m^2 - 3 + n^2$

$= (-3)^2 - 3 + (2)^2$

$= 9 - 3 + 4$

$= 6 + 4$

$= 10$

(iv) $15m + 2n + 12$

$= 15 \times (-3) + 2 \times 2 + 12$

$= -45 + 4 + 12$

$= -41 + 12$

$= -29$

6. Simplify the expression and find the value of the following expressions if $a = 0$, $b = -1$ and $c = 2$

(i) $(a^2 - 8ab - 5) + (3ab - 4a^2 + 8)$

$= (a^2 - 4a^2) + (-8ab + 3ab) + (-5 + 8)$

$= -3a^2 - 5ab + 3$

We have $a = 0$, $b = -1$, $c = 2$

$= -3 \times (0)^2 - 5 \times 0 \times (-1) + 3$

$= 0 - 0 + 3 = 3$

(ii) $2a - 3b - [3a - 2b - \{a - c - (a - 2b)\}]$

$= 2a - 3b - [3a - 2b - \{a - c - a + 2b\}]$

$= 2a - 3b - [3a - 2b - \{2b - c\}]$

$= 2a - 3b - [3a - 2b - 2b + c]$

$= 2a - 3b - [3a - 4b + c]$

$= 2a - 3b - 3a + 4b - c$

$= -a + b - c$

We have, $a = 0$, $b = -1$, $c = 2$

$= -0 + (-1) - 2$

$= 0 - 1 - 2 = -3$

(iii) $15a^2 - 6ab^2 + 5c - 12a^2$

$= (15a^2 - 12a^2) - 6ab^2 + 5c$

$= 3a^2 - 6ab^2 + 5c$

We have, $a = 0, b = -1, c = 2$

$= 3 \times (0)^2 - 6 \times 0 \times (-1)^2 + 5 \times 2$

$= 0 - 0 + 10$

$= 10$

Chapter 7 : Linear Equations

Exercise 7.1

1. Write equations for the following statements :

(i) Seven times m is 91.

$7m = 91$

(ii) One-sixth of p is 2 more than 8.

$\frac{1}{6}p = 2 + 8 \quad \Rightarrow \quad \frac{p}{6} = 10$

(iii) The sum of numbers x and 8 is 25.

$x + 8 = 25$

(iv) Six times x added to 7 gives 19.

$6x + 7 = 19$

(v) 4 added to two-thirds of a number is 24.

$\frac{2}{3}a + 4 = 24$

(vi) 4 times a number is 20.

$4x = 20$ (let number be x)

(vii) 13 subtracted from 2 times a number is 8.

$2x - 13 = 8$ (let number be x)

(vii) 13 subtracted from 2 times a number is 8.

$2x - 13 = 8$ (let number be x)

(viii) When a number is multiplied by 7 and then 10 is subtracted from it, the value becomes 130.

$7x - 10 = 130$ (let number be x)

2. Write the following equations in statement forms :

(i) $3x + 5 = 27$ — 5 is added to the 3 times a number is 27.

(ii) $\frac{2}{5}x = 10$ — Two-fifth of a number x is 10.

(iii) $2x - 7 = 11$ — Subtract 7 from 2 times a number x is 11.

(iv) $7x = 49$ — When 7 is multiplied a number x, product is 49.

(v) $5x - 15 = 5$ Difference of 5 times a number and 15 is 5.

(vi) $5 - y = 3$ Difference of 5 and y is 3.

(vii) $\frac{x}{9} = 5$ When a number x is divided by 9, the quotient is 5.

(viii) $x + 2 = 14$ Sum of a number and 2 is 14.

3. Check whether the given value in the brackets is a solution to the given equations :

(i) $3y - 2 = 13 \, (y = 5)$

$3 \times 5 - 2 = 13$

$15 - 2 = 13$

$13 = 13$

$\therefore$ LHS = RHS

Yes, $y = 5$ is a solution

(ii) $5x + 2 = 11 \, (x = 3)$

$5 \times 3 + 2 = 11$

$15 + 2 = 11$

$\therefore \quad 17 \neq 11$

LHS $\neq$ RHS

No, $x = 3$ is not a solution

(iii) $2\,(3x + 1) - 7 = 13 \;\; (x = 4)$

$2\,(3 \times 4 + 1) - 7 = 13$

$2\,(12 + 1) - 7 = 13$

$26 - 7 = 13$

$19 \neq 13$

$\therefore$ LHS $\neq$ RHS

No, $x = 4$ is not a solution.

(iv) $x + 5 = 0 \;\; (x = -5)$

$-5 + 5 = 0$

$0 = 0$

$\therefore$ LHS = RHS

Yes, $x = -5$ is a solution.

4. Form an equation for the following cases :

(i) Ravi is 6 years older than his friend Neeru. The sum of their ages is 24.

$\Rightarrow$ Let Neeru's age = x years

Ravi's age = $(x + 6)$ years

$\therefore \quad x + (x + 6) = 24$

$2x + 6 = 24$

(ii) In an isosceles triangle, the vertex angle is trice of either base angle.

$\Rightarrow$ Let each base angle be x, then vertex angle will be $3x$.

(iii A no. added to its half gives 33.

Let the number be x.

then $\frac{1}{2}x + x = 33$

(iv) Mohan's father's age is 3 times the age of Mohan. The sum of their ages is 64 years.

Let age of Mohan = x years

Age of Mohan's father = $3x$ years

$\therefore \quad x + 3x = 64$

(v) A teacher tells the class that the highest marks obtained by a student in her class is twice the lowest marks plus 7. The height marks are 87.

$\Rightarrow$ Let lowest marks be x

Then $x + 7 = 87$

(vi) Square of a number p exceeds 11 by 14

$\Rightarrow \quad p + 11 = 14$

Exercise 7.2

1. Find the solution of the following equations by the trial and error method :

(i) $x + 5 = 12$

x	LHS	RHS	Is LHS = RHS ?
1	$1 + 5 = 6$	12	No
2	$2 + 5 = 7$	12	No
3	$3 + 5 = 8$	12	No
4	$4 + 5 = 9$	12	No
5	$5 + 5 = 10$	12	No
6	$6 + 5 = 11$	12	No
7	$7 + 5 = 12$	12	Yes

$\therefore$ When $x = 7$, LHS = RHS

So, $x = 7$ is the solution of the given equation.

(ii) $y - 2 = 3$

y	LHS	RHS	Is LHS = RHS ?
1	$1 - 2 = -1$	3	No
2	$2 - 2 = 0$	3	No
3	$3 - 2 = 1$	3	No
4	$4 - 2 = 2$	3	No
5	$5 - 2 = 3$	3	Yes

$\therefore$ When $y = 5$, LHS = RHS

So, $y = 5$ is the solution of the given equation.

(iii) $\frac{x}{3} = 2$

x	LHS	RHS	Is LHS = RHS ?
1	$\frac{1}{3}$	2	No
2	$\frac{2}{3}$	2	No
3	$\frac{3}{3} = 1$	2	No
4	$\frac{4}{3}$	2	No
5	$\frac{5}{3}$	2	No
6	$\frac{6}{3} = 2$	2	Yes

$\therefore$ When $x = 6$, LHS = RHS

So, $x = 6$ is the solution of the given equation

(iv) $\frac{1}{3}x + 8 = 11$

x	LHS	RHS	Is LHS = RHS ?
1	$\frac{1}{3} + 8 = \frac{25}{3}$	11	No
2	$\frac{2}{3} + 8 = \frac{26}{3}$	11	No
3	$\frac{3}{3} + 8 = \frac{27}{3} = 9$	11	No
4	$\frac{4}{3} + 8 = \frac{28}{3}$	11	No
5	$\frac{5}{3} + 8 = \frac{29}{3}$	11	No
6	$\frac{6}{3} + 8 = \frac{30}{3} = 10$	11	No
7	$\frac{7}{3} + 8 = \frac{31}{3}$	11	No
8	$\frac{8}{3} + 8 = \frac{32}{3}$	11	No
9	$\frac{9}{3} + 8 = \frac{33}{3} = 11$	11	Yes

$\therefore$ When $x = 9$, LHS = RHS

So, $x = 9$ is the solution of the given equation.

(v) $z - 4 = -3$

z	LHS	RHS	Is LHS = RHS ?
1	$1 - 4 = -3$	–3	Yes

$\therefore$ When $z = 1$, LHS = RHS

So, $z = 1$ is the solution of the given equation.

(vi) $4m = 28$

m	LHS	RHS	Is LHS = RHS ?
1	$4 \times 1 = 4$	28	No
2	$4 \times 2 = 8$	28	No
3	$4 \times 3 = 12$	28	No
4	$4 \times 4 = 16$	28	No

5	$4 \times 5 = 20$	28	No
6	$4 \times 6 = 24$	28	No
7	$4 \times 7 = 28$	28	Yes

$\therefore$ When $m = 7$, LHS = RHS.

So, $m = 7$ is the solution of the given equation.

2. Give the steps that you will use to separate the variable and then solve the equations :

(i) $x - 4 = 0$

Add 4 to both sides

$$x - 4 + 4 = 0 + 4$$

$$x = 4$$

(ii) $x + 5 = 3$

Subtract 5 from both sides

$$x + 5 - 5 = 3 - 5$$

$$x = -2$$

(iii) $y + 8 = 20$

Subtract 8 from both sides

$$y + 8 - 8 = 20 - 8$$

$$y = 12$$

(iv) $p + 5 = -6$

Subtract 5 from both sides

$$p + 5 - 5 = -6 - 5$$

$$p = -11$$

(v) $30t = -60$

Divide both sides by 30

$$\frac{30t}{30} = \frac{-60}{30}$$

$$t = -2$$

(vi) $\frac{-s}{7} = 6$

Multiply both sides by (-7)

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

$$s = -42$$

(vii) $\frac{2}{3}m = 8$

Multiply by 3 to both sides

$$\frac{2}{3}m \times 3 = 8 \times 3$$

$$2m = 24$$

Divide both sides by 2

$$\frac{2m}{2} = \frac{24}{2}$$

$$m = 12$$

(viii) $7x + 1 = 36$

Subtract 1 from both sides

$$7x + 1 - 1 = 36 - 1$$

$$7x = 35$$

Divide both sides by 7

$$\frac{7x}{7} = \frac{35}{7}$$

$$x = 5$$

3. Solve the following equations :

(i) $9z - 13 = 11z + 27$

$\Rightarrow$ $9z - 11z = 27 + 13$ (Subtract 11 z from both sides)

$$-2z = 40$$

$$z = \frac{40}{-2}$$ (Divide both sides by 2)

$$z = -20$$

(ii) $8x + 5 = 6x - 10$

$8x - 6x = -10 - 5$ (Subtract $6x$ from both sides)

$2x = -15$

$x = \frac{-15}{2}$ (Divide both sides by 2)

Exercise 7.3

1. Solve the following equations and check your result :

(i) $2m + \frac{5}{2} = \frac{37}{2}$

$2m = \frac{37}{2} - \frac{5}{2}$

$2m = \frac{37 - 5}{2}$

$2m = \frac{32}{2}$

$2m = 16$

$m = \frac{16}{2}$

$m = 8$

Check $2m + \frac{5}{2} = \frac{37}{2}$

$2 \times 8 + \frac{5}{2} = \frac{37}{2}$

$\frac{16}{1} + \frac{5}{2} = \frac{37}{2}$

$\frac{32 + 5}{2} = \frac{37}{2}$

$\frac{37}{2} = \frac{37}{2}$

$\therefore$ LHS = RHS

(ii) $5(m + 7) = 40$

$5m + 35 = 40$

$5m = 40 - 35$

$5m = 5$

$m = \frac{5}{5}$

$m = 1$

Check $5(m + 7) = 40$

$5(1 + 7) = 40$

$5 \times 8 = 40$

$40 = 40$

$\therefore$ LHS = RHS

(iii) $\frac{9}{2}y = \frac{27}{8}$

$9y = \frac{27}{8} \times 2$

$9y = \frac{27}{4}$

$y = \frac{27}{4 \times 9}$

$y = \frac{3}{4}$

Check $\frac{9}{2}y = \frac{27}{8}$

$\frac{9}{2} \times \frac{3}{4} = \frac{27}{8}$

$\frac{27}{8} = \frac{27}{8}$

$\therefore$ LHS = RHS

(iv) $4x + \frac{3}{5} = 5$

$4x = \frac{5}{1} - \frac{3}{5}$

$4x = \frac{25 - 3}{5}$

$4x = \frac{22}{5}$

$x = \frac{22}{5 \times 4}$

$x = \frac{11}{10}$

Check $4x + \frac{3}{5} = 5$

$4 \times \frac{11}{10} + \frac{3}{5} = 5$

$\frac{22}{5} + \frac{3}{5} = 5$

$\frac{22 + 3}{5} = 5$

$\frac{25}{5} = 5$

$\therefore$ LHS = RHS

(v) $2y + 3 = 6y + 13$

$2y - 6y = 13 - 3$

$-4y = 10$

$y = \frac{10}{-4}$

$y = \frac{-5}{2}$

Check $2y + 3 = 6y + 13$

$2 \times \left(\frac{-5}{2}\right) + 3 = 6 \times \left(\frac{-5}{2}\right) + 13$

$-5 + 3 = -15 + 13$

$-2 = -2$

$\therefore$ LHS = RHS

(vi) $13p - 3 = 49$

$13p = 49 + 3$

$13p = 52$

$p = \frac{52}{13}$

$p = 4$

Check $13p - 3 = 49$

$13 \times 4 - 3 = 49$

$52 - 3 = 49$

$49 = 49$

$\therefore$ LHS = RHS

(vii) $\frac{y}{4} + 2 = \frac{2y}{3} - \frac{1}{2}$

$\frac{y}{4} - \frac{2y}{3} = \frac{-1}{2} - \frac{2}{1}$

$\frac{3y - 8y}{12} = \frac{-1 - 4}{2}$

$\frac{-5y}{12} = \frac{-5}{2}$

$y = \frac{-5}{2} \times \frac{12}{-5}$

$y = 6$

Check $\frac{y}{4} + 2 = \frac{2y}{3} - \frac{1}{2}$

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

$\frac{3}{2} + \frac{2}{1} = \frac{4}{1} - \frac{1}{2}$

$\frac{3 + 4}{2} = \frac{8 - 1}{2}$

$\frac{7}{2} = \frac{7}{2}$

$\therefore$ LHS = RHS

(viii) $3(t+2)+4=16$

$3t+6+4=16$

$3t+10=16$

$3t=16-10$

$3t=6$

$t=\frac{6}{3}$

$t=2$

Check $3(t+2)+4=16$

$3(2+2)+4$

$3\times 4+4=16$

$12+4=16$

$12+4=16$

$16=16$

$\therefore$ LHS = RHS

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

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

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

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

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

$x=\frac{19}{4}$

Check $2x-\frac{1}{3}=\frac{2}{3}x+6$

$2\times\frac{19}{4}-\frac{1}{3}=\frac{2}{3}\times\frac{19}{4}+6$

$\frac{19}{2}-\frac{1}{3}=\frac{19}{6}+\frac{6}{1}$

$\frac{57-2}{6}=\frac{19+36}{6}$

$\frac{55}{6}=\frac{55}{6}$

$\therefore$ LHS = RHS

(x) $3x-9=2x+3$

$3x-2x=3+9$

$x=12$

Check $3x-9=2x+3$

$3\times 12-9=2\times 12+3$

$36-9=24+3$

$27=27$

$\therefore$ LHS = RHS

(xi) $4(5x-4)+3(2x-1)=7$

$20x-16+6x-3=7$

$20x+6x-19=7$

$26x=7+19$

$26x=26$

$x=\frac{26}{26}$

$x=1$

Check $4(5x-4)+3(2x-1)=7$

$4(5\times 1-4)+3(2\times 1-1)=7$

$4(5-4)+3(2-1)=7$

$4\times 1+3\times 1=7$

$4+3=7$

$7=7$

$\therefore$ LHS = RHS

(xii) $-5 = 6(p - 11) + 8$

$-5 = 6p - 66 + 8$

$-5 = 6p - 58$

$53 = 6p$

$p = \frac{53}{6}$

Check $-5 = 6\left(\frac{53}{6} - 11\right) + 8$

$-5 = 6 \times \left(\frac{53 - 66}{6}\right) + 8$

$-5 = (-13) + 8$

$-5 = -5$

$\therefore$ LHS = RHS

2. Solve the following linear equation :

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

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

$$\frac{(6x + 1) + 2}{2} = \frac{7x - 3}{3}$$

$$\frac{6x + 3}{2} \times \frac{7x - 3}{3}$$

$$3(6x + 3) = (7x - 3)$$

$$18x + 9 = 14x - 6$$

$$18x - 14x = -6 - 9$$

$$4x = -15$$

$\therefore$ $$x = \frac{-15}{4}$$

Exercise 7.4

1. Let the number be x.

Then $2x - 11 = 17$

$2x = 17 + 11$

$2x = 28$

$x = \frac{28}{2}$

$x = 14$

Hence, the required number is 14.

2. Let the number be x.

Then, $\frac{1}{3}x - 3 = 5$

$\frac{1}{3}x = 5 + 3$

$\frac{x}{3} = 8$

$x = 24$

Hence, the required number is 24.

3. If two consecutive odd numbers are $(2x + 1), (2x + 3)$
then $(2x + 1) + (2x + 3) = 100$

$$4x + 4 = 100$$
$$4x = 100 - 4$$
$$4x = 96$$
$$x = \frac{96}{4} = 24$$
$$x = 24$$

Hence, Ist number $= 2x + 1 = 2 \times 24 + 1 = 48 + 1 = 49$

IInd number $= 2x + 1 = 2 \times 24 + 3 = 48 + 3 = 51$

4. Let Ist number be x
Then IInd number be $(95 - x)$

$\therefore$ $x + 3 = 95 - x$
$$x + x = 95 - 3$$
$$2x = 92$$
$$x = \frac{92}{2}$$
$$x = 46$$

Hence Ist number $= x = 46$

IInd number $= 95 - x = 95 - 46 = 49$

5. Let the breadth of the rectangle be x m
and the length of the rectangle be $3x$ m

Then, $2(l + b) = 96$
$$2(x + 3x) = 96$$
$$2 \times 4x = 96$$
$$8x = 96$$
$$x = \frac{96}{8}$$
$$x = 12$$

Hence, breadth of the rectangle $= x = 12$ m

Length of the rectangle $= 3x = 3 \times 12 = 36$ m

6. Let Ist number be x and IInd number be $5x$
Then, $x + 5x = 54$
$$6x = 54$$
$$x = \frac{54}{6}$$
$$x = 9$$

Hence, Ist number $= x = 9$

IInd number $= 5x = 5 \times 9 = 45$

7. Let Ashu's age = x years

Mother's age = $(3x + 5)$ years

Then, $3x + 5 = 44$

$3x = 44 - 5$

$3x = 39$

$\therefore \quad x = \frac{39}{3} = 13$

$x = 13$

Hence, Ashu's age is 13 years.

8. Let the no. of boys in a school be x and the number of girls be $(x + 42)$.

Then, $x + (x + 42) = 1200$

$2x + 42 = 1200$

$2x = 1200 - 42$

$2x = 1158$

$x = \frac{1158}{2} = 579$

$x = 579$

Hence no. of boys in school = $x = 579$

Number of girls in school = $x + 42 = 579 + 42 = 621$

9. Let Sakshi's age = x years

Her father's age = $7x$ years

Then, $x + 7x = 64$

$8x = 64$

$x = \frac{64}{8}$

$x = 8$

Hence, Sakshi's age = $x = 8$ years

Her father's age = $7x = 7 \times 8 = 56$ years

10. Let the no. of coins of 2 rupee and 5 rupee be x each.

then, $2x + 5x = 70$

$7x = 70$

$x = \frac{70}{7}$

$x = 10$

Hence, the wallet contains 10 coins of 2 rupee and 5 rupee each.

11. Let the lowest score be x.

Then, $2x + 11 = 91$

$2x = 91 - 11$

$2x = 80$

$x = \frac{80}{2} = 40$

$x = 40$

Hence, the lowest score in class is 40.

12. Three consecutive natural numbers are

$$x, x+1, x+2$$

Then, $x + x + 1 + x + 2 = 447$

$$3x + 3 = 447$$

$$3x = 447 - 3$$

$$3x = 444$$

$$x = \frac{444}{3} = 148$$

$$x = 148$$

Hence, Ist number $= x = 148$

IInd number $= x + 1 = 148 + 1 = 149$

IIIrd number $= x + 2 = 148 + 2 = 150$

13. Let the side of the square be x m.

Then, perimeter of square $= 4 \times$ side

$$32 = 4 \times x$$

$$x = 8$$

Hence, the side of the square is 8 cm.

14. Let the numerator of a fraction $= x$

and the denominator of the fraction $= x + 2$

Then, $$\frac{x}{x+2+1} = \frac{1}{2}$$

or $$\frac{x}{x+3} = \frac{1}{2}$$

or $$2 \times x = x + 3$$

$$2x - x = 3$$

$$x = 3$$

Hence, Numerator $= x = 3$

Denominator $= x + 2 = 3 + 2 = 5$

So, fraction is $\frac{3}{5}$.

Chapter 8 : Comparing Quantities

Exercise 8.1

1. Find the ratio of :

(i) ₹ 5 to 75 paise

= ₹ 5 : 75 paise

= 500 paise : 75 paise

$= \frac{500}{75}$

$= \frac{20}{3} = 20 : 3$

(ii) 50 cm to 3m

= 50 cm : 300 cm

$= \frac{50}{300}$

$= \frac{1}{6}$

$= 1 : 6$

(iii) 35 min to 3 h

$= 35 \text{ min} : 3 \times 60 \text{ min}$

$= \frac{35}{180}$

$= \frac{7}{36} = 7 : 36$

(iv) 15 m to 25 km

$= 15 \text{ m} : 25000 \text{ m}$

$= \frac{15}{25000}$

$= \frac{3}{5000} = 3 : 5000$

2. Let Ist part = $7x$

IInd part = $8x$

$\therefore \quad 7x + 8x = 1050$

$15x = 1050$

$x = \frac{1050}{15}$

$x = 70$

Hence, Ist part = $7x$ = ₹ 7×70 = ₹ 490

IInd part = $8x$ = ₹ 8×70 = ₹ 560

3. Are the following numbers in proportion ?

(i) 8, 16, 42

$8 : 16 :: 16 : 42$

$\frac{8}{16} = \frac{16}{42}$

$\frac{1}{2} = \frac{8}{21}$

$21 = 16$

LHS ≠ RHS

No, these terms are not in proportion.

(ii) 40, 48, 160, 192

$40 : 48 :: 160 : 192$

$\frac{40}{48} = \frac{160}{192}$

$\frac{5}{6} = \frac{5}{6}$

$30 = 30$

LHS = RHS

Yes, these terms are in proportion.

(iii) 27, 54, 81, 108

$27 : 54 :: 81 : 108$

$\frac{27}{54} = \frac{81}{108}$

$\frac{1}{2} = \frac{3}{4}$

$4 = 6$

LHS ≠ RHS

No, these terms are not in proportion.

4. Which is greater 3 : 4 or 2 : 5 ?

We have

$\frac{3}{4} \times \frac{2}{5}$

$3 \times 5 = 4 \times 2$

$15 > 8$

$\frac{3}{4} > \frac{2}{5}$

Hence, $\frac{3}{4}$ (3 : 4) is greater.

5. Let Ram's share = $2x$

Raj's share = $4x$

$\therefore \quad 2x + 4x = 120$

$6x = 120$

$x = \frac{120}{6}$

$x = 20$

Hence, Ram's share = $2x$ = ₹ 2×20 = ₹ 40

Raj's share = $4x$ = ₹ 4×20 = ₹ 80

6. Express the following ratios in their simplest form :

(i) 150 : 400

$= \frac{150}{400}$

$= \frac{15}{40}$

$= \frac{3}{8}$

(ii) 85 : 205

$= \frac{85}{205}$

$= \frac{17}{41}$

(iii) 322 : 84

$= \frac{322}{84}$

$= \frac{161}{42}$

$= \frac{23}{6}$

7. Show that the following numbers are in continued proportion :

(i) 7, 14, 28, 56

$\Rightarrow$ 7 : 14 : : 28 : 56

$\frac{7}{14} = \frac{28}{56}$

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

Hence, these terms are in continued proportion.

(ii) 9, 12, 16

$\Rightarrow$ 9 : 12 : : 12 : 16

$\frac{9}{12} = \frac{12}{16}$

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

Hence, these terms are in continued proportion.

8. Find the mean propirtional between :

(i) 5 and 125

Let x be the mean proportional between 5 and 125

$\Rightarrow$ 5 : x : : x = 125

$\frac{5}{x} \times \frac{x}{125}$

$625 = x^2$

$x^2 = 25^2$

$x = 25$

Hence, the required mean proportional is 25.

(ii) 3 and 27

Let x be the mean proportional between 3 and 27

$\Rightarrow$ 3 : x : : x : 27

$\frac{3}{x} \times \frac{x}{27}$

$81 = x^2$

$x^2 = 9^2$

$x = 9$

Hence, the required mean proportional is 9.

9. Find the value of x in the following :

(i) $7 : 6 = x : 36$

$\Rightarrow \quad \frac{7}{6} \times \frac{x}{36}$

$\frac{7 \times 36}{6} = x$

$x = 42$

(ii) $18 : x = 27 : 3$

$\frac{18}{x} \times \frac{27}{3}$

$x = \frac{18 \times 3}{27}$

$x = 2$

(iii) $3 : 4 = 15 : x$

$\frac{3}{4} \times \frac{15}{x}$

$3 \times x = 15 \times 4$

$x = \frac{15 \times 4}{3}$

$x = 20$

(ii) $x : 50 :: 5 : 2$

$\frac{x}{50} \times \frac{5}{2}$

$x \times 2 = 50 \times 5$

$x = \frac{50 \times 5}{2}$

$x = 125$

10. First term = 7

Second term = 14

Third term = 25

Let fourth term be x and all these terms are in proportion.

$7 : 14 :: 25 : x$

$\Rightarrow \quad \frac{7}{14} = \frac{25}{x}$

$x = \frac{14 \times 25}{7}$

$x = 50$

Hence, the required term is 50.

11. Let the fourth proportional be x

Then $51 : 85 :: 57 : x$

$\Rightarrow \quad \frac{51}{85} = \frac{57}{x}$

$x = \frac{85 \times 57}{51}$

$x = \frac{5 \times 57}{3}$

$x = 95$

Hence, the fourth proportional is 95.

12. Income = $7x$

Expenditure = $6x$

We have, income = ₹ 1400

$7x = 1400$

$x = \frac{1400}{7}$

$x = 200$

$\therefore$ If expenditure = $6x$ = ₹ 6×200 = ₹ 1200

Then saving = ₹ (1400 – 1200) = ₹ 200

Hence, the saving of the family is ₹ 200

13. Let first side of triangle = $2x$

Second side of triangle = $3x$

Third side of triangle = $4x$

We have, perimeter of triangle = 45 cm

$$2x + 3x + 4x = 45$$

$$9x = 45$$

$$x = \frac{45}{9}$$

$$x = 5$$

Hence, length of I side = $2x = 2 \times 5 = 10$ cm

II side = $3x = 3 \times 5 = 15$ cm

III side = $4x = 4 \times 5 = 20$ cm

14. Ratio of the no. of girls to the number of boys in a school = $\frac{5}{8}$

Ratio of the no. of girls to the boys in other school = $\frac{7}{10}$

Now, $\frac{5}{8} \times \frac{7}{10}$

$50 < 56$

Hence, second school has higher ratio of girls.

Exercise 8.2

1. The cost of 3 kg of flour = ₹ 78

The cost of 1 kg of flour = ₹ $\frac{78}{3}$

The cost of 15 kg of flour = ₹ $\frac{78}{3} \times 15$

= ₹ $78 \times 5 = 390$

Hence, the cost of 15 kg of flour is ₹ 390.

2. Distance covered by Raj in 4 hours = 18 km

Distance covered by Raj in 1 hour = $\frac{18}{4}$ km

Distance covered by Raj in 6 hours = $\frac{18}{4} \times 6$ km

$= \frac{18 \times 3}{2} = 27$ km

Hence, Raj covers 27 km distance in 6 hours.

3. No. of computers required for 8 students = 4

No. of computers required for 1 student $= \frac{4}{8}$

No. of computers required for 40 students $= \frac{4}{8} \times 40$

$= 20$ computers

Hence, 20 computers are required for 40 students.

4. The price of 5 umbrellas = ₹ 2500

The price of an umbrella $= ₹ \frac{2500}{5}$

The price of 16 umbrellas $= ₹ \frac{2500}{5} \times 16$

$= ₹ 8000$

Hence, the cost of 16 umbrellas is ₹ 8000.

5. Amount paid to 16 workers = ₹ 8000

Amount paid to 1 worker $= ₹ \frac{8000}{16}$

Amount paid to 55 workers $= ₹ \frac{8000}{16} \times 55$

$= ₹ 500 \times 55$

$= ₹ 27500$

Hence, ₹ 27500 are paid to 55 workers.

6. 60 persons use rice in = 30 days

1 person will use rice in $= \frac{30}{60}$ days

18 persons will use rice in $= \frac{30}{60} \times 18$

$= \frac{18}{2} = 9$ days.

Hence, the rice would last for in 9 days.

7. Speed of a train in 4 hours = 28 km/hr

Distance covered in 4 hrs = Speed × time

$= 28 \times 4$

$= 112$ km

$\therefore$ Speed to cover 112 km in 7 hrs

$= \frac{112}{7} = 16$ km/hr

Hence, the speed of train should be 16 km/hr

8. Cost of 25 metres of cloth = ₹ 200

Cost of 1 metre of cloth = ₹ $\frac{200}{25}$

Cost of 10 metres of cloth = ₹ $\frac{200}{25} \times 10$

= ₹ 80

Hence, the cost of 10 metres of cloth is ₹ 80.

9. No. of boxes to pack 600 plates = 15

No. of boxes to pack 1 plate = $\frac{15}{600}$

No. of boxes to pack 1280 plates = $\frac{15}{600} \times 1280$

$= \frac{1280}{40} = 32$

Hence, 32 boxes are required to pack 1280 plates.

10. (i) Time taken by the train to travel 225 km = 3 hours

Time taken by the train to travel 1 km = $\frac{3}{225}$

Time taken by the train to travel 375 km = $\frac{3}{225} \times 375$

= 5 hours

Hence, it will take 5 hours to travel 375 km.

(ii) Distance covered by a train in 3 hours = 225 km

Distance covered by the train in an hour = $\frac{225}{3}$ km

Distance covered by the train in 7 hours = $\frac{225}{3} \times 7 = 525$ km

Hence, it will travel 525 km in 7 hours.

Exercise 8.3

1. Express the following percent in lowest forms :

(i) 5%

$= \frac{5}{100}$

$= \frac{1}{20}$

(ii) $5\frac{1}{4}\%$

$= \frac{21}{4} \times \frac{1}{100}$

$= \frac{21}{400}$

(iii) 39%

$= \frac{39}{100}$

2. Express the following percent as decimals :

(i) 33%

$= \frac{33}{100}$

$= 0.33$

(ii) 7.2%

$= \frac{7.2}{100}$

$= \frac{72}{1000} = 0.072$

(iii) 3.25%

$= \frac{3.25}{100}$

$= \frac{325}{10000}$

$= 0.0325$

3. Write the following fractions as percents :

(i) $6\frac{1}{2}$

$= \frac{13}{2} \times 100\%$

$= 650\%$

(ii) $\frac{3}{40}$

$= \frac{3}{40} \times 100\%$

$= \frac{15}{2}\%$

(iii) $\frac{5}{7}$

$= \frac{5}{7} \times 100\%$

$= \frac{500}{7}\%$

4. Convert each of the following decimals into a percentage :

(i) 0.25

$= 0.25 \times 100\%$

$= \frac{25}{100} \times 100\%$

$= 25\%$

(ii) 0.2

$= 0.2 \times 100\%$

$= \frac{2}{10} \times 100\%$

$= 20\%$

(iii) 0.8

$= 0.8 \times 100\%$

$= \frac{8}{10} \times 100\%$

$= 80\%$

5. Find the value of :

(i) 20% of ₹ 1000

$= \frac{20}{100} \times$ ₹ 1000

= ₹ 200

(ii) 35% of 500 gm

$= \frac{35}{100} \times 500$ gm

= 175 gm

(iii) 10% of ₹ 1

$= \frac{10}{100} \times 100$ paise

= 10 paise

(iv) 40% of 120 km

$= \frac{40}{100} \times 120$ km

= 48 km

6. Find the value of x if :

(i) 20% of $x = 50$

$\frac{20}{100} \times x = 50$

$x = \frac{50 \times 100}{20}$

$x = 250$

(ii) 3.5 % of $x = 7$

$\frac{3.5}{100} \times x = 7$

$x = \frac{7 \times 1000}{35}$

$x = \frac{1000}{5}$

$x = 200$

(iii) 5% of $x = 0.25$

$$\frac{5}{100} \times x = 0.25$$

$$x = \frac{25 \times 100}{5 \times 100}$$

$$x = 5$$

(iv) 9% of $x = 45$

$$\frac{9}{100} \times x = 45$$

$$x = \frac{45 \times 100}{9}$$

$$x = 500$$

7. Total no. of bulbs = 500

No. of defective bulbs = 75

Percentage of defective bulbs = $\frac{75}{500} \times 100\%$

$$= \frac{75}{5} = 15\%$$

8. Let x% of 40 km be 800 m

$$\therefore \quad \frac{x}{100} \times 40000 \text{ m} = 800 \text{ m}$$

or $$x = \frac{100 \times 800}{40000}$$

$$x = \frac{8}{4}$$

$$x = 2\%$$

9. Total no. of apples = 240

No. of rotten apples = $240 \times 5\%$

$$= 240 \times \frac{5}{100} = \frac{24}{2} = 12$$

No. of good apples = $(240 - 12)$

$$= 228 \text{ apples}$$

10. Total no. of students = 64

No. of absent students = 16

Percentage of absent students = $\frac{16}{64} \times 100\%$

$$= 25\%$$

11. Let angles of triangle be x, $2x$, $3x$

$$x + 2x + 3x = 180^\circ$$

$$6x = 180^\circ$$

$$x = 30^\circ$$

Hence, I angle = $x = 30^\circ$

II angle = $2x = 2 \times 30 = 60^\circ$

III angle = $3x = 3 \times 30 = 90^\circ$

12. Total marks = 600

Ishita scored = 62%

Then marks obtained by Ishita = $600 \times 62\%$

$$= 600 \times \frac{62}{100} = 372 \text{ marks}$$

13. Increase number = (125 – 80) = 45

Increase percentage = $\frac{45}{125} \times 100\%$

$$= \frac{45 \times 4}{5} = 36\%$$

14. Find the percentage increase or decrease :

(i) No. of students increased from 2000 to 2160

Increase in number = (2160 – 2000) = 160

Increase percentage = $\frac{160}{2160} \times 100\%$

$$= \frac{200}{27}\%$$

(ii) Price of a pair of shoes decreased from ₹ 330 to ₹ 277

Decrease in number = (330 – 277) = 53

Decrease percentage = $\frac{53}{330} \times 100\%$

$$= \frac{530}{33}\%$$

15. Total no. of students = 3000

No. of girls = $3000 \times \frac{40}{100} = 1200$

Then no. of boys = (3000 – 1200) = 1800

No. of boys won the prizes = $1800 \times \frac{10}{100} = 180$

No. of girls won the prizes = $1200 \times \frac{12}{100} = 144$

$\therefore$ Total no. of students won the prizes = (180 + 144) = 324

Percentage of total no. of students who won the prizes = $\frac{324}{3000} \times 100\%$

$$= \frac{324}{30} = 10.8\%$$

16. Quantity of water in a tank = 600 litres

Added water in the tank = 120 litres

$\therefore$ Total quantity of water = (600 + 120) = 720 litres

Percentage increase in amount of water = $\frac{120}{600} \times 100\% = \frac{120}{6} = 20\%$

17. Seeta's income = ₹ 12000
Seeta's expenditure ₹ 8000

$$\text{Percentage of spent money} = \frac{8000}{12000} \times 100\%$$

$$= \frac{800}{12} = 66.67\%$$

18. Let the required sum be x.

$$30\% \text{ of } x = ₹\ 270$$

$$\frac{30}{100} \times x = ₹\ 270$$

$$x = \frac{270 \times 100}{30}$$

$$x = 900$$

Hence, the required sum is ₹ 900.

Exercise 8.4

1. Find the unknown value of each of the following :

(i) CP = ₹ 500, SP = ? Profit = ₹ 120

$SP = CP +$ Profit

= ₹ (500 + 120)

= ₹ 620

(ii) CP = ₹ 700, SP = ₹ 665, Loss = ?

Loss = $CP - SP$

= ₹ (700 – 665)

= ₹ 35

(iii) CP = ?, SP = ₹ 360, Profit = ₹ 60

$CP = SP$ – Profit

= ₹ (360 – 60) = ₹ 300

(iv) CP = ₹ 4000, SP = ₹ 3000, Loss = ?

Loss = $CP - SP$

= ₹ (4000 – 3000)

= ₹ 1000

2. Calculate profit or loss percentage for the following :

(i) CP = ₹ 2000, SP = ₹ 2500

Here $SP > CP$

Profit = $(SP - CP)$

= ₹ (2500 – 2000)

= ₹ 500

$$\text{Profit \%} = \frac{P}{CP} \times 100\%$$

$$= \frac{500}{2000} \times 100\%$$

$$= 25\%$$

(ii) $CP = ₹\ 1060$, $SP = ₹\ 1000$

Here $CP > SP$

$$\text{Loss} = ₹\ (1060 - 1000)$$

$$= ₹\ 60$$

$$\text{Loss \%} = \frac{\text{Loss}}{CP} \times 100\%$$

$$= \frac{60}{1060} \times 100\%$$

$$= \frac{60 \times 10}{106}\%$$

$$= \frac{300}{53}\%$$

$$= 5\frac{35}{53}\%$$

3. CP of an article = ₹ 360

SP of the article = ₹ 270

Here, $CP > SP$

$$\text{Loss} = (CP - SP)$$

$$= ₹\ (360 - 270) = ₹\ 90$$

$$\text{Loss\%} = \frac{\text{Loss}}{CP} \times 100\%$$

$$= \frac{90}{360} \times 100\%$$

$$= \frac{10 \times 10}{4} = 25\%$$

4. CP of a computer table = ₹ 2200

Profit = 20%

$$\text{Profit} = 2200 \times \frac{20}{100} = 440$$

$$\therefore \quad SP = CP + P$$

$$= ₹\ (2200 + ₹\ 440)$$

$$= ₹\ 2640$$

5. Let CP of each article = ₹ x

CP of 10 articles = ₹ $10x$

SP of 10 articles = CP of 11 articles

$= 11x$

$P = SP - CP$

$= 11x - 10x$

$= x$

$\therefore \quad P\% = \frac{P}{CP} \times 100 = \frac{x}{10x} \times 100 = 10\%$

6. SP of an article = ₹ 950

Loss % = 5%

$SP = CP - \text{Loss}$

$950 = CP - 5\% \text{ of } CP$

$950 = CP - \frac{5}{100} \times CP$

$950 = CP - 0.05 \times CP$

$950 = 0.95 \times CP$

$\therefore \quad CP = \frac{950}{0.95} = 1000 ₹$

7. CP of a car = ₹ 70000

Spent on painting = ₹ 5000

$\therefore$ Total CP = ₹ (70000 + 5000)

= ₹ (75000)

SP = ₹ 67500

Here, $CP > SP$

Loss = $(CP - SP)$

= ₹ (75000 − 67500)

= ₹ 7500

$\therefore \quad \text{Loss \%} = \frac{\text{Loss}}{\text{Total CP}} \times 100\%$

$= \frac{7500}{75000} \times 100 = 10\%$

8. Cost of a dozen eggs = ₹ 36

Cost of 5 dozen eggs = $\frac{36}{12} \times 60$

= ₹ 180

Broken eggs = $60 \times 5\%$

$= 60 \times \frac{5}{100} = 3$

Remaining eggs = (60 − 3) = 57 eggs

SP of 12 eggs = 48

SP of 57 eggs = $\frac{48}{12} \times 57 =$ ₹ 228

$\therefore$ Profit = $SP - CP$

= ₹ (228 – 180)

= ₹ 48

9. S.P. of two machines at ₹ 2400 each

On selling one machines, his gain = 20%

Then, $CP = \frac{2400 \times 100}{120}$ = ₹ 2000

Gain = 2400 – 2000 = ₹ 400

Now, on selling second machines, his loss% = 20%

Then, $CP = \frac{2400 \times 100}{80}$ = ₹ 3000

Loss = 3000 – 2400 = ₹ 600

His net loss = ₹ (600 – 400)

= ₹ 200

Loss % = $\frac{\text{Loss}}{\text{Total } CP} \times 100$

$= \frac{200}{4800} \times 100 = 4\frac{1}{6}\%$

10. S.P. of an item = ₹ 540

Loss % = 5%

Loss = $540 \times \frac{5}{100} = \frac{54}{2}$ = ₹ 27

C.P. = SP + Loss

= ₹ (540 + 27)

= ₹ 567

Exercise 8.5

1. Calculate the interest and the amount in each of the folloiwng cases :

(a) P = ₹ 2500, R = 9%, T = 2 years

$\therefore$ $SI = \frac{P \times R \times T}{100}$

$= \frac{2500 \times 9 \times 2}{2}$ = ₹ 450

Amount = P + SI

= (2500 + 450) = ₹ 2050

(b) P = ₹ 10000, R = 5%, T = 4 years

$\therefore$ $SI = \frac{P \times R \times T}{100}$

$= \frac{10000 \times 5 \times 4}{100}$ = ₹ 2000

Amount = $P + SI$

= ₹ (10000 + 2000) = ₹ 12000

(c) $P = ₹\ 2575,\ R = 10\%,\ T = 5$ years

$$SI = \frac{P \times R \times T}{100}$$

$$= \frac{2575 \times 10 \times 5}{100}$$

$$= \frac{2575}{2} = ₹\ 1287.5$$

$$\text{Amount} = P + SI$$

$$= ₹\ (2575 + 1287.5)$$

$$= ₹\ 3862.5$$

(d) $P = ₹\ 1500,\ R = 6.5\ \%,\ T = 3$ years

$$SI = \frac{P \times R \times T}{100}$$

$$= \frac{1500 \times 6.5 \times 3}{100} = ₹\ 292.5$$

$$\text{Amount} = P + SI$$

$$= ₹\ (1500 + 292.5) = ₹\ 1792.5$$

2. Find the principal in each of the following cases :

(a) $SI = ₹\ 360,\ T = 5$ years, $R = 6\%$

$$SI = \frac{P \times R \times T}{100}$$

$$P = \frac{SI \times 100}{R \times T}$$

$$= \frac{360 \times 100}{6 \times 5} = ₹\ 1200$$

(b) $SI = ₹\ 2304,\ T = 4$ years, $R = 12\%$

$$P = \frac{SI \times 100}{R \times T}$$

$$= \frac{2304 \times 100}{12 \times 4}$$

$$= ₹\ 192 \times 25 = ₹\ 4800$$

3. Find the rate of interest in each of the following cases :

(a) $I = ₹\ 288,\ P = ₹\ 960,\ T = 2$ years

$$R = \frac{SI \times 100}{P \times T}$$

$$= \frac{288 \times 10}{960 \times 2} = \frac{288 \times 5}{96}$$

$$= 15\%$$

(b) $I = ₹\ 40,\ P = ₹\ 200,\ T = 4$ years

$$R = \frac{SI \times 100}{P \times T}$$

$$= \frac{40 \times 100}{200 \times 4} = \frac{10}{2} = 5\%$$

4. (a) $P = ₹\ 3000,\ I = ₹\ 60,\ R = 4\%$

$$T = \frac{SI \times 100}{P \times R}$$

$$= \frac{60 \times 100}{3000 \times 4} = \frac{60}{30 \times 4} = \frac{15}{30}$$

$$= \frac{1}{2} \text{ years or 6 months}$$

(b) $P = ₹\ 6000,\ I = ₹\ 720,\ R = 3\%$

$$T = \frac{SI \times 100}{P \times R}$$

$$= \frac{720 \times 100}{6000 \times 3} = \frac{12}{3} = 4 \text{ years}$$

5. $T = ?,\ P = ₹\ 2000,\ I = ₹\ 560$

$R = 14\%$

$\therefore$ $$SI = \frac{P \times R \times T}{100}$$

$$T = \frac{SI \times 100}{P \times R} = \frac{560 \times 100}{2000 \times 14} = \frac{56}{28}$$

$= 2$ years

6. $P = ₹\ 1400,\ R = 8\%,\ T = 2$ years

Amount = ?

$$SI = \frac{P \times R \times T}{100}$$

$$= \frac{1400 \times 8 \times 2}{100} = ₹\ 224$$

Amount = $P + SI$

$= ₹\ (1400 + 224) = ₹\ 1624$

Hence, Swati paid ₹ 1624 back to her friend.

7. $T = 1$ year, $R = 12\%,\ I = ₹\ 4800$

$P = ?$

$$P = \frac{SI \times 100}{R \times T}$$

$$= \frac{4800 \times 100}{12 \times 1} = ₹\ 40000$$

8. $R = ?,\ I = ₹\ 238,\ P = ₹\ 595,\ T = 6$ years

$$R = \frac{SI \times 100}{P \times T}$$

$$= \frac{238 \times 100}{595 \times 6} = \frac{238 \times 20}{119 \times 6}$$

$$= \frac{20}{3} = 6\frac{2}{3}\%$$

9. $I = ?,\ A = ?,\ P = ₹\ 4500,\ R = 8\%,\ T = 3$ years

$$I = \frac{P \times R \times T}{100}$$

$$= \frac{4500 \times 8 \times 3}{100} = ₹\ 1080$$

$\therefore$ Amount $= P + SI$

$$= (4500 + 1080) = ₹\ 5580$$

10. $A = ₹\ 44000,\ R = 5\%,\ T = 2$ years

$$\text{Amount} = P + SI$$

$$44000 = P + \frac{P \times R \times T}{100}$$

$$44000 = P\left[1 + \frac{R \times T}{100}\right]$$

$$44000 = P\left[1 + \frac{5 \times 2}{100}\right]$$

$$44000 = P\left[1 + \frac{10}{100}\right]$$

$$44000 = P\left[\frac{100 + 10}{100}\right]$$

$$44000 = P \times \frac{110}{100}$$

$$\frac{44000 \times 10}{11} = P$$

$$P = ₹\ 40{,}000$$

Now, $A = ?,\ R = 5\%,\ T = 3$ years

$$SI = \frac{P \times R \times T}{100} = \frac{40000 \times 5 \times 3}{100}$$

$$= ₹\ 6000$$

$\therefore$ Amount $= P + SI$

$$= ₹\ (40000 + 6000) = ₹\ 46000$$

11. $T = ?$, $A = 2P$, $R = 10\%$

Amount $= P + SI$

$$A = P + \left[\frac{P \times R \times T}{100}\right]$$

$$2P = P\left[1 + \frac{R \times T}{100}\right]$$

$$2 = 1 + \frac{10 \times T}{100}$$

$$2 - 1 = \frac{10T}{100}$$

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

$$T = 10 \text{ years}$$

12. In which case, the interest earned is more :

(a) $P = ₹\ 5000$, $T = 5$ years, $R = 4\%$

$$SI = \frac{P \times R \times T}{100}$$

$$= \frac{5000 \times 4 \times 5}{100} = ₹\ 1000$$

(b) $P = ₹\ 4000$, $T = 6$ years , $R = 5\%$

$$SI = \frac{P \times R \times T}{100}$$

$$= \frac{4000 \times 5 \times 6}{100} = ₹\ 1200$$

Hence, in second case the interest is earned more.

Chapter 9 : Lines and Angles

Exercise 9.1

1. Find the complement of the following angles :

(i) $25°$ Complement angle $= 90 - 25° = 65°$

(ii) $36°$ Complement angle $= 90 - 36° = 54°$

(iii) $75°$ Complement angle $= 90 - 65° = 25°$

(iv) $63°$ Complement angle $= 90 - 63° = 27°$

2. Find the supplement of the following angles :

(i) $90°$ Supplement angle $= 180° - 90° = 90°$

(ii) $130°$ Supplement angle $= 180° - 130° = 50°$

(iii) $168°$ Supplement angle $= 180° - 168° = 12°$

(i) $108°$ Supplement angle $= 180° - 108° = 72°$

3. Identify, which of the following pairs of angles are complementary or supplementary :

(i) $40°$ and $140°$ (ii) $85°$ and $5°$

Sum = $40° + 140°$
$= 180°$
So, it is a pair of supplementary angles.

(iii) $34°$ and $56°$
Sum = $34° + 56°$
$= 90°$
So, it is a pair of complementary angles

Sum = $85° + 5°$
$= 90°$
So, it is a pair of complementary angles.

(iv) $136°$ and $44°$
Sum = $136° + 44°$
$= 180°$
So, it is a pair of supplementary angles.

4. Let angle be x
Its complement = $90 - x$
Then, $x = 2(90° - x)$
or $x = 180° - 2x$
or $x + 2x = 180°$
or $3x = 180°$
$\therefore \quad x = \frac{180°}{3} = 60°$

5. Let angle be x
Its supplement = $180° - x$
Then, $x = 180° - x$
$x + x = 180°$
$2x = 180°$
$x = \frac{180°}{2}$
$x = 90°$

6. Let first angle be $4x$
and second angle be $5x$
Then, $4x + 5x = 180°$
or $9x = 180°$
or $x = \frac{180°}{9}$ or $x = 20$
Hence, first angle = $4x = 4 \times 20° = 80°$
Second angle = $5x = 5 \times 20° = 100°$

7. Find the value of x in each of the following figures :

(i) $3x + 2x = 180°$ (linear pair property)
$5x = 180°$
$x = \frac{180°}{5}$
$x = 36°$

(ii) $7x° + 2x° = 180°$ (linear pair property)
$9x = 180°$
$x = \frac{180°}{9}$
$x = 20°$

(iii) $(3x + 10°) + (2x + 5°) = 180°$ (l.p.p.)
$5x + 15° = 180°$
$5x = 180° - 15°$
$5x = 165°$
$x = \frac{165°}{5}$
$x = 33°$

(iv) $x + 80° + x = 180°$ (Straight line)
$2x + 80° = 180°$
$2x = 180° - 80°$
$2x = 100°$
$x = \frac{100°}{2}$
$x = 50°$

(v) $x + 2x + 3x + 4x = 180°$ (straight line)
$10x = 180°$
$x = \frac{180°}{10}$
$x = 18°$

(vi) $2x + x = 90°$ (right angle)
$3x = 90°$
$x = \frac{90°}{3}$
$x = 30°$

8. In the given figure, name the following pairs of angles : (i) $\angle XOP$ and $\angle YOQ$
(ii) $\angle SOQ$ and $\angle ROQ$ (iii) $\angle ROX$ and $\angle XOP$
(iv) $\angle QOR$ and $\angle ROP$ (v) $\angle POX$ and $\angle XOR$

9. Let an angle = x
Its supplement = $180°-x$
then, $x-(180°-x) = 30°$
$x-180°+x = 30°$
$2x = 30°+180°$
$2x = 210°$
$x = \frac{210°}{2} = 105°$
Hence, Ist angle = $x = 105°$
IInd angle = $180°-x = 180°-105° = 75°$

10. Let an angle be x.
Its complement = $90°-x$
We have, $90-x = 25°$
$90-25 = x$
$65 = x$
Now , supplement of $65° = 180°-65°$
$= 105°$

11. In the figure, if $\angle 1 = 35°$, find $\angle 2$, $\angle 3$ and $\angle 4$.
We have, $\angle 1 = 35°$
then, $\angle 2 = 180°-35°$ (linear pair)
$\angle 2 = 145°$
Now, $\angle 3 = \angle 1 = 35°$ (Vertically opposite angles)
and $\angle 4 = \angle 2 = 145°$ (Vertically opposite angles)

12. No, in the given figure $\angle ABC$ and $\angle BCD$ do not form a pair of adjacent angles, because they have no common vertex.

Exercise 9.2

1. Line l is the transversal to the lines m and n. Identify the following :
(i) $\angle a$ and $\angle e$, $\angle d$ and $\angle h$, $\angle b$ and $\angle f$, $\angle c$ and $\angle g$ (ii) $\angle c$ and $\angle e$, $\angle f$ and $\angle d$
(iii) $\angle a$ and $\angle g$, $\angle h$ and $\angle b$ (iv) $\angle c$ and $\angle f$, $\angle d$ and $\angle e$
(v) $\angle b$ and $\angle g$, $\angle a$ and $\angle h$

2. Find the value of x in the following figures, if $c \parallel d$:
(i) $x+115° = 180°$ (sum of co-interior angles is 180°)
$x = 180°-115°$
$x = 65°$
(ii) $x+98° = 180°$ (linear pair property)
$x = 180°-98°$
$x = 82°$

(iii) $x + 130° = 180°$ (linear pair property)

$x = 180° - 130°$

$x = 50°$

(iv) $x + 54° = 180°$ (linear pair property)

$x = 180° - 54°$

$x = 126°$

3. In the given figure, check whether $p \parallel q$:

(i) $61° + 61° = 122°$

$\neq 180°$

So, p and q are not parallel.

(ii) $53° + 127° = 180°$

$\Rightarrow$ $p \parallel q$

(iii) $99° + 81° = 180°$

$\Rightarrow$ $p \parallel q$

(iv) $110° + 120° = 230°$

$\neq 180°$ So p and q are not parallel.

4. $\angle PQR = \angle BPQ + QRD$

$= 20° + 30°$

$= 50°$

5. $\angle 1 = 180° - 70°$ (linear pair)

$= 110°$

$\angle 3 = \angle 1 = 110°$ (vertically opposite angles)

$\angle 2 = 70°$ (vertically opposite angles)

$\angle 4 = \angle 1 = 110°$ (corresponding angles)

$\angle 5 = \angle 2 = 70°$ (corresponding angles)

$\angle 6 = \angle 3 = 110°$ (corresponding angles)

$\angle 7 = 70°$ (corresponding angles)

6. $\angle y = 180° - 43°$ (linear pair)

$= 137°$

$\angle x = 43°$ (alternate interior angles)

$\angle z = \angle x = 43°$ (vertically opposite angles)

7. In the following figure, if $q \parallel r$, find the value of t.

Since $q \parallel r$ and p is a transversal,

$8t - 21 = 15 - 10t$ (alternate exterior angles)

$8t + 10t = 15 + 21$

$18t = 36$

$t = \frac{36}{18}$

$t = 2$

8. In the given figure, $AB \parallel DC$ and $AD \parallel BC$. Find the value of x and y :

Since $AD \parallel BC$

$\angle y = 60°$ (alternate interior angles)

$\angle x = 40°$ (alternate interior angles)

Chapter 10 : Triangles and their Properties

Exercise 10.1

1. Find the value of unknown angles in the following figures :

(i) by angle sum property of a triangle

$\angle A + \angle B + \angle C = 180°$

$x + 70° + 60° = 180°$

$x + 130° = 180°$

$x = 180° - 130°$

$x = 50°$

(ii) by angle sum property of a triangle

$\angle D + \angle E + \angle F = 180°$

$90° + 30° + x = 180°$

$120° + x = 180°$

$x = 180° - 120°$

$x = 60°$

(iii) by angle sum property of a triangle

$\angle P + \angle Q + \angle R = 180°$

$x + x + x = 180°$

$3x = 180°$

$x = \frac{180°}{3}$

$x = 60°$

(iv) by angle sum property of a triangle

$\angle L + \angle M + \angle N = 180°$

$x + 115° + 30° = 180°$

$x + 145° = 180°$

$x = 180° - 145°$

$x = 35°$

(v) $\angle x = 74°$ (Vertically opposite angles)

Now, by angle sum property of a triangle

$x + 40° + y = 180°$

$74° + 40° + y = 180°$

$114° + y = 180°$

$y = 180° - 114°$

$y = 166°$

2. If first angle of a triangle = 40°

Second angle of the triangle = 70°

$\angle A + \angle B + \angle C = 180°$ (by angle sum property of a Δ)

then, $40° + 70° + \angle C = 180°$

$110° + \angle C = 180°$

$\angle C = 180° - 110°$

$\angle C = 70°$

Hence, third angle of the triangle is 70°

3. Let first angle of a triangle = $2x$

Second angle of the triangle = $3x$

Third angle of the triangle = $4x$

By angle sum property of a triangle

$\angle A + \angle B + \angle C = 180°$

$$2x + 3x + 4x = 180°$$

or $$9x = 180°$$

$\therefore$ $$x = \frac{180°}{9}$$

$$x = 20°$$

Hence, I angle $= 2x = 2 \times 20° = 40°$

II angle $= 3x = 3 \times 20° = 60°$

III angle $= 4x = 4 \times 20° = 80°$

4. Let the smallest angle of the triangle $= x$
second angle of the triangle $= 4x$

third angle of the triangle $= 5x$

By angle sum property of a Δ,

$$\angle A + \angle B + \angle C = 180°$$

$$x + 4x + 5x = 180°$$

$$10x = 180°$$

$$x = \frac{180°}{10}$$

$$x = 18°$$

Hence, the smallest angle $= x = 18°$

Second angle $= 4x = 4 \times 18° = 72°$

Third angle $= 5x = 5 \times 18° = 90°$

5. In right angled triangle $\angle A = 90°$

Let $\angle B = 2x$,

$\angle C = 3x$

By angle sum property of a Δ,

$$\angle A + \angle B + \angle C = 180°$$

$$90° + 2x + 3x = 180°$$

$$5x = 180° - 90°$$

$$5x = 90°$$

$$x = \frac{90°}{5}$$

$$x = 18°$$

Hence, $\angle B = 2x = 2 \times 18° = 36°$

$\angle C = 3x = 3 \times 18° = 54°$

6. We have, $\angle A = \angle B + \angle C$
Now, by angle sum property of a Δ,

$$\angle A + \angle B + \angle C = 180°$$

$$\angle A + \angle A = 180°$$

or $2\angle A = 180°$

$\therefore \quad \angle A = \frac{180°}{2}$

$\angle A = 90°$

7. We have, in ΔABC

$\angle A = 100°$ and $\angle B = \angle C = x$ (let)

By angle sum property of a Δ,

$\angle A + \angle B + \angle C = 180°$

$100° + x + x = 180°$

$2x = 180° - 100°$

$2x = 80°$

$x = \frac{80°}{2}$

$x = 40°$

Hence, equal angles $\angle B = \angle C = x = 40°$

8. Since $DE \| BC$,

$\therefore \quad \angle x = 30°$ (corresponding angles)

Now, in ΔADE by angle sum property of a Δ ,

$\angle A + \angle D + \angle E = 180°$

$40° + x + z = 180°$

$40° + 30° + z = 180°$

$70° + z = 180°$

$z = 180° - 70°$

$z = 110°$

$\therefore \quad \angle y = \angle z = 110°$ (corresponding angles)

9. (i) Yes, sum of the three angles of a triangle is 180°. If one of the angles is obtuse then the other two are less than 90° (acute angles).

(ii) No, obtuse angle is greater than 90° and as sum of three angles is equal to 180°. So, two angles can never be 90° or grater than 90°.

(iii) No, if all angles are less than 60° each then their sum will be less than 180° which is not possible in a triangle.

(iv) No, because sum of three angles is 180°. So two angles can never be 90° or greater 90°.

10. Find the unknown angles in the following figures :

(i) In ΔADC ,

$\angle A + \angle D + \angle C = 180°$ (by angle sum property of a Δ)

$45° + x + 60° = 180°$

$x + 105° = 180°$ $x = 180° - 105°$

$x = 75°$

$\therefore \quad y + x = 180°$ (linear pair property)

$$y + 75° = 180°$$
$$y = -75° = 180°$$
$$y = 105°$$

Now, In ΔABD

$$\angle A + \angle B + \angle D = 180° \quad \text{(by angle sum property of a } \Delta\text{)}$$
$$z + 40° + y = 180°$$
$$z + 40° + 105° = 180°$$
$$z + 145° = 180°$$
$$z = 180° - 145°$$
$$z = 35°$$

(ii) In ΔPQR

$$\angle P + \angle Q + \angle R = 180° \quad \text{(by angle sum property of a } \Delta\text{)}$$
$$x + 90° + 20° = 180°$$
$$x + 110° = 180°$$
$$z = 180° - 110°$$
$$z = 70°$$

Now, $y = 20°$ (Vertically opposite angles)

$$u + 20° = 180°$$
$$u = 180° - 20°$$
$$u = 160°$$

and $v = u = 160°$

11. In ΔACE,

$\angle A + \angle C + \angle E = 180°$ (by angle sum property of a Δ)

In ΔBDF, …(1)

$\angle B + \angle D + \angle F = 180°$ (by angle sum property of a Δ) …(2)

On adding the corresponding parts of (1) and (2), we get,

$$\angle A + \angle C + \angle E + \angle B + \angle D + \angle F = 180° + 180°$$
$$\Rightarrow \quad \angle A + \angle C + \angle E + \angle B + \angle D + \angle F = 360°$$

12. We have, in a ΔABC

$$\angle A = \angle B = 2\angle C$$

by angle sum property of a Δ,

$$\angle A + \angle B + \angle C = 180°$$
$$2\angle C + 2\angle C + \angle C = 180°$$
$$5 < = 180°$$
$$\angle C = \frac{180°}{5}$$
$$\angle C = 36°$$
$$\therefore \quad \angle A = \angle B = 2\angle C = 2 \times 36° = 72°$$

Exercise 10.2

1. Are the following figures correct ? Give reasons for your answers :

(i) Yes, external angle = sum of the interior opposite angles

$$110° = 50° + 60°$$

$$110° = 110°$$

(ii) No, external angle ≠ sum of the interior opposite angles

$$100° \neq 55° + 40°$$

$$100° \neq 95°$$

(iii) Yes, external angle = sum of the interior opposite angles

$$120° = 50° + 70°$$

$$120° = 120°$$

2. Find angle x in the following figures :

(i) Exterior angle = sum of the interior opp. angles

$$115° = x + 35°$$

$$x = 115° - 35°$$

$$x = 80°$$

(ii) Exterior angle = sum of the interior opp. angles

$$108° = x + 50°$$

$$x = 108° - 50°$$

$$x = 58°$$

(iii) Exterior angle = sum of the interior opp. angles

$$x = 90° + 30°$$

$$x = 120°$$

(iv) Exterior angle = sum of the interior opp. angles

$$120° = x + x$$

$$120° = 2x$$

$$x = \frac{120°}{2}$$

$$x = 60°$$

3. Exterior angle of a $\Delta = 110°$

One of its interior opposite angles = 60°

then, exterior angle = sum of the interior opposite angles

$$110° = 60° + x$$

$$x = 110° - 60°$$

$$x = 50°$$

Hence, the measure of other interior opposite angle is 50°

4. If exterior angle of a $\Delta = 80°$
and other two interior opp. angles are $3x$ and $5x$
then, exterior angle = sum of the interior opp. angles

$$80° = 3x + 5x$$

or $$80° = 8x$$

or $$x = \frac{80°}{8}$$

$$x = 10°$$

Hence, the measure of two interior opp. angles

$$= 3x = 3 \times 10° = 30°$$

and $$= 5x = 5 \times 10° = 50°$$

5. If $\angle ACD = 115°$
then by exterior angle = sum of the interior opp. angles

$$\angle ACD = \angle ABC + \angle CAB$$

$$115° = 95° + \angle CAB$$

$$\angle CAB = 115° - 95°$$

$$\angle CAB = 20°$$

$\therefore$ $\angle CAE = 180° - CAB$ (linear pair property)

$$= 180° - 20°$$

$$\angle CAE = 160°$$

6. In the figure, $y + 70° = 180°$ (linear pair property)

$$y = 180° - 70°$$

$$y = 110°$$

Now, in CAB, by angle sum property of a Δ ,

$$\angle A + \angle C + \angle B = 180°$$

$$40° + \angle C + y = 180°$$

$$40 + \angle C + 110° = 180°$$

$$150° + \angle C = 180° - 150°$$

$$\angle C = 30°$$

$x = 180° - \angle ACB$ (linear pair property)

$$= 180° - 30°$$

$$x = 150°$$

7. In ΔPQR

$\angle PQR = 180° - 120°$ (linear pair property)

$$= 60°$$

and $\angle PRT = 180° - 130°$ (linear pair property)

$$= 50°$$

Now, in ΔPQR by angle sum property of a Δ,

$$\angle P + \angle Q + \angle R = 180°$$

$$\angle P + 60° + 50° = 180°$$

$$\angle P = 180° - 110°$$

$$\angle P = 70°$$

8. In the given figure,

$$\angle BCA = 50°, \angle ADB = 80°$$

and $$\angle A = 4\angle ABD$$

In ΔABD by angle sum property of a Δ,

$$\angle ABD + \angle BAD + \angle BDA = 180°$$

$$\angle ABD + 4\angle ABD + 80° = 180°$$

$$5\angle ABD = 180° - 80°$$

$$5\angle ABD = 100°$$

$$\angle ABD = \frac{100°}{5}$$

$$\angle ABD = 20°$$

and $$\angle A = 4\angle ABD$$

$$= 4 \times 20° = 80°$$

$$\angle A = 80°$$

Now, in ΔABC by angle sum property of a Δ,

$$\angle A + \angle B + \angle C = 180°$$

$$80° + \angle B + 50° = 180°$$

$$130° + \angle B = 180°$$

$$\angle B = 180° - 130°$$

$$\angle B = 50°$$

Hence, $$\angle ABC = 50°$$

9. If in isosceles ΔABC, $AB = AC$

$\Rightarrow$ $$\angle B = \angle C = 45°$$ (Given)

then by angle sum property of a Δ,

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

$$45° + \angle BAC + 45° = 180°$$

$$\angle BAC + 90° = 180°$$

$$\angle BAC = 180° - 90°$$

$$\angle BAC = 90°$$

$\therefore$ $$x = \angle DAC$$

$$= 180° - \angle BAC$$ (linear pair)

$$= 180° - 90°$$

$$x = 90°$$

10. Find the unknown angles in the fillowing figures :

(i) In ΔABC, $AB = AC$

$\Rightarrow$ $\angle B = \angle C$

So, $x = 45°$

Now, by angle sum property of a Δ,

$$\angle A + \angle B + \angle C = 180°$$
$$\angle A + x + 45° = 180°$$
$$\angle A + 45° + 45° = 180°$$
$$\angle A = 180° - 90°$$
$$\angle A = 90°$$

(ii) In ΔPQR, by angle sum property of a Δ,

$$\angle P + \angle Q + \angle R = 180°$$
$$\angle P + 90° + 45° = 180°$$
$$\angle P + 135° = 180°$$
$$\angle P = 180° - 135°$$
$$\angle P = 45°$$

(iii) In ΔDEF, $DE = DF$

$\Rightarrow$ $\angle E = \angle F = 62°$

$\therefore$ In ΔDEF by angle sum property of a Δ,

$$\angle D + \angle E + \angle F = 180°$$
$$\angle D + 62° + 62° = 180°$$
$$\angle D + 124° = 180°$$
$$\angle D = 180° - 124°$$
$$\angle D = 56°$$

Now, $y = \angle GDF = 180° - 56°$ (linear pair)

$= 124°$

(iv) In ΔPQR,

$$y + 104° = 180°$$
$$y = 180° - 104°$$
$$y = 76°$$

Now, in ΔPQR, by angle sum property of a Δ,

$\angle P + \angle Q + \angle R = 180°$ [$\because$ $PR = QR$, $\angle P = \angle Q$]

$x + x + y = 180°$

or $2x + 76° = 180°$

$2x = 180° - 76°$

$2x = 104°$

$\therefore \quad x = \frac{104^\circ}{2}$

$x = 52^\circ$

(v) In ΔABC, $AB = AC$

$\Rightarrow \quad \angle B = \angle C$

$\angle A + \angle B + \angle C = 180^\circ$ (by angle sum property of a Δ)

$30^\circ + \angle C + \angle C = 180^\circ$

or $30^\circ + 2\angle C = 180^\circ$

or $2\angle C = 180^\circ - 30^\circ$

or $\angle C = \frac{150^\circ}{2}$

$\angle C = 75^\circ$

$\therefore \quad \angle B = \angle C = 75^\circ$

Now, $x = 180^\circ - \angle B$ (linear pair)

$= 180^\circ - 75^\circ$

$= 105^\circ$

and $y = 180^\circ - \angle C$ (linear pair)

$= 180^\circ - 75^\circ$

$= 105^\circ$

11. We have, in an isosceles ΔABC

$AB = AC$

$\Rightarrow \quad \angle B = \angle C$

and given $\angle B = 2\angle A$

then by angle sum property of a Δ,

$\angle A + \angle B + \angle C = 180^\circ$

$\angle A + 2\angle A + 2\angle A = 180^\circ$

$5\angle A = 180^\circ$

$\angle A = \frac{180^\circ}{5}$

Hence, $\angle A = 36^\circ$

$\angle B = \angle C = 2\angle A = 2 \times 36^\circ = 72^\circ$

12. In the given figure,

$x = 180^\circ - 110^\circ$ (linear pair)

$x = 70^\circ$

Now, in ΔABC, by angle sum property of a Δ,

$\angle A + \angle B + \angle C = 180^\circ$

$40^\circ + x + y = 180^\circ$

$40^\circ + 70^\circ + y = 180^\circ$

$= 180° - 110°$

$y = 70°$

here, $x = y = 70°$

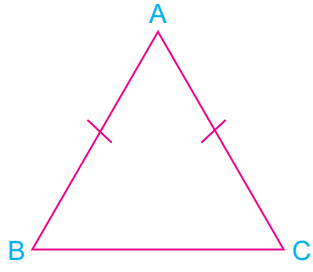
$\Rightarrow \quad \angle B = \angle C$

$\Rightarrow \quad AB = AC$

Hence, ΔABC is an isosceles triangle.

13. We have, in an isosceles triangle ABC,

$\angle A = 4\angle B$



We have, that in an isosceles triangle

$AB = AC$

$\Rightarrow \quad \angle B = \angle C$

Then by angle sum property of a Δ, $\angle A + \angle B + \angle C = 180°$

$4\angle B + \angle B + \angle B = 180°$

$6\angle B = 180°$

$\angle B = \frac{180°}{6}$

$\angle B = 30°$

Hence, $\angle A = 4\angle B = 4 \times 30° = 120°$

and $\angle B = \angle C = 30°$

14. In a right angled isosceles triangle ABC

$\angle B = 90°$

$AB = BC$

$\Rightarrow \quad \angle A = \angle C = x$ (let)

By angle sum property of a Δ,

$\angle A + \angle B + \angle C = 180°$

$x + 90° + x = 180°$

$2x + 90° = 180°$

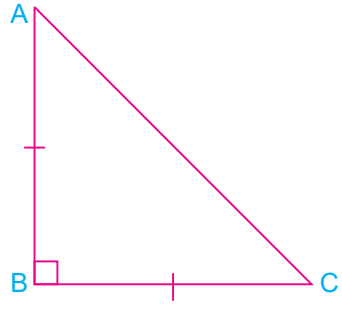
$2x = 180° - 90°$

$2x = 90°$

$x = \frac{90°}{2}$

$x = 45°$

Hence, $\angle A = \angle C = x = 45°$



Exercise 10.3

1. Fill in the blanks :

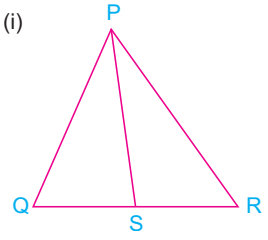
(i) Perpendicular line segment, opposite

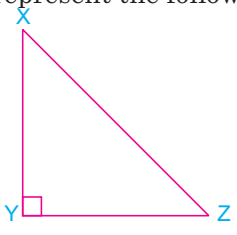
(ii) line segment, mid point

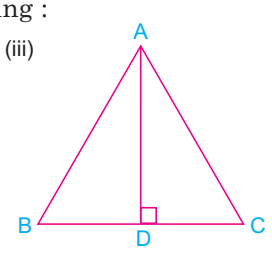
(iii) AC and CB

(iv) interior

2. Draw rough diagrams which represent the following :

(i) 

(ii) 

(iii) 

3. (i) A triangle can have only 3 medians (from three vertices)
(ii) A triangle can have only 3 altitudes. (from three vertices)

4. If in a given ΔABC, medians $BE = CF$
then it is an isosceles triangle

Hence, option (ii) is correct.

Exercise 10.4

1. (i) right triangle (Pythagorean triplet)
(ii) not possible (Not Pythagorean Triplet)
(iii) Scalene triangle (Pythagorean triplet)
(iv) Scalene triangle (Pythagorean triplet)

2. Find the unknown length in the fillowing figures :

(i) In right angled ΔABC
by Pythagoras Property

$$(AC)^2 = (AB)^2 + (BC)^2$$
$$x^2 = (4)^2 + (3)^2$$
or $$x^2 = 16 + 9$$
or $$x^2 = 5^2$$
$\therefore$ $$x = 5\,\text{cm}$$

(ii) In right angled ΔPQR
by Pythagoras Property

$$(PR)^2 = (PQ)^2 + (RQ)^2$$
$$x^2 = (6)^2 + (8)^2$$
or $$x^2 = 36 + 64$$
or $$x^2 = 100$$
or $$x^2 = 10^2$$
$\therefore$ $$x = 10\,\text{cm}$$

(iii) In right angled ΔLMN
by Pythagoras Property

$$(LN)^2 = (LM)^2 + (MN)^2$$
$$(13)^2 = (5)^2 + x^2$$
or $$169 = 25 + x^2$$

or $169 - 25 = x^2$

or $144 = x^2$

or $12^2 = x^2$

$\therefore$ $x = 12\,\text{cm}$

(iv) In right angled ΔPQR

by Pythagoras Property

$$(PR)^2 = (PQ)^2 + (RQ)^2$$

$$x^2 = (24)^2 + (7)^2$$

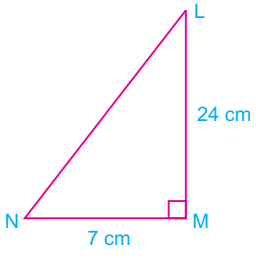
or $x^2 = 576 + 49$

or $x^2 = 625$

or $x^2 = 25^2$

$\therefore$ $x = 25\,\text{cm}$

3. In right angled ΔLMN by Pythagoras Property



$$(LN)^2 = (LM)^2 + (MN)^2$$

$$= (24)^2 + (7)^2$$

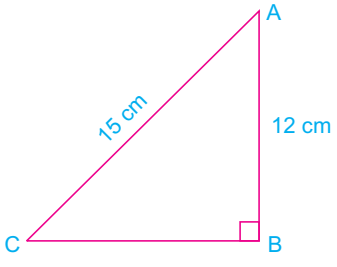
$$= 576 + 49$$

$$(LN)^2 = 625$$

$$(LN)^2 = 25^2$$

$\therefore$ Hypotenuse $LN = 25\,\text{cm}$

4. In right triangle ABC, by Pythagoras Property



$$(AC)^2 = (AB)^2 + (BC)^2$$

$$(15)^2 = (12)^2 + (BC)^2$$

$$225 = 144 + (BC)^2$$

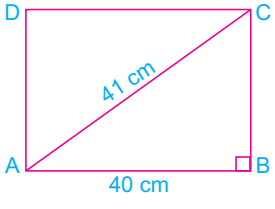
or $225 - 144 = BC^2$

or $81 = BC^2$

or $BC^2 = 9^2$

$\therefore$ (third side) $BC = 9\,\text{cm}$

5. In right angled ΔABC, by Pythagoras Property



$$(AC)^2 = (BC)^2 + (AB)^2$$

$$(41)^2 = (BC)^2 + (40)^2$$

$$1681 = (BC)^2 + 1600$$

$$1681 - 1600 = (BC)^2$$

$$81 = (BC)^2$$

$$9^2 = BC^2$$

(breadth of rectangle) $BC = 9\,\text{cm}$

and length $AB = 40$ cm (Given)

Now, Perimeter of rectangle $= 2 \times (l + b)$

$= 2 \times (40 + 9)$

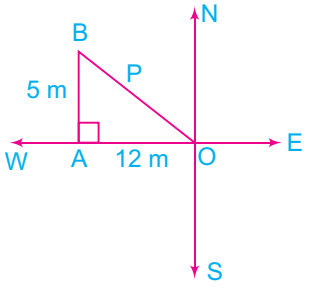
$= 2 \times 49$

$= 98$ cm

Hence, the perimeter of rectangle is 98 cm.

6. Let O be the starting position of Niru

$\therefore$ $OA = 12$ m $AB = 5$ m, $OB = ?$



In the right angled ΔOAB

$(OB)^2 = (OA)^2 + (AB)^2$ by Pythagoras Property

$= (12)^2 + (5)^2$

$= 144 + 25$

$= 169$

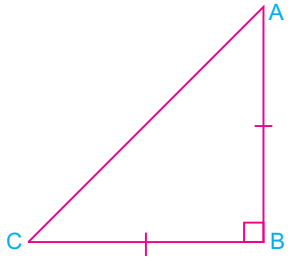
or $(OB)^2 = (13)^2$

$= OB = 13$ m

Hence, Niru is at a distance of 13 m from her starting point.

7. Let ABC be an isosceles triangle, right angled at $B, AB = BC$, $AC^2 = 50\,\text{cm}^2$

by Pythagoras property



$(AC)^2 = (AB)^2 + (BC)^2$

$50 = x^2 + x^2$

or $50 = 2x^2$

or $\frac{50}{2} = x^2$

or $x^2 = 25$

or $x^2 = 5^2$

$\therefore$ $x = 5$ cm

Hence, each of equal sides of the isosceles triangle is 5 cm.

8. Let the three sides be

$a = 6$ cm, $b = 4.5$ and $c = 7.5$ cm

$a^2 + b^2 = (6)^2 + (4.5)^2$

$= 36 + 20.25 = 56.25$

and $c^2 = (7.5)^2$

$= 56.25$

Since, $a^2 + b^2 = c^2$

So, this triangle is a right triangle with hypotenuse (longest side) 7.5 cm.

9. We have,

$PR = 17$ m, $PQ = 15$ m and $QP = ?$

In right angled triangle PQR, by Pythagoras Property,

$(PR)^2 = (PQ)^2 + (QR)^2$

$(17)^2 = (15)^2 + (QR)^2$

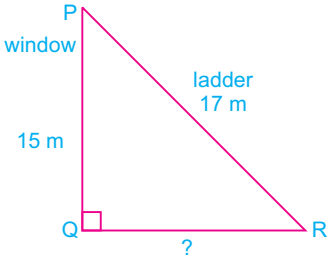
$289 = 225 + (QR)^2$

or $289 - 225 = (QR)^2$

or $64 = (QR)^2$

or $QR^2 = 8^2$

$\therefore$ $QR = 8$ m



Hence, the lower end of the ladder is 8 m for from the base of the wall.

10. In right angled triangle ABC, by Pythagoras property

$(AC)^2 = (AB)^2 + (BC)^2$

$(26)^2 = (AB)^2 + (10)^2$

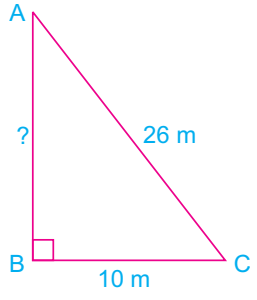
$676 = (AB)^2 + 100$

or $676 - 100 = (AB)^2$

or $576 = (AB)^2$

or $(AB)^2 = 24^2$

$\therefore$ $AB = 24$ cm



11. Let total height of the tree before falling be AB. Let C be the point from where the trunk is bent so that the point B touches the ground at point D.

then, $CD = CB$

height of tree $= AC + CD$

Now, in right angled ΔDAC,

$(CD)^2 = (AC)^2 + (AD)^2$ (Pythagoras property)

$= (6)^2 + (8)^2$

$= 36 + 64$

$(CD)^2 = 100$

$CD^2 = 10^2$

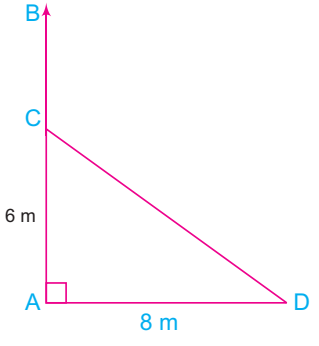
$CD = 10$ m

Hence, the total (actual) height of the tree

$= AC + CD$

$= (6 + 10)$ m

$= 16$ m



12. Let AB and CD be the given poles and AC be the distance between them. Draw $DE \perp AB$ and join BD.

$AB = 36$ m, $CD = 21$ m, $AC = 36$ m, $DE = 36$ m,

$BE = AB - AE$

$= AB - CD$

$= 36 - 21 = 15$

In ΔBED, $\angle E = 90°$

$DE = 36$ m, $BE = 15$ m

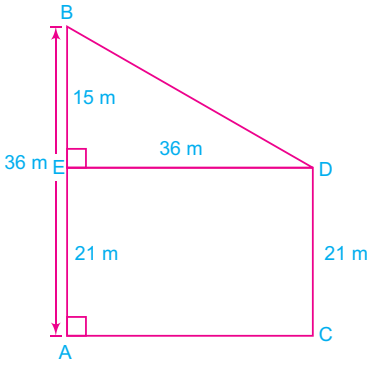
In right angled triangle BED, by Pythagoras property

$$(BD)^2 = (BE)^2 + (DE)^2$$
$$= (15)^2 + (36)^2$$
$$= 225 + 1296$$
$$= 1521$$

or $(BD)^2 = 39^2$

$\therefore$ $BD = 39$ m

Hence, the distance between their tops is 39 m.



Chapter 11 : Congruent Triangles

Exercise 11.1

1. Which of the following line segments are congruent? (Measure and state) :

Do yourself by measuring with ruler.

2. Which of the following angles are congruent? (Measure and state)

Do yourself by measuring with protractor.

3. Fill in the Blanks :

(i) they have the same measure

(ii) length, breadth

(iii) size, shape

(iv) 5 cm

4. According to congruence rule,

$CAB \leftrightarrow EDF$

(i) $AC = DE$ (iii) $\angle B = \angle F$

(v) $\angle A = \angle D$ and (vi) $AB = DF$

only these four statements are correct.

5. We have, $\angle AOC = \angle DOB$

then $\angle AOD = \angle BOC$

$\Rightarrow$ $\angle AOD \cong \angle BOC$

Exercise 11.2

1. (i) No

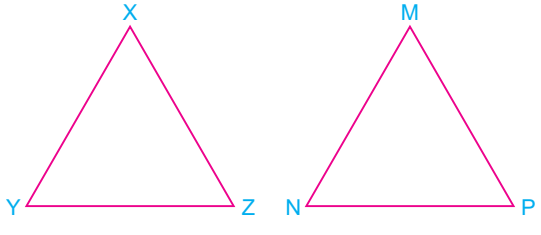
(ii) No

(iii) Yes, $\Delta XYZ \cong \Delta MNP$

because $XZ \leftrightarrow MP$ (4.5 cm)

$YZ \leftrightarrow NP$ (3 cm)

$\angle X \leftrightarrow \angle M$ (60°)



2. From the given figure :
In ΔCAB and ΔDAB,

$AC = AD$ (4.5 cm)

$CB = DB$ (3 cm)

$AB = AB$ (common)

by SSS congruence condition $\Delta CAB \cong \Delta DAB$

3. From the given figure,
In ΔPQO and ΔPRO

$PQ = PR$ (Given)

$QO = OR$ (O is mid point)

$PO = PO$ (common)

by SSS congruence condition

$\Delta PQO \cong \Delta PRO$

4. In ΔABC and ΔACB
(where ΔABC is an equilateral triangle)

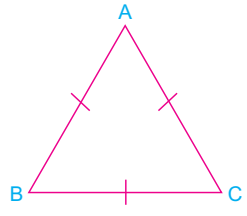
$AB = AC$

$BC = BC$

$\angle B = \angle C$

by SAS congruence condition

$\Delta ABC \cong \Delta ACB$



5. (i) From the given figure,
In ΔABC and ΔDBC

$AC = DC$ (Given)

$AB = DB$ (given)

$BC = BC$ (common)

by SSS congruence condition

$\angle ABC \cong \Delta\ DBC$

(ii) Yes, BC bisects $\angle ABD$ and $\angle ACD$ by C.P.C.T. (corresponding parts of congruent triangles)

(iii) Yes, $\angle A = \angle D$ (by C.P.C.T.)

6. From the figure,
In ΔABC and ΔCDA

$\angle BAC = \angle DCA$ (Given)

$\angle BCA = \angle DAC$ (Given)

$AC = AC$ (common)

by ASA congruence condition

$\Delta ABC \cong \Delta CDA$

7. In ΔCBD and ΔBCE

$BD = CE$ (Given)

$\angle D = \angle E$ (90°)

$BC = BC$ (common)

$\Delta CBD \cong \Delta BCE$

by C.P.C.T., $CD = BE$

8. In ΔPQO and ΔSRO

$\angle POQ = \angle ROS$ (Given)

$PO = SO$ (Given)

$\angle PQO = \angle SRO$ (Given)

by ASA congruence condition

$\Delta PQO \cong \Delta SRO$

9. In ΔPQS and ΔRQS

$PQ = QR$ (Given)

$\angle QSP = \angle QSR$ (90°)

$QS = QS$ (Common)

by SAS congruence condition

$\Delta PQS \cong \Delta RQS$

10. We have, $ABCD$ is a parallelogram and in a || gm opposite sides and opposite angles are equal.

Now, In ΔABD and ΔDCA

$AB = DC$ (opposite sides of || gm)

$BD = AC$ (opposite sides of || gm)

$AD = AD$ (Common)

by SSS congruence condition

$\Delta ABD \cong \Delta DCA$

11. From the given figure

In ΔPQM and ΔPRM

$PQ = PR$ (Given)

$PM = PM$ (common)

$\angle QPM = \angle RPM$ (Given)

by SAS congruence condition, $\Delta PQM \cong \Delta PRM$

by C.P.C.T., $QM = MR$

$\Rightarrow$ M is the mid point of QR.

12. In ΔADC and ΔCBA

$AD = BC$ (Given)

$CD = AB$ (Given)

$CA = CA$ (Common)

by SSS congruence condition

$\Delta ADC \cong \Delta CBA$

Chapter 12 : Practical Geometry

Exercise 12.1

Do yourself.

Exercise 12.2

Do yourself.

Exercise 12.3

Do yourself.

Exercise 12.4

Do yourself.

Exercise 12.5

Do Yourself.

Chapter 13 : Perimeter and Area

Exercise 13.1

1. Length of the rectangle = 60 cm
Breadth of the rectangle = 40 cm

$\therefore$ Area of the rectangle = $l \times b$

$= 60 \times 40\ \text{cm}^2$

$= 2400\ \text{cm}^2$

2. Perimeter of square = 80 m

$4 \times \text{side} = 80\ \text{m}$

$\text{side} = \frac{80}{4}$

$\text{side} = 20\ \text{m}$

Now, area of the square = side $\times$ side

$= 20 \times 20\ \text{m}^2$

$= 400\ \text{m}^2$

3. Area of the rectangle = $560\ \text{cm}^2$

Breath of the rectangle = 20 cm

$\therefore$ Area of rectangle = $l \times b$

$560 = l \times 20$

$\frac{560}{20} = l$

$l = 28\ \text{cm}$

$\therefore$ Perimeter of rectangle = $2 \times (l + b)$

$= 2 \times (28 + 20)$

$= 2 \times 48$

$= 96\ \text{cm}$

4. Length of the rectangle = 70 m

Breath of the rectangle = $40\frac{1}{2}$ m

$\therefore$ Perimeter of rectangle = $2 \times (l + b)$

$$= 2 \times \left(70 + 40\frac{1}{2}\right)$$

$$= 2 \times \left(70 + \frac{81}{2}\right)$$

$$= 2 \times \left(\frac{140 + 81}{2}\right)$$

$$= 221 \text{ m.}$$

and Area of rectangle $= l \times b$

$$= 70 \times 40\frac{1}{2} \text{ m}^2$$

$$= 70 \times \frac{81}{2} \text{ m}^2$$

$$= 35 \times 81 \text{m}^2 = 2835 \text{m}^2$$

5. We have, side of the square = 8 cm

Length of the rectangle = 12 cm

Given : Perimeter of the rectangle = Perimeter of the square

$$2(l + b) = 4 \times \text{side}$$

$$2(12 + b) = 4 \times 8$$

$$24 + 2b = 32$$

$$2b = 32 - 24$$

$$2b = 8$$

$$b = \frac{8}{2} = 4$$

$\therefore$ breadth of the rectangle $b = 4$ cm

6. Side of the square = 75 mm

$$= 7.5 \text{ cm}$$

Perimeter of square $= 4 \times$ side

$$= 4 \times 7.5 \text{ cm} = 30.0 \text{ cm}$$

Area of square = side $\times$ side

$$= 7.5 \times 7.5 \text{ cm}^2$$

$$= 56.25 \text{ cm}^2$$

7. Length of the room = 1500 cm = 15 m

Breadth of the room = 10 m

$\therefore$ Area of the room $= l \times b$

$$= 15 \times 10 \text{ m}^2$$

$$= 150 \text{m}^2$$

So, the Area of carpet is 150m^2 that covers the floor of the room.

Cost of dry cleaning the carpet = ₹ 15×150

= ₹ 2250

8. Diagonal length of a square = 16 cm

$$a\sqrt{2} = 16$$

$$a = \frac{16}{\sqrt{2}}$$

$\therefore$ side of square $= \frac{16}{\sqrt{2}}$

Now, Area of the square = side × side

$$= \frac{16}{\sqrt{2}} \times \frac{16}{\sqrt{2}}$$

$$= \frac{256}{2} = 128\,\text{cm}^2$$

10. Given that total wire remains same both for square as well as rectangle

Perimeter of rectangle = Perimeter of square

$$2 \times (l + b) = 4 \times \text{side}$$

$$2 \times (12 + 10) = 4 \times \text{side}$$

$$2 \times 22 = 4 \times a$$

$$\frac{44}{4} = a$$

$\therefore$ side of the square $a = 11$ cm

11. Length of the wall = 4.84m = 484 cm

Height of the wall = 3.1m = 310 cm

$\therefore$ Area of the wall $= l \times b$

$$= 484 \times 310\,\text{cm}^2$$

length of the tile = 22 cm

breath of the tile = 10 cm

$\therefore$ Area of the tile $= l \times b$

$$= 22 \times 10\,\text{cm}^2$$

$$\text{No. of tiles} = \frac{\text{Area of the wall}}{\text{Area of a tile}}$$

$$= \frac{484 \times 310}{22 \times 10}$$

$$= 22 \times 31$$

$$= 682 \text{ tiles}$$

Total cost of the tiles at ₹ 1.50 per tile

$$= ₹\ 682 \times 1.50$$

$$= ₹\ 1023$$

12. Area of the room $= \frac{\text{Total cost}}{\text{Cost at per metre}}$

$$= \frac{₹1125}{₹25}$$

$$= 45\,\text{m}^2$$

Width of the room = 5 m

$\therefore$ Area of the room $= l \times b$

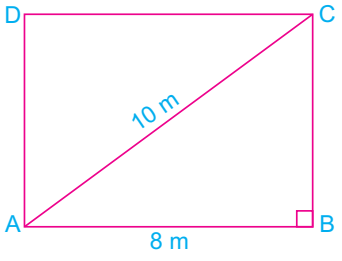
$45 = l \times 5$

$= \frac{45}{5} = 9$

$\therefore$ (length of the room) $l = 9$ m

13. Length of diagonal $= 10$ m

Length of rectangle $= 8$ m



Now, in right angled ΔABC by Pythagoras property

$(AC)^2 = (AB)^2 + (BC)^2$

$(10)^2 = (8)^2 + (BC)^2$

$100 = 64 + (BC)^2$

$100 - 64 = (BC)^2$

$36 = (BC)^2$

$BC^2 = 6^2$

$\therefore$ Breath of the rectangle, $BC = 6$ m

$\therefore$ Area of the rectangular plot $= l \times b$

$= 8\,\text{m} \times 6\,\text{m}$

$= 48\,\text{m}^2$

14. Length of the room $= 7$ m

Breadth of the room $= 5.5$ m

Height of the room $= 3.5$ m

Area of 4 walls $= 2(l + b) \times h$

$= 2 \times (7 + 5.5) \times 3.5$

$= 2 \times 12.5 \times 3.5$

$= 87.5\ \text{m}^2$

Length of the door $= 2$ m

Breadth of the door $= 1.5$ m

Area of the door $= l \times b$

$= 2 \times 1.5 = 3.0\text{m}^2$

Length of the window $= 1.5$ m

Breadth of the window $= 1$ m

Area of 2 windows $= 2 \times (l \times b)$

$= 2 \times (1.5 \times 1)$

$= 3.0\ \text{m}^2$

Total Area of door and windows $= (3 + 3)\ \text{m}^2 = 6\ \text{m}^2$

Required area for white washing the walls $= (87.5 - 6)\ \text{m}^2 = 81.5$ m

Cost of white washing $= ₹\,50 \times 81.5$

$= ₹\,4075$

15. We have, side of the square park = 90 m

length of the rectangular park = 270 m

Given area of the square park = area of the rectangular park

$$\text{side} \times \text{side} = l \times b$$

$$90 \times 90 = 270 \times b$$

$$b = \frac{90 \times 90}{270}$$

$$= \frac{90}{3} = 30$$

$$b = 30 \text{ m}$$

$\therefore$ breadth of the rectangular park is 30 m.

Exercise 13.2

1. Find the area of each of the following parallelograms :

(i) Area of || gm $= b \times h$

$= DC \times DE$

$= 6 \times 4$

$= 24 \text{ cm}^2$

(ii) Area of || gm $= b \times h$

$= PQ \times SM$

$= 5 \times 3 \text{ cm}^2$

$= 15 \text{ cm}^2$

(iii) Area of || gm $= b \times h$

$= NM \times LP$

$= 2 \times 4.4 \text{ cm}^2$

$= 8.8 \text{ cm}^2$

2. Find the area of each of the following triangles :

(i) Area of triangle $= \frac{1}{2} \times b \times h$

$= \frac{1}{2} \times 3 \times 4 \text{ cm}^2$

$= 6 \text{ cm}^2$

(ii) Area of triangle $= \frac{1}{2} \times b \times h$

$= \frac{1}{2} \times 5 \times 4 \text{ cm}^2$

$= 10 \text{ cm}^2$

(iii) Area of triangle LMN $= \frac{1}{2} \times b \times h$

$= \frac{1}{2} \times 3 \times 2\,\text{cm}^2$

$= 3\,\text{cm}^2$

3. Complete the following table :

(i) Base $= 3.5\,\text{cm}$

Area of || gm $= 9.45\,\text{cm}^2$

height $= ?$

Area of || gm $= B \times H$

$9.45 = 3.5 \times H$

$H = \frac{9.45}{3.5}$

$H = 2.7\,\text{cm}$

(ii) Base $= ?$

height $= 21\,\text{cm}$

Area of || gm $= 32.76\,\text{cm}^2$

Area of || gm $= B \times H$

$32.76 = B \times 21$

$B = \frac{32.76}{21}$

$B = 1.56\,\text{cm}$

(iii) Base $= 7.8\,\text{cm}$

height $= 5\,\text{cm}$

Area of || gm $= ?$

Area of || gm $= B \times H$

$= 7.8 \times 5\,\text{cm}^2$

$= 39.0\,\text{cm}^2$

4. Find the missing values :

(i) Base $= 22\,\text{cm}$

height $= ?$

Area of triangle $= 170.5\,\text{cm}^2$

Area of triangle $= \frac{1}{2} \times b \times h$

$170.5 = \frac{1}{2} \times 22 \times h$

or $h = \frac{170.5}{11}$

$\therefore \quad h = 15.5\,\text{cm}$

(ii) Base = 15 cm

height = 11.6 cm

Area of triangle = $\frac{1}{2} \times b \times h$

$= \frac{1}{2} \times 15 \times 11.6$

$= 87\ \text{cm}^2$

(iii) Base = ?

height = 10 cm = 0.10 m

Area of triangle = 0.5m^2

Area of triangle = $\frac{1}{2} \times b \times h$

$0.5 = \frac{1}{2} \times b \times 0.10$

$\frac{0.5 \times 100}{0.05 \times 10} = b$

$\frac{50}{5} = b$

$b = 10$ m

5. Base = ?

Area of || gm = $1545.5\ \text{cm}^2$

height = 15 cm

Area of|| gm = $b \times h$

$1545.5 = b \times 15$

or $\frac{1545.5}{15} = b$

$\therefore$ $b = 103.03$ cm

6. Let base of the triangle = $3x$

height of the triangle = $2x$

Area of the triangle = $108\ \text{cm}^2$

Area of triangle = $\frac{1}{2} \times b \times h$

$108 = \frac{1}{2} \times 3x \times 2x$

or $108 = 3x^2$

or $x^2 = \frac{108}{3}$

or $x^2 = 36$

or $x^2 = 6^2$

$\therefore$ $x = 6$ cm

Hence, base of the rectangle = $3x = 3 \times 6 = 18$ cm

height of the rectangle = $2x = 2 \times 6 = 12$ cm

7. Altitude = ?

Area of triangle = $42\,cm^2$

base = $12\,cm$

$\therefore$ Area of triangle = $\frac{1}{2} \times b \times h$

$$42 = \frac{1}{2} \times 12 \times h$$

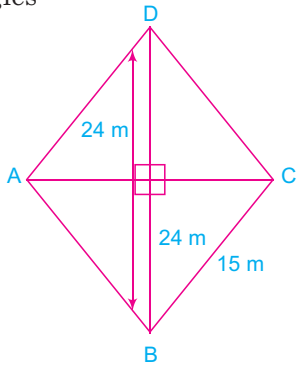
$$42 = 6 \times h$$

$$\frac{42}{6} = h$$

$$h = 7\,cm$$

Hence, altitude of the triangle is 7cm.

8. Let $ABCD$ be a rhombus whose trigonals interest at right angles
In right angled ΔCOB



$$(BC)^2 = (OC)^2 + (OB)^2$$

$$(15)^2 = (OC)^2 + (12)^2$$

$$225 = (OC)^2 + (12)^2$$

$$225 - 144 = (OC)^2$$

$$81 = OC^2$$

$$OC = 9\,cm$$

So, diagonal $AC = 2 \times OC$

$= 2 \times 9 = 18\,cm$

and diagonal $BD = 24\,cm$ (Given)

$\therefore$ Area of rhombus = $\frac{1}{2} \times d_1 \times d_2$

$$= \frac{1}{2} \times 18 \times 24$$

$$= 9 \times 24 = 216\,cm^2$$

9. Let base of || gm = $x\,cm$

height of || gm = $3x\,cm$

Area of || gm = $108\,cm^2$

$\therefore$ Area of || gm = $b \times h$

$$108 = x \times 3x$$

or $$108 = 3x^2$$

or $x^2 = \frac{108}{3}$

or $x^2 = 36$

or $x^2 = 6^2$

$\therefore$ $x = 6$

Hence, base of || gm $= x = 6$ cm

height of || gm $= 3x = 3 \times 6$

$= 18$ cm

10. From the figure,

Area of || gm corresponding height RN = Area of || gm corresponding height RM

$SP \times RN = PQ \times RM$

$30 \times RN = 50 \times RM$

but Area of || gm $= 1500\,\text{cm}^2$

So, $30 \times RN = 1500$ and $50 \times RM = 1500$

$RN = \frac{1500}{30}$ $RM = \frac{1500}{50}$

$RN = 50$ cm $RM = 30$ cm

11. Area of || gm = ?

base $= 12$ dm

height $= 450$ dm

$\therefore$ Area of || gm $= b \times h$

$= 12 \times 450\,\text{dm}^2$

$= 5400\,\text{dm}^2$

12. Area of triangle $= \frac{1}{2} \times b \times h$

If $b = 2b, h = 2h$

then Area of new triangle $= \frac{1}{2} \times b \times h$

$= \frac{1}{2} \times 2b \times 2h$

$= \frac{1}{2} bh \times 4$

$= 4 \times$ Area of triangle

Hence, new area of triangle will be 4 times the original area.

13. Area of triangle corresponding height, $CD = \frac{1}{2} \times b \times h$

$$= \frac{1}{2} \times 20 \times 9$$

$$= 90\,\text{cm}^2$$

$\therefore$ Area of triangle corresponding height, $AE = \frac{1}{2} \times AE \times BC$

$$90 = \frac{1}{2} \times AE \times 15$$

or $$\frac{90 \times 2}{15} = AE$$

$\therefore$ $$AE = 12\,\text{cm}$$

14. Area of rectangle $ABCD = l \times b$

$$= 12 \times 7\,\text{cm}^2$$

$$= 84\,\text{cm}^2$$

Area of $\Delta DEA = \frac{1}{2} \times b \times h$

$$= \frac{1}{2} \times 7 \times 4$$

$$= 14\,\text{cm}^2$$

$\therefore$ Area of shaded portion = A of Rectangle – A of ΔDEA

$$= (84 - 14)\,\text{cm}^2$$

$$= 70\,\text{cm}^2$$

15. Area of $\Delta BCD = \frac{1}{2} \times BD \times CM$

$$= \frac{1}{2} \times 40 \times 8\text{m}^2$$

$$= 160\text{m}^2$$

Area of $\Delta BAD = \frac{1}{2} \times BD \times AL$

$$= \frac{1}{2} \times 40 \times 10$$

$$= 200\text{m}^2$$

$\therefore$ Total Area of quadrilateral $ABCD$

$$= \text{A of } \Delta BCD + \text{A of } \Delta BAD$$

$$= (160 + 200)\text{m}^2$$

$$= 360\text{m}^2$$

Exercise 13.3

1. Find the circumference and area of a circle of radius :

(i) Radius = 10.5 cm

Circumference of circle, $C = 2\pi r$

$$= 2 \times \frac{22}{7} \times 10.5$$

$$= 66 \text{ cm}$$

and Area of circle (A) $= \pi r^2$

$$= \frac{22}{7} \times 10.5 \times 10.5$$

$$= 346.5 \text{ cm}^2$$

(ii) $r = 14$ cm

Circumference of circle, $C = 2\pi r$

$$= 2 \times \frac{22}{7} \times 14$$

$$= 88 \text{ cm}$$

and Area of circle (A) $= \pi r^2$

$$= \frac{22}{7} \times 14 \times 14 = 616 \text{ cm}^2$$

(iii) $r = 3.2$ cm

Circumference of circle, $C = 2\pi r$

$$= 2 \times \frac{22}{7} \times 3.2$$

$$= \frac{140.8}{7} \times 20.11 \text{ cm}$$

and Area of circle, $A = \pi r^2$

$$= \frac{22}{7} \times 3.2 \times 3.2$$

$$= \frac{225.28}{7} = 32.18 \text{ cm}^2$$

2. Find the circumference and area of a circle of diameter:

(i) diameter = 48 cm

$$\text{radius} = \frac{d}{2} = \frac{48}{2} = 24 \text{ cm}$$

$\therefore$ $C = 2\pi r$

$$= 2 \times \frac{22}{7} \times 24 = \frac{1056}{7} = 150.85 \text{ cm}$$

and $A = \pi r^2$

$$= \frac{22}{7} \times 24 \times 24$$

$$= \frac{12672}{7}$$

$$= 1810.28 \text{ cm}^2$$

(ii) diameter = 3.5 cm

$$\text{radius} = \frac{d}{2} = \frac{3.5}{2} \text{ cm}$$

$\therefore$ $C = 2\pi r = 2 \times \frac{22}{7} \times \frac{3.5}{2} = 11.0 \text{ cm}$

and $A = \pi r^2 = \frac{22}{7} \times \frac{3.5}{2} \times \frac{3.5}{2} = \frac{5.5 \times 3.5}{2} = 9.625 \text{ cm}^2$

(iii) diameter = 7 cm

$$\text{radius} = \frac{d}{2} = \frac{7}{2} \text{ cm}$$

$\therefore$ $C = 2\pi r = 2 \times \frac{22}{7} \times \frac{7}{2} = 22 \text{ cm}$

and $A = \pi r^2 = \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} = \frac{77}{2}$

$$= 38.5 \text{ cm}^2$$

3. Radius of an engine wheel = 2.8 cm

Distance covered by engine in one round (C)

$$= 2\pi r$$

$$= 2 \times \frac{22}{7} \times 2.8$$

$$= 17.6 \text{ cm}$$

Distance covered by engine in 100 revolutions

$$= 100 \times 17.6 \text{ cm}$$

$$= 1760.0 \text{ cm}$$

4. Diameter of a ring = 21 m

$$\text{Radius} = \frac{d}{2} = \frac{21}{2} \text{ m}$$

$\therefore$ Area of ring = πr^2

$$= \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} = \frac{33 \times 21}{2}$$

$$= \frac{693}{2} = 346.5\,\text{cm}^2$$

5. Circumference of a circle = 18π cm

$$2\pi r = 18\pi$$

$$2r = 18$$

$$r = \frac{18}{2} = 9$$

$\therefore$ radius of circle, $r = 9$ cm

6. Diameter of a wheel = 70 cm

Radius = $\frac{d}{2} = \frac{70}{2}$ cm = 35 cm

Distance covered by the wheel in one revolution = $2\pi r$

$$= 2 \times \frac{22}{7} \times 35$$

$$= 220\,\text{cm}$$

distance covered by the wheel in 15 revolutions = 15×220

$$= 3300\,\text{cm}$$

7. Let radius of Ist circle, $r_1 = 3x$

Let radius of IInd circle, $r_2 = 4x$

$\therefore$ ratio of their circumferences = $\left(\frac{C_1}{C_2}\right) = \frac{2\pi r_1}{2\pi r_2}$

$$= \frac{r_1}{r_2}$$

$$= \frac{3x}{4x} = \frac{3}{4}$$

$$= 3:4$$

8. Given that circumference of a circle = Perimeter of a square

$$2\pi r = 4 \times \text{side}$$

$$2\pi r = 4 \times 22$$

$$2 \times \frac{22}{7} \times r = 4 \times 22$$

$$r = \frac{4 \times 22 \times 7}{2 \times 22}$$

$\therefore$ radius of the circle $r = 14$ cm

9. Diameter of the inner circle = 3 m

$$\text{Radius } (r) = \frac{3}{2} \text{ m}$$

Diameter of the outer circle = 11 m

$$\text{Radius } (R) = \frac{11}{2} \text{ m}$$

Area enclosed by two circles $= (\pi R^2 - \pi r^2)$

$$= \pi(R^2 - r^2)$$

$$= \frac{22}{7}\left[\left(\frac{11}{2}\right)^2 - \left(\frac{3}{2}\right)^2\right]$$

$$= \frac{22}{7} \times \left(\frac{121}{4} - \frac{9}{4}\right)$$

$$= \frac{22}{7} \times \left(\frac{121 - 9}{4}\right)$$

$$= \frac{22}{7} \times \frac{112}{4}$$

$$= 22 \times 4 = 88 \text{ cm}^2$$

10. $r = 14$ cm

and 45 minutes $= \frac{45}{60} = \frac{3}{4}$ hour

Distance covered in 1 hour = Circumference $= 2\pi r$

$$= 2 \times \frac{22}{7} \times 14$$

Distance covered in $\frac{3}{4}$ hour $= 2 \times \frac{22}{7} \times 14 \times \frac{3}{4}$

$$= 22 \times 3 = 66 \text{ cm}$$

Hence, the tip of the minute hand moves 66 cm in 45 minutes

11. Area of a circle $(A_1) = 77 \text{ cm}^2$

Radius of the other circle = ?

Area of other circle $(A_2) = 2 \times A_1$ (Given)

$$= 2 \times 77$$

$$= 154 \text{ cm}^2$$

$\therefore$ Area of circle $(A_2) = \pi r^2$

$$154 = \frac{22}{7} \times r^2$$

or $\frac{154 \times 7}{22} = r^2$

or $7^2 = r^2$

$\therefore$ $r = 7\,\text{cm}$

Hence, radius of the other circle is 7 cm.

12. Diameter of a circular top = 1.4 m

$$\text{radius} = \frac{d}{2} = \frac{1.4}{2} = 0.7\,\text{m}$$

Area of the top = πr^2

$$= \frac{22}{7} \times \frac{0.7}{2} \times \frac{0.7}{2}$$

$$= \frac{1.1 \times 0.7}{2} = \frac{0.77}{2}$$

$$= 0.1925\,\text{cm}^2$$

$\therefore$ the cost of polishing the circle top = ₹ 25×0.1925

= ₹ 4.8125

13. Radius of circle = 1.4 cm

Area of two circles having same radius

$$= \pi r^2 \times 2$$

$$= \frac{22}{7} \times 1.4 \times 1.4 \times 2$$

$$= 12.32\,\text{cm}^2$$

Base of the triangle = 3 cm

Height of the triangle = 2 cm

Area of the triangle = $\frac{1}{2} \times b \times h$

$$= \frac{1}{2} \times 3 \times 2\,\text{cm}^2$$

Length of the rectangle = 4 cm

Breadth of the rectangle = 2 cm

Area of the rectangle = $l \times b = 4 \times 2 = 8\,\text{cm}^2$

Now, Area of biggest circle = πR^2

$$= \frac{22}{7} \times 7 \times 7$$

$$= 154\,\text{cm}^2$$

Now, required remaining area = $(154 - (12.32 + 3 + 8)\,\text{cm}^2$

$$= (154 - 23.32)\,\text{cm}^2$$

$$= 130.68\,\text{cm}^2$$

14. Radius of the smaller circle (garden) = 56 m

Radius of the larger circle (garden with road) = (56 + 7) m

= 63 m

Area of the road = A of larger circle – A of smaller circle = $\pi r_1^2 - \pi r_2^2$

$= \pi(r_1^2 - r_2^2)$

$= \frac{22}{7} \times [(63)^2 - (56)^2]$

$= \frac{22}{7} \times [3969 - 3136]$

$= \frac{22}{7} \times 833 = 2618\ \text{m}^2$

Cost of gravelling 1 sq m of road = ₹ 50

Cost of gravelling 2618 sq m of read = ₹ 50×2618

= ₹ 130900

Exercise 13.4

1. Length of garden (AB) = 95 m

Breadth of garden (BC) = 80 m

Area of the garden ($ABCD$) = $l \times b$

$= 95 \times 80\ \text{m}^2$

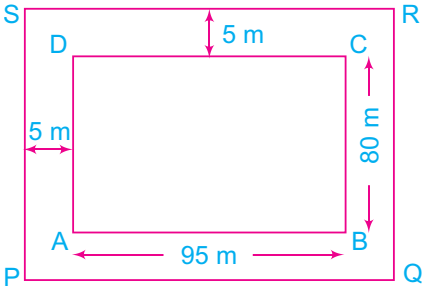
$= 7600\ \text{m}^2$

Length of garden with path (PQ) = (95 + 5 + 5)

= 105 m

Breadth of garden with path (RQ) = (80 + 5 + 5)

= 90 m



∴ Area of rectangle $PQRS$ = $l \times b$

$= 105 \times 90\ \text{m}^2$

$= 9450\ \text{m}^2$

∴ Area of the path = A of Rec $PQRS$ – A of Rec $ABCD$

$= (9450 - 7600)\ \text{m}^2$

$= 1850\ \text{m}^2$

$= 1850 \times 100 \times 100\ \text{cm}^2$

$= 18500000\ \text{cm}^2$

2. Length of land (PQ) = 300 m

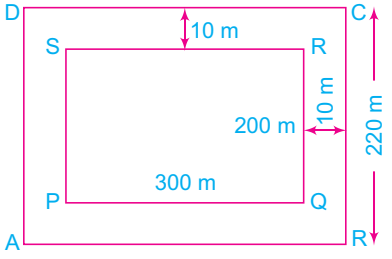
Breadth of land (RQ) = 200 m

Area of land = $l \times b$

$= 300 \times 200\ m^2 = 60000\ m^2$

Length of land with road (AB) = $(300 + 10 + 10) = 320$ m

Breadth of land with road (BC) = $(200 + 10 + 10) = 220$ m



Area of land with road = $l \times b$

$= 320 \times 220\ m^2$

$= 70400\ m^2$

$\therefore$ Area of the road = A of rec $ABCD$ = A of rec $PQRS$

$= (70400 - 60000)\ m^2$

$= 10400\ m^2$

Cost of levelling the road = ₹ 1.50×10400

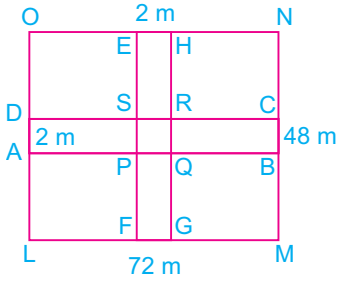
= ₹ 15600

3. Length of rectangular park (LM) = 72 m

Breadth of rectangular park (MN) = 48 m

Area of rectangular of park ($LMNO$) = $l \times b = 72 \times 48\ m^2$

$= 3456\ m^2$



Area of cross roads = Area of rectangle $ABCD$ + A of rectangle $EFGH$ – A of square $PQRS$

$= (72 \times 2 + 48 \times 2 - 2 \times 2)\ m^2$

$= (144 + 96 - 4)\ m^2 = 236\ m^2$

$\therefore$ Area of the remaining portion of the park = (A of rec $LMNO$ – A of cross road)

$= (3456 - 236)\ m^2$

$= 3220\ m^2$

4. Side of the outer garden = 30 m

Width of the path = 1 m

Side of inner square garden = $(30 - 1 - 1)$ m

= 28 m

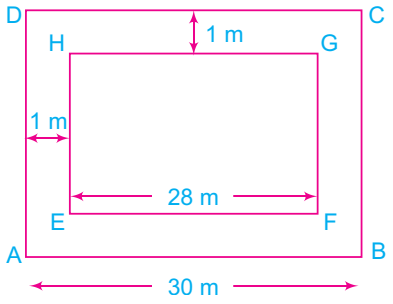
Area of the square garden = $(\text{side})^2$

$= (30\ m)^2$

$= 900\ m^2$

Area of the inner square garden = $(\text{Side})^2$

$= (28\,\text{m})^2 = 784\ \text{m}^2$



(i) ∴ Area of the path

= A of the outer square garden

– A of the inner square garden

$= (900 - 784)\ \text{m}^2 = 116\ \text{m}^2$

(ii) Area of garden over which grass to be planted = $784\ \text{m}^2$

Cost of planting 1 sq m grass = ₹ 2.50

Cost of planting 784 sq. m grass = ₹ 784 × ₹ 2.50

= ₹ 1960

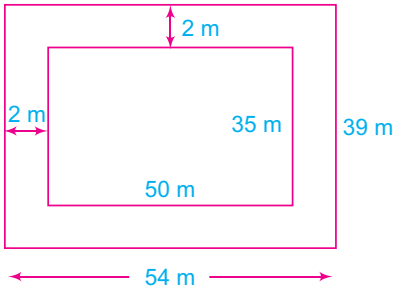
5. Length of the inner rectangle = 50 m

Breadth of the inner rectangle = 35 m

Area of the inner rectangle = $l \times b$

$= 50 \times 35\,\text{m}^2$

$= 1750\,\text{m}^2$



Length of the outer rectangle = (50 + 2 + 2)

= 54 m

Breadth of the outer rectangle = (35 + 2 + 2) = 39 m

Area of the outer rectangle = $l \times b$

$= 54 \times 39 = 2106\,\text{m}^2$

$\therefore$ Area of the path = A of the outer rectangle – A of the inner rectangle

$= (2106 - 1750)\,m^2 = 356\,m^2$

Cost of constructing 10 sq m of path = ₹ 350

Cost of constructing 1 sq m of path = ₹ $\frac{350}{10}$

Cost of constructing 356 sq m of path = ₹ $\frac{350}{10} \times 356$

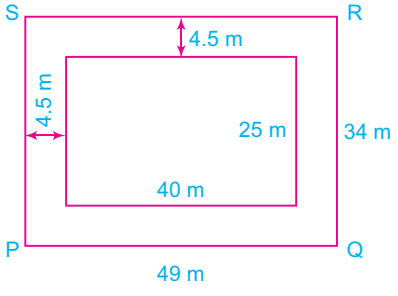
= ₹ 12460

6. Length of the auditorium = 40 m

Breadth of the auditorium = 25 m

Area of the auditorium ($ABCD$) = 40×25

$= 1000\ m^2$



Length of the auditorium with verandah

= (40 + 4.5 + 4.5) m

= 49 m

Breadth of the auditorium with verandah = (25 + 4.5 + 4.5)m

= 34 m

Area of the auditorium with verandah ($PQRS$) = 49×34

$= 1666\ m^2$

$\therefore$ Area of verandah = A of rec $PQRS$ – A of rec $ABCD$

$= (1666 - 1000)\ m^2$

$= 666\,m^2$

7. (i) Length of rectangular field = 30 m

Breadth of rectangular field = 15.5 m

Area of rec. $ABCD = AB \times AD$

$= 30 \times 1.4$

$= 42.0\ m^2$

Area of rec. $EFGH = EG \times FE$

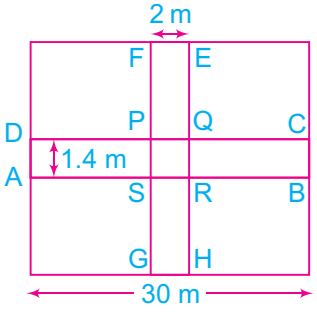
$= 15.5 \times 2$

$= 31.0\ m^2$

Area of rec $PQRS = PQ \times PS$

$= 1.4 \times 2$

$= 2.8\ m^2$



$\therefore$ The Area of the paths = (A of rec $ABCD$ + A of rec $EFGH$ – A of rec $PQRS$)

$= (42 + 31 - 2.8)\ m^2$

$= 70.2\ m^2$

(ii) The cost of cementing the paths at ₹ 70 per m^2

$= ₹\ 70 \times 70.2$

$= ₹\ 4914.0$

8. Length of saree (AB) = 5 m = 500 cm

Width of saree (AB) = 1.3 m = 130 cm

Length of sree with border = (500 + 25 + 25) cm

= 550 cm

Width of saree with border = (130 + 25 + 25) cm

= 180 cm

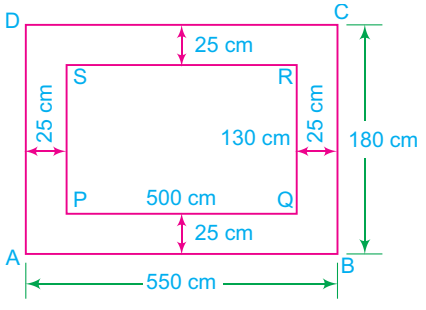
Area of the border = [Area of rectangle $ABCD$

– Area of Rectangle $PQRS$]

$= [550 \times 180 - 500 \times 130]\ cm^2$

$= [99000 - 65000]\ cm^2$

$= 34000\ cm^2$



$\therefore$ Cost of printing the border at ₹ 1 per

$= ₹\ \frac{34000 \times 1}{100}$

$= ₹\ 340$

9. (i) Length of rec (AB) = 20 m

Breadth of rec (BC) = 13 m

$\therefore$ Area of rec $ABCD = 20 \times 13$

$= 260\ m^2$

Length of rec (LM) = 20 m

Breadth of rec (MN) = 2 m

Area of rec $LMNO = 20 \times 2 = 40\ m^2$

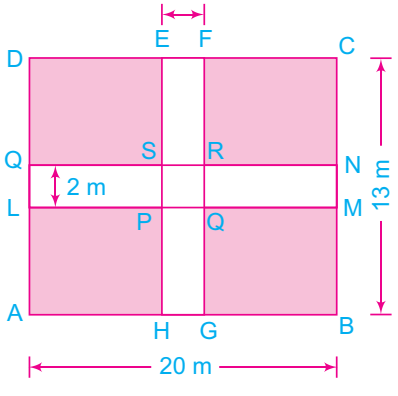
Length of rec (GF) = 13 m

Breadth of red (EF) = 2 m

Area of rec $EFGH = 13 \times 2 = 26\ m^2$

Side of square $PQRS$ = 2 m

Area of square $PQRS = 2 \times 2 = 4\ m^2$



$\therefore$ Area of the path = [A of rec $LMNO$ + A of the rec $EFGH$ – A of square $PQRS$]

$= [40 + 26 - 4]\ m^2 = 62\ m^2$

Now, Area of shaded region = [A of rec $ABCD$ – A of the path]

$= (260 - 62)\,m^2$

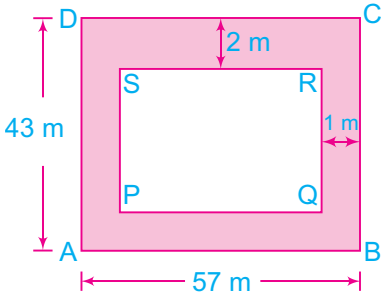
$= 198\,m^2$

(ii) Length of the outer rectangle (AB) = 57 m

Breadth of the outer rectangle (BC) = 43 m

Area of the outer rectangle $ABCD = 47 \times 43\,m$

$= 2451\,m^2$



Length of the inner rectangle (PQ) = (57 – 2 – 2)

$= (57 \times 4) = 53\,m^2$

Breadth of the inner rectangle (QR) = (43 – 1 – 1)

$= (43 - 2) = 41\,m^2$

Area of the inner rectangle ($PQRS$) = $53 \times 41\,m^2$

$= 2173\ m^2$

Now, Area of shaded region = [A of rec $ABCD$ – A of rec $PQRS$]

$= (2451 - 2173)\,m^2$

$= 278\,m^2$

Chaapter 14 : Data Handling

Exercise 14.1

1. Find the mean of first seven even numbers :

First seven even numbers 2, 4, 6, 8, 10, 12, 14

$$\text{Mean} = \frac{\text{sum of all observations}}{\text{Total no. of observations}}$$

$$= \frac{2+4+6+8+10+12+14}{7} = \frac{56}{7} = 8$$

2. Find the range and mean of the following values :

We have, 44, 61, 68, 57, 52, 30, 67, 35

Highest score = 68

Lowest score = 30

$\therefore$ Range = highest score – lowest score

$= (68 - 30) = 38$

$\therefore$ $$\text{Mean} = \frac{\text{Sum of all observations}}{\text{Total no. of observations}}$$

$$= \frac{44+61+68+57+52+30+67+35}{8}$$

$$= \frac{414}{8} = 51.75$$

3. Following are the ages (in years) of 10 teachers in a school :

Ages of 10 teachers are $23, 35, 32, 22, 25, 40, 42, 36, 45, 33$

(i) The age of the oldest teacher is 45 years

(ii) The age of the youngest teacher is 22 years

(iii) Range = age of the oldest teacher – age of the youngest

$= (45 - 22) = 23$

(iv) $\therefore$ Mean age $= \dfrac{\text{Sum of all observations}}{\text{Total no. of observations}}$

$= \dfrac{23 + 35 + 32 + 22 + 25 + 40 + 42 + 36 + 45 + 33}{10}$

$= \dfrac{333}{10} = 33.3$ years

(v) The no. of teachers having the age less than mean age = $5 (22, 23, 25, 32, 33)$

4. Marks obtained by 7 students

59, 68, 72, 49, 84, 92, 24

(i) Mean marks $= \dfrac{\text{Sum of all observations}}{\text{Total no. of observation}}$

$= \dfrac{59 + 68 + 72 + 49 + 84 + 92 + 24}{7}$

$= \dfrac{448}{7} = 64$

(ii) Mean marks if a student whose marks are 48 is also included,

Mean marks $= \dfrac{448 + 48}{8}$

$= \dfrac{496}{8} = 62$

(ii) Mean marks if a student whose marks are 72 is excluded,

Mean marks $= \dfrac{448 - 72}{6}$

$= \dfrac{376}{6} = 62.66$

5. The attendance in a school during 6 days of the week,

$1555, 1670, 1750, 1513, 1640, 1622$

Mean attendance $= \dfrac{\text{Sum of all observations}}{\text{Total no. of observations}}$

$= \dfrac{1555 + 1670 + 1750 + 1513 + 1640 + 1622}{6}$

$= \dfrac{9750}{6} = 1625$

6. We have, $9.3, 7.7, 8.6, 2.5, 6.9, 10$ and 4.7

$\text{Mean} = \dfrac{\text{Sum of all observations}}{\text{Total no. of observations}}$

$$= \frac{9.3 + 7.7 + 8.6 + 2.5 + 6.9 + 10 + 4.7}{7}$$

$$= \frac{49.7}{7} = 7.1$$

7. If mean of $7, 9, x, 13, 6$ is 8, then

$$\text{Mean} = \frac{7 + 9 + x + 13 + 6}{5}$$

$$8 = \frac{35 + x}{5}$$

or $\quad 40 = 35 + x$

or $\quad x = 40 - 35 = 5$

$\therefore$ Value of x is $x = 5$.

8. Mean of 12 numbers = 16

$$\frac{x_1 + x_2 + \ldots\ldots + x_{12}}{12} = 16$$

$$x_1 + x_2 + \ldots\ldots + x_{12} = 12 \times 16$$

$$x_1 + x_2 + \ldots\ldots + x_{12} = 192$$

If each number is multiplied by 5, then

$$\text{Mean} = \frac{5 \times (x_1 + x_2 + \ldots\ldots + x_n)}{12} = \frac{5 \times 192}{12} = 80$$

So, the new mean is 80.

9. The first 5 multiples of 7 are $7, 14, 21, 28$ and 35

$$\text{Mean} = \frac{7 + 14 + 21 + 28 + 35}{5} = \frac{105}{5} = 21$$

If each multiple is divided by 7, then

$$\text{new mean} = \frac{21}{7} = 3$$

10. Prepare a frequency table for the following data :

$9, 10, 9, 10, 8, 12, 10, 11, 9, 9, 7, 12, 8, 10, 7, 8, 9, 10, 10, 9$

x	Tally marks	Frequency
7	||	2
8	|||	3
9	𝍸 |	6
10	𝍸 |	6
11	|	1
12	||	2
	Total	20

11. The following table shows the weights (in kg) of 20 students of a class :

weight (in kg) (x)	frequency (f)	$f \times x$
50	7	350
55	3	165
58	4	232
60	2	120
62	4	248
	$\Sigma f = 20$	$\Sigma fx = 1115$

$$\therefore \quad \text{Mean} = \frac{\Sigma fx}{\Sigma f}$$

$$= \frac{1115}{20} = 55.75$$

12. Find the mean of the following distribution :

x	f	$f \times x$
4	5	20
6	10	60
9	10	90
10	7	70
15	8	120
	$\Sigma f = 40$	$\Sigma fx = 360$

$$\therefore \quad \text{Mean} = \frac{\Sigma fx}{\Sigma f} = \frac{360}{40} = 9$$

Exercise 14.2

1. We have the data, 96, 98, 100, 110, 110, 115, 120, 121, 123, 123

$n = 10$ (even)

Median = ?

Ascending order : 96, 98, 100, 110, 110, 115, 120, 121, 123, 123

$$\therefore \quad \text{Median} = \frac{\left(\frac{n}{2}\right)^{\text{th}} \text{term} + \left(\frac{n}{2}+1\right)^{\text{th}} \text{term}}{2}$$

$$= \frac{\left(\frac{10}{2}\right)^{\text{th}} \text{term} + \left(\frac{10}{2}+1\right)^{\text{th}} \text{term}}{2}$$

$$= \frac{5^{\text{th}} \text{ term} + 6^{\text{th}} \text{ term}}{2}$$

$$= \frac{110+115}{2} = \frac{225}{2} = 112.5$$

2. Find the mean, median and mode of the following :

(i) 15, 19, 15, 14, 15, 16, 14, 21, 15

Ascending order : 14, 14, 15, 15, 15, 15, 16, 19, 21 (n = 9 odd)

$$= \frac{\text{Sum of all observations}}{\text{Total no. of observations}}$$

$$= \frac{14+14+15+15+15+15+16+19+21}{9}$$

$$= \frac{144}{9} = 16$$

$$\text{Median} = \left(\frac{n+1}{2}\right)^{\text{th}} \text{term} = \left(\frac{9+1}{2}\right)^{\text{th}} \text{term}$$

$$= \left(\frac{10}{2}\right)^{\text{th}} \text{term}$$

$$= 5^{\text{th}} \text{ term}$$

$$= 15$$

Mode = 15 (because 15 occurs maximum frequency)

i.e. 4 times

(ii) 5, 6, 7, 7, 7, 9, 9, 9, 12, 10

Ascending order : 5, 6, 7, 7, 7, 9, 9, 9, 10, 12 (n = 10 even)

$$\text{Mean} = \frac{\text{Sum of all observations}}{\text{Total no. of observations}}$$

$$= \frac{5+6+7+7+7+9+9+9+10+12}{10}$$

$$= \frac{81}{10} = 8.1$$

$$\text{Median} = \frac{\left(\frac{n}{2}\right)^{\text{th}} \text{term} + \left(\frac{n}{2}+1\right)^{\text{th}} \text{term}}{2}$$

$$= \frac{\left(\frac{10}{2}\right)^{\text{th}} \text{term} + \left(\frac{10}{2}+1\right)^{\text{th}} \text{term}}{2}$$

$$= \frac{5^{\text{th}} \text{ term} + 6^{\text{th}} \text{ term}}{2} = \frac{7+9}{2}$$

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

Mode = 7 and 9 (because 7 and 9 both occur equal no. of maximum frequency i.e. 3 times)

3. The first 10 even numbers

$2, 4, 6, 8, 10, 12, 14, 16, 18, 20$ ($n = 10$ even)

$$\text{Median} = \frac{\left(\frac{n}{2}\right)^{\text{th}} \text{term} + \left(\frac{n}{2}+1\right)^{\text{th}} \text{term}}{2}$$

$$= \frac{\left(\frac{10}{2}\right)^{\text{th}} \text{term} + \left(\frac{10}{2}+1\right)^{\text{th}} \text{term}}{2}$$

$$= \frac{5^{\text{th}} \text{ term} + 6^{\text{th}} \text{ term}}{2}$$

$$= \frac{10+12}{2} = \frac{22}{2} = 11$$

4. The marks of 15 students are $27, 15, 30, 45, 49, 48, 15, 16, 20, 35, 18, 28, 34, 49, 50$

Ascending order : $15, 15, 16, 18, 20, 27, 28, 30, 34, 35, 45, 48, 49, 49, 50$ ($n = 15$ odd)

$$\text{Median} = \left(\frac{n+1}{2}\right)^{\text{th}} \text{term}$$

$$= \left(\frac{15+1}{2}\right)^{\text{th}} \text{term} = \left(\frac{16}{2}\right)^{\text{th}} \text{term}$$

$$= 8^{\text{th}} \text{ term}$$

$$= 30$$

5. Numbers lying between 30 and 60 which are divisible by 6 are

$36, 42, 48, 54$ ($n = 4$ even)

$$\text{Median} = \frac{\left(\frac{n}{2}\right)^{\text{th}} \text{term} + \left(\frac{n}{2}+1\right)^{\text{th}} \text{term}}{2}$$

$$= \frac{\left(\frac{4}{2}\right)^{\text{th}} \text{term} + \left(\frac{4}{2}+1\right)^{\text{th}} \text{term}}{2}$$

$$= \frac{2^{\text{th}} \text{ term} + 3^{\text{rd}} \text{ term}}{2}$$

$$= \frac{42+48}{2} = \frac{90}{2} = 45$$

6. Find the mode of the following frequency distribution :

(i) From the given frequency distribution,

Mode = 43 (because it has maximum frequency)

(ii) Mode = 51 (because it has maximum frequency)

7. Weight (kg) of 11 students are $42, 52, 48, 52, 55, 58, 53, 54, 46, 49, 57$ ($n = 11$ odd)

Ascending order : $42, 46, 48, 49, 52, 52, 53, 54, 55, 57, 58$

$$\text{Median} = \left(\frac{n+1}{2}\right)^{\text{th}} \text{ term}$$

$$= \left(\frac{11+1}{2}\right)^{\text{th}} \text{ term}$$

$$= \left(\frac{12}{2}\right)^{\text{th}} \text{ term} = 6^{\text{th}} \text{ term}$$

$$= 52$$

If a student of 58 kg left the school and a new student of 68 kg joined, then, we have 42, 46, 48, 49, 52, 52, 53, 54, 55, 57, 68

$$\therefore \quad \text{New Median} = \left(\frac{n+1}{2}\right)^{\text{th}} \text{ term}$$

$$= \left(\frac{11+1}{2}\right)^{th} \text{ term} = \left(\frac{12}{2}\right)^{th} \text{ term}$$

$$= 6^{\text{th}} \text{ term}$$

$$= 52$$

8. The marks of 15 students are 38, 42, 35, 37, 45, 50, 32, 43, 43, 40, 36, 38, 43, 48, 47 ($n = 15$) odd

Ascending order : 32, 35, 36, 37, 38, 38, 40, 42, 43, 43, 43, 45, 47, 48, 50

$$\text{Medium marks} = \left(\frac{n+1}{2}\right)^{\text{th}} \text{ term}$$

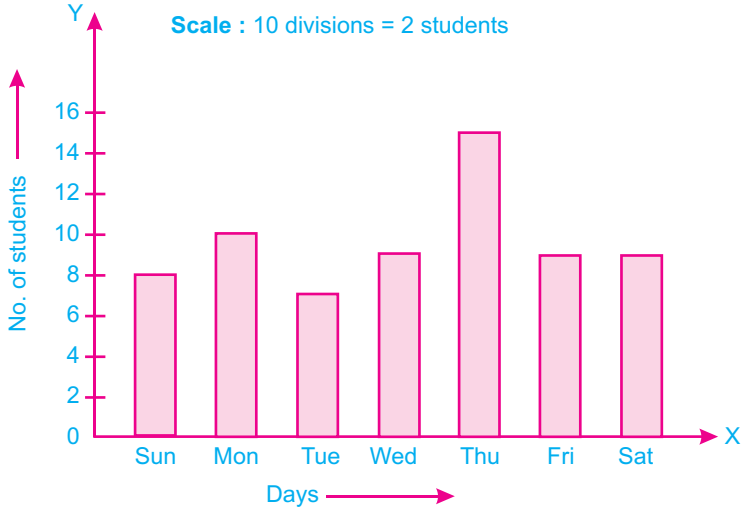
$$= \left(\frac{15+1}{2}\right)^{\text{th}} \text{ term} = \left(\frac{16}{2}\right)^{\text{th}} \text{ term}$$

$$= 8^{\text{th}} \text{ term}$$

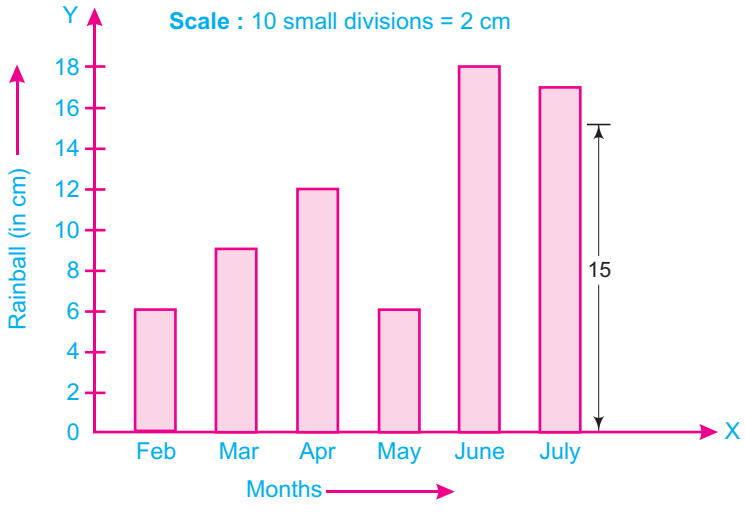
$$= 42$$

Exercise 14.3

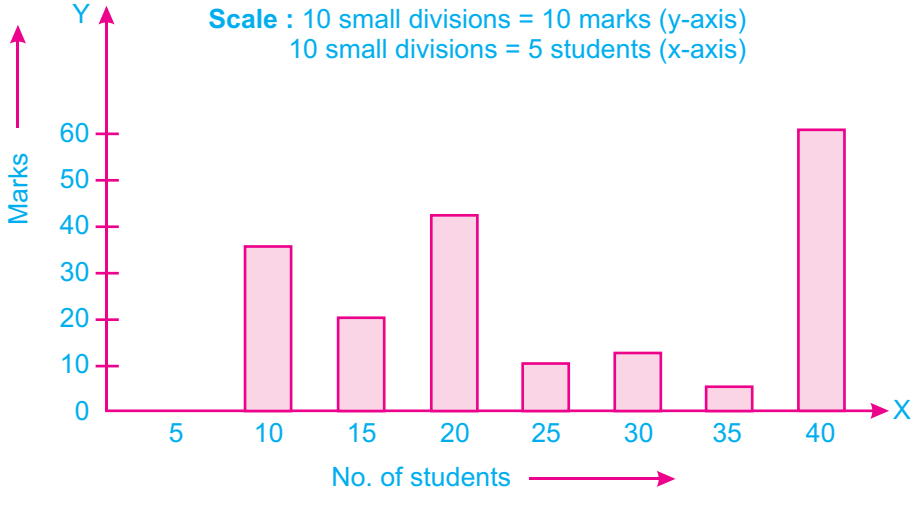
1. (i)



(ii)



2.



(i) Highest marks = 58 (40 students)

Money required = ₹ 40×10

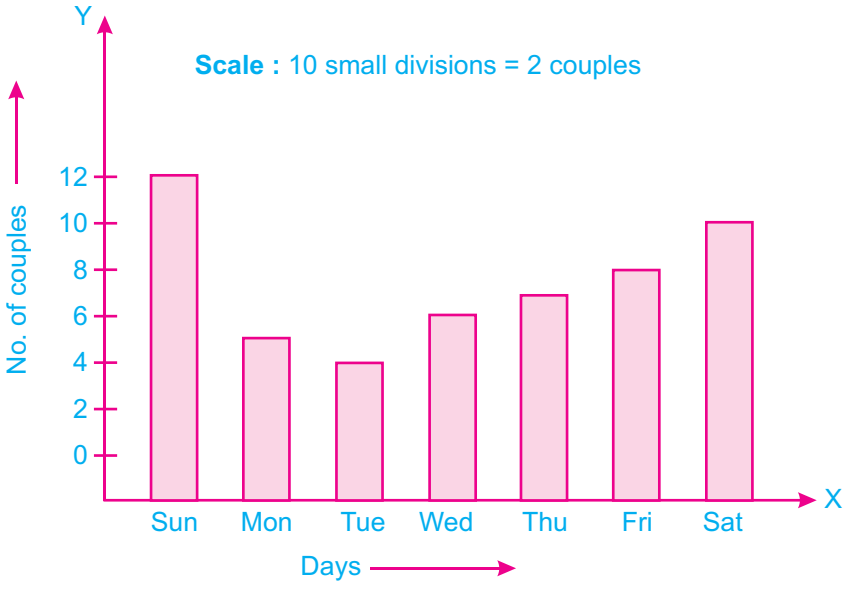
= ₹ 400

(ii) Lowest marks = 5 (35 students)

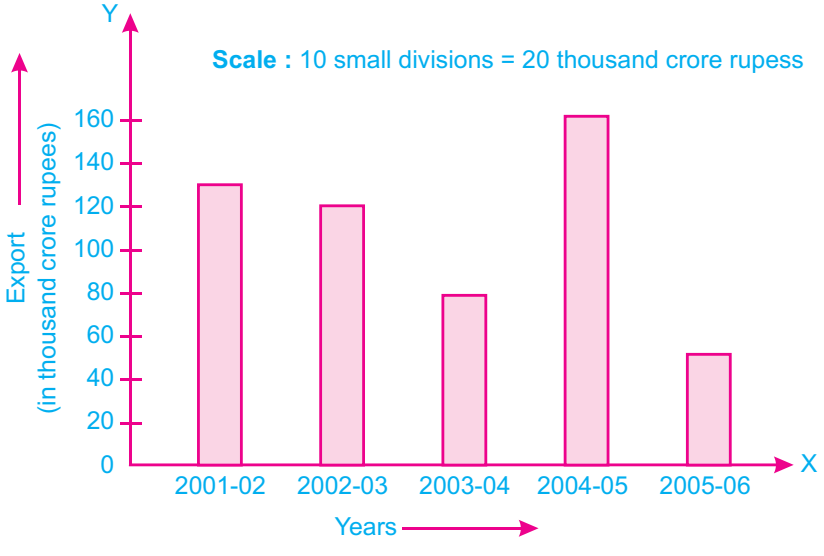
No. of problems = 35×15

= 525

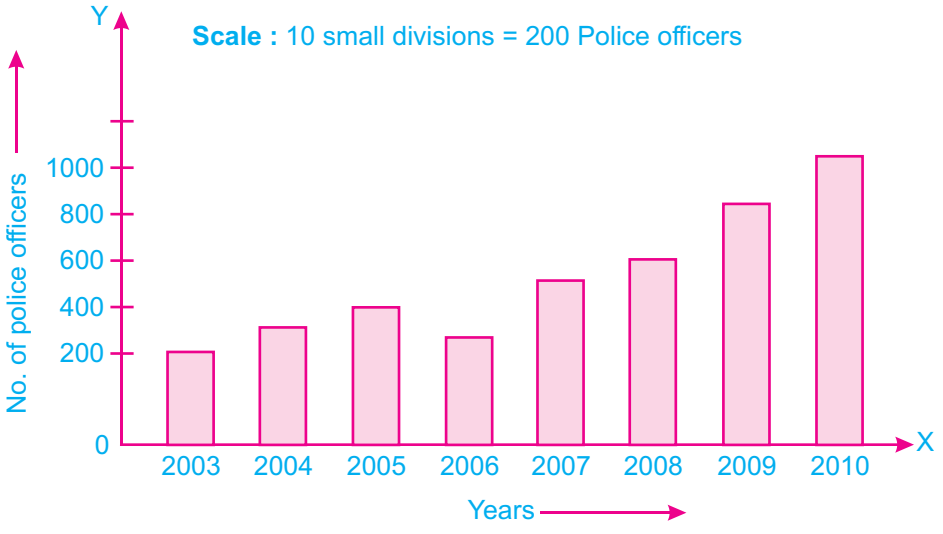
3.


Y
Scale : 10 small divisions = 2 couples
No. of couples
12
10
8
6
4
2
0
X
Sun
Mon
Tue
Wed
Thu
Fri
Sat
Days

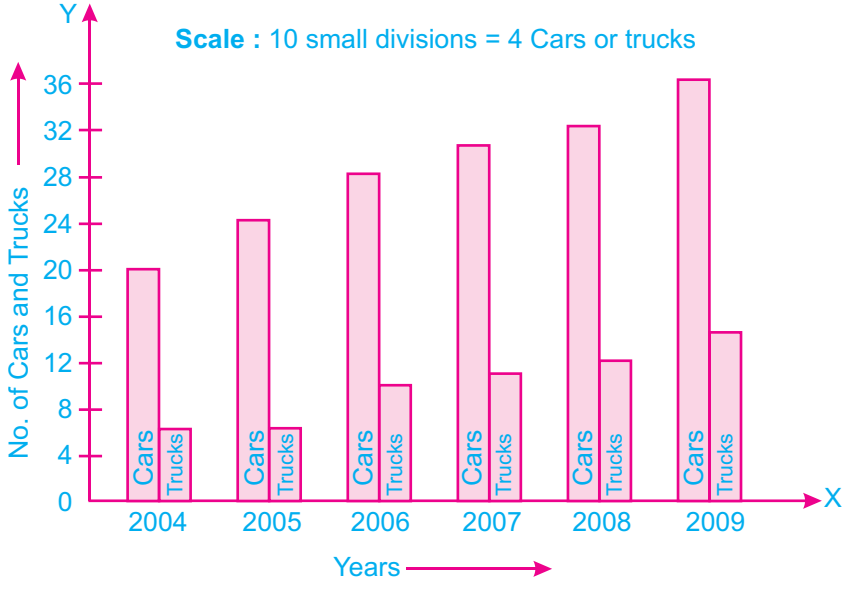
4.


Y
Scale : 10 small divisions = 20 thousand crore rupess
Export
(in thousand crore rupees)
160
140
120
100
80
60
40
20
0
X
2001-02
2002-03
2003-04
2004-05
2005-06
Years

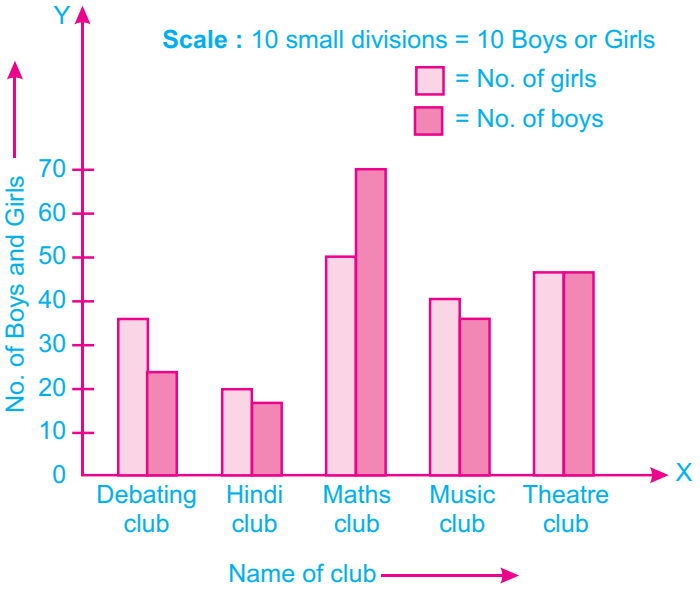
5.


Y
Scale : 10 small divisions = 200 Police officers
No. of police officers
1000
800
600
400
200
0
X
2003
2004
2005
2006
2007
2008
2009
2010
Years

6.


Y
Scale : 10 small divisions = 4 Cars or trucks
No. of Cars and Trucks
36
32
28
24
20
16
12
8
4
0
Cars
Trucks
X
2004
2005
2006
2007
2008
2009
Years

7.



(i) The bar graph represents the no. of girls and boys who are members of various clubs in a school.

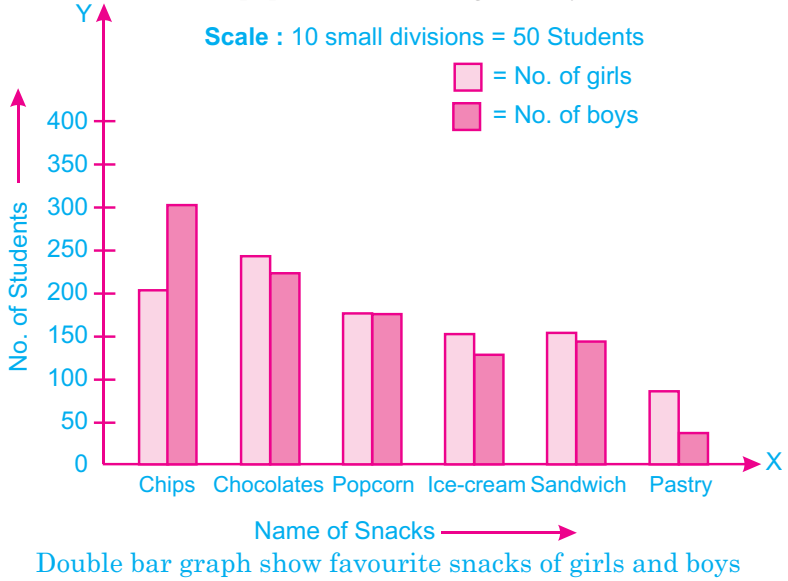
(ii) Five clubs are being considered.

(iii) Theatre club has equal no. of boys and girls.

(iv) Maths club has the maximum no. of students.

(v) Maths club is the most popular club among the boys.

8.



Double bar graph show favourite snacks of girls and boys

(i) This graph shows the comparison of favourite snacks.

(ii) Pastry

(iii) Popcorn

Exercise 14.4

1. We have vowels = a, e, i, o, u

Total no. of alphabets = 26

$$\text{Probability of choosing a vowel} = \frac{\text{Possible outcomes}}{\text{Total no. of outcomes}}$$

$$= \frac{5}{26}$$

2. No. of red balls = 3

No. of black balls = 4

No. of white balls = 2

Total no. of balls = 9

Probability of drawing a red ball

$$= \frac{\text{Possible outcomes}}{\text{Total no. of outcomes}}$$

$$= \frac{3}{9} = \frac{1}{3}$$

3. (i) The sun will rise from the west tomorrow.

(ii) On throwing a die, 9 will be obtained.

4. On throwing a die, we have total outcomes

$$= 1, 2, 3, 4, 5, 6 \quad (6)$$

Number less than 5 = $1, 2, 3, 4$ (4)

$$\text{Probability of getting a number less than 5} = \frac{\text{Possible outcomes}}{\text{Total no. of outcomes}}$$

$$= \frac{4}{6} = \frac{2}{3}$$

5. The numbers from 1 to 20 are $1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20$.

Total numbers = 20

Prime numbers = $2, 3, 5, 7, 11, 13, 17, 19$ (8)

$$\text{Probability of choosing a number} = \frac{\text{Possible outcomes}}{\text{Total no. of outcomes}}$$

$$= \frac{8}{20} = \frac{2}{5}$$

6. Probability that which team will start the game on tossing a coin = $\frac{1}{2}$ (Head or tail)

7. Write whether the following is certain to happen, can happen but not certain, impossible :

(i) can happen but not certain

(ii) impossible

(iii) impossible

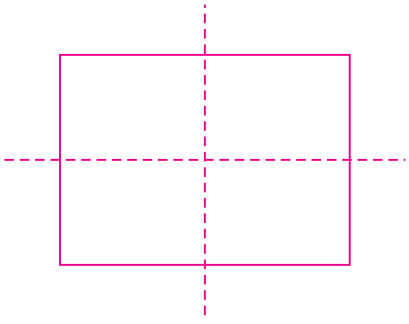
(iv) can happen but not certain

(v) certain to happen

Chapter 15 : Symmetry

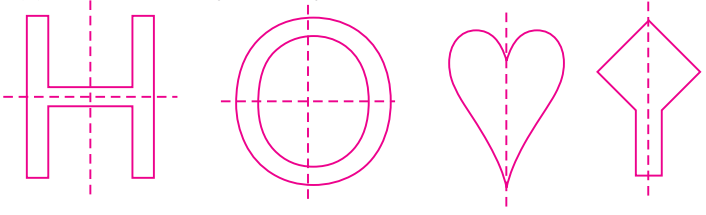
Exercise15.1

1.



2. Which of the following has line of symmetry?

(ii), (iii), (iv) and (v) have line of symmetry



3. Parallelogram and scalene triangle

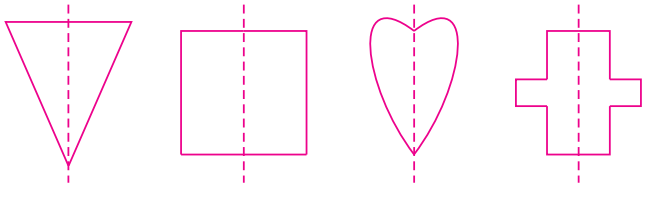
4. Which letters of the English alphabet have reflectional symmetry about :

(i) A, H, I, M, O, T, U, V, W, X, Y

(ii) B, C, D, E, H, I, O, X

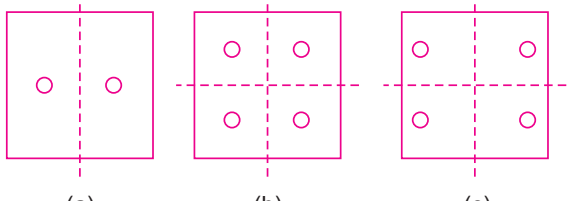
(iii) H, I, O, X

5.

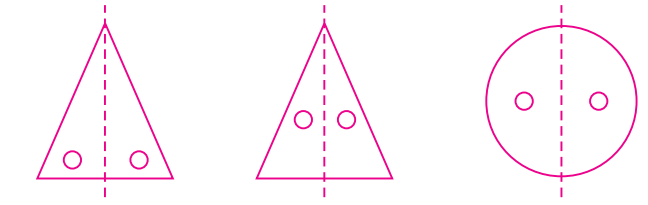


(a) (b) (c) (d)

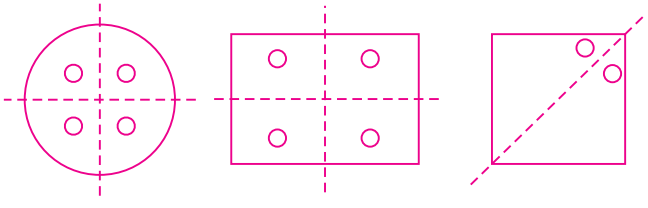
6.



(a) (b) (c)



(d) (e) (f)



(g) (h) (i)

7. Do yourself.

Exercise 15.2

1. (a) No (b) No (c) Yes (d) Yes (e) No

2. (a) 4 (b) 2 (c) 2 (d) 6 (e) 2 (f) 3 (g) 5 (h) 6 (i) 2 (j) 2

3. Write the no. of lines of symmetry and order of rotational symmetry in the following :

Alphabet	No. of lines of symmetry	Order of Rotational Symmetry
C	1	1
D	1	1
X	2	4
H	2	2

4. An isosceles triangle.

5. Complete the following table :

No.	Shape	Order of Rotational Symmetry	Angle of Rotation
a.	Trapezium	1	360°
b.	Rhombus	2	180°
c.	Parallelogram	2	180°
d.	Equilateral triangle	3	120°
e.	Regular pentagon	5	72°
f.	Regular hexagon	6	60°
g.	Isosceles right triangle	1	360°
h.	Semicircle	1	360°

6. Fill in the blanks :

Alphabet Letters	Presence of Line of Symmetry	Number of Lines of Symmetry	Rotational Symmetry of order more than 1	Order of Rotational Symmetry
Z	No	0	Yes	2
H	Yes	2	Yes	2
O	Yes	2	Yes	2
S	No	0	Yes	2
E	Yes	1	No	1
N	No	0	Yes	2
C	Yes	1	No	1
I	Yes	2	Yes	2

Chapter 16 : Visualising Solid Shapes

Exercise 16.1

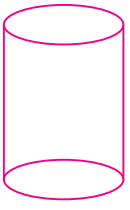
1. (a) Cuboid (b) Cylinder (c) Sphere (d) Cube (e) Pyramid (f) Cone

2. Fill in the blanks :

(a) 6, 12 and 8 (b) edge (c) face (d) plane, curved

3. Draw a solid shape that has two flat faces and one curved surface.

The required solid shape is a cylinder.

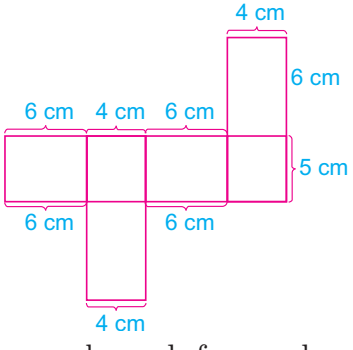


4. Write down the no. of edges in each of the following solids :

(i) Cube → 12 edges (ii) Sphere → No edge

(iii) Cylinder → 2 curved edges (iv) Cone → No edge

5.



6. Which solid shape can be made from each net shown below :

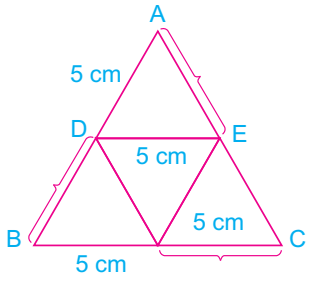
(a) Cube (b) Square Pyramid (c) Cuboid

7. Match the nets with appropriate solids :

a → (iii) b → (ii) c → (v) d → (vi) e → (viii)

f → (i) g → (vii) h → (ix) i → (iv)

8. 4 faces, triangle



Exercose 16.2

1. Do yourself **2.** Do yourself **3.** Do yourself **4.** Do yourself

Exercise 16.3

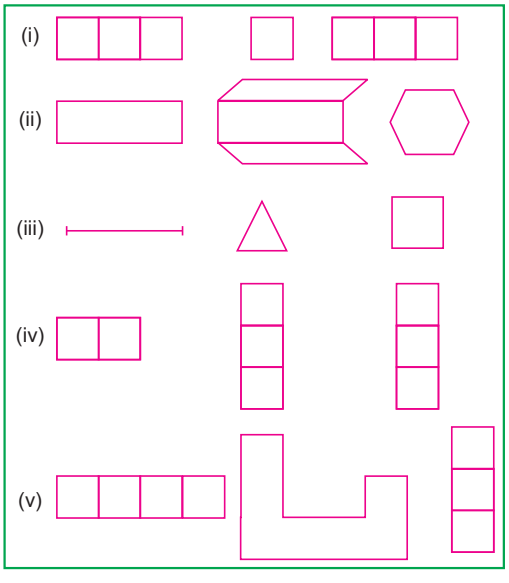
1. (a) 9 Cubes (b) 16 Cubes (c) 29 Cubes

2.

(a)	(i) front	(ii) side	(iii) top
(b)	(i) side	(ii) top	(iii) front
(c)	(i) front	(ii) side	(iii) top
(d)	(i) top	(ii) front	(iii) side
(e)	(i) top	(ii) front	(iii) side
(f)	(i) front	(ii) side	(iii) top
(g)	(i) side	(ii) top	(iii) front
(h)	(i) side	(ii) front	(iii) top
(i)	(i) side	(ii) front	(iii) top

3. (a) rectangle, rectangle (b) circle, circle
(c) isosceles triangle, circle
(d) triangle, circle

4.



5. (a) Almirah (b) die (c) ice-cream cone.

❑