Exercise 1.1

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

[Using associative property]

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

[Using distributive property]

$=\frac{3}{5}\left(\frac{-4-1}{6}\right)+\frac{5}{2}$

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

$=-\frac{1}{2}+\frac{5}{2}=\frac{-1+5}{2}=\frac{4}{2}=\mathbf{2}$

(ii) $\frac{2}{5}\times\left(\frac{3}{-7}\right)-\frac{1}{6}\times\frac{3}{2}+\frac{1}{14}\times\frac{2}{5}$

$=\frac{2}{5}\times\left(\frac{-3}{7}\right)+\frac{1}{14}\times\frac{2}{5}-\frac{1}{6}\times\frac{3}{2}$

[Using associative property]

$=\frac{2}{5}\times\left(\frac{-3}{7}+\frac{1}{14}\right)-\frac{1}{4}$

[Using distributive property]

$=\frac{2}{5}\times\left(\frac{-6+1}{14}\right)-\frac{1}{4}=\frac{2}{5}\times\frac{-5}{14}-\frac{1}{4}$

$=\frac{-1}{7}-\frac{1}{4}=\frac{-4-7}{28}=\mathbf{\frac{-11}{28}}$

2. We know that additive inverse of a rational number $\frac{a}{b}$ is $\left(\frac{-a}{b}\right)$, such that $\frac{a}{b}+\left(\frac{-a}{b}\right)=0$

(i) Additive inverse of $\frac{2}{8}$ is $\mathbf{\frac{-2}{8}}$.

(ii) Additive inverse of $\frac{-5}{9}$ is $\frac{5}{9}$.

(iii) Additive inverse of $\frac{-6}{-5}$ is $\frac{-6}{5}$.

(iv) Additive inverse of $\frac{2}{-9}$ is $\frac{2}{9}$.

(v) Additive inverse of $\frac{19}{-6}$ is $\frac{19}{6}$.

3. (i) Putting $x = \frac{11}{15}$ in $-(-x) = x$,

$$-\left(-\frac{11}{15}\right) = \frac{11}{15} \quad \Rightarrow \quad \frac{11}{15} = \frac{11}{15}$$

$\Rightarrow$ **LHS = RHS**

Hence, verified.

(ii) Putting $x = -\frac{13}{17}$ in $-(-x) = x$,

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

$$\Rightarrow \quad \frac{-13}{17} = \frac{-13}{17}$$

$\Rightarrow$ **LHS = RHS**

Hence, verified.

4. We know that multiplicative inverse of a rational number a is $\left(\frac{1}{a}\right)$, such that $a \times \frac{1}{a} = 1$.

(i) Multiplicative inverse of -13 is $\frac{-1}{13}$.

(ii) Multiplicative inverse of $\frac{-13}{19}$ is $\frac{-19}{13}$.

(iii) Multiplicative inverse of $\frac{1}{5}$ is 5.

(iv) Multiplicative inverse of $\frac{-5}{8} \times \frac{-3}{7} = \frac{15}{56}$ is $\frac{56}{15}$.

(v) Multiplicative inverse of $-1 \times \frac{-2}{5} = \frac{2}{5}$ is $\frac{5}{2}$.

(vi) Multiplicative inverse of -1 is $\frac{1}{-1} = -1$.

5. (i) 1 is the multiplicative identity.
(ii) Commutative property.
(iii) Multiplicative inverse property.

6. The reciprocal of $\frac{-7}{16}$ is $\frac{-16}{7}$.

According to the question,

$$\frac{6}{13} \times \left(\frac{-16}{7}\right) = \frac{-96}{91}$$

7. By using associative property of multiplication, $a \times (b \times c) = (a \times b) \times c$.

8. Since multiplicative inverse of a rational number a is $\left(\frac{1}{a}\right)$, if $a \times \frac{1}{a} = 1$.

Therefore, $\frac{8}{9} \times \left(-1\frac{1}{8}\right) = \frac{8}{9} \times \frac{-9}{8} = -1$

But its product must be positive 1.

Therefore, $\frac{8}{9}$ is not the multiplicative inverse of $\left(-1\frac{1}{8}\right)$.

9. Since multiplicative inverse of a rational number a is $\left(\frac{1}{a}\right)$, if $a \times \frac{1}{a} = 1$.

Therefore, $0.3 \times 3\frac{1}{3} = \frac{3}{10} \times \frac{10}{3} = 1$

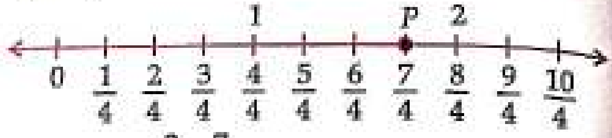
Therefore, Yes 0.3 is the multiplicative inverse of $3\frac{1}{3}$.

10. (i) The rational number that does not have a reciprocal is **0**.
(ii) The rational numbers that are equal to their reciprocals are **1** and **−1**.
(iii) The rational number that is equal to its negative is **0**.

11. (i) **No** (ii) **1, −1**
(iii) $\frac{-1}{5}$
(iv) x
(v) **Rational number**
(vi) **Positive**

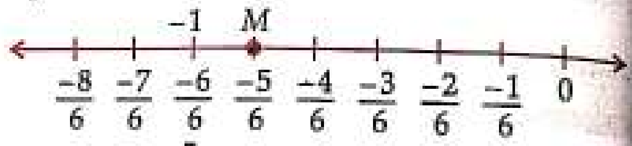
Exercise 1.2

1. (i) $\frac{7}{4} = 1\frac{3}{4}$



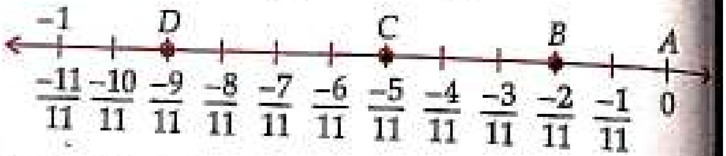
Here, P is $1\frac{3}{4} = \frac{7}{4}$

(ii) $\frac{-5}{6}$



Here, M is $\frac{-5}{6}$.

2. Here, $B = \frac{-2}{11}$, $C = \frac{-5}{11}$ and $D = \frac{-9}{11}$



3. Five rational numbers which are smaller than 2 are : $\frac{1}{3}, \frac{1}{4}, \frac{1}{2}, \frac{-1}{2}, \frac{-1}{5}$.

4. Given rational numbers are $\frac{-2}{5}$ and $\frac{1}{2}$.

Here, L.C.M. of 5 and 2 is 10.

$\therefore \quad \frac{-2}{5} \times \frac{2}{2} = \frac{-4}{10}$ and $\frac{1}{2} \times \frac{5}{5} = \frac{5}{10}$

Again, $\quad \frac{-4}{10} \times \frac{2}{2} = \frac{-8}{20}$ and $\frac{5}{10} \times \frac{2}{2} = \frac{10}{20}$

$\therefore$ Ten rational numbers between $\frac{-2}{5}$ and $\frac{1}{2}$ ar
$\frac{-7}{20}, \frac{-6}{20}, \frac{-5}{20}, \frac{-4}{20}, \frac{-3}{20}, \frac{-2}{20}, \frac{-1}{20}, 0, \frac{1}{20}, \frac{2}{20}$.

· (i) Given rational numbers are $\frac{2}{3}$ and $\frac{4}{5}$.

L.C.M. of 3 and 5 is 15.

$\therefore \quad \frac{2}{3} \times \frac{5}{5} = \frac{10}{15}$ and $\frac{4}{5} \times \frac{3}{3} = \frac{12}{15}$

Again $\quad \frac{10}{15} \times \frac{4}{4} = \frac{40}{60}$ and $\frac{12}{15} \times \frac{4}{4} = \frac{48}{60}$

$\therefore$ Five rational numbers between $\frac{2}{3}$ and $\frac{4}{5}$ are
$\frac{41}{60}, \frac{42}{60}, \frac{43}{60}, \frac{44}{60}, \frac{45}{60}$.

(ii) Given rational numbers are $\frac{-3}{2}$ and $\frac{5}{3}$.

L.C.M. of 2 and 3 is 6.

$\therefore \quad \frac{-3}{2} \times \frac{3}{3} = \frac{-9}{6}$ and $\frac{5}{3} \times \frac{2}{2} = \frac{10}{6}$

$\therefore$ Five rational numbers between $\frac{-3}{2}$ and $\frac{5}{3}$ are

$\frac{-8}{6}, \frac{-7}{6}, 0, \frac{1}{6}, \frac{2}{6}$.

(iii) Given rational numbers are $\frac{1}{4}$ and $\frac{1}{2}$.

L.C.M. of 4 and 2 is 4.

$\therefore \quad \frac{1}{4} \times \frac{1}{1} = \frac{1}{4}$ and $\frac{1}{2} \times \frac{2}{2} = \frac{2}{4}$

Again $\quad \frac{1}{4} \times \frac{8}{8} = \frac{8}{32}$ and $\frac{2}{4} \times \frac{8}{8} = \frac{16}{32}$

$\therefore$ Five rational numbers between $\frac{1}{4}$ and $\frac{1}{2}$ are

$\frac{9}{32}, \frac{10}{32}, \frac{11}{32}, \frac{12}{32}, \frac{13}{32}$.

6. Five rational numbers greater than -2 are :

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

[Other rational numbers may also be possible]

7. The given rational numbers are $\frac{3}{5}$ and $\frac{3}{4}$.

L.C.M. of 5 and 4 is 20.

$\therefore$ $$\frac{3}{5} \times \frac{4}{4} = \frac{12}{20}$$

and $$\frac{3}{4} \times \frac{5}{5} = \frac{15}{20}$$

Again $$\frac{12}{20} \times \frac{8}{8} = \frac{96}{160}$$

and $$\frac{15}{20} \times \frac{8}{8} = \frac{120}{160}$$

$\therefore$ Ten rational numbers between $\frac{3}{5}$ and $\frac{3}{4}$ are :

$$\frac{97}{160}, \frac{98}{160}, \frac{99}{160}, \frac{100}{160}, \frac{101}{160}, \frac{102}{160}, \frac{103}{160}, \frac{104}{160}, \frac{105}{160}, \frac{106}{160}$$

Exercise 2.1

1. $x - 2 = 7$

$\Rightarrow \quad x - 2 + 2 = 7 + 2$ [Adding 2 both sides]

$\Rightarrow \quad x = \mathbf{9}$

2. $y + 3 = 10$

$\Rightarrow \quad y + 3 - 3 = 10 - 3$ [Subtracting 3 both sides]

$\Rightarrow \quad y = \mathbf{7}$

3. $6 = z + 2$

$\Rightarrow \quad 6 - 2 = z + 2 - 2$ [Subtracting 2 both sides]

$\Rightarrow \quad 4 = z$

$\Rightarrow \quad z = \mathbf{4}$

4. $\frac{3}{7} + x = \frac{17}{7}$

$\Rightarrow \quad x + \frac{3}{7} - \frac{3}{7} = \frac{17}{7} - \frac{3}{7}$ [Subtracting $\frac{3}{7}$ both sides]

$\Rightarrow \quad x = \frac{17 - 3}{7}$

$\Rightarrow \quad x = \frac{14}{7}$

$\Rightarrow \quad x = \mathbf{2}$

5. $6x = 12$

$\Rightarrow \quad \frac{x}{6} = \frac{12}{6}$ [Dividing both sides by 6]

$\Rightarrow \quad x = \mathbf{2}$

6. $\frac{t}{5} = 10$

$\Rightarrow \quad \frac{t}{5} \times 5 = 10 \times 5$ [Multiplying both sides by 5]

$\Rightarrow \quad t = \mathbf{50}$

7. $\frac{2x}{3} = 18$

$\Rightarrow \quad \frac{2x}{3} \times 3 = 18 \times 3$ [Multiplying both sides by 3]

$\Rightarrow \quad 2x = 18 \times 3$

$$\Rightarrow \quad \frac{2x}{2} = \frac{18 \times 3}{2}$$ [Dividing both sides by 2]

$$\Rightarrow \quad x = \mathbf{27}$$

8. $1.6 = \frac{y}{1.5}$

$$\Rightarrow \quad 1.6 \times 1.5 = \frac{y}{1.5} \times 1.5$$

[Multiplying both sides by 1.5]

$$\Rightarrow \quad 2.40 = y$$

$$\Rightarrow \quad y = \mathbf{2.40}$$

9. $7x - 9 = 16$

$$\Rightarrow \quad 7x - 9 + 9 = 16 + 9$$ [Adding 9 both sides]

$$\Rightarrow \quad 7x = 25$$

$$\Rightarrow \quad \frac{7x}{7} = \frac{25}{7}$$ [Dividing both sides by 7]

$$\Rightarrow \quad x = \mathbf{\frac{25}{7}}$$

10. $14y - 8 = 13$

$$\Rightarrow \quad 14y - 8 + 8 = 13 + 8$$ [Adding 8 both sides]

$$\Rightarrow \quad 14y = 21$$

$$\Rightarrow \quad \frac{14y}{14} = \frac{21}{14}$$ [Dividing both sides by 14]

$$\Rightarrow \quad y = \mathbf{\frac{3}{2}}$$

10. $14y - 8 = 13$

$\Rightarrow \quad 14y - 8 + 8 = 13 + 8$ [Adding 8 both sides]

$\Rightarrow \quad 14y = 21$

$\Rightarrow \quad \frac{14y}{14} = \frac{21}{14}$ [Dividing both sides by 14]

$\Rightarrow \quad y = \frac{3}{2}$

11. $17 + 6p = 9$

$\Rightarrow 17 + 6p - 17 = 9 - 17$

[Subtracting 17 from both sides]

$\Rightarrow \quad 6p = -8$

$\Rightarrow \quad \frac{6p}{6} = \frac{-8}{6}$ [Dividing both sides by 6]

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

12. $\frac{x}{3} + 1 = \frac{7}{15}$

$$\Rightarrow \quad \frac{x}{3}+1-1=\frac{7}{15}-1$$

[Subtracting 1 from both sides]

$$\Rightarrow \quad \frac{x}{3}=\frac{7-15}{15}$$

$$\Rightarrow \quad \frac{x}{3}=\frac{-8}{15}$$

$$\Rightarrow \quad \frac{x}{3}\times 3=\frac{-8}{15}\times 3$$

$$\Rightarrow \quad x=\frac{-8}{5}$$ [Multiplying both sides by 3]

Exercise 2.2

1. Let the number be x.

According to the question, $\frac{1}{2}\left(x-\frac{1}{2}\right)=\frac{1}{8}$

$$\Rightarrow \quad 2\times\frac{1}{2}\left(x-\frac{1}{2}\right)=\frac{1}{8}\times 2$$

[Multiplying both sides by 2]

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

$$\Rightarrow \quad x-\frac{1}{2}+\frac{1}{2}=\frac{1}{4}+\frac{1}{2} \quad \text{[Adding both sides } \tfrac{1}{2}\text{]}$$

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

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

Hence, the required number is $\frac{3}{4}$.

2. Let the breadth of the rectangular pool $(b)=x$ m.

Then, the length of the pool $(l)=(2x+2)$ m

Perimeter of the pool $=2(l+b)$

$$\Rightarrow \quad 154=2(2x+2+x)$$

$$\Rightarrow \quad \frac{154}{2}=\frac{2(2x+2+x)}{2}$$

[Dividing both sides by 2]

$$\Rightarrow \quad 77=3x+2$$

$$\Rightarrow \quad 77-2=3x+2-2$$

[Subtracting 2 from both sides]

$$\Rightarrow \quad 75=3x$$

$$\Rightarrow \quad \frac{75}{3}=\frac{3x}{3}$$

[Dividing both sides by 3]

$$\Rightarrow \quad 25=x \quad \Rightarrow x=25 \text{ m}$$

Length of the pool $=2x+2=2\times 25=50+2=52$ m

Hence, the length of the pool is **52 m** and breadth is **25 m.**

3. Let each of equal sides of an isosceles triangle be x cm.

Perimeter of a triangle = Sum of all three sides

$$\Rightarrow \quad 4\frac{2}{15} = \frac{4}{3} + x + x$$

$$\Rightarrow \quad \frac{62}{15} = \frac{4}{3} + 2x$$

$$\Rightarrow \quad \frac{62}{15} - \frac{4}{3} = \frac{4}{3} - \frac{4}{3} + 2x$$

[Subtracting $\frac{4}{3}$ from both sides]

$$\Rightarrow \quad \frac{62-20}{15} = 2x$$

$$\Rightarrow \quad \frac{42}{15} = 2x$$

$$\Rightarrow \quad \frac{42}{15 \times 2} = \frac{2x}{2}$$

[Dividing both sides by 2]

$$\Rightarrow \quad \frac{7}{5} = x$$

$$\Rightarrow \quad x = 1\frac{2}{5} \text{ cm}$$

Hence, each equal side of an isosceles triangle is **$1\frac{2}{5}$ cm.**

4. Sum of two number $= 95$

Let the first number be x, then another number be $x + 15$.

According to the question,

$$x + x + 15 = 95$$

$\Rightarrow \quad 2x + 15 = 95$

$\Rightarrow \quad 2x + 15 - 15 = 95 - 15$

[Subtracting 15 from both sides]

$\Rightarrow \quad 2x = 80$

$\Rightarrow \quad \frac{2x}{2} = \frac{80}{2}$ [Dividing both sides by 2]

$\Rightarrow \quad x = 40$

So, the first number $= 40$ and another number $= 40 + 15 = 55$

Hence, the two numbers are **40** and **55.**

5. Let the two numbers be $5x$ and $3x$.

According to the question,

$$5x - 3x = 18$$

$$\Rightarrow \quad 2x = 18$$

$$\Rightarrow \quad \frac{2x}{2} = \frac{18}{2}$$

[Dividing both sides by 2]

$\Rightarrow \qquad x = 9$

Hence, first number $= 5 \times 9 = \mathbf{45}$ and second number $= 3 \times 9 = \mathbf{27}$.

6. Let the three consecutive integers be $x, x+1$ and $x+2$.

According to the question,

$$x + x + 1 + x + 2 = 51$$

$\Rightarrow \qquad 3x + 3 = 51$

$\Rightarrow \qquad 3x + 3 - 3 = 51 - 3$

[Subtracting 3 from both sides]

$\Rightarrow \qquad 3x = 48$

$\Rightarrow \qquad \frac{3x}{3} = \frac{48}{3}$

[Dividing both sides by 3]

$\Rightarrow \qquad x = 16$

Hence, first integer $= \mathbf{16}$, second integer $= 16 + 1 = \mathbf{17}$ and third integer $= 16 + 2 = \mathbf{18}$.

7. Let the three consecutive multiples of 8 be $x, x+8$ and $x+16$.

According to the question,

$$x + x + 8 + x + 16 = 888$$

$$3x + 24 = 888$$

$$\Rightarrow \quad 3x + 24 - 24 = 888 - 24$$

[Subtracting 24 from both sides]

$$\Rightarrow \quad 3x = 864$$

$$\Rightarrow \quad \frac{3x}{3} = \frac{864}{3}$$

[Dividing both sides by 3]

$$\Rightarrow \quad x = 288$$

Hence, first multiple of $8 = $ **288**, second multiple of $8 = 288 + 8 = $ **296** and third multiple of $8 = 288 + 16 = $ **304**.

8. Let the three consecutive integers be $x, x+1$ and $x+2$

According to the question,

$$2x+3(x+1)+4(x+2)=74$$

$$\Rightarrow 2x+3x+3+4x+8=74$$

$$\Rightarrow 9x+11=74$$

$$\Rightarrow 9x+11-11=74-11$$

[Subtracting 11 from both sides]

$$\Rightarrow 9x=63$$

$$\Rightarrow \frac{9x}{9}=\frac{63}{9}$$

[Dividing both sides by 9]

$$\Rightarrow x=7$$

Hence, first integer $=7$, second integer $=7+1=8$ and third integer $=7+2=$ **9**.

9. Let the present ages of Rahul and Haroon be $5x$ years and $7x$ years respectively.

According to the question,

$$(5x+4)+(7x+4)=56$$

$$\Rightarrow \quad 12x+8=56$$

$$\Rightarrow \quad 12x+8-8=56-8$$

[Subtracting 8 from both sides]

$$\Rightarrow \quad 12x=48$$

$$\Rightarrow \quad \frac{12x}{12}=\frac{48}{12}$$

[Dividing both sides by 12]

$$\Rightarrow \quad x=4$$

Hence, present age of Rahul $=5\times4=$ **20 years** and present age of Haroon $=7\times4=$ **28 years.**

10. Let the number of girls be x.

Then, the number of boys $= x + 8$.

According to the question,

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

$\Rightarrow$ $$5(x+8) = 7x$$

$\Rightarrow$ $$5x + 40 = 7x$$

$\Rightarrow$ $$5x - 7x = -40$$

[Transposing $7x$ to LHS and 40 to RHS]

$\Rightarrow$ $$-2x = -40$$

$\Rightarrow$ $$\frac{-2x}{-2} = \frac{-40}{-2}$$

[Dividing both sides by -2]

$\Rightarrow$ $$x = 20$$

Hence, the number of girls $= 20$ and number of boys $= 20 + 8 = 28$.

11. Let Baichung's age be x years, then Baichung's father's age $(x+29)$ years and Baichung's granddaughter's age $=(x+29+26)=(x+55)$ years.

According to condition,

$$x+x+29+x+55=135$$

$$\Rightarrow \quad 3x+84=135$$

$$\Rightarrow \quad 3x+84-84=135-84$$

[Subtracting 84 from both sides]

$$\Rightarrow \quad 3x=51$$

$$\Rightarrow \quad \frac{3x}{3}=\frac{51}{3}$$

[Dividing both sides by 3]

$$\Rightarrow \quad x = 17 \text{ years}$$

Hence, Baichung's age $= \mathbf{17}$ **years**, Baichung's father's age $= 17 + 29 =$ **46 years** and Baichung's granddaughter's age $= 17 + 29 + 26 =$ **72 years.**

12. Let Ravi's present age be x years.

After fifteen years, Ravi's age $= 4x$ years.

Fifteen years from now, Ravi's age $= (x + 15)$ years.

According to the question,

$$4x = x + 15$$

$$\Rightarrow \quad 4x - x = 15 \text{ [Transposing } x \text{ to LHS]}$$

$$\Rightarrow \quad 3x = 15$$

$$\Rightarrow \quad \frac{3x}{3} = \frac{15}{3}$$

[Dividing both sides by 3]

$$\Rightarrow \quad x = 5 \text{ years}$$

Hence, Ravi's present age be **5 years.**

13. Let the rational number be x.

According to the question,

$$\frac{5}{2}x + \frac{2}{3} = \frac{-7}{12}$$

$$\Rightarrow \quad \frac{5}{2}x + \frac{2}{3} - \frac{2}{3} = \frac{-7}{12} - \frac{2}{3}$$

[Subtracting $\frac{2}{3}$ from both sides]

$$\Rightarrow \quad \frac{5x}{2} = \frac{-7-8}{12}$$

$$\Rightarrow \quad \frac{5x}{2} = \frac{-15}{12}$$

$$\Rightarrow \quad 5x \times 12 = -15 \times 2$$

$$\Rightarrow \quad 60x = -30$$

$$\Rightarrow \quad \frac{60x}{60} = \frac{-30}{60}$$

[Dividing both sides by 60]

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

Hence, the rational number is $\frac{-1}{2}$.

14. Let number of notes be $2x$, $3x$ and $5x$.

According to the question,

$$100 \times 2x + 50 \times 3x + 10 \times 5x = 4,00,000$$

$$\Rightarrow \quad 200x + 150x + 50x = 4,00,000$$

$$\Rightarrow \quad 400x = 4,00,000$$

$$\Rightarrow \quad \frac{400x}{400} = \frac{4,00,000}{400}$$

[Dividing both sides by 400]

$$\Rightarrow \quad x = 1000$$

Hence, number of denominations of ₹ 100 notes

$$= 2 \times 1000 = 2000$$

Number of denominations of ₹ 50 notes

$$= 3 \times 1000 = 3000$$

Number of denominations of ₹ 10 notes

$$= 5 \times 1000 = 5000$$

Therefore, required denominations of notes of ₹ 100, ₹ 50 and ₹ 10 are **2000, 3000** and **5000** respectively.

15. Total sum of money = ₹ 300

Let the number of ₹ 5 coins be x, number of ₹ 2 coins be $3x$ and number of ₹ 1 coins be $160 - (x + 3x) = 160 - 4x$.

According to question,

$5 \times x + 2 \times (3x) + 1 \times (160 - 4x) = 300$

$\Rightarrow \quad 5x + 6x + 160 - 4x = 300$

$\Rightarrow \quad 7x + 160 = 300$

$\Rightarrow \quad 7x + 160 - 160 = 300 - 160$

[Subtracting 160 from both sides]

$\Rightarrow \quad 7x = 140$

$\Rightarrow \quad \frac{7x}{7} = \frac{140}{7}$

[Dividing both sides by 7]

$\Rightarrow \quad x = 20$

Hence, the number of coins of ₹ 5 denomination = **20**

Number of coins of ₹ 2 denomination $= 3 \times 20 =$ **60**

Number of coins of ₹ 1 denomination $= 160 - 4 \times 20$

$= 160 - 80 =$ **80**

16. Total sum of money = ₹ 3000

Let the number of winners of ₹ 100 be x.

And those who are not winners $= 63 - x$

According to the question,

$$100 \times x + 25 \times (63 - x) = 3000$$

$\Rightarrow$ $$100x + 1575 - 25x = 3000$$

$\Rightarrow$ $$75x + 1575 = 3000$$

$\Rightarrow$ $$75x + 1575 - 1575 = 3000 - 1575$$

[Subtracting 1575 from both sides]

$\Rightarrow$ $$75x = 1425$$

$\Rightarrow$ $$\frac{75x}{75} = \frac{1425}{75}$$

[Dividing both sides by 7]

$\Rightarrow$ $$x = 19$$

Hence, the number of winner is **19**.

Exercise 2.3

1. $3x = 2x + 18$

$$\Rightarrow \quad 3x - 2x = 18$$

$$\Rightarrow \quad x = \mathbf{18}$$

To check :

$$3x = 2x + 18$$

$$\Rightarrow \quad 3 \times 18 = 2 \times 18 + 18$$

$$\Rightarrow \quad 54 = 36 + 18$$

$$\Rightarrow \quad 54 = 54$$

$$\Rightarrow \quad \text{LHS} = \text{RHS}$$

Hence, $x = \mathbf{18}$ is correct result.

2. $5t - 3 = 3t - 5$

$$\Rightarrow \quad 5t - 3t = -5 + 3$$

$$\Rightarrow \quad 2t = -2$$

$$\Rightarrow \quad t = \frac{-2}{2} = -1$$

To check :

$$5t - 3 = 3t - 5$$

$$\Rightarrow \quad 5 \times (-1) - 3 = 3 \times (-1) - 5$$

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

$$\Rightarrow \quad -8 = -8$$

$$\Rightarrow \quad \text{LHS} = \text{RHS}$$

Hence, $t = -\mathbf{1}$ is correct result.

3. $5x + 9 = 5 + 3x$

$$\Rightarrow \quad 5x - 3x = 5 - 9$$

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

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

To check :

$$\Rightarrow \quad 5x + 9 = 5 + 3x$$

$$\Rightarrow \quad 5 \times (-2) + 9 = 5 + 3 \times (-2)$$

$$\Rightarrow \quad -10 + 9 = 5 - 6$$

$$\Rightarrow \quad -1 = -1$$

$$\Rightarrow \quad \text{LHS} = \text{RHS}$$

Hence, $x = -$ **2** is correct result.

4. $4z + 3 = 6 + 2z$

$$\Rightarrow \quad 4z - 2z = 6 - 3$$

$$\Rightarrow \quad 2z = 3$$

$$\Rightarrow \quad z = \frac{3}{2}$$

To check :

$$4z + 3 = 6 + 2z$$

$$\Rightarrow \quad 4 \times \frac{3}{2} + 3 = 6 + 2 \times \frac{3}{2}$$

$$\Rightarrow \quad 2 \times 3 + 3 = 6 + 3$$

$$\Rightarrow \quad 6+3=9$$

$$\Rightarrow \quad 9=9$$

$$\Rightarrow \quad \text{LHS} = \text{RHS}$$

Hence, $z=\frac{3}{2}$ is correct result.

5. $2x-1=14-x$

$$\Rightarrow \quad 2x+x=14+1$$

$$\Rightarrow \quad 3x=15$$

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

To check :

$$\Rightarrow \quad 2x-1=14-x$$

$$\Rightarrow \quad 2\times5-1=14-5$$

$$\Rightarrow \quad 10-1=9$$

$$\Rightarrow \quad 9=9$$

$$\Rightarrow \quad \text{LHS} = \text{RHS}$$

Hence, $x=\mathbf{5}$ is correct result.

6. $8x + 4 = 3(x - 1) + 7$

$$\Rightarrow \quad 8x + 4 = 3x - 3 + 7$$

$$\Rightarrow \quad 8x - 3x = -3 + 7 - 4$$

$$\Rightarrow \quad 5x = 0$$

$$\Rightarrow \quad x = \frac{0}{5} = 0$$

To check :

$$\Rightarrow \quad 8x + 4 = 3(x - 1) + 7$$

$$\Rightarrow \quad 8 \times 0 + 4 = 3(0 - 1) + 7$$

$$\Rightarrow \quad 0 + 4 = 3 \times (-1) + 7$$

$$\Rightarrow \quad 4 = -3 + 7$$

$$\Rightarrow \quad 4 = 4$$

$$\Rightarrow \quad \text{LHS} = \text{RHS}$$

Hence, $x = \mathbf{0}$ is correct result.

7. $x = \frac{4}{5}(x + 10)$

$$\Rightarrow \quad 5x = 4(x + 10)$$

$$\Rightarrow \quad 5x = 4x + 40$$

$$\Rightarrow \quad 5x - 4x = 40$$

$$\Rightarrow \quad x = 40$$

To check :

$$x = \frac{4}{5}(x + 10)$$

$$\Rightarrow \quad 40 = \frac{4}{5}(40 + 10)$$

$$\Rightarrow \quad 40 = \frac{4}{5} \times 50$$

$$\Rightarrow \quad 40 = 4 \times 10$$

$$\Rightarrow \quad 40 = 40$$

$$\Rightarrow \quad \text{LHS} = \text{RHS}$$

Hence, $x = \mathbf{40}$ is correct result.

8. $\frac{2x}{3} + 1 = \frac{7x}{15} + 3$

$$\Rightarrow \quad \frac{2x}{3} - \frac{7x}{15} = 3 - 1$$

$$\Rightarrow \quad \frac{10x - 7x}{15} = 2$$

$$\Rightarrow \quad 3x = 30$$

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

To check :

$$\frac{2x}{3} + 1 = \frac{7x}{15} + 3$$

$$\Rightarrow \quad \frac{2 \times 10}{3} + 1 = \frac{7 \times 10}{15} + 3$$

$$\Rightarrow \quad \frac{20}{3} + 1 = \frac{14}{3} + 3$$

$$\Rightarrow \quad \frac{20 + 3}{3} = \frac{14 + 9}{3}$$

$$\Rightarrow \quad \frac{23}{3} = \frac{23}{3}$$

$$\Rightarrow \quad \text{LHS} = \text{RHS}$$

Hence, $x = \mathbf{10}$ is correct result.

9. $2y+\frac{5}{3}=\frac{26}{3}-y$

$$\Rightarrow \quad 2y+y=\frac{26}{3}-\frac{5}{3}$$

$$\Rightarrow \quad 3y=\frac{26-5}{3}$$

$$\Rightarrow \quad 3y=\frac{21}{3}$$

$$\Rightarrow \quad y=\frac{21}{3\times 3}=\frac{7}{3}$$

To check :

$$2y+\frac{5}{3}=\frac{26}{3}-y$$

$$\Rightarrow \quad 2\times\frac{7}{3}+\frac{5}{3}=\frac{26}{3}-\frac{7}{3}$$

$$\Rightarrow \quad \frac{14}{3}+\frac{5}{3}=\frac{26}{3}-\frac{7}{3}$$

$$\Rightarrow \quad \frac{14+5}{3}=\frac{26-7}{3}$$

$$\Rightarrow \quad \frac{19}{3}=\frac{19}{3}$$

$$\Rightarrow \quad \text{LHS} = \text{RHS}$$

Hence, $y = \frac{7}{3}$ is correct result.

10. $3m = 5m - \frac{8}{5}$

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

$$\Rightarrow \quad -2m = \frac{-8}{5}$$

$$\Rightarrow \quad m = \frac{-8}{5 \times (-2)}$$

$$\Rightarrow \quad m = \frac{4}{5}$$

To check :

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

$$\Rightarrow \quad 3 \times \frac{4}{5} = 5 \times \frac{4}{5} - \frac{8}{5}$$

$$\Rightarrow \quad \frac{12}{5} = 4 - \frac{8}{5}$$

$$\Rightarrow \quad \frac{12}{5} = \frac{20-8}{5}$$

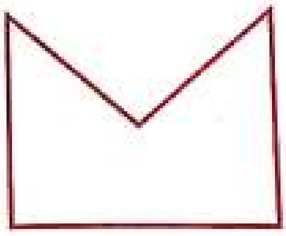
$$\Rightarrow \quad \frac{12}{5} = \frac{12}{5}$$

$$\Rightarrow \quad \text{LHS} = \text{RHS}$$

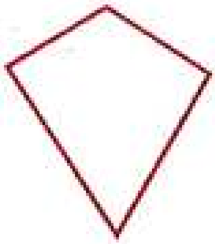
Hence, $m = \frac{4}{5}$ is correct result.

Exercise 3.1

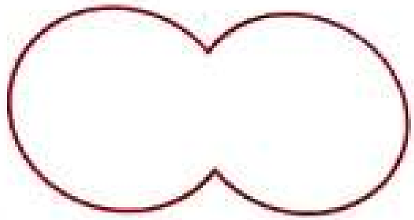
1. (a) Simple curve



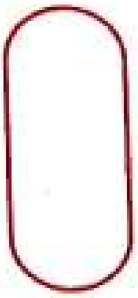
(1)



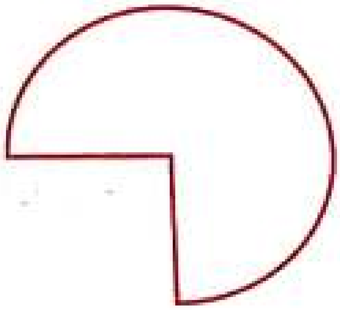
(2)



(5)

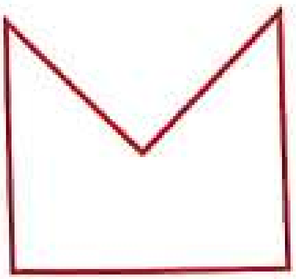


(6)

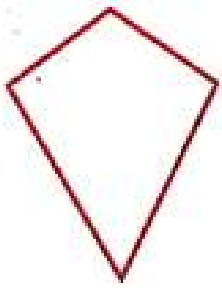


(7)

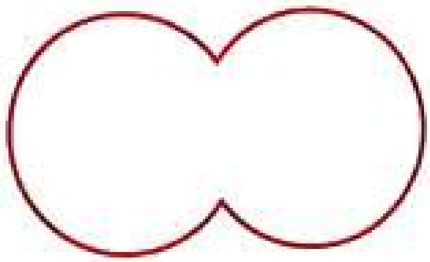
(b) Simple closed curve



(1)



(2)

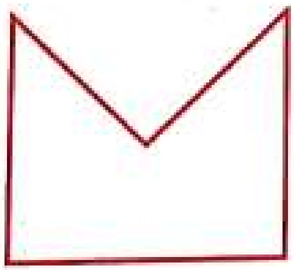


(5)

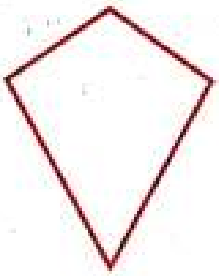
(6)

(7)

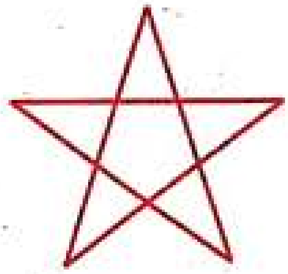
(c) Polygon



(1)

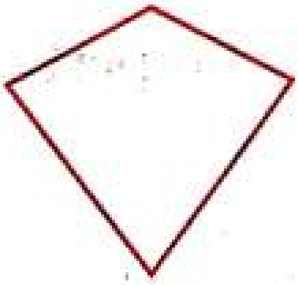


(2)



(4)

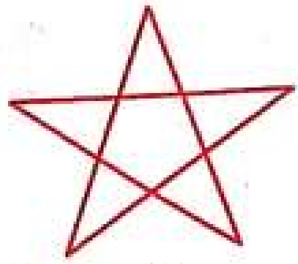
(d) Convex polygon



(1)

(e) Concave polygon

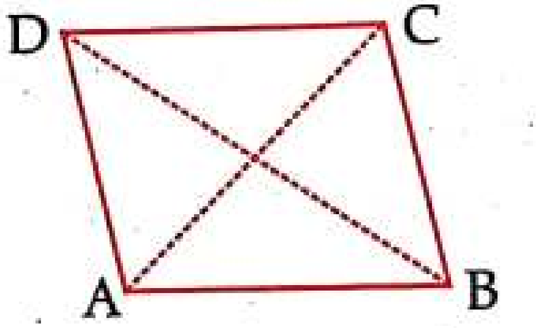
(1)



(4)

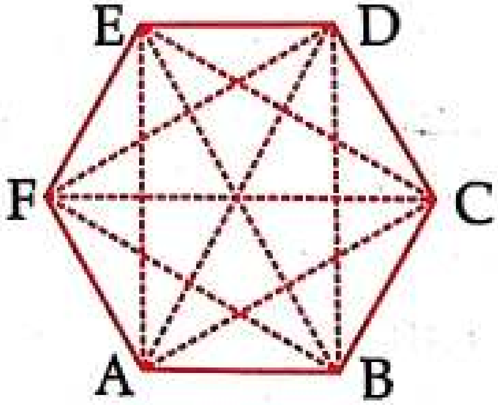
2. (a) A convex quadrilateral has two diagonals.

Here, ***AC*** and ***BD*** are two diagonals.



(b) A regular hexagon has 9 diagonals.

Here, diagonals are ***AD, AE, BD, BE, FC, FB, AC, EC*** and ***FD***.



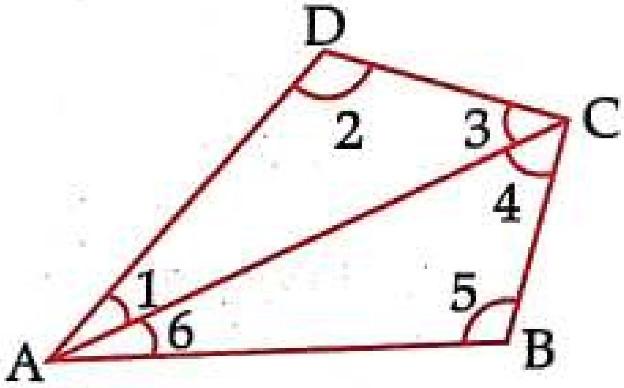
(c) A triangle has **no** diagonal.

3. Let $ABCD$ is a convex quadrilateral, then we draw a diagonal AC which divides the quadrilateral in two triangles.

$$\angle A + B + \angle C + \angle D$$
$$= \angle 1 + \angle 6 + \angle 5 + \angle 4 + \angle 3 + \angle 2$$
$$= (\angle 1 + \angle 2 + \angle 3) + (\angle 4 + \angle 5 + \angle 6)$$
$$= 180° + 180°$$

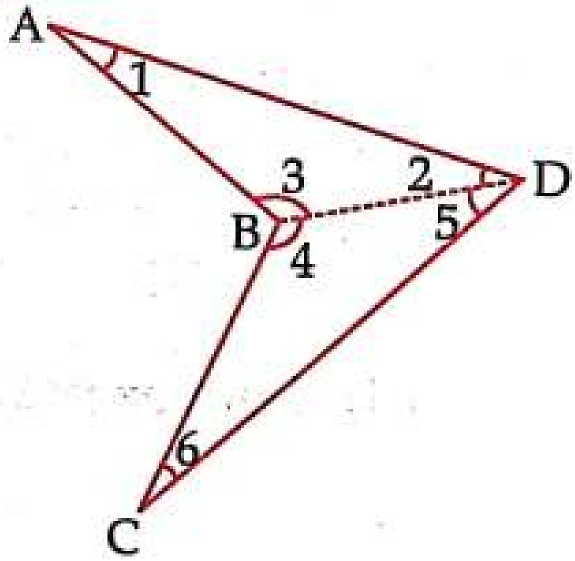
[By Angle sum property of triangle]

$$= \mathbf{360°}$$



Hence, the sum of the measures of the angles of a convex quadrilateral is 360°.

Yes, if quadrilateral is not convex then, this property will also be applied.



Let $ABCD$ is a non-convex quadrilateral and join BD, which also divides the quadrilateral in two triangles.

Using angle sum property of triangle.

In ΔABD,

$$\angle 1 + \angle 2 + \angle 3 = 180° \quad \text{...(i)}$$

In ΔBDC, $$\angle 4 + \angle 5 + \angle 6 = 180° \quad \text{...(ii)}$$

Adding eq. (i) and (ii),

$$\angle 1+\angle 2+\angle 3+\angle 4+\angle 5+\angle 6=360^\circ$$

$$\Rightarrow \angle 1+(\angle 3+\angle 4)+\angle 6+(\angle 2+\angle 5)=360^\circ$$

$$\Rightarrow \angle A+\angle B+\angle C+\angle D=360^\circ$$

Hence proved.

4. (a) When $n=7$, then

Angle sum of a polygon $=(n-2)\times 180^\circ$

$=(7-2)\times 180^\circ$

$=5\times 180^\circ=900^\circ$

(b) When $n=8$, then

Angle sum of a polygon $=(n-2)\times 180^\circ$

$=(8-2)\times 180^\circ$

$=6\times 180^\circ=1080^\circ$

(c) When $n=10$, then

Angle sum of a polygon $=(n-2)\times 180^\circ$

$=(10-2)\times 180^\circ$

$=8\times 180^\circ=1440^\circ$

(d) When $n=n$, then

Angle sum of a polygon $=(n-2)\times 180^\circ$

11 side

5. **A regular polygon:** A polygon having all sides of equal length and the interior angles of equal size is known as regular polygon.

(i) 3 sides

Polygon having three sides is called a ***triangle***.

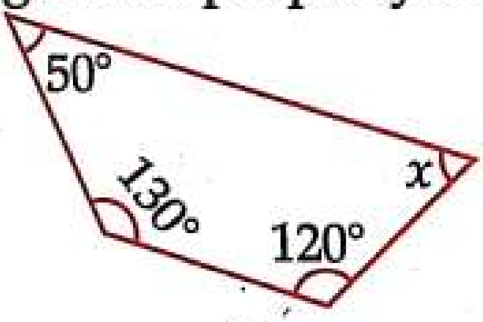
(ii) 4 sides

Polygon having four sides is called a ***quadrilateral***.

(iii) 6 sides

Polygon having six sides is called a ***hexagon***.

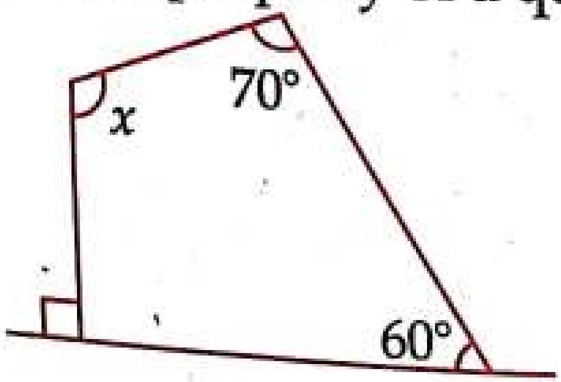
6. (a) Using angle sum property of a quadrilateral,



(a)

$$50° + 130° + 120° + x = 360°$$
$$\Rightarrow \quad 300° + x = 360°$$
$$\Rightarrow \quad x = 360° - 300°$$
$$\Rightarrow \quad x = \mathbf{60°}$$

(b) Using angle sum property of a quadrilateral,



(b)

$$90° + 60° + 70° + x = 360°$$

$\Rightarrow \quad 220° + x = 360°$

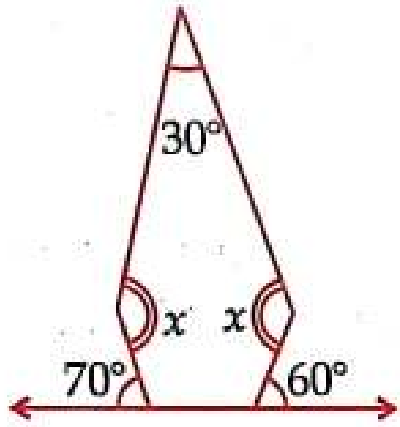
$\Rightarrow \quad x = 360° - 220°$

$\Rightarrow \quad x = \mathbf{140°}$

(c) First base interior angle $= 180° - 70° = 110°$

Second base interior angle $= 180° - 60° = 120°$

There are 5 sides, $n = 5$



(c)

$\therefore$ Angle sum of a polygon $= (n-2) \times 180°$

$= (5-2) \times 180°$

$= 3 \times 180° = 540°$

$\therefore \quad 30° + x + 110° + 120° + x = 540°$

$\Rightarrow \quad 260° + 2x = 540°$

$\Rightarrow \quad 2x = 540° - 260°$

$\Rightarrow \quad 2x = 280°$

$\Rightarrow \quad x = \mathbf{140°}$

(d) Angle sum of a polygon $= (n-2) \times 180°$

$= (5-2) \times 180°$

$= 3 \times 180°$

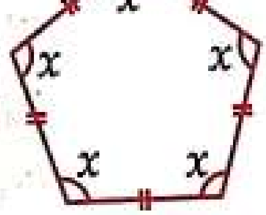
$= 540°$

$\therefore \quad x + x + x + x + x = 540°$

$\Rightarrow \quad 5x = 540°$

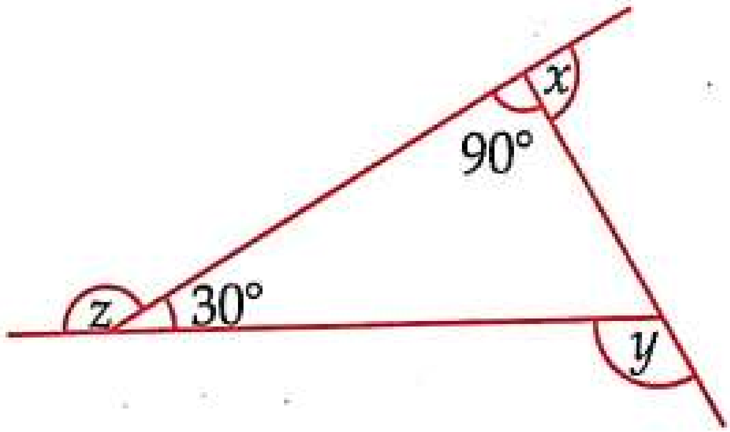
$\Rightarrow \quad x = 108°$

Hence, each interior angle is **108°**.



(d)

7. (a) Since sum of linear pair angles is 108°.



$\therefore \quad 90° + x = 180°$

$\Rightarrow \quad x = 180° - 90° = 90°$

And $\quad z + 30° = 180°$

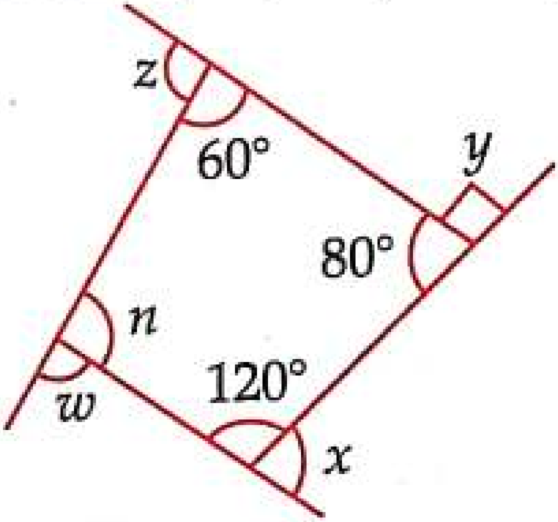
$\Rightarrow \quad z = 180° - 30° = 150°$

Also $\quad y = 90° + 30° = 120°$

[Exterior angle property]

$\therefore \quad x + y + x = 90° + 120° + 150° = \mathbf{360°}$

(b) Using angle sum property of a quadrilateral,



$$60° + 80° + 120° + n = 360°$$

$$\Rightarrow \quad 260° + n = 360°$$

$$\Rightarrow \quad n = 360° - 260°$$

$$\Rightarrow \quad n = 100°$$

Since sum of linear pair angles is 180°.

$$\therefore \quad w + 100° = 180° \quad \text{...(i)}$$

$$x + 120° = 180° \quad \text{...(ii)}$$

$$y + 80° = 180° \quad \text{...(iii)}$$

$$z + 60° = 180° \quad \text{...(iv)}$$

Adding eq. (i), (ii), (iii) and (iv),

$$\Rightarrow \quad x + y + z + w + 100° + 120° + 80° + 60° = 180° + 180° + 180° + 180°$$

$$\Rightarrow x + y + z + w + 360° = 720°$$

$$\Rightarrow \quad x + y + z + w = 720° - 360°$$

$$\Rightarrow \quad x + y + z + w = \mathbf{360°}$$

Exercise 4.1

1. (i) **Given** : $AB = 4.5$ cm, $BC = 5.5$ cm, $CD = 4$ cm, $AD = 6$ cm, $AC = 7$ cm

To construct : A quadrilateral $ABCD$

Steps of construction :

(a) Draw $AB = 4.5$ cm.

(b) Draw an arc taking radius 5.5 cm from point B.

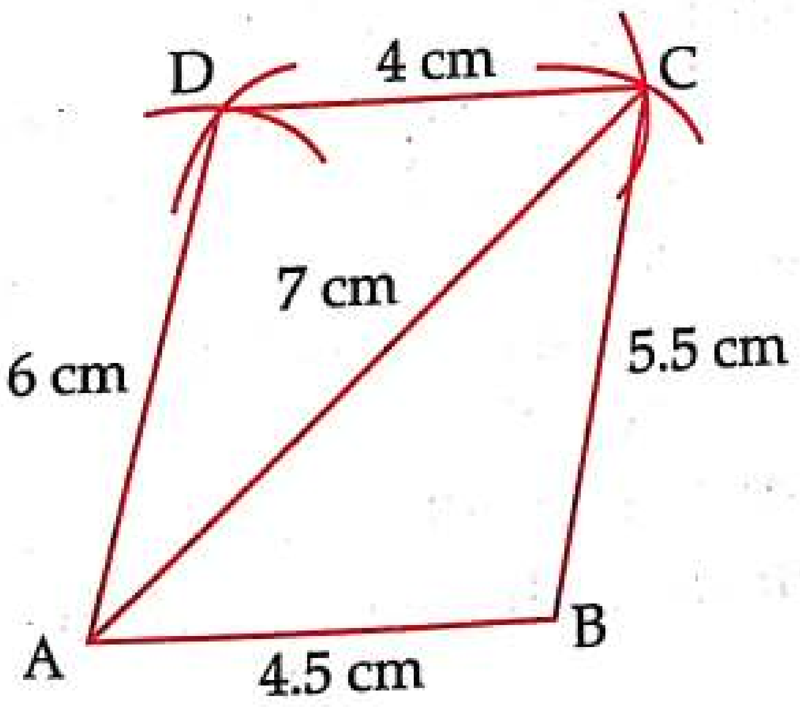
(c) Taking radius 7 cm, draw another arc from point A which intersects the first arc at point C.

(d) Join BC and AC.

(e) Draw an arc of radius 6 cm from point A and draw another arc of radius 4 cm from point C which intersects at D.

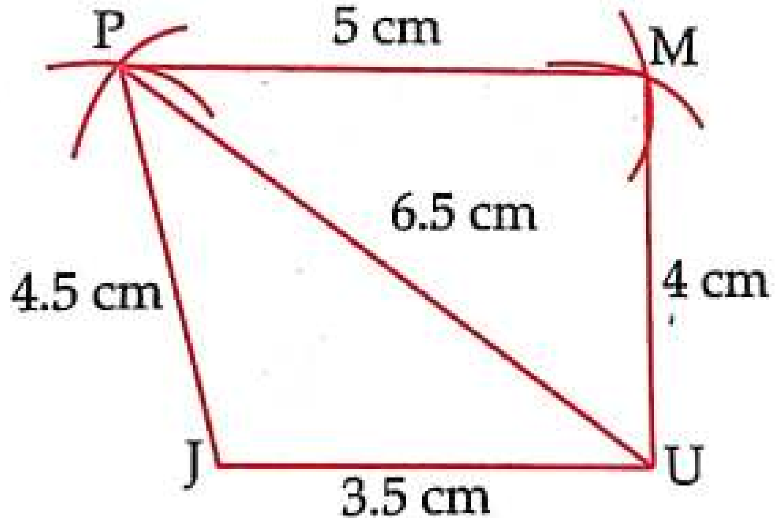
(f) Join AD and CD.

$ABCD$ is the required quadrilateral.



(ii) **Given :** $JU = 3.5$ cm, $UM = 4$ cm, $MP = 5$ cm, $PJ = 4.5$ cm, $PU = 6.5$ cm

To construct : A quadrilateral *JUMP*



Steps of construction :

(a) Draw $JU = 3.5$ cm.

(b) Draw an arc of radius 4.5 cm taking centre *J* and then draw another arc of radius 6.5 cm taking *U* as centre. Both arcs intersect at *P*.

(c) Join *PJ* and *PU*.

(d) Draw a arc of radius 5 cm and 4 cm taking P and U as centres respectively, which intersect at M.

(e) Join MP and MU.

$JUMP$ is the required quadrilateral.

(iii) **Given :** $OR = 6$ cm, $RE = 4.5$ cm, $EO = 7.5$ cm

To construct : A parallelogram $MORE$.

Steps of construction :

(a) Draw $OR = 6$ cm.

(b) Draw arcs of radius 7.5 cm and radius 4.5 cm taking O and R as centres respectively, which intersect at E.

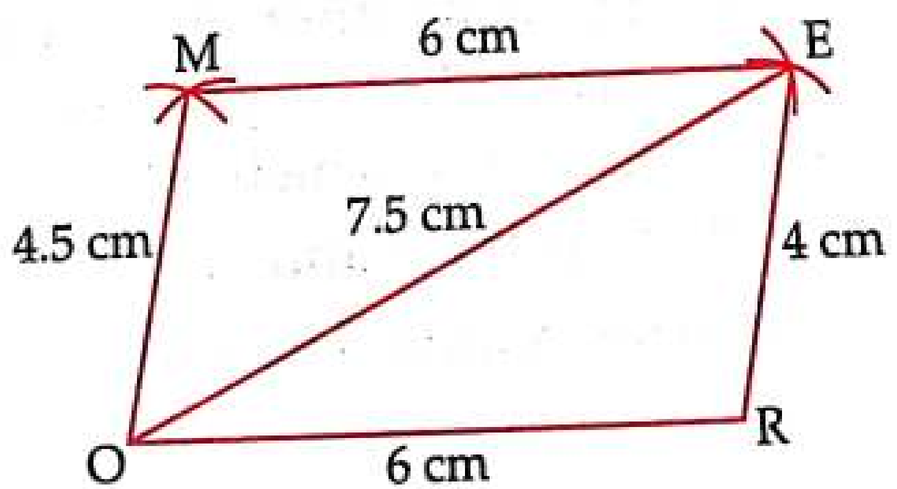
(c) Join OE and RE.

(d) Draw an arc of 6 cm radius taking E as centre.

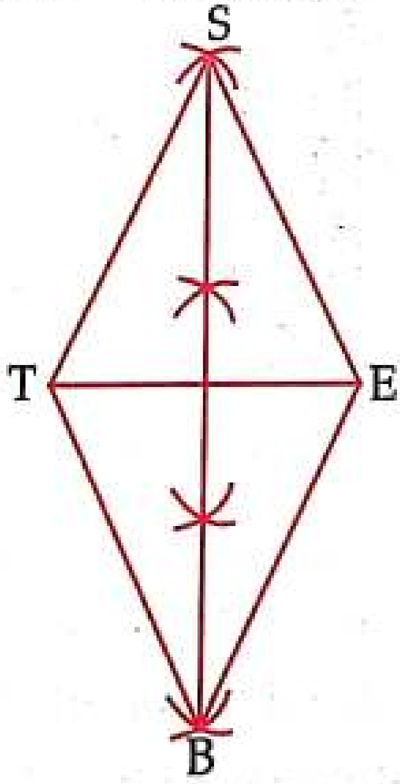
(e) Draw another arc of 4.5 cm radius taking O as centre, which intersects at M.

(f) Join OM and EM.

$MORE$ is the required parallelogram.



(*iv*) **Given :** $BE = 4.5\text{ cm}, ET = 6\text{ cm}$



To construct : A rhombus *BEST*.

Steps of construction :

(a) Draw $TE = 6\text{ cm}$ and bisect it into two equal parts.

(b) Draw up and down perpendiculars to TE.

(c) Draw two arcs of 4.5 cm taking E and T as centres, which intersect at S.

(d) Again draw two arcs of 4.5 cm taking E and T as centres, which intersects at B.

(e) Join TS, ES, BT and EB.

$BEST$ is the required rhombus.

Exercise 8.1

1. (a) Speed of cycle = 15 km/hr

Speed of scooter = 30 km/hr

Hence, ratio of speed of cycle to that of scooter = 15 : 30

$$= \frac{15}{30} = \frac{1}{2} = \mathbf{1:2}$$

(b) $\because$ 1 km = 1000 m

$\therefore$ 10 km = 10 x 1000 = 10000 m

$\therefore$ Ratio of 5 m to 10 km $= \frac{5\,\text{m}}{10000\,\text{m}}$

$$= \frac{1}{2000} = 1:2000$$

$$= \mathbf{1:2000}$$

(c) $\because$ ₹1 = 100 paise

$\because$ ₹5 = 5 × 100 = 500 paise

Hence, Ratio of 50 paise to ₹5 $= \frac{50\text{ paise}}{₹5}$

$$= \frac{50\text{ paise}}{500\text{ paise}} = \frac{1}{10} = 1:10$$

$$= \mathbf{1:10}$$

2. (a) Percentage of 3 : 4 $= \frac{3}{4} \times 100\% = 75\%$

(b) Percentage of 2 : 3 $= \frac{2}{3} \times 100\% = 66\frac{2}{3}\%$

3. Total number of students = 25

Number of good students in mathematics

$$= 72\% \text{ of } 25$$

$$= \frac{72}{100} \times 25 = 18$$

Number of students not good in mathematics

$$= 25 - 18 = 7$$

4. Let total number of matches be x

According to question,

40% of total matches = 10

$$\Rightarrow \quad 40\% \text{ of } x = 10$$

$$\Rightarrow \quad \frac{40}{100} \times x = 10$$

$$\Rightarrow \quad x = \frac{10 \times 100}{40} = 25$$

Hence, total number of matches are **25.**

5. Let Chameli had the money in the beginning = ₹x.

According to question,

$$x - 75\% \text{ of } x = 600$$

$$\Rightarrow \quad x - \frac{75}{100} \times x = 600$$

$$\Rightarrow \quad x - \frac{3}{4}x = 600$$

$$\Rightarrow \quad x\left(1-\frac{3}{4}\right)=600$$

$$\Rightarrow \quad x\left(\frac{4-3}{4}\right)=600$$

$$\Rightarrow \quad x=600\times 4=₹\,2400$$

Hence, the money in the beginning was **₹ 2,400.**

6. Number of people who like cricket = 60%

Number of people who like football = 30%

Number of people who like other games

$$= 100\% - (60\% + 30\%) = 10\%$$

Total number of people in the city = 50 Lakh

$$= 50,00,000$$

Now, number of people who like cricket = 60% of 50,00,000

$$= \frac{60}{100}\times 50,00,000 = 30,00,000$$

And, number of people who like football = 30% of 50,00,000

$$= \frac{30}{100}\times 50,00,000 = 15,00,000$$

∴ Number of people who like other games

$$= 10\% \text{ of } 50,00,000$$

$$= \frac{10}{100}\times 50,00,000 = 5,00,000$$

Hence, number of people who like other games are **5 lakh.**

Exercise 8.2

1. Let original salary be ₹ 100.

Therefore, new salary *i.e.*, 10% increase

$$= 100 + 10 = ₹\,110$$

$\because$ New salary is ₹ 110, when original salary

$$= ₹\ 100$$

$\therefore$ New salary is ₹ 1, when original salary

$$= \frac{100}{110}$$

$\therefore$ New salary is ₹ 1,54,000,

When original salary $= \frac{100}{110} \times 154000$

$$= ₹\,1,40,000$$

Hence original salary is **₹ 1,40,000.**

2. On Sunday, people went to the Zoo = 845

On Monday, people went to the Zoo = 169

Number of decrease in the people

$$= 845 - 169 = 676$$

$$\text{Decrease per cent} = \frac{676}{845} \times 100 = 80\%$$

Hence, decrease in the people visiting the Zoo on Monday is **80%**.

3. No. of articles = 80

Cost price of articles = ₹ 2,400

And profit = 16%

Let cost price of articles is ₹ 100,

then selling price = 100 + 16 = ₹ 116

∴ Cost price of articles is ₹ 1, then

$$\text{Selling price} = ₹\frac{116}{100}$$

∴ Cost price of articles is ₹ 2400,

$$\text{then selling price} = ₹\frac{116}{100} \times 2400$$

$$= ₹\,2784$$

Hence, selling price of 80 articles = ₹ 2784

$$\text{Therefore, selling price of 1 article} = \frac{2784}{80}$$

$$= ₹\,34.80$$

4. Here, C.P. = ₹ 15,500 and repair cost = ₹ 450

Therefore, Total cost price = 15500 + 450

= ₹ 15,950

Let C.P. be ₹ 100, then S.P. = 100 + 15 = ₹ 115

∴ When C.P. is ₹ 1, then S.P. = $\frac{115}{100}$

∴ When C.P. is ₹ 15950, then S.P. = ₹ $\frac{115}{100} \times 15950$

= ₹ 18,342.50

5. Cost price of VCR = ₹ 8000

and Cost price of TV = ₹ 8000

Total cost price of both articles = ₹8000 + ₹8000

= ₹16,000

Now VCR is sold at 4% loss.

Let C.P. of VCR be ₹ 100, then S.P. of VCR

= 100 − 4 = ₹ 96

When C.P. is ₹ 100, then SP = ₹ 96

∴ When C.P. is ₹ 1, then SP = $\frac{96}{100}$

∴ When C.P. is ₹ 8000, then S.P. = $\frac{96}{100} \times 8000$

= ₹ 7,680

And TV is sold at 8% profit, then S.P. of TV

= 100 + 8 = ₹ 108

$\because$ When C.P. is ₹ 100, then S.P. = ₹ 108

$\therefore$ When C.P. is ₹ 1, then S.P. $= \frac{108}{100}$

$\therefore$ When C.P. is ₹ 8000, then S.P. $= \frac{108}{100} \times 8000$

$= ₹ 8,640$

Then, Total S.P. = ₹ 7,680 + ₹ 8,640 = ₹ 16,320

Since S.P. > C.P.,

Therefore, Profit = S. P. − C. P. = 16320 − 16000

= ₹ 320

$$\text{And Profit\%} = \frac{\text{Profit}}{\text{Cost Price}} \times 100$$

$$= \frac{320}{16000} \times 100 = 2\%$$

6. Rate of discount on all items = 10%

Marked Price of a pair of jeans = ₹ 1450

and Marked Price of a shirt = ₹ 850

Discount on a pair of jeans = 10% of ₹ 1430.

$= ₹ \frac{10 \times 1450}{100} = ₹ 145$

$\therefore$ S.P. of a pair of jeans = ₹ 1450 − ₹ 145

= ₹ 1305

Marked Price of two shirts = 2 × 850 = ₹ 1700

Discount on two shirts = 10% of ₹ 1700

$= ₹ \frac{10 \times 1700}{100} = ₹ 170$

$\therefore$ S.P. of two shirts = ₹ 1700 − ₹ 170 = ₹ 1530

Therefore, the customer had to pay

= 1305 + 1530

= ₹ **2835**

7. S.P. of each buffalo = ₹ 20,000

S.P. of two buffaloes = ₹ 20,000 × 2 = ₹ 40,000

One buffalo is sold at 5% gain.

Let C.P. be ₹ 100, then S.P. = 100 + 5 = ₹ 105

∵ When S.P. is ₹ 105, then C.P.

$$= ₹\,100$$

∴ When S.P. is ₹ 1, then C.P. $= \frac{100}{105}$

∴ When S.P. is ₹ 20,000, then C.P.

$$= \frac{100}{105} \times 20000$$

$$= ₹\,19{,}047.62$$

Another buffalo is sold at 10% loss.

Let C.P. be ₹ 100, then S.P. = 100 − 10 = ₹ 90

$\because$ When $S.P.$ is ₹ 90, then $C.P.$ = ₹ 100

$\therefore$ When $S.P.$ is ₹ 1, then $C.P. = \frac{100}{90}$

$\therefore$ When $S.P.$ is ₹ 20,000, then $C.P.$

$$= \frac{100}{90} \times 20000$$

$$= ₹\ 22,222.22$$

Total $C.P.$ = ₹ 19,047.62 + ₹ 22,222.22

= ₹ 41,269.84

Since $C.P. > S.P.$

Therefore here it is loss.

Loss = $C.P. - S.P.$ = ₹41,269.84 – ₹40,000.00

= **₹ 1,269.84**

8. S.P. = ₹ 13,000 and $S.T.$ rate = 12%

Let $C.P.$ be ₹ 100, then $S.P.$ for purchaser

$$= 100 + 12 = ₹112$$

$\because$ When $C.P.$ is ₹ 100, then $S.P.$ = ₹ 112

$\therefore$ When $C.P.$ is ₹ 100, then $S.P. = \frac{112}{100}$

$\therefore$ When $C.P.$ is ₹ 13,000, then $S.P.$

$$= \frac{112}{100} \times 13000 = ₹\ \mathbf{14,560}$$

9. S.P. = ₹ 1,600 and Rate of discount = 20%

Let $M.P.$ be ₹ 100, then $S.P.$ for customer

$$= 100 - 20 = ₹\ 80$$

$\because$ When $S.P.$ is ₹ 80, then $M.P.$ = ₹ 100

$\therefore$ When $S.P.$ is ₹ 1, then $M.P. = \frac{100}{80}$

$\therefore$ When $S.P.$ is ₹ 16,000, then $M.P.$

$$= \frac{100}{90} \times 1600 = ₹\ \mathbf{2,000}$$

10. $C.P. =$ ₹ 5,400 and Rate of Vate $= 8\%$

Let $C.P.$ without VAT is ₹ 100, then price including VAT $= 100 + 8 =$ ₹ 108

$\because$ When price including VAT is ₹ 108, then original price $=$ ₹ 100

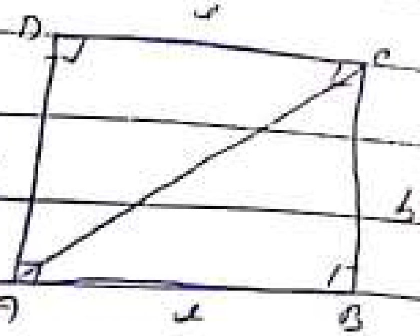
$\therefore$ When price including VAT is ₹ 1, then original \price $= \frac{100}{108}$

$\therefore$ When price including VAT is 5400,

then original price $= \frac{100}{108} \times 5400 =$ ₹ **5000**

Ex:- 1.

Rectangle



The area of rectangle = $l \times b$

The length of rectangle = $\frac{\text{Area}}{\text{breadth}}$

The breadth of rectangle = $\frac{\text{Area}}{\text{length}}$

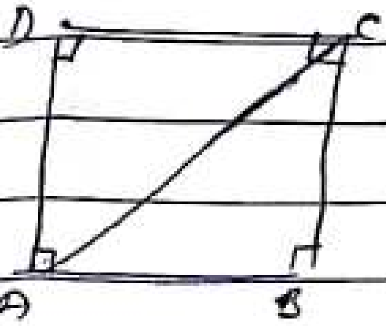
The perimeter of rectangle = 2(length + breadth)

The length of rectangle = $\frac{\text{perimeter}}{2}$ − breadth

The breadth of rectangle = $\frac{\text{perimeter}}{2}$ − length

The diagonal of rectangle = $\sqrt{\text{length}^2 + \text{breadth}^2}$

Square



The area of Square = $(\text{Side})^2$

One side of Square = $\sqrt{\text{Area}}$

The Area of Square $= (\text{Side})^2 = \frac{1}{2}\left(\frac{\text{diagonal}}{\sqrt{2}}\right)^2 = \frac{\text{diag}^2}{2}$

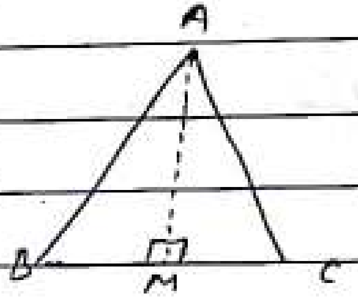
The perimeter of Square $=$ 4 x one side

One side of Square $= \frac{\text{perimeter}}{4}$

The diagonal of Square $= \sqrt{2} \times$ one side

One side of Square $= \frac{\text{diagonal}}{\sqrt{2}}$

Triangle

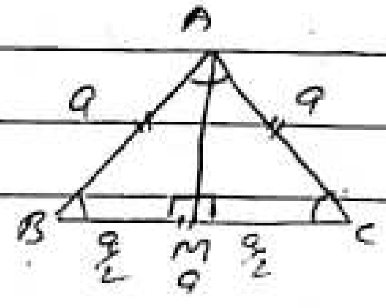


The area of Triangle $=$
$\frac{1}{2} \times$ base $\times$ height

The base of triangle $= \frac{2 \times \text{Area}}{\text{height}}$

The height of triangle $= \frac{2 \times \text{Area}}{\text{base}}$

Equilateral triangle



Let,

$\triangle ABC$ is an equilateral triangle in which AB = BC = CA = a

and $\angle A = \angle B = \angle C = 60°$

in $\triangle ABM$,

$AM = \sqrt{(a)^2 - (\frac{a}{2})^2}$

$= \sqrt{a^2 - \frac{a^2}{4}}$

$= \sqrt{\frac{4a^2 - a^2}{4}}$

$= \frac{\sqrt{3a^2}}{\sqrt{4}} = \frac{\sqrt{3}a}{2}$

Hence, The height of equilateral triangle = $\frac{\sqrt{3}}{2} \times$ one side.

The Area of equilateral triangle =

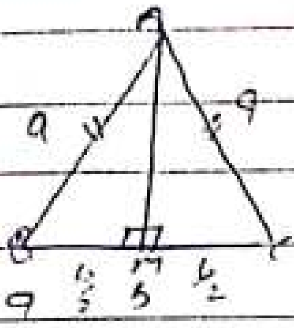
$= \frac{1}{2} \times a \times \frac{\sqrt{3}}{2} \times a$

$= \frac{\sqrt{3}a^2}{4}$

Hence Area of equilateral triangle = $\frac{\sqrt{3}}{4} \times (side)^2$

The perimeter of equilateral triangle = 3 × one side

Isoscales triangle



Lets

Triangle ABC is an Isoscales triangle

in which AB = AC = a

and BC = b

Since $AM \perp BC$

So, $BM = MC = \frac{b}{2}$

in $\triangle ABC$,

$$AM = \sqrt{a^2 - \left(\frac{b}{2}\right)^2}$$

$$\sqrt{a^2 - \frac{b^2}{4}}$$

$$\sqrt{\frac{4a^2 - b^2}{4}} = \frac{\sqrt{4a^2 - b^2}}{2}$$

Hence, The height of Isoscales triangle =

$$\frac{1}{2}\sqrt{4a^2 - b^2}$$

The Area of $\triangle ABC$ =

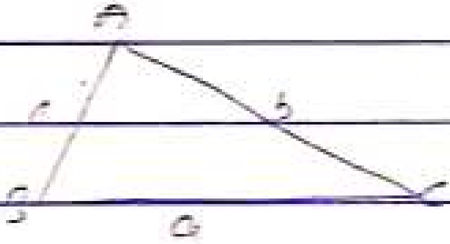
$$\frac{1}{2} \times b \times \frac{1}{2}\sqrt{4a^2 - b^2}$$

$\frac{1}{4} b \sqrt{4a^2 - b^2}$

Hence, The Area of a Isosceles triangle = $\frac{1}{4} b \sqrt{4a^2 - b^2}$

The perimeter of Isosceles triangle = $2a + b$

Scalene triangle

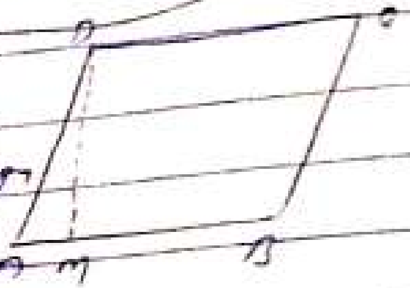


The Semiperimeter of Scalene triangle = $\frac{a+b+c}{2}$

The Area of triangle = $\sqrt{s(s-a)(s-b)(s-c)}$

The perimeter of Scalene triangle = $a+b+c$

parallelogram



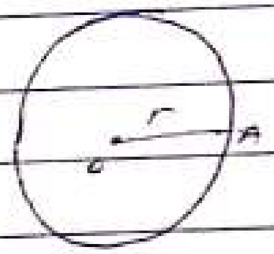
The area of parallelogram = Base × height

The Base of parallelogram = $\frac{\text{Area}}{\text{height}}$

The height of parallelogram = $\frac{\text{Area}}{\text{Base}}$

The perimeter of parallelogram = 2(length + width)

circle



The Area of circle = πr^2

The diameter of circle = $2r$

The radius of circle = $\frac{d}{2}$

The circumference of circle = $2\pi r$

Area of circle = $\pi r^2 = \pi\left(\frac{d}{2}\right)^2 = \frac{\pi d^2}{4}$

Exercise - 11.1

1. A Square and a rectangular field with measurements as given in the figure have the same perimeter. Which field has larger area.

Let,

The breadth of rectangular field = b

According to the Question,

The perimeter of Square = The perimeter of rectangular field

$4 \times$ one side $= 2(l+b)$

$\Rightarrow 4 \times 60 = 2(80+b)$

$\Rightarrow 120 = 80+b$

$\therefore b = 120-80 = 40m$

Hence, The breadth of rectangular field = 40m

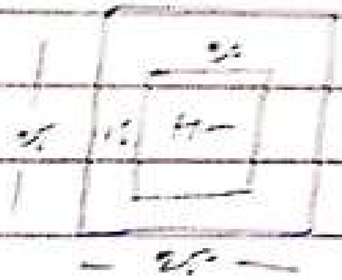
The area of Square = $60 \times 60 = 3600\ m^2$

and The area of rectangular field = 80×40

$= 3200\ m^2$

Hence, The area of Square is larger than rectangular field.

2. Mr. Kaushik has a square plot with the measurement as shown in the figure. He wants to construct a house in the middle of a plot. A garden is developed around the house. Find the total cost of developing a garden around the house at the rate of ₹ 55 per m²



The area of garden =

$25 \times 25 - 20 \times 15$

$= 625 - 300$

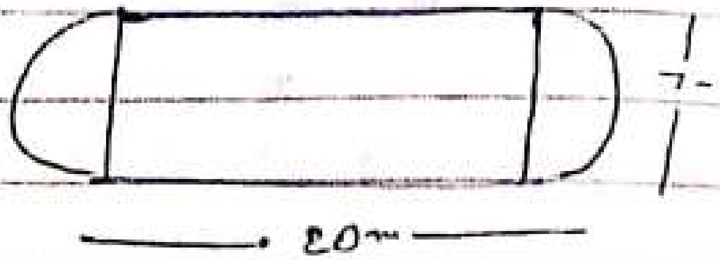
$= 325 \, m^2$

Total cost of developing a garden =

55×325

$= 17875$ ₹

3. The shape of a garden is rectangular in the middle and semicircle at the ends shown in the diagram. Find the area and the perimeter of the garden



The Length of rectangle = $20 - (3.5 + 3.5)$

$= 20 - 7 = 13$ m

The breadth of rectangle = 7m

The area of given digram :

$$13 \times 7 + \frac{22}{7} \times \frac{35}{10} \times \frac{35}{10}$$

$$= 91 + \frac{154}{4}$$

$$= 91 + 38.5 = 129.5 \text{ m}^2$$

The perimeter of garden = $13 + 13 + \frac{22}{7} \times 2 \times \frac{35}{10}$

$= 26 + 22$

$= 48$ m

4. A flooring tile has the shape of a parallelogram whose base is 24 cm and the corresponding height is 10 cm. How many such tiles are required to cover a floor of area 1080 m².

The area of tile = Base x corresponding height

$= \frac{24}{100} \times \frac{10}{100}$

$= \frac{240}{10000} m^2 = .024 m^2$

required tiles to cover the floor =

$\frac{1080000}{0.024} = 45000$ tiles.

5. An ant is moving around a few of a parallelogram whose base is 24 cm and the food pieces of different shape scattered on the floor for which food piece would the ant have to take a longer round? Remember circumference of a circle can be obtained by using the expression:

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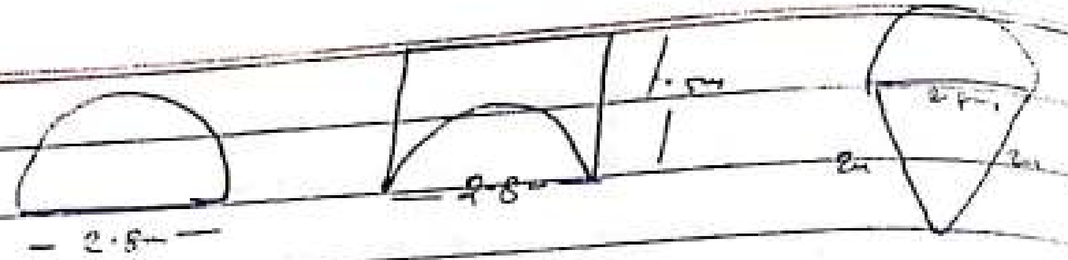
a. 

Total distance covered by the ant in first figure $= \frac{14}{10} \times \frac{22}{7} + 2 \times \frac{14}{10}$

$= \frac{44}{10} + \frac{28}{10}$

$= 4·4 + 2·8 = 7·2$ m

Total distance covered by the ant in second figure =

$\frac{22}{7} \times 1·4 + 2·8 + 1·5 + 1·5$

$\frac{2·8}{10} \times \frac{1·5}{10} - \frac{2 \times 22}{7} \times \frac{14}{10}$

$= \frac{442}{10} - \frac{22}{10}$

$= 4·4 - 2·2 \quad 4·2 - 2·2$

$= 2·0$

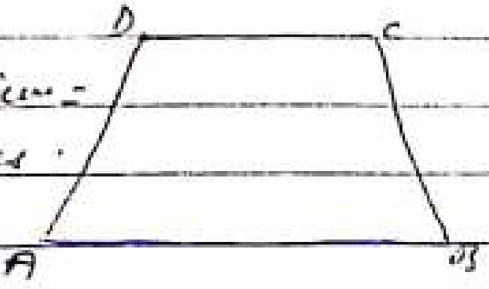
Total distance covered by the ant in third figure

$2 \times \frac{22}{7} \times \frac{14}{10} + 4$

$\frac{44}{10} + 4$

$= 4·4 + 4 = 8·4$

Trapezium



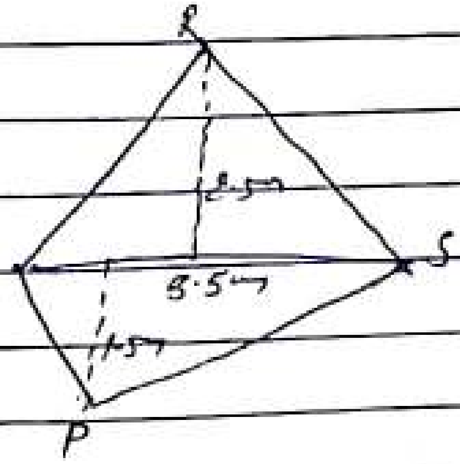
* The perimeter of trapezium = The sum of all sides.

* The area of trapezium = $\frac{1}{2}$ (The sum of parallel sides) × height

* The sum of parallel sides of trapezium = $\frac{\text{Area} \times 2}{\text{height}}$

Ex-1

Find the area of quadrilateral PQRS shown in figure 11.11.



The area of given figure $= \frac{1}{2} \times 5.5 \times 2.5 + \frac{1}{2} \times 5.5 \times 1.5$

$= \frac{1}{2} \times 5.5 (2.5 + 1.5)$

$= \frac{1}{2} \times \frac{55}{10} \times 4 = 11\ cm^2$

Ex:-2

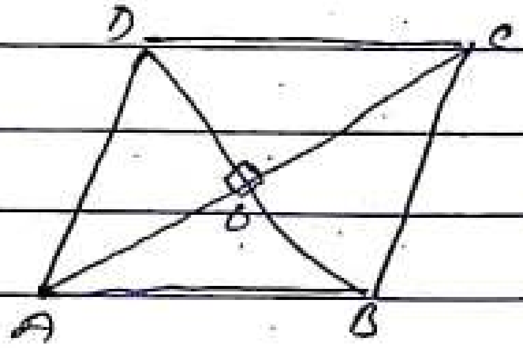
Find the area of a rhombus whose diagonals are of length 10cm and 8.2cm

The area of rhombus $= \frac{1}{2} \times$ First diagonal $\times$ secondary

$\frac{1}{2} \times 10 \times \frac{8.2}{10} = 41$ cm

Rhombus

The area of rhombus
= Base x height



The area of rhombus = ar(ACD) + ar(ABC)

$= \frac{1}{2} \times AC \times OD + \frac{1}{2} \times AC \times OB$

$= \frac{1}{2} \times AC \times BD$

Here, The area of rhombus $= \frac{1}{2} \times d_1 \times d_2$

Ex.- 1 The area of a trapezium shaped field is 480 m². The distance between two parallel sides is 15 m and one of the parallel side is 20 m find the other parallel side.

Let,
The other parallel side of trapezium = x m

According to the question,

The area of trapezium = $\frac{1}{2}$ (The sum of parallel sides) × height

$480 = \frac{1}{2} \times 15 (20 + x)$

or, $\frac{480 \times 2}{15} = 20 + x$

or $64 - 20 = x$

So, $x = 44$ m

2. The area of a rhombus is 240 cm² and one of the diagonals is 16 cm find the other diagonal.

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Let,
The second diagonal of rhombus = d_2

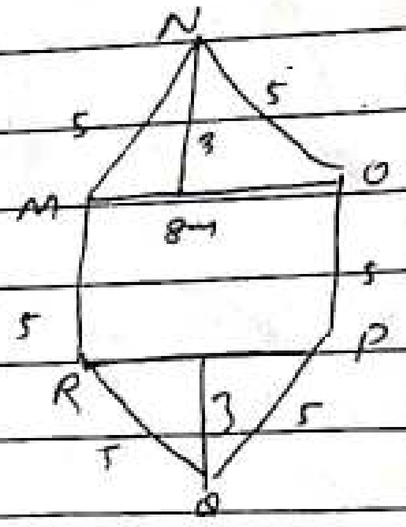
Since,
The area of rhombus = $\frac{1}{2} \times d_1 \times d_2$

or $240 = \frac{1}{2} \times 16 \times d_2$

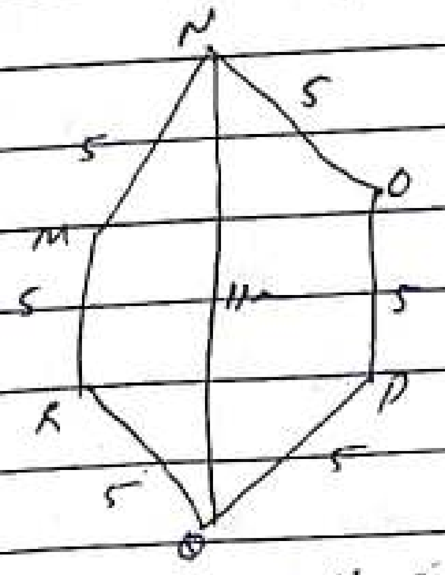
or $\frac{240 \times 2}{16} = d_2$

So, $d_2 = 30$ cm

Ex: 3 There is a hexagon MNOPQR of side 5cm. Aman and Ridhima divided it in two different ways.



Ridhima's method



Aman's method

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By Ridhima's method

The area of hexagon = ar(MNO) + ar(OPRM) + ar(PQR)

$= \frac{1}{2} \times 8 \times 3 + 8 \times 5 + \frac{1}{2} \times 8 \times 3$

$= 12 + 40 + 12$

$= 64 m^2$

Aman's method

The area of hexagon = ar(MNQR) + ar(MNQP)

$= \frac{1}{2} \times (11+5) \times 4 + \frac{1}{2} \times (5+11) \times 4$

$= 32 + 32$

$= 64 m^2$

Ex:- 11.2

1. The shape of the top surface of a table is a trapezium. finds its area if its parallel sides are 1m and 1.2m and perpendicular distance between them is 0.8m

The area of top surface of a table = $\frac{1}{2} \times$ (The sum of parallel sides) $\times$ height

$= .88 m^2 = \frac{1}{2} \times (1 + 1.2) \times \frac{0.8}{10} = \frac{1}{2} \times \frac{22}{10} \times \frac{0.8}{10} = \frac{88}{100}$

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2\. The area of a trapezium is 34 sq m and the length of one of the parallel sides is 10 m and its height is 4 m. Find the length of the other parallel side.

Let,

The length of the other parallel side of trapezium = x

Since,

The area of a Trapezium = $\frac{1}{2}$ (sum of parallel side) × height

or $34 = \frac{1}{2} \times (10 + x) \times 4$

or $17 = 10 + x$

so $x = 17 - 10 = 7$ m

3\. Length of the face of a trapezium shaped field ABCD is 120 m. If BC = 48 m, CD = 17 m and AD = 40 m find the area of this field. Side AB is perpendicular to the parallel sides AD and BC

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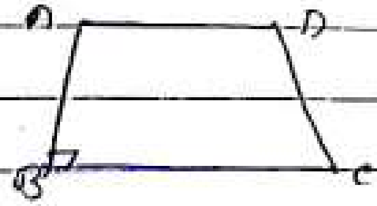
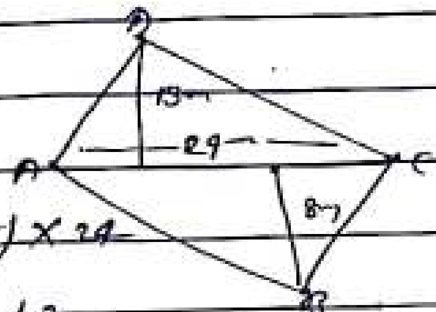


$AB = 120 - (48 + 17 + 40)$
$= 120 - 105$
$= 15\,m$

The area of the field $= \frac{1}{2}(AD + BC) \times AB$
$= \frac{1}{2} \times (40 + 48) \times 15$
$= \frac{1}{2} \times 88 \times 15$ (44)
$= 660\,m^2$

(4) The diagonal of a quadrilateral shaped is 24 m and the perpendicular dropped on it from the remaining opposite vertices are 8 m and 13 m. find the area of the field.



The area of the field $= \frac{1}{2}(13 + 8) \times 24$
$= \frac{1}{2} \times 21 \times 24$ (12) $= 252\,m^2$

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5\. The diagonals of a rhombus are 7.5 cm and 12 cm finds its area.

The area of rhombus $= \frac{1}{2} \times d_1 \times d_2$

$= \frac{1}{2} \times \frac{75}{10} \times 12 = 45$ cm

6\. Find the area of a rhombus whose side is 5 cm and whose altitude is 4.8 cm if one of its diagonal is 8 cm long. find the length of the other diagonal.

The area of rhombus = Base × Altitude

$5 \times \frac{48}{10} = 24$ cm

The length of the other diagonal of rhombus $= \frac{2 \times \text{Area}}{\text{First diagonal}}$

$= \frac{2 \times 24}{8} = 6$ cm

7. The floor of a building consists of 3000 tiles which are rhombus shaped and each of its diagonals are 45 cm and 30 cm in length. Find the total cost of polishing the floor if the cost per m^2 is ₹ 4.

A The area of one tile $= \frac{1}{2} \times d_1 \times d_2$

$= \frac{1}{2} \times 45 \times 30^{15}$

$= 675 \, cm^2$

Area of 3000 tiles $= 675 \times 3000$

$= \frac{2025000 \, cm^2}{10000}$

$= 202.5 \, m^2$

The total cost of polishing the floor =

$= {}^2\!\!\!4 \times \frac{202.5^{405}}{10_5} = 810$ Rupees

(8) Mohan wants to buy a trapezium shaped field its side along the river is parallel to and twice the side along the road. If the area of this field is 10500 m² and the perpendicular distance between the two parallel sides is 100 m find the length of the side along the river

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Let,

the length of the side along the road = x

then, " " " river " = $2x$

Since,

The area of trapezium = $\frac{1}{2}$ × (sum of parallel sides) × height

$\Rightarrow 10500 = \frac{1}{2}(x+2x) \times 100$

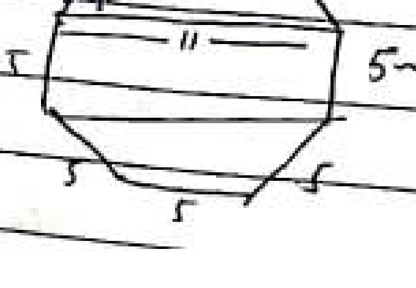
or $210 = 3x$

$\therefore x = 70$ m

Hence, The length of the side along the river = $2x$ = 2×70

= 140 m

9. Top Surface of a raised platform is in the shape of a regular octagon as shown in the figure. find the area of the octagonal surface.



The area of 8th octagonal surface =

$2 \times \frac{1}{2}(11+5) \times 4 + 11 \times 5$

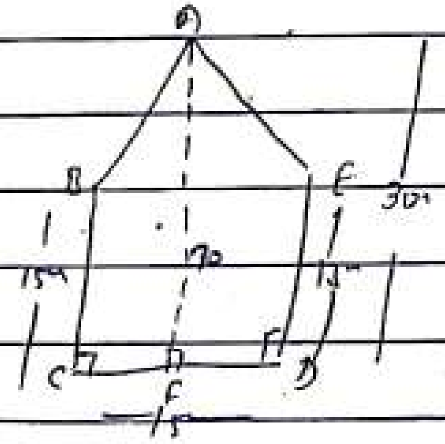
$= 16 \times 4 + 11 \times 5$

$= 64 + 55$

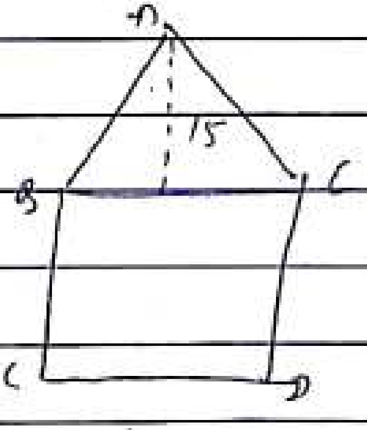
$= 119 \text{ m}^2$

10. There is a pentagonal shaped park as shown in the figure

For finding its area Jyoti and Kavita divided it in two different ways



Jyoti's diagram



Kavita's diagram

The area of pentagonal park by Jyoti's diagram =

$2 \times \frac{1}{2} \times (15+30) \times 7.5$

$45 \times \frac{7.5}{10} = 15 = \frac{525}{2} = 337.5$

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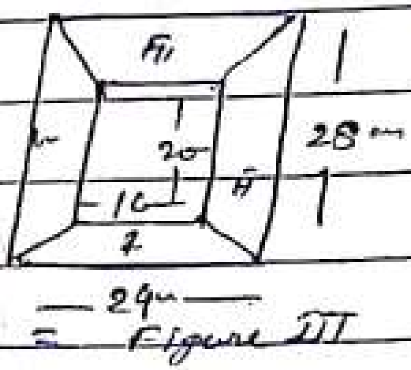
10. Area of pentagonal park by Kavita's diagram = $\frac{1}{2} \times 15 \times 15 + 15 \times 15$

$= \frac{225}{2} + 225$

$= 112.5 + 225$

$= 337.5 m^2$

11. Diagram of the adjacent figure from has outer dimension - 24 cm x 28 cm and inner dimension 16x20. Find the area of each section of the frame if the width of each section is same.



The area of figure I =

$\frac{1}{2} \times (24+16) \times 4$

$40 \times 2 = 80 m^2$

The area of figure II = $\frac{1}{2} \times (20+28) \times 4$

$= 48 \times 2$

$= 96$ - The area of figure