$\Rightarrow \qquad b = \dfrac{\overset{2}{\cancel{14}} \times 18}{\underset{1}{\cancel{7}}}$ (by transposition)

$\Rightarrow \qquad b = 16$

Hence, $b = 16$ is a solution.

Check : L.H.S. $= \dfrac{7b}{8} - 15 = \dfrac{7 \times \overset{2}{\cancel{16}}}{\underset{1}{\cancel{8}}} - 15 = 7 \times 2 - 15 = 14 - 15 = -1 =$ R.H.S.

18. $\dfrac{x}{4} = \dfrac{x}{5} + 1$

We have, $\dfrac{x}{4} = \dfrac{x}{5} + 1$

$\Rightarrow \qquad \dfrac{x}{4} - \dfrac{x}{5} = 1$ (by transposition)

$\Rightarrow \qquad \dfrac{5x - 4x}{20} = 1$

$\Rightarrow \qquad \dfrac{x}{20} = 1$

$\Rightarrow \qquad x = 1 \times 20$ (by transposition)

$\Rightarrow \qquad x = 20$

Hence, $x = 20$ is a solution.

Check : L.H.S. $= \dfrac{x}{4} = \dfrac{20}{4} = 5$

R.H.S. $= \dfrac{x}{5} + 1$

$= \dfrac{\overset{4}{\cancel{20}}}{\underset{1}{\cancel{5}}} + 1 = 4 + 1 = 5$

$\therefore$ L.H.S. $=$ R.H.S.

19. $34 - 5(n - 1) = 4$

We have, $34 - 5(n - 1) = 4$

$\Rightarrow \qquad 34 - 5n + 5 = 4$

$\Rightarrow \qquad 39 - 5n = 4$

$\Rightarrow \qquad -5n = 4 - 39$ (by transposition)

$\Rightarrow \qquad -5n = -35$

$\Rightarrow \qquad n = \dfrac{-35}{(-5)}$ (by transposition)

$\Rightarrow \qquad n = 7$

Hence, $n = 7$ is a solution.

Check : L.H.S. $= 34 - 5(n - 1) = 34 - 5(7 - 1) = 34 - 5 \times 6$

$= 34 - 3 = 4 =$ R.H.S.

20. $3P - 2(2P - 5) = 2(P + 3) - 8$

We have, $3P - 2(2P - 5) = 2(P + 3) - 8$

$\Rightarrow \qquad 3P - 4P + 10 = 2P + 6 - 8$

$\Rightarrow \qquad -P + 10 = 2P - 2$

$\Rightarrow \quad 10 = 2p - 2 + P$ (by transposition)

$\Rightarrow \quad 10 = 3p - 2$

$\Rightarrow \quad 10 + 2 = 3P$ (by transposition)

$\Rightarrow \quad 12 = 3P$

$\Rightarrow \quad \frac{12}{3} = P$ (by transposition)

$\Rightarrow \quad 4 = P$ or $P = 4$

Hence, $P = 4$ is a solution.

Check : L.H.S. $= 3P - 2(2P - 5) = 3 \times 4 - 2(2 \times 4 - 5)$

$= 12 - 2(8 - 5) = 12 - 2 \times 3 = 12 - 6 = 6$

R.H.S. $= 2(P + 3) - 8 = 2(4 + 3) - 8 = 2 \times 7 - 8 = 14 - 8 = 6$

$\therefore$ L.H.S. $=$ R.H.S.

Exercise 8.5

1. Let the number be x. 35 added to x gives $x + 35$.

So, the following equation is obtained.

$$x + 35 = 217$$

or, $x = 217 - 35 = 182$

Hence, the number is 182.

Check : $182 + 35 = 217$

2. Let the number be x. twice the number is $2x$.

7 added to $2x$ gives 59, so we obtain the following equation.

$$2x + 7 = 59$$

$\Rightarrow \quad 2x = 59 - 7$

$\Rightarrow \quad 2x = 52$

$\Rightarrow \quad x = \frac{52}{2}$

$\Rightarrow \quad x = 26$

Hence, the required number is 26.

Check : $2 \times 26 + 7 = 52 + 7 = 59$

3. Let the number be x. 5 times the number $= 5x$,

Subtracting 3 from it, we get $5x - 3$. so, the following eqn is obtained

$$5x - 3 = 42$$

$\Rightarrow \quad 5x = 42 + 3 = 45$

$\Rightarrow \quad \frac{5x}{5} = \frac{\overset{9}{45}}{\underset{1}{5}}$

$\Rightarrow \quad x = 9$

Hence, the required number is 9.

Check : Do yourself as above.

4. Let the number be x. Multiplication by $\frac{5}{6}$ is $\frac{5x}{6}$,

So we obtain the following equation.

$$\frac{5}{6}x = 60$$

$\Rightarrow \quad 5x = 60 \times 6$

$\Rightarrow \qquad x = \dfrac{\overset{12}{\cancel{60}} \times 6}{\underset{1}{\cancel{5}}} = 12 \times 6$

$\Rightarrow \qquad x = 72$

Hence, the required number is 72.

5. Let the number be x. Two-third of the number is $\frac{2}{3}x$.

one-third of the number is $\frac{x}{3}$. So, the equation is

$$\frac{2}{3}x = \frac{x}{3} + 3 \qquad \Rightarrow \qquad \frac{2x}{3} - \frac{x}{3} = 3$$

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

$$\Rightarrow \qquad x = 3 \times 3 = 9$$

Hence, the required number is 9.

6. Let the number be x. Its three-fourth is $\frac{3}{4}x$.

So, the equation is $x + \frac{3x}{4} = 91$

$$\Rightarrow \qquad \frac{4x + 3x}{4} = 91 \qquad \Rightarrow \qquad \frac{7x}{4} = 91$$

$$\Rightarrow \qquad 7x = 91 \times 4 \qquad \Rightarrow \qquad x = \frac{\overset{13}{\cancel{91}} \times 4}{\underset{1}{\cancel{7}}} = 13 \times 4$$

$$\Rightarrow \qquad x = 52$$

Hence, the required number is 52.

7. Let one of the numbers be x. Then, the second number will be $(x + 1)$.

Then, $\qquad x + (x + 1) = 203 \qquad \Rightarrow \qquad 2x + 1 = 203$

$\Rightarrow \qquad 2x = 203 - 1 \qquad \Rightarrow \qquad 2x = 202$

$\Rightarrow \qquad x = \dfrac{202}{2} \qquad \Rightarrow \qquad x = 101$

$\therefore$ one number = 101 and the second number = $101 + 1 = 102$

8. Let one of the odd numbers be x

Then, the next consecutive odd number = $x + 2$

Sum of 2 consecutive odd number = 136

$\therefore \qquad x + (x + 2) = 136$

or, $\qquad 2x + 2 = 136$

or, $\qquad 2x = (136 - 2) = 134$

or, $\qquad x = \dfrac{134}{2} = 67$

Hence, one odd number = 67

and the second odd number = $67 + 2 = 69$

9. Let one the even number be x.

Then, the next consecutive even number = $x + 2$.

Sum of 2 consecutive even number = 502

$\therefore \qquad x + (x + 2) = 502$

$2x + 2 = 502$

$2x = 502 - 2 = 500$

$\Rightarrow \qquad x = 250$

Hence, one even number $= 250$ and the second even number $= 250 + 2 = 252$

10. Let the 3 consecutive integers be $x, x + 1, x + 2$

Sum of all the inegers is $x + (x + 1) + (x + 2)$.

$\therefore \qquad x + (x + 1) + (x + 2) = 24$

or, $\qquad 3x + 3 = 24$

or, $\qquad 3x = 24 - 3 = 21$

or, $\qquad x = \dfrac{\overset{7}{\cancel{21}}}{\underset{1}{\cancel{3}}} = 7 \qquad \Rightarrow \qquad x = 7$

$\therefore$ First integer $= 7$ Second $= 7 + 1 = 8$ and the third integer $= 7 + 2 = 9$

11. Let the number of boys in the class be x.

then, the number of girls $= \frac{5}{6}$ of the number of boys $= \frac{5}{6} \times x = \frac{5x}{6}$

Total number of students $= 44$

Now, the number of girls + The number of boys = Total number of students

$\Rightarrow \qquad \dfrac{5x}{6} + x = 44 \qquad \Rightarrow \qquad \dfrac{5x + 6x}{6} = 44$

$\Rightarrow \qquad \dfrac{11x}{6} = 44 \qquad \Rightarrow \qquad x = \dfrac{\overset{4}{\cancel{44}} \times 6}{\underset{1}{\cancel{11}}}$

$\Rightarrow \qquad x = 24$

Hence, the number of girls in the class $= \dfrac{5}{6} \times \overset{4}{\cancel{24}} = 20$

12. Let the number be x. half of the number is $\dfrac{x}{2}$.

$\therefore \qquad x + \dfrac{x}{2} = 45$

$\Rightarrow \qquad \dfrac{2x + x}{2} = 45$

$\Rightarrow \qquad \dfrac{3x}{2} = 45$

$\Rightarrow \qquad 3x = 45 \times 2$

$\Rightarrow \qquad x = \dfrac{\overset{15}{\cancel{45}} \times 2}{\underset{1}{\cancel{3}}} = 15 \times 2 = 30$

$\therefore$ The number $= 30$

13. Let Sahil's age be x years. Then his mother's age is $5x$.

Sum of their ages is $(x + 5x)$ years.

$\therefore \quad x + 5x = 48 \qquad \Rightarrow \qquad 6x = 48 \qquad \Rightarrow \qquad x = \dfrac{\overset{8}{\cancel{48}}}{\underset{1}{\cancel{6}}} = 8$

Hence, Sahil age $= 8$ years and is mother's age $= 5 \times 8 = 40$ years

14. Let Mayank's present age = x years

Then, after 15 years, Mayank's age = $(x + 15)$ years

$\therefore \quad x + 15 = 4 \times \text{(Present age)} = 4x$

$\Rightarrow \quad x + 15 = 4x$

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

$\Rightarrow \quad \frac{\overset{5}{\cancel{15}}}{\underset{1}{\cancel{3}}} = x \quad \Rightarrow \quad 5 = x$

$\Rightarrow \quad x = 5$

$\therefore$ Manayk's present age = 5 years

15. Let Isha's brother age be x years.

Then, Ishas's age = $(x - 5)$ years.

After 4 years, Isha's brother age will be $(x + 4)$ years

and Isha's age will be = $(x - 5) + 4 = (x - 1)$ years

$\therefore \quad \frac{(x+5)+4}{x+4} = \frac{2}{3} \quad \Rightarrow \quad \frac{x-1}{x+4} = \frac{2}{3}$

$\Rightarrow \quad 3(x - 1) = 2(x + 4)$

$\Rightarrow \quad 3x - 3 = 2x + 8$

$\Rightarrow \quad 3x - 2x = 8 + 3$

$\Rightarrow \quad x = 11$

Hence,Isha's brother age = $x = 11$ years and Isha's age = $(x - 5) = (11 - 5) = 6$ years

16. Let breadth of rectangle = x m. Then length of rectangle = $(4x - 3)$ m

Perimeter of rectangle = 94 m. Perimeter of rectangle = $2(l + b)$

$94 = 2(4x - 3 + x)$

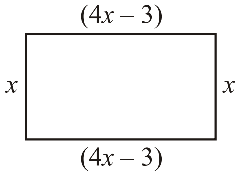
$\Rightarrow \quad \frac{\overset{47}{\cancel{94}}}{\cancel{2}} = 5x - 3$

$\Rightarrow \quad 47 = 5x - 3$

$\Rightarrow \quad 47 + 3 = 5x$

$\Rightarrow \quad 50 = 5x$

$\Rightarrow \quad \frac{50}{5} = x \quad \Rightarrow \quad x = 10$



$\therefore$ Breadth = $x = 10$ m

Length = $(4x - 3) = 4 \times 10 - 3 = 40 - 3 = 37$ m

17. Let Yuvraj scored = x runs and Gautam scored = $2x$

Together, their run fell five short of a double century = $(100 + 100 - 5) = 195$

$\therefore \quad x + 2x = 195$

$\Rightarrow \quad 3x = 195$

$\Rightarrow \quad x = \frac{\overset{65}{195}}{\underset{1}{3}}$

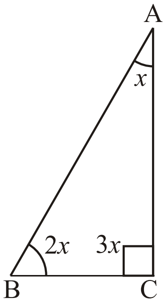
$\Rightarrow \quad x = 65$

$\therefore$ Yuvraj scored = $x = 65$ runs

Gautam scored = $2x - 2 \times 65 = 130$ runs

18. Let angle are $\angle A = x°, \angle B = 2x°, \angle C = 3x°$

We know that the sum of 3 angles of a triangle is 180°.



$\therefore$ The equation is. $\angle A + \angle B + \angle C = 180°$

i.e., $x + 2x + 3x = 180$

$\Rightarrow$ $6x = 180$

$\Rightarrow$ $x = \frac{\overset{30}{\cancel{180}}}{\underset{1}{\cancel{6}}}$

$\Rightarrow$ $x = 30°$

$\angle A = x° = 30°$

$\angle B = 2x° = 2 \times 30° = 60°$

$\angle C = 3x° = 3 \times 30° = 90°$

19. Let the number of 2-rupee coins be x

$\therefore$ the number of 1-rupee coins = $3x$

value of one-rupee coin = ₹ 2

value of x 2-rupee coin = ₹ $2x$

value of one 1-rupee coin = ₹ 1

value of $3x$ 1-rupee coin = ₹ $3x$

Total value of (2-rupee + 1-rupee) coins = ₹ $(2x + 3x)$

Hence, the equation is $2x + 3x =$ ₹ 50

$\Rightarrow$ $5x = 50$

$\Rightarrow$ $x = \frac{\overset{10}{\cancel{50}}}{\underset{1}{\cancel{5}}} = 10$ $\Rightarrow$ $x = 10$

$\therefore$ number of 2 rupee coins $= x = 10$

number of 1-rupee coins = $3x = 3 \times 10 = 30$

20. Total number of notes = 30

Let the number of ₹ 100 notes be x

$\therefore$ The number of ₹ 500 notes be = $(30 - x)$

Total rupees in the purse is ₹ 5000.

$\therefore$ The equation is $x.100 + (30 - x).500 = 5000$

$\Rightarrow$ $100x + 15000 - 500x = 5000$

$\Rightarrow$ $15000 - 400x = 5000$ $\Rightarrow$ $10000 = 400x$

$\Rightarrow$ $\frac{\overset{25}{\cancel{10000}}}{\cancel{400}} = x$ $\Rightarrow$ $x = 25$

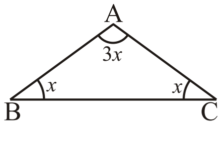
Hence, the number of ₹ 100 = 25

and the number of ₹ 500 = $(30 - 25) = 5$

21. Let base angel be $\angle B = x$ and $\angle C = x$

Then, vertex angle $\angle A = 3x$

The sum of 3 angles of a triangle is 180°.



i.e., $\angle A + \angle B + \angle C = 180°$

$\Rightarrow$ $3x + x + x = 180°$

$\Rightarrow$ $5x = 180°$

$\Rightarrow$ $x = \frac{180°}{5} = 36°$

$\therefore$ measure of $\angle B = x° = -36°$

measure of $\angle C = x° = 36$

measure of $\angle A = 3x° = 3 \times 36 = 108°$

22. Let Garima's age be x years

Then mother's age = $3x$

Hence, the equation is, $x + 3x = 72$

$$\Rightarrow \quad 4x = 72$$

$$\Rightarrow \quad x = \frac{\overset{18}{\cancel{72}}}{\underset{1}{\cancel{4}}} = 18$$

$$\Rightarrow \quad x = 18$$

Hence, Garima's age = 18 years and mother age = $3 \times 18 = 54$ years

MCQ's

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

Formative Assessment-2

Tick (✓) the correct answer.

1. (c) **2.** (b) **3.** (c) **4.** (b) **5.** (a) **6.** (a) **7.** (b) **8.** (b) **9.** (b) **10.** (c) **11.** (a) **12.** (b) **13.** (c) **14.** (a)
15. (b) **18.** (a) **19.** (d) **20.** (b).

Summative Assessment-1

Tick (✓) the correct answer.

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

9. $\frac{11}{2} + 2\frac{1}{3} = \frac{11}{2} + \frac{7}{3} = \frac{33+14}{6} = \frac{47}{6} = 7\frac{5}{6}$

10. 19.267 – 31.01 + 29.21 = (19.267 + 29.21) – 31.01 = 48.477 – 31.01 = 17.467

11. Product of $(-13) \times (-7) = (+) 13 \times 7 = 91$ $\qquad [\because - x - = +]$

12. $\frac{-6}{13} = \frac{-6 \times 6}{13 \times 6} = \frac{-36}{78}.$

13. Value of 3° – 4° + 2° = 5° – 4° = 1°

14. $3x^2 + (-7x^2) + 5x^2 = (3x^2 + 5x^2) - 7x^2 = 8x^2 - 7x^2 = x^2$

15. $12x - 11 = 5x + 3 \quad \Rightarrow \quad 12x - 5x = 11 + 3$

$$7x = 14 \quad \Rightarrow \quad x = \frac{\overset{2}{\cancel{14}}}{\underset{1}{\cancel{7}}} = 2$$

$$x = 2$$

16. $8 \text{ hr} : 1 \text{ day} = \frac{8 \text{ hr}}{1 \text{ day}} = \frac{\overset{1}{\cancel{8}}\text{hr}}{\underset{3}{\cancel{24}}\text{hr}} = \frac{1}{3} = 1 : 3$

17. Male teachers = 51 Let total teachers = x

Then female teachers = 25% of $x = \frac{25}{100} \times x = \frac{x}{4}$

Now, female teachers + male teachers = Total teachers

$$\Rightarrow \quad \frac{x}{4} + 51 = x$$

$$\Rightarrow \qquad 51 = x - \frac{x}{4} \qquad \text{(by transposition)}$$

$$\Rightarrow \qquad 51 = \frac{3x}{4}$$

$$\Rightarrow \qquad x = \frac{\overset{17}{\cancel{51}} \times 4}{\underset{1}{\cancel{3}}} = 68$$

∴ Total teacher i.e., both male + female are 68.

18. $\left(5x^2 - \frac{x}{4} + \frac{2y}{3}\right) + \left(\frac{2x^2}{5} + \frac{x}{3} + \frac{2y}{3}\right) + \left(-x^2 + \frac{x}{2} - y\right)$

$$= \left(5x^2 + \frac{2x^2}{5} - x^2\right) + \left(\frac{x}{3} + \frac{x}{2} - \frac{x}{4}\right) + \left(\frac{2y}{3} + \frac{2y}{3} - \frac{y}{5}\right)$$

$$= \left(\frac{4x^2}{1} + \frac{2}{5}x^2\right) + \left(\frac{4x + 6x - 3x}{12}\right) + \left(\frac{2y + 2y - 3y}{3}\right)$$

$$= \left(\frac{20x^2 + 2x^2}{5}\right) + \left(\frac{10x - 3x}{12}\right) + \left(\frac{4y - 3y}{3}\right)$$

$$= \frac{22}{5}x^2 + \frac{7}{12}x + \frac{y}{3}$$

19. 52 lakh = 52,00000 = 50,00000 + 2,00000

20. Product of two numbers = $\frac{10}{3}$ one of them number = $\left(\frac{-15}{4}\right)$

∴ The other number $= \left(\frac{10}{3}\right) \div \left(\frac{-15}{4}\right) = \frac{\overset{2}{10}}{3} \times \left(\frac{-4}{\underset{3}{15}}\right) = \frac{-8}{9}$

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

21. Ascending order is $\left(\frac{-9}{10}\right) < \left(\frac{-11}{30}\right) < \left(\frac{-2}{15}\right) < 0.$

22. $36 \div 3 + 4 \times 3 - 4 = \left(\frac{36}{3}\right) + 4 \times 3 - 4 = 12 + 12 - 4 = 24 - 4 = 20$

23. $11.5 \times 1.5 \times 1.5 = \frac{15 \times 15 \times 15}{10 \times 10 \times 10} = \frac{3375}{1000} = 3.375$

24. $\left(\frac{7}{9} - \frac{5}{27}\right) \times \left(\frac{1}{3} - \frac{5}{18}\right) = \left(\frac{21 - 5}{27}\right) \times \left(\frac{6 - 5}{18}\right)$

$$= \frac{\overset{8}{\cancel{16}}}{27} \times \frac{1}{\underset{9}{\cancel{18}}} = \frac{8}{243}$$

25. $\left(9\frac{7}{3}\right) \times 5\frac{4}{9} - \left(1\frac{2}{3} \div 8\frac{1}{3}\right) = \left(\frac{\overset{22}{\cancel{66}}}{\underset{1}{7}} \times \frac{\overset{7}{49}}{\underset{3}{\cancel{9}}}\right) - \left(\frac{5}{3} \div \frac{25}{3}\right)$

$$= \left(\frac{22 \times 7}{3}\right) - \left(\frac{\overset{1}{\cancel{5}}}{3} \times \frac{3}{\underset{5}{\cancel{25}}}\right) = \frac{154}{3} - \frac{1}{5}$$

$$= \frac{770 - 3}{15} \qquad [\because \text{LCM of } (3, 5) = 15]$$

$$= \frac{767}{15} \text{ or } 51\frac{2}{15}$$

26. The cost of 2.5 kg of tomatoes = ₹ 20.625

∴ The cost of 1 kg of tomatoes = ₹ 20.625 ÷ 2.5

$$= \frac{20.625}{2.5} = ₹\ 8.25$$

and the cost of 4 kg of tomatoes $4 \times 8.25 =$ ₹ 33

27. Given pattern $\frac{15}{-6}, \frac{10}{-12}, \frac{5}{-18}, \frac{20}{-24}$.

Therefore, 4 next numbers will be

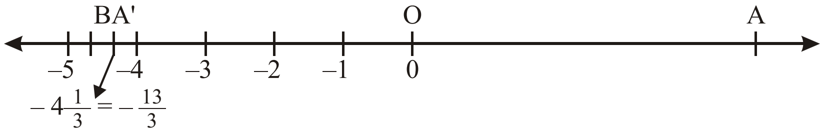
$$\therefore \quad \frac{15 \times (-1)}{-6 \times (-1)}, \frac{10 \times (-1)}{-12 \times (-1)}, \frac{5 \times (-1)}{-18 \times (-1)}, \frac{20 \times (-1)}{-24 \times (-1)} = \frac{-15}{6}, \frac{-10}{2}, \frac{-5}{18}, \frac{-20}{24}$$

$$\frac{15 \times 2}{-6 \times 2}, \frac{10 \times 2}{-12 \times 2}, \frac{5 \times 2}{-18 \times 2}, \frac{20 \times 2}{-24 \times 2} = \frac{30}{-12}, \frac{20}{-24}, \frac{10}{-36}, \frac{40}{-48}$$

$$\frac{15 \times 3}{-6 \times 3}, \frac{10 \times 3}{-12 \times 3}, \frac{5 \times 3}{-18 \times 3}, \frac{20 \times 3}{-24 \times 3} = \frac{45}{-18}, \frac{30}{-36}, \frac{15}{-54}, \frac{60}{-72}$$

$$\frac{15 \times 14}{-6 \times 4}, \frac{10 \times 4}{-12 \times 4}, \frac{5 \times 4}{-18 \times 3},. \frac{20 \times 4}{-24 \times 4} = \frac{60}{-24}, \frac{40}{-48}, \frac{20}{-72}, \frac{80}{-96}$$

28. $\frac{-13}{3} = -4\frac{1}{3} = -4.33$



29. $(4^{-1} - 5^{-1}) + (5^{-1} - 6^{1}) = \left(\frac{1}{4} - \frac{1}{5}\right) + \left(\frac{1}{5} - \frac{6}{1}\right)$

$$= \left(\frac{5-4}{20}\right) + \left(\frac{1-30}{5}\right) = \frac{1}{20} + \left(\frac{-29}{5}\right)$$

$$= \frac{1}{20} - \frac{29}{5} = \frac{1-116}{20} = \frac{-\overset{23}{\cancel{115}}}{\underset{4}{\cancel{20}}} = \frac{-23}{4}$$

30. $[5z - (x + 2y)] - [3x - (y - 2z)] = [5z - x - 2y] - [3x - y + 2z]$

$$= 5z - x - 2y - 3x + y - 2z$$

$$= (5z - 2z) - x - 3x + (y - 2y)$$

$$= 3z - 4x - y$$

31. $2a(a^2 + b^2 - 2b^2 (b + a) + 2 = 2a^3 + 2ab^2 - 2b^3 - 2ab^2 + 2$

$$= 2a^3 - 2b^3 + 2ab^2 - 2ab^2 + 2$$

32. Let sister's age be x years then Saurab's age will be $(x+6)$ years

sum of their age is $x+(x+6)$

$\therefore$ The equation will be $x+(x+6)=24$

or $\quad 2x+6=24 \quad$ or $\quad 2x+24-6=18$

or $\quad x=\frac{\overset{9}{\cancel{18}}}{\underset{1}{\cancel{2}}}=9$

Hence, sister's Age = 9 years and Saurabh's Age = $(9+6)=15$ year

Check : Sum of their ages = $9+15=24$ which is true.

33.
$$8-7x=-20(x-2) \quad \Rightarrow \quad 8-7x=-20x+40$$
$$\Rightarrow \quad 8-7+20x=40 \quad \Rightarrow \quad 20x-7x=40-8$$
$$\Rightarrow \quad 13x=32 \quad \Rightarrow \quad x=\frac{32}{13}$$

Check : $\text{LHS}=8-7x=8-7\times\frac{32}{13}=\frac{104-224}{13}=\frac{-120}{13}$

$$\text{RHS}=-20(x-2)=-20\left(\frac{32}{13}-2\right)$$
$$=-20\left(\frac{32-26}{13}\right)-20\times\frac{6}{13}=\frac{-120}{13}$$

34. The original price of the cell phone = ₹ 3500

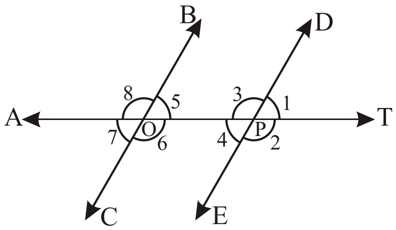
reduced price of the cellphone = ₹ 3100

Decrease in price of the cell phone = ₹ 3500 – ₹ 3100 = ₹ 400

$$\therefore \quad \text{Decrease }\% = \frac{\text{Decrease in price}}{\text{Original Price}}\times 100$$
$$=\frac{4\cancel{0}\cancel{0}}{\underset{7}{\cancel{35}\cancel{0}\cancel{0}}}\times\overset{20}{\cancel{100}}=\frac{80}{7}$$
$$=11.42\% \text{ or } 11\frac{3}{7}\%$$

9. Understanding Shapes

Exercise 9.1



1. (a) Linear pairs will be :

$(\angle 5, \angle 8)$ and $(\angle 1, \angle 3)$
$(\angle 8, \angle 7)$ and $(\angle 3, \angle 4)$
$(\angle 7, \angle 6)$ and $(\angle 4, \angle 2)$
$(\angle 6, \angle 5)$ and $(\angle 2, \angle 1)$

(b) Vertically opposite angles are :

$(\angle 1, \angle 4)$, and $(\angle 5, \angle 7)$
$(\angle 2, \angle 3)$ and $(\angle 8, \angle 6)$

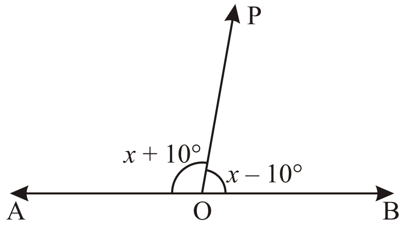
2. Since AOB is a straight line.

$\therefore \quad \angle AOB = 180°$

$\Rightarrow \quad x+10°+x-10°=180°$

$\Rightarrow \quad 2x=180°$

$\Rightarrow \qquad x = \dfrac{180°}{2} = 90°$



(a) $\angle AOP = x + 10° = 90° + 10° = 100°$

(b) $\angle BOP = x - 10° = 90 - 10 = 80°$

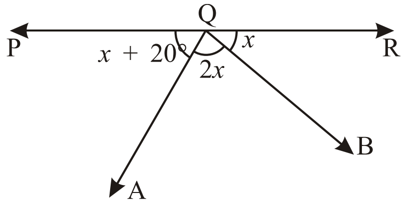
(c) Since $80° < 90°$

$\therefore \quad \angle BOP$ is acute angle.

(d) Since $100° > 90°$.

$\therefore \quad \angle AOP$ is obtuse angle.

3. Since PQR is a straight line.



$\therefore \qquad \angle PQR = 180°$

$\Rightarrow \qquad x + 20° + 2x + x = 180°$

$\Rightarrow \qquad 4x + 20° = 180°$

$\Rightarrow \qquad 4x = 180° - 20° = 160°$

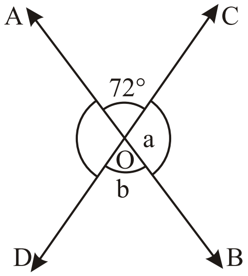
$\Rightarrow \qquad x = \dfrac{160°}{4} = 40°$

(a) $\angle AQB = 2x = 2 \times 40° = 80°$

(b) $\angle BQP = 2x + x + 20 = 3x + 20 = 3 \times 40° + 20° = 140°$

(c) $\angle AQR = 2x + x = 3x = 3 \times 40 = 120°$

4. (a) Since AOB is a straight line



$\therefore \qquad \angle AOB = 180°$

$\Rightarrow \qquad 72° + \angle a = 180°$

$\Rightarrow \qquad \angle a = 180 - 72 = 108°$

(b) Adjacent angles are

$\angle BOC, \angle COA, \angle AOD, \angle DOB$

(c) Vertically opposite angles are

($\angle AOC$ and $\angle DOB$)

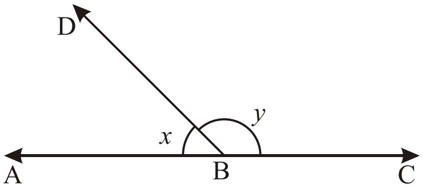
($\angle AOD$ and $\angle BOC$).

(d) $\angle DOB = \angle AOC = 72°$ (vertically opposite angles

$\angle BOC = \angle AOD$ (vertically opposite angles)

$a = \angle AOD$ $108° = \angle AOD$

5. If $x = 45°$, $y = ?$



Since ABC is a straight line

$\therefore \qquad \angle ABC = 180°$

$\Rightarrow \qquad x + y = 180°$

$\Rightarrow \qquad 45° + y = 180°$

$\Rightarrow \qquad y = 180 - 45 = 135°$

6. If $y = 2x, x = ?, y = ?$

Since ABC is a straight line

$\therefore \qquad \angle ABC = 180°$

$\Rightarrow \qquad x + y = 180°$

$\Rightarrow \qquad x + 2x = 180° \qquad [\because y = 2x \text{ given}]$

$\Rightarrow \qquad 3x = 180°$

$\Rightarrow \qquad x = \dfrac{180}{3} = 60°$

$\Rightarrow \qquad y = 2 \times x = 2 \times 60 = 120°$

7. $y = ?$, IF $x = \frac{y}{2}$ Since ABC is a straight line (from the figure)

$\therefore \quad \angle ABC = 180°$

$\Rightarrow \quad x + y = 180°$

$\Rightarrow \quad \frac{y}{2} + y = 180° \qquad \left[\because \quad x = \frac{y}{2} \text{(given)}\right]$

$\Rightarrow \quad \frac{3y}{2} = 180°$

$\Rightarrow \quad y = \frac{\overset{60}{\cancel{180}} \times 2}{\cancel{3}} = 120°$

8. if $y = 1\frac{1}{2}$ right angle, $x = ?$

$y = \frac{3}{2}$ right angle

$= \frac{3}{2} \times 90 = 3 \times 45° = 135° \qquad [\because \quad 1\text{Right angle} = 90]$

Since ABC is a straight line (from the fig.)

$\therefore \quad \angle ABC = 180° \quad \Rightarrow \quad x + y = 180°$

$x + 135° = 180° \quad \Rightarrow \quad x = 180 - 135 = 45°$

$\Rightarrow \quad x = 45°$

9. (a) $\angle POR = \angle POQ + \angle QOR = x + y$

(b) $\angle POR - \angle QOR = x + y - y = x$

(c) $\angle QOS - \angle SOR$

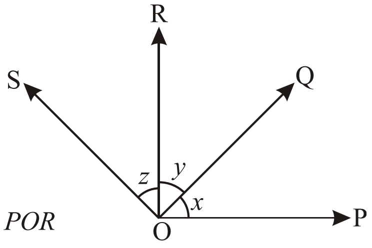
$= \angle QOR + \angle ROS - \angle SOR$

$= y + z - z = y$

(d) $\angle POS - \angle QOR - \angle POQ$

$= \angle POQ + \angle QOR + \angle ROS - \angle QOR - \angle POR$

$= \angle ROS = z$



10. (a) $x + y = \angle POQ + \angle QOR = \angle POR$

(b) $x + y + z = \angle POQ + \angle QOR + \angle ROS = \angle POS$

(c) $y + z = \angle QOR + \angle ROS = \angle QOS$

(d) $x + y + z - z = x + y = \angle POQ + \angle QOR = \angle POR$

11. If $x = 25°$, $y = 60°$, $\angle POR = ?$

$\angle POR = x + y \qquad$ (by figure)

$= 25 + 60 = 85°$

12. If $\angle SOQ = 100°$, $\angle QOR = 55°$, $\angle SOR = ?$

$\angle SOR + \angle QOR = \angle SOQ$

$\angle SOR + 55° = 100°$

$\angle SOR = 100° - 55° = 45°$

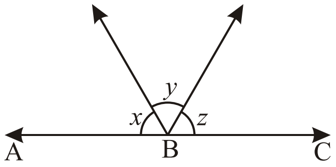
13. If $\quad x = \frac{1}{3}$ right angle $= \frac{1}{3} \times 90° = 30°$

$y = \frac{2}{3}$ right angle $= \frac{2}{3} \times 90° = 2 \times 30 = 60°$

$z = \frac{1}{2}$ right angle $= \frac{1}{2} \times 90° = 45°$

$$\angle POS = x + y + z$$
$$= 30 + 60 + 45 = 135^\circ$$

14. (a) Given, $x = y = 80, z = 30^\circ$



$$\angle ABC = x + y + z$$
$$= 80 + 80 + 30 = 190^\circ$$

Since $\angle ABC = 190^\circ \neq 180^\circ$.

Hence, ABC is not a straight line.

(b) Given, $x = y = z = \frac{2}{3}$

Right angle $\frac{2}{\underset{1}{3}} \times \overset{30}{90} = 60^\circ$

$$\angle ABC = x + y + z$$
$$= 60 + 60 + 60 = 180$$

Since $\angle ABC = 180^\circ$.

Hence, ABC is a straight line.

(c) Given, $x = \frac{2}{3}$

Right angle $= \frac{2}{3} \times 90 = 60^\circ$

$y = 1$

Right angle $= 90^\circ$

$z = \frac{1}{2}$

Right angle $= \frac{1}{2} \times 90^\circ = 45^\circ$

$$\angle ABC = x + y + z$$
$$= 60 + 90 + 45 = 195$$

Since $\angle ABC = 195^\circ \neq 180^\circ$.

Hence, ABC is not a straight line.

(d) $z = 1\frac{1}{2}$

Right angle $= \frac{3}{2}$

Right angle $= \frac{3}{2} \times \overset{45}{90} = 135^\circ$

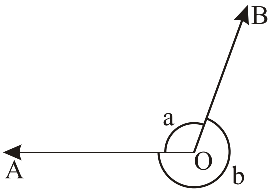
$$\angle ABC = x + y + z$$
$$= 30 + 30 + 135^\circ = 195$$

Since $\angle ABC = 195^\circ \neq 180^\circ$.

Hence, ABC is not a straight line.

15. (a) if $a = 110^\circ, b = ?$

$\angle AOB + \angle BOA = 360^\circ$ (Angles at a point)



$$a + b = 360$$
$$110 + b = 360$$
$$\Rightarrow \quad b = 360^\circ - 110^\circ = 250^\circ$$
$$\Rightarrow \quad b = 250^\circ$$

(b) If $b = 200, a = ?$

$\angle AOB + \angle BOA = 360^\circ$ (sum of all the angles at a point is 360°)

$a + b = 360^\circ$

$a + 200 = 360$

$\Rightarrow \quad a = 360 - 200 = 160^\circ$

$\Rightarrow \quad a = 160^\circ$

(c) If $a = \frac{5}{3}$ right angle $= \frac{5}{3} \times 90 = 5 \times 30 = 15^\circ$ $b = ?$

$\because \quad a + b = 360^\circ$ (sum of all the angles at a point is 360°)

$150 + b = 360^\circ$

$b = 360 - 150 = 210^\circ$

16. (a) 30°

$a + b = 90^\circ$ (Sum of two angles is 90°)

$a + 30 = 90 \quad \Rightarrow \quad a = 90 - 30$

$\Rightarrow \quad a = 60^\circ$

(b) 80°

$a + b = 90^\circ$

$a = 90^\circ - 80^\circ \quad \Rightarrow \quad a = 10^\circ$

(c) 15°

$a + b = 90^\circ$

$a + 15 = 90^\circ \quad \Rightarrow \quad a = 90 - 15 = 75^\circ$

(d) 75°

$a + b = 90^\circ$

$a + 75^\circ = 90^\circ \quad \Rightarrow \quad a + 90^\circ - 75^\circ$

$\Rightarrow \quad a = 15^\circ$

(e) 45°

$\because \quad a + b = 90^\circ$ (Sum of two angles is 90°)

$a + 45 = 90^\circ \quad \Rightarrow \quad a = 90^\circ - 45^\circ$

$\Rightarrow \quad a = 45^\circ$

(f) x°

$\because \quad a + b = 90^\circ$

$a + x^\circ = 90^\circ \quad \Rightarrow \quad a = 90 - x^\circ$

(g) 35°

$\because \quad a + b = 90^\circ$

$a + 35^\circ = 90^\circ \quad \Rightarrow \quad a = 90 - 35^\circ$

$\Rightarrow \quad a = 55^\circ$

(h) $10^\circ + y^\circ$

$\because \quad a + b = 90^\circ$

$a + (10 + y) = 90^\circ \quad \Rightarrow \quad a = 90 - 10 - y \quad \Rightarrow \quad a = 80y$

17. (a) $\frac{1}{3}$ of $90^\circ = \frac{1}{3} \times 90 = 30^\circ$

$\because \quad a + b = 90^\circ \quad \Rightarrow \quad a + 30 = 90$

$a = 90 - 30 \quad \Rightarrow \quad a = 60^\circ$

(b) $\frac{1}{4}$ of $80^\circ = \frac{1}{4} \times 80 = 20^\circ$

$\because \quad a + b = 90^\circ \quad \Rightarrow \quad a + 20 = 90$

$a = 90 - 20 \quad \Rightarrow \quad a = 70^\circ$

(c) $\frac{1}{2}$ of $60° = \frac{1}{2} \times 60° = 30°$

$\because \quad a + b = 90°$

$\Rightarrow \quad a + 30 = 90°$

$a = 90 - 30 = 60° \quad \Rightarrow \quad a = 60°$

(d) $\frac{2}{5}$ of $70 = \frac{2}{5} \times \overset{14}{70} = 28°$

$\because \quad a + b = 90°$

$\Rightarrow \quad a + 28 = 90$

$a = 90 - 28 \quad \Rightarrow \quad a = 62°$

18. (a) 70°

$\because \quad a + b = 180°$ $\quad$ ($\because$ Sum of two supplement angles is 180°)

$a + 70 = 180° \quad \Rightarrow \quad a = 180° - 70° = 110°$

(b) 80°

$\because \quad a + b = 180°$

$a + 80 = 180 \quad \Rightarrow \quad a = 180° - 80° = 100°$

(c) 195°

$\because \quad a + b = 180$

$a + 195° = 180 \quad \Rightarrow \quad a = 180° - 195° = -15°$

(d) 135°

$\because \quad a + b = 180°$

$a + 135 = 180 \quad \Rightarrow \quad a = 180° - 135° = 45°$

(e) 40°

$\because \quad a + b = 180°$ $\quad$ ($\because$ Sum of two supplement angles is 180°)

$a + 40 = 180° \quad \Rightarrow \quad a = 180° - 40° = 140°$

(f) 121°

$\because \quad a + b = 180°$ $\quad$ ($\because$ Sum of two supplement angles is 180°)

$a + 121 = 180 \quad \Rightarrow \quad a = 180 - 121 = 59°$

(g) $x°$

$\because \quad a + b = 180°$ $\quad$ ($\because$ Sum of two supplement angles is 180°)

$a + x° = 180 \quad \Rightarrow \quad a = 180° - x°$

(h) $20° + y°$

$\because \quad a + b = 180$ $\quad$ ($\because$ Sum of two supplement angles is 180°)

$a + (20 + y) = 180 \quad \Rightarrow \quad a = 180 - 20 - y = 160 - y°$

19. (a) $\frac{3}{4}$ of $160° = \frac{3}{4} \times 160° = 120°$

$\because \quad a + b = 180°$ $\quad$ ($\because$ Sum of two angles is 180°)

$a + 120° = 180 \quad \Rightarrow \quad a = 180 - 120 = 60°$

(b) $\frac{1}{2}$ of $120° = \frac{1}{2} \times 120 = 60°$

$\because \quad a + b = 180°$ $\quad$ ($\because$ Sum of two supplement angles is 180°)

$a + 60 = 180 \quad \Rightarrow \quad a = 180 - 60 = 120°$

(c) $\frac{1}{3}$ of $150 = \frac{1}{3} \times 150° = 50°$

$\because \quad a + b = 180°$ $\quad$ ($\because$ Sum of two supplement angles is 180°)

$a + 50 = 180 \quad \Rightarrow \quad a = 180 - 50 = 130°$

(d) $\frac{3}{5}$ of $100 = \frac{3}{5} \times 100 = 3 \times 2 = 60°$

$\because \ a + b = 180°$ (∵ Sum of two supplement angles is 180°)

$a + 60 = 180 \quad \Rightarrow \quad a = 180° - 60° = 120°$

20. Let angles be $7x°$, $8x°$

∵ Angles are complementary

$\therefore \quad 7x° + 8x° = 90°$ (∵ Sum of two complementary angles is 90°)

$15x° = 90°$

$x = \frac{90}{15} = 6°$

Thus, the angles are $7x° = 7 \times 6 = 42°$ and $8x° = 8 \times 6 = 48°$

21. Let angles be $7x°$, $11x°$ (∵ Angles are supplementary)

$\therefore \quad 7x° + 11x° = 180°$ (∵ Sum of two supplementary angles is 180°)

$18x° = 180$

$x = \frac{180°}{18} = 10°$

Thus, the angles are $7x° = 7 \times 10° = 70°$ and $11x° = 11 \times 10° = 110°$

22. (a) Let both the angles be $x°$. (∵ Angles are complement)

$\therefore \quad x° + x° = 90° \quad \Rightarrow \quad 2x = 90$

$x = \frac{90°}{2} = 45 \quad \Rightarrow \quad x = 45°$

(b) Let both the angles be $x°$ (∵ Angles are supplementary)

$x + x = 180° \quad \Rightarrow \quad 2x = 180$

$x = \frac{180}{2} = 90° \quad \Rightarrow \quad x = 90°$

23. (a) No, (b) No

(c) $a + b = 180$ (Sum of linear pair is 180°)

$a + 90 = 180 \quad \Rightarrow \quad a = 180 - 90 = 90°$

∴ other angle is 90°

(d) $a + b = 180$

obtuse angle + $b = 180°$

$b = 180 -$ obtuse angle = acute angle

24. Let $\angle a = 3x + 15°,\ \angle b = (2x + 5)°,\ x = ?$

$\angle a + \angle b = 180°$ (∵ Sum of two supplementary angles is 180°)

$3x + 15 + 2x + 5 = 180°$

$5x + 20 = 180°$

$5x = 180 - 120 = 160°$

$x = \frac{160°}{5} = 32°$

25. Let $\angle A = (2x - 7°),\ \angle B = (x + 4)°$

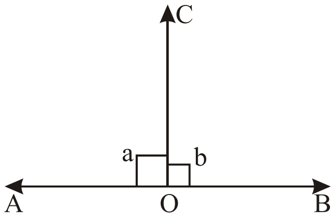
$\because \quad \angle A + \angle B = 90°$ (∵ Sum of two complementary angles is 90°)

$(2x - 7) + (x + 4) = 90° \quad \Rightarrow \quad (2x + x) + (4 - 7) = 90$

$3x - 3 = 90 \quad \Rightarrow \quad 3x = 90 + 3$

$\Rightarrow \quad x = \frac{\overset{31}{\cancel{93}}}{\underset{1}{\cancel{3}}} \quad \Rightarrow \quad x = 31°$

26. (a) Let $\angle a = \angle b$, then



$$a + b = 180$$
$$\Rightarrow \quad a + a = 180$$
$$2a = 180$$
$$\Rightarrow \quad a = \frac{\overset{90}{\cancel{180}}}{\cancel{2}} = 90$$
$$\therefore \quad a = b = 90°$$

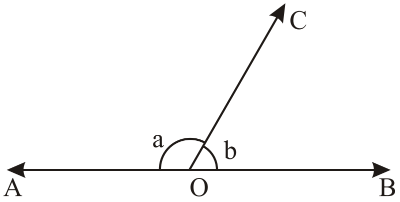
$\Rightarrow$ The given angles are vertical and supplementary.

(b) Given, $a + b = 150°$ ($\because$ Sum of adjacent angles)

$a - b = 30$ ($\because$ Difference of both angles is 30°)

Adding both equation,

$$2a = 150 + 30 = 180° \quad \Rightarrow \quad a = \frac{180}{2} = 90°$$



Putting $a = 90°$ in equation (1), we get

$$90 + b = 150°$$
$$\Rightarrow \quad b = 150 - 90$$
$$b = 60°$$

$\therefore$ $a = 90°$ and $b = 60°$

(c) Let smaller angle = $x°$

then larger angle = $4x°$

$\because$ $x + 4x = 90°$ (by complementary angles property)

$$5x = 90 \quad \Rightarrow \quad x = \frac{\overset{18}{\cancel{90}}}{\underset{1}{\cancel{5}}} = 18°$$

$$x = 18°$$

$\therefore$ smaller angle = 18° and larger scale = $4 \times 18 = 72°$

(d) Let the larger angle = $x°$

Then the smaller angle = $(x - 30)°$

$\because$ $x + (x - 30°) = 90$ (by complementary angles property)

$$2x = 90 + 30$$
$$x = \frac{\overset{60}{\cancel{120}}}{\underset{1}{\cancel{2}}} = 60$$
$$x = 60°$$

$\therefore$ The larger angle = 60° and The smaller angle = $(60° - 30°) = 30°$

(e) Let the smaller angle = $x°$

Then the larger angle = $x + 60°$

$\because$ $x + (x + 60°) = 180°$ (by supplementary angles property)

$$2x + 60 = 180°$$
$$2x = 180 - 60 = 120°$$
$$x = \frac{\overset{60}{\cancel{120}}}{\underset{1}{\cancel{2}}} = 60$$

$\Rightarrow \qquad x = 60$

$\therefore$ smaller angle = 60° and larger angle = $60 + 60 = 120^\circ$

(f) Let the number angle = x° Then the smaller angle = $\frac{x^\circ}{2}$

$\because \qquad x^\circ + \frac{x^\circ}{2} = 180^\circ$ (by supplementary angles property)

$$\frac{3x^\circ}{2} = 180$$

$$x^\circ = \frac{\overset{60}{180} \times 2}{3} = 120^\circ$$

$\therefore$ The larger angle of 120° and the smaller angle = $\frac{120}{2} = 60^\circ$

(g) Let the smaller angle = x°

Then the larger angle = $(3x^\circ - 20^\circ)$

$\therefore \quad x^\circ + (3x^\circ - 20^\circ) = 180^\circ$ (by supplementary angles property)

$$4x^\circ - 20^\circ = 180^\circ$$

$$4x = 180 + 20 = 200^\circ$$

$$x = \frac{200^\circ}{4} = 50^\circ$$

$\therefore$ The smaller angle = 50° and the larger angle = $(3 \times 50^\circ - 20^\circ) = 130^\circ$

27. Given $\angle BAD = (5x^\circ - 30^\circ)$, $\quad \angle CAD = 2x^\circ$

$\because \quad \angle CAB$ is a straight angle

$\therefore \quad \angle CAD + \angle BAD = 180^\circ$

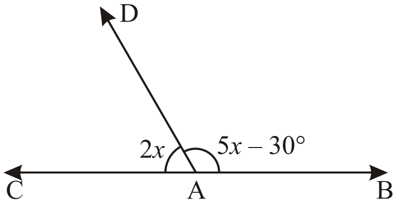
$$2x + (5x - 30) = 180$$

$$7x - 30 = 180$$

$$7x = 180 + 130 = 210$$

$$x = \frac{210^\circ}{7} = 30^\circ$$

$\therefore \qquad x = 30^\circ$



Exercise 9.2

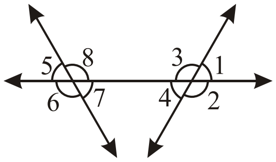
1. (a) $\angle 2$ and $\angle 7$ = Alternate interior angles

(b) $\angle 4$ and $\angle 8$ = Corresponding angles

(c) $\angle 1$ and $\angle 8$ = Alternate exterior angles

(d) $\angle 1$ and $\angle 5$ = Corresponding angles

(e) $\angle 4$ and $\angle 7$ = None

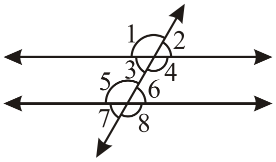


2. (a) $(\angle 2, \angle 4)$ = None

(b) $(\angle 1, \angle 8)$ = Alternate exterior angles

(c) $(\angle 4, \angle 5)$ = Alternate interior angles

(d) $(\angle 3, \angle 5)$ = None



3. (a) $(\angle 1, \angle 10)$ = Corresponding angles

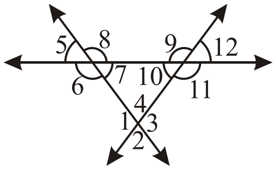
(b) $(\angle 6, \angle 2)$ = Alternate exterior

(c) $(\angle 8, \angle 10)$ = Alternate interior

(d) $(\angle 4, \angle 11)$ = Alternate interior

(e) $(\angle 2, \angle 8)$ = Alternate interior

(f) $(\angle 5, \angle 7)$ = None



4. (a) $\because$ AOB is a straight line

$\therefore$ $\angle AOB = 180°$

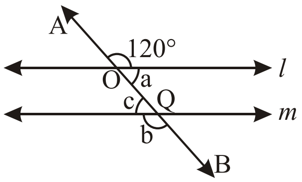
$\Rightarrow$ $120 + a = 180°$

$\Rightarrow$ $a = 180° - 120°$

$\Rightarrow$ $a = 60°$

$\angle c = \angle a$ (Interior alternate angle)

$\angle c = 60°$



Now, AQB is a straight line

$\therefore$ $\angle AQB = 180°$ $\Rightarrow$ $c + b = 180°$

$60 + b = 180$

$\Rightarrow$ $b = 180 - 60 = 120°$

$b = 120°$

(b) $\because$ $\angle b = 40°$

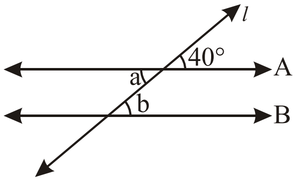
(corresponding angles)

$\Rightarrow$ $b = 40°$

$\because$ $a = b$

(alternate angles)

$\Rightarrow$ $a = 40°$



(c) $\because$ $a = 60$

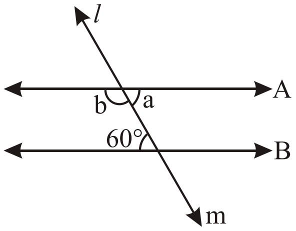
(Alternate interior angles)

$b + 60° = 180°$

(Allied or conjoined angled)

$b = 180 - 60$

$\therefore$ $b = 120°$



(d) $\because$ $a = 110°$

(Vertically opposite angle)

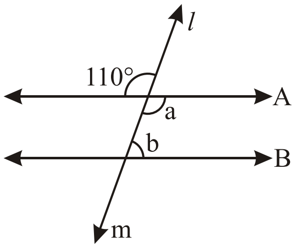
$a + 10 = 180°$

(Allied or conjoined angled)

$110° + b = 180°$

$b = 180 - 110°$

$\therefore$ $b = 70°$



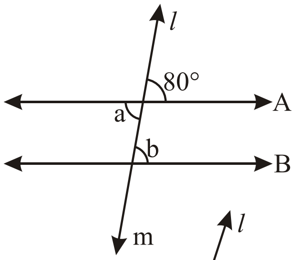
(e) $\because$ $b = 80°$

(Corresponding angles)

$a = b$

(Alternative interior angles)

$\therefore$ $a = 80°$



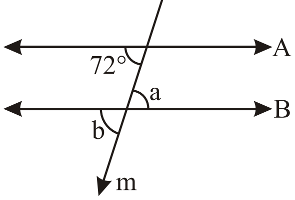
(f) $\because$ $a = 72°$

(Alternate interior angles)

$b = a$

(Vertically opposite angles)

$\therefore$ $b = 72°$



(g) $\because$ $b = 75°$

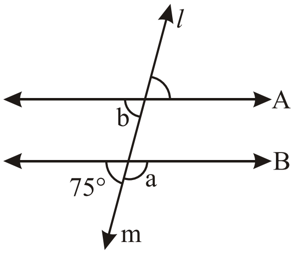
(Corresponding angles)

$a + 75° = 180°$

(straight angles)

$a = 180° - 75°$

$\therefore$ $a = 105°$



(h) $\because$ $b = 100°$

(Corresponding angles)

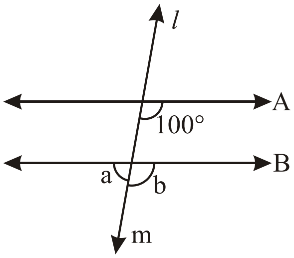
$a + b = 180°$

(straight line)

$a + 100 = 180°$

$a = 180 - 100 = 80°$

$\Rightarrow$ $a = 80°$



(i) $\because$ lm is a straight line

$\therefore$ $a + 120 = 180°$

(by straight line property)

$= 180° - 120°$

$\Rightarrow$ $a = 60°$

$\because$ $a + x = 180°$

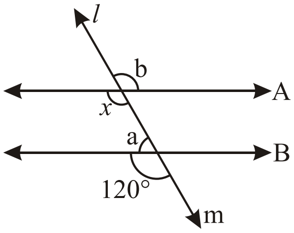
(Allied or conjoined angles)

$60 + x = 180°$

$\Rightarrow$ $x = 180 - 60 = 120°$

Now, $b = x$ (vertically opposite angle)

$\therefore$ $b = 120°$



(j) $\because$ $b = 102°$

(Corresponding angle)

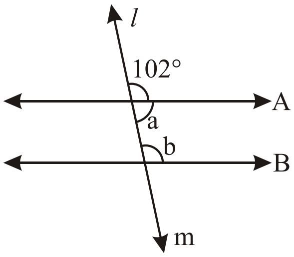
$\because$ lm is a straight line.

$\because$ $a + 102 = 180°$

(by straight line property)

$a = 180° - 102° = 78°$

$\therefore$ $a = 78°$



(k) $\because$ $b = 62°$

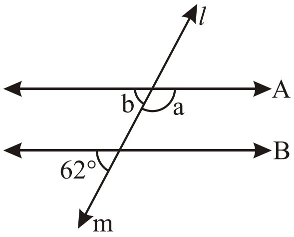
(Corresponding angle)

$\because$ $a + b = 180°$

(straight line)

$a = 180° - 62°$

$\therefore$ $a = 118°$



(*l*) ∵ $b = 130°$

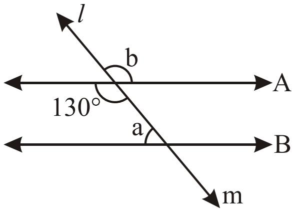
(vertically opposite angle)

$a + 130° = 180°$

(Allied or conjoined angles)

$a = 180° - 130°$

⇒ $a = 50°$



(m) ∵ $a = 35$

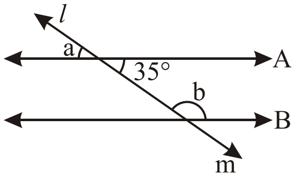
(Vertically opposite angle)

$b + 35° = 180°$

(Allied or conjoined angles)

$b = 180° - 35° = 145°$

∴ $b = 145°$



(n) $b = 90°$

(Corresponding angle)

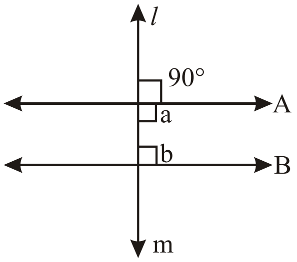
∵ *lm* is a straight line

∴ $a + 90° = 180°$

(straight line)

$a = 180 - 90 = 90°$

⇒ $a = 90°$



5. $\angle x = 60°$ (corresponding angle)

$\angle z = \angle x$ (corresponding angle)

∴ $\angle z = 60°$

$\angle p = \angle z$ (vertically opposite angle)

∴ $\angle p = 60°$

$\angle r + 60 = 180°$ (straight line)

$\angle r + 60 = 180°$

⇒ $\angle r = 180° - 60° = 120°$

∴ $\angle r = 120°$

$\angle s = \angle r$ (vertically opposite angle)

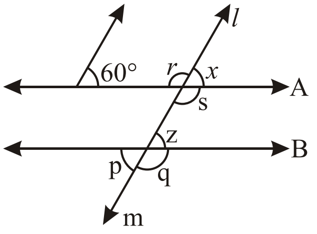
∴ $\angle s = 120°$

$\angle q = \angle s$ (corresponding angle)

$= 120°$

$x = 60°$ $z = 60°$

Hence, $p = 60°$ $q = 120°$ $r = 120°$ $s = 120°$



6. given $\angle 1 = 120°$, $\angle 8 = 60°$

$\angle 3 = \angle 1$ (vertically opposite angle)

∴ $\angle 3 = 120°$ [$\because \angle 1 = 120°$]

∵ $\angle 1 + \angle 2 = 180°$ [straight line]

$120° + \angle 2 = 180°$

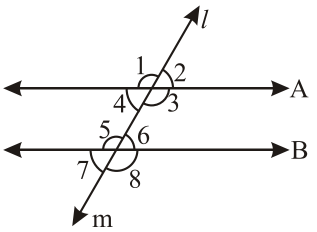
⇒ $\angle 2 = 180° - 120° = 60°$

$\angle 2 = 60°$

similarly, $\angle 5 + \angle 6 = 180°$

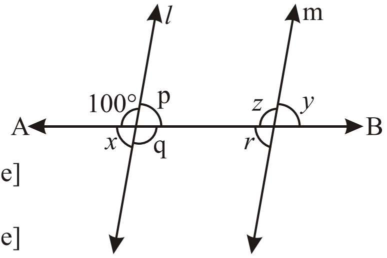
(straight line)

$\angle 5 + \angle 6 = 180°$



$\Rightarrow$ $\angle 6 = 180^\circ - 120^\circ = 60^\circ$
$\Rightarrow$ $\angle 6 = 60^\circ$
$\angle 4 = \angle 2$ (vertically opposite angle)
$\therefore$ $\angle 4 = 60^\circ$
$\because$ $\angle 5 + \angle 6 = 180^\circ$ (straight line)
$\angle 5 + 60^\circ = 180^\circ$
$\Rightarrow$ $\angle 5 = 180 - 60^\circ = 120^\circ$
$\Rightarrow$ $\angle 5 = 120^\circ$
Now, since given,
$\angle 8 = 60^\circ$ (Note)
$\therefore$ $\angle 7 + \angle 8 = 180^\circ$ (straight line)
$\angle 7 + 60^\circ = 180^\circ$
$\Rightarrow$ $\angle 7 = 180^\circ - 60^\circ = 120^\circ$
$\Rightarrow$ $\angle 7 = 120^\circ$

7. $\because$ AB is a straight line
$\therefore$ $100 + P = 180$
[straight line]
$P = 180^\circ - 100^\circ = 80^\circ$
$\Rightarrow$ $P = 80^\circ$
$\because$ $q = 100^\circ$
[vertically opp. angle]
$\Rightarrow$ $q = 100^\circ$
$\therefore$ $x = P$ [vertically opp. angle]
$\Rightarrow$ $x = 80^\circ$
$\because$ $z = 100^\circ$ [corresponding angle]
$\Rightarrow$ $z = 100^\circ$
$\because$ $r = z$ [vertically opp. angle]
$\Rightarrow$ $r = 100^\circ$
$\because$ $z + y = 180^\circ$ [straight line]
$100 + y = 180^\circ$
$y = 180 - 100 = 80^\circ$
$\Rightarrow$ $y = 80^\circ$



8. $a = 30^\circ$
(vertically opp. angles)
$d = a$
(corresponding angles)
$\Rightarrow$ $d = 130^\circ$
$c = 150$ (Alternative angles)
$b = c$ (coresponding angles)
$\Rightarrow$ $b = 150^\circ$.
Hence $a = 130^\circ$,
$b = 150^\circ$,
$c = 150^\circ$,
$d = 130^\circ$