Section – A

1. (D)

Since $x + 1$ and $x + 2$ are factors $\Rightarrow -1, -2$ are roots

$\Rightarrow \quad p(-1) = 0$ and $p(-2) = 0$

$\Rightarrow \quad -1 + 3 + 2\alpha + \beta = 0$

$2\alpha + \beta = -2 \qquad .....(1)$

and $-8 + 12 + 4\alpha + \beta = 0$

$4\alpha + \beta = -4 \qquad .....(2)$

$\Rightarrow \quad \alpha = -1, \ \beta = 0$

2. (A)

$$3x^2 + 7x - 6 \overline{)\, 3x^3 + x^2 - 22x + 9} \quad (x - 2)$$

$$3x^3 + 7x^2 - 6x$$

$$-6x^2 - 16x + 9$$

$$-6x^2 - 14x + 12$$

$$-2x - 3$$

$\Rightarrow \quad -2x - 3$ is the remainder.

Hence, we must add $2x + 3$ so that it becomes exactly divisible.

3. (C)

Sum of roots $= \dfrac{-2}{k}$.

Product of roots $= \dfrac{3\cancel{k}}{\cancel{k}} = 3$

$\Rightarrow \quad \dfrac{-2}{k} = 3 \Rightarrow k = \dfrac{-2}{3}$

4. (B)

$x^2 + 2x - 3 = 0 \ \Rightarrow \ (x + 3)(x - 1) = 0$

$x = -3, 1$. Larger root = 1

$2x^2 - 18x + 40 = 0 \ \Rightarrow (x - 4)(x - 5) = 0$

Smaller root = 4

$\Rightarrow$ Roots of $p(x) = 1, 4$

$\Rightarrow \quad p(x) = k \cdot \left(x^2 - (4 + 1)x + 4 \times 1\right)$

$k = 2 \quad \Rightarrow \quad p(x) = 2x^2 - 10x + 8$

$a=-10,\ b=8$

$a-b=-18$

5. (C)

x^4+8x

$\Rightarrow\ x\cdot\left(x^3+8\right)$

$\Rightarrow\ x\cdot(x+2)\left(x^2-2x+4\right)$

6. (C)

$x=\dfrac{1}{1+\sqrt{2}}\times\dfrac{1-\sqrt{2}}{1-\sqrt{2}}$

$x=\sqrt{2}-1$

$\Rightarrow\ x+1=\sqrt{2}$ (Square both sides)

$x^2+2x+1=2$

$\Rightarrow\ x^2+2x+3=4$

7. (D)

$$\frac{p_{10}-p_9}{p_8}=\frac{\alpha^{10}+\beta^{10}-\left(\alpha^9+\beta^9\right)}{\alpha^8+\beta^8}$$

$$\Rightarrow\ \frac{\alpha^{10}-\alpha^9+\beta^{10}-\beta^9}{\alpha^8+\beta^8}$$

$$\Rightarrow\ \frac{\alpha^8\left(\alpha^2-\alpha\right)+\beta^8\left(\beta^2-\beta\right)}{\alpha^8+\beta^8} \qquad .....(1)$$

Since α and β are roots of the polynomial, $\alpha^2-\alpha-7=0$

$\Rightarrow\ \alpha^2-\alpha=7$ and $\beta^2-\beta=7$

Substitute in (1)

$$\Rightarrow\ \frac{\alpha^8\times7+\beta^8\times7}{\alpha^8+\beta^8}=7$$

8. (B)

Let x be the number of rows.

Let y be student in each row.

A.T.Q.

$(y+1)(x-2)=xy$

$\Rightarrow\ \cancel{xy}-2y+x-2=\cancel{xy}$

$x-2y=2 \qquad .....(1)$

and $(y-1)(x+3)=xy$

$\cancel{xy}+3y-x-3=\cancel{xy}$

$3y-x=3 \qquad .....(2)$

$\Rightarrow\ y=5,\ x=12$

$\Rightarrow$ Students $=5\times12=60$

9. (C)

Let unit's digit = x

ten's digit = y

$\Rightarrow$ Number = $10y + x$

A.T.Q.

$10y + x + 10x + y = 110$

$\Rightarrow \quad x + y = 10 \qquad .....(1)$

and $10y + x - 10 = 5 \times (x + y) + 4$

$5y - 4x = 14 \qquad .....(2)$

$y = 6, \ x = 4$

$\Rightarrow$ Number = 64

10. (A)

Let age of man = x

sum of ages of the sons = y

A.T.Q.

$x = 3y \qquad .....(1)$

and $x + 5 = 2(y + 10)$

$x + 5 = 2y + 20$

$x - 2y = 15 \qquad .....(2)$

$\Rightarrow \quad y = 15, \ x = 45$

11. (D)

Let distance covered = d km

Let original speed of train = v km/h

$\Rightarrow$ Scheduled time $= \left(\frac{d}{v}\right)$ hours.

A.T.Q. $\frac{d}{v+10} = \frac{d}{v} - 2$

$\cancel{dv} = \cancel{dv} + 10d - 2v^2 - 20v$

$\Rightarrow \quad v^2 + 10v = 5d \qquad .....(1)$

and $\frac{d}{v-10} = \frac{d}{v} + 3$

$\cancel{dv} = \cancel{dv} - 10d + 3v(v - 10)$

$3v^2 - 30v = 10d \qquad .....(2)$

(2) – (1) × 2

$\Rightarrow \quad v^2 - 50v = 0$

$\Rightarrow \quad v = 50$ km/h

$\Rightarrow \quad d = 600$ km

12. (C)

L.C.M = $(x - 1)(x - 2)(x - 3)(x - 4)$

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

$\Rightarrow \quad \frac{x^2 - 7x + 12 + x^2 - 5x + 4 - x^2 - 3x + 2}{(x-1)(x-2)(x-3)(x-3)} = \frac{1}{6}$

$$\Rightarrow \quad \frac{3x^2-15x+18}{(x-1)(x-2)(x-3)(x-3)}=\frac{1}{6}$$

$$\Rightarrow \quad \frac{3\cdot \cancel{(x-2)}\,\cancel{(x-3)}}{(x-1)\,\cancel{(x-2)}\,\cancel{(x-3)}\,(x-4)}=\frac{1}{6}$$

$$\Rightarrow \quad 18=(x-1)(x-4)$$

$$\Rightarrow \quad x^2-5x-14=0$$

$$(x-7)(x+2)=0$$

$$x=7,-2$$

Largest = 7

13. (A)

Let the 2 numbers be x and y.

$$x+y=15 \qquad .....(1)$$

$$\frac{1}{x}+\frac{1}{y}=\frac{3}{10}$$

$$10(x+y)=3xy$$

$$\Rightarrow \quad 10\times 15=3xy$$

$$\Rightarrow \quad xy=50$$

$$\Rightarrow \quad x\cdot(15-x)=50$$

$$\Rightarrow \quad 15x-x^2=50$$

$$x^2-15x+50=0$$

$$x=10 \text{ or } x=5$$

Smaller number = 5

14. (B)

A.T.Q.

$$\frac{x}{2}+\frac{x}{4}+\frac{x}{5}+7=x$$

$$\frac{10x+5x+4x}{20}=x-7$$

$$\Rightarrow \quad 7=x-\frac{19x}{20}$$

$$\Rightarrow \quad \frac{x}{20}=7$$

15. (A)

Take 2 at a time

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

$$10x-3y=23 \qquad .....(1)$$

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

$$5x+3y=7 \qquad .....(2)$$

(1) + (2)

$15x=30 \Rightarrow x=2$

16. (A)

For equal roots $\Rightarrow D = 0$

$\Rightarrow \quad b^2 - 4ac = 0$

$\left(2\cdot(\alpha-12)\right)^2 - 4\times(2)\times(\alpha-12) = 0$

$\Rightarrow \quad 4\cdot(\alpha-12)\left[(\alpha-12)-2\right] = 0$

$4\cdot(\alpha-12)(\alpha-14) = 0$

$\alpha = 12,\ \alpha = 14$

But if $\alpha = 12$, the expression will no longer be a quadratic since the coefficient of x^2 becomes *O*.

17. (D)

Let root be α, 6α.

$\Rightarrow \quad \alpha + 6\alpha = \dfrac{-(-14)}{p}$.

$\Rightarrow \quad 7\alpha = \dfrac{14}{p} \Rightarrow \alpha = \dfrac{2}{p} \qquad .....(1)$

and $\alpha\cdot 6\alpha = \dfrac{8}{p}$

$\Rightarrow \quad \alpha^2 p = \dfrac{4}{3}$

Substitute for α

$\Rightarrow \quad \dfrac{\cancel{4}}{p^2}\cdot p = \dfrac{\cancel{4}}{3} \Rightarrow p = 3$

18. (C)

Let amount lent at 10% p.a. = *x*

Let amount lent at 15% p.a. = *y*

A.T.Q.

$0.1x + 0.15y = 1900 \qquad .....(1)$

and $0.15x + 0.1y = 2100 \qquad .....(2)$

$(1)+(2) \Rightarrow 0.25(x+y) = 4000$

$\Rightarrow \quad x + y = 16000$

19. (C)

$\dfrac{a_1}{a_2}, \dfrac{b_1}{b_2}, \dfrac{c_1}{c_2}$

$\Rightarrow \quad \dfrac{2}{6}, \dfrac{5}{15}, \dfrac{6}{18}$

$\Rightarrow \quad \dfrac{1}{3} = \dfrac{1}{3} = \dfrac{1}{3}$

Hence, the two lines are coincident.

20. (A)

$\dfrac{3}{y} + \dfrac{2}{x} = 13$

$\dfrac{4}{y} - \dfrac{5}{x} = 2$

Let $\frac{1}{x}=u$ and $\frac{1}{y}=v$

$\Rightarrow \quad 3v+2u=13 \qquad .....(1)$

$\quad 4v-5u=2 \qquad .....(2)$

$(1)\times 5+(2)\times 2$

$\quad 23v=69$

$\Rightarrow \quad v=3, u=2$

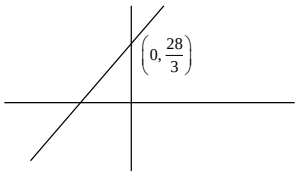
$\Rightarrow \quad x=\frac{1}{2},\ y=\frac{1}{3}$

Section – B

21. (C)

$8x-3y+28=0$

$y=\frac{8}{3}x+\frac{28}{3}$



22. (A)

Let $x=\sqrt{6+\sqrt{6+.....\infty}}$

$\Rightarrow \quad x=\sqrt{6+x}$

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

$\quad x^2-x-6=0$

$\quad (x-3)(x+2)=0$

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

$x\neq -2$ since it is a positive value.

23. (C)

Let original speed of aircraft = x km/h

Reduced speed = $(x-200)$ km/h

A.T.Q. :

$\frac{600}{x-200}-\frac{600}{x}=\frac{30}{60}=\frac{1}{2}$

$\Rightarrow \quad 600x-600(x-200)=\frac{1}{2}\cdot x\cdot (x-200)$

$\Rightarrow \quad x^2-200x-240000=0$

$\quad (x-600)(x+400)=0$

$\Rightarrow \quad x=600$ km/h.

Original duration $=\frac{600}{600}=1$ hr.

24. (A)

Speed of Raj's car = x km/h

Speed of Ajay's car = $x + 5$ km/h.

A.T.Q.

$$\frac{400}{x} - \frac{400}{x+5} = 4$$

$$\Rightarrow \quad 400(x+5) - 400x = 4 \cdot x \cdot (x+5)$$

$$\Rightarrow \quad x^2 + 5x - 500 = 0$$

$$\Rightarrow \quad (x+25)(x-20) = 0$$

$$x = 20 \text{ km/h}$$

Distance travelled by Ajay in 2 hours.

$$\Rightarrow \quad 2 \times (x+5) = 2 \times 25 = 50 \text{ km}.$$

25. (C)

Divide by x^2.

$$\Rightarrow \quad 12x^2 + \frac{12}{x^2} - 56x - \frac{56}{x} + 89 = 0$$

$$\Rightarrow \quad 12 \cdot \left(x + \frac{1}{x}\right)^2 - 56\left(x + \frac{1}{x}\right) + 65 = 0$$

Let $x + \frac{1}{x} = t$

$$\Rightarrow \quad 12t^2 - 56t + 65 = 0$$

$$\Rightarrow \quad (6t - 13)(2t - 5) = 0$$

$$t = \frac{13}{6} \text{ or } t = \frac{5}{2}$$

$$\Rightarrow \quad x + \frac{1}{x} = \frac{13}{6}, \; x + \frac{1}{x} = \frac{5}{2}$$

$$\Rightarrow \quad 6x^2 - 13x + 6 = 0 \text{ or } 2x^2 - 5x + 2 = 0$$

$$\Rightarrow \quad (3x-2) \cdot (2x-3) = 0 \text{ or } (x-2)(2x-1) = 0$$

Roots are $\frac{1}{2}, \frac{2}{3}, \frac{3}{2}, 2$.

Section – C:

26. (B)

27. (A)

28. (D)

base $\rightarrow$ ose

park $\rightarrow$ larta

29. (D)

$8 \times 1 - 2 = 6; \;\; 6 \times 2 - 3 = 9$

$9 \times 3 - 4 = 23; \;\; 23 \times 4 - 5 = 87$

$\Rightarrow \; 87 \times 5 - 6 = 429$

30. (D)

None of the statements can be conclusively known as facts.