Section-A.

1. $\sqrt{112}$ [option-d]

2. 7 [option-c]

3. $m \geq 1$ [option-c]

4. both negative [option-a].

5. -2 [option b]

6. $\frac{-1}{2}$ [option-d].

7. $x + 63$ [option-c].

8. 5 [option-b]

9. $ac \leq \frac{b^2}{4}$ [option-d].

10. A is false but R is true [option-d].

Section-B

(11.) (a) $\frac{2x}{(x-4)} + \frac{(2x-5)}{(x-3)} = \frac{25}{3}$

$$\frac{(2x)(x-3) + (2x-5)(x-4)}{(x-4)(x-3)} = \frac{25}{3}$$

$$\frac{2x^2 - 6x + 2x^2 - 8x - 5x + 20}{x^2 - 3x - 4x + 12} = \frac{25}{3}.$$

$$\frac{4x^2 - 19x + 20}{x^2 - 7x + 12} = \frac{25}{3}$$

$$3(4x^2 - 19x + 20) = 25(x^2 - 7x + 12)$$

$$12x^2 - 57x + 60 = 25x^2 - 175x + 300$$

$$25x^2 - 12x^2 - 175x + 57x + 300 - 60 = 0$$

$$13x^2 - 118x + 240 = 0$$

$D = b^2 - 4ac$

$D = (-118)^2 - 4(13)(240)$

$D = 13924 - 12480$

$D = \sqrt{1444} = 38.$

$$x = \frac{-b \pm \sqrt{D}}{2a}$$

$$= \frac{118 + 38}{26} = \frac{156}{26} \quad \cancel{78}\ 6$$

$\cancel{13}\ 1$

and, $x = \frac{-b-\sqrt{D}}{2a}$

$= \frac{118-38}{26} = \frac{\cancel{70}}{\cancel{26}} \frac{35}{13}$

(OR) (b.) $(2p+1)x^2 - (7p+2)x + (7p-3) = 0$

For equal roots,

$D = 0$

$b^2 - 4ac = 0.$

$(7p+2)^2 - 4(2p+1)(7p-3) = 0$

$49p^2 + 28p + 4 - 4(14p^2 + 7p - 6p - 3) = 0$

$49p^2 + 28p + 4 - 4(14p^2 + p - 3) = 0$

$4p^2 + 28p + 4 - 56p^2 - 4p + 12 = 0$

$-7p^2 + 24p + 16 = 0$

$7p^2 - 28p + 4p - 16 = 0$

$7p(p-4) + 4(p-4) = 0$

$(7p+4)(p-4) = 0$

$p = \frac{-4}{7}, \quad p = 4.$

∴ value of P for Q.E has equal roots are $\frac{-4}{7}$ and 4.

(12.) Speed of boat in still water = 8 km/hr.

let speed of stream be x.

So, speed of boat upstream $= 8 - x$

& speed of boat downstream $= 8 + x$

time taken for upstream $= \frac{15}{8-x}$

time taken for downstream $= \frac{22}{8-x}$

A.T.Q

$$\frac{15}{8-x} + \frac{22}{8-x} = 5.$$

$$\frac{15(8-x) + 22(8-x)}{(8-x)(8-x)} = 5$$

$$\frac{120 - 15x + 176 - 22x}{(8-x)^2} = 5$$

$$\frac{296 - 37x}{64 - 16x + x^2} = 5$$

$$296 - 37x = 5(64 - 16x + x^2)$$

$$296 - 37x = 320 - 80x + 5x^2$$

$$296 - 320 - 37x + 80x + 5x^2 = 0$$

$$-24 + 7x + 5x^2 = 0$$

$D = b^2 - 4ac$, $5x^2 - 7x - 24 = 0$

$$5x^2 - 15x + 8x - 24 = 0$$

$$5x(x-3) + 8(x-3) = 0$$

$$(5x+8)(x-3) = 0$$

$$x = \frac{-8}{5}, \quad x = 3$$

(rejected)

∴ speed of stream is 7 km/hr.

(13) $a_2 - a_1 = a_3 - a_2$.

$2k^2 + 3k + 6 - k^2 - 4k - 8 = 3k^2 + 4k + 4 - 2k^2 - 3k - 6$

$k^2 - k - 2 = k^2 + k - 2$.

$\Rightarrow 2k = 0$

$\Rightarrow k = 0$.

$\therefore$ A.P is 8, 4, 6.

Section-C

(14) (a) let length of cloth be x. &
" cost " " be y.

A.T.Q.

$(x+5)(y-2) = 200$.

$xy - 2x + 5y - 10 = 200$. — (1)

$xy = 200$ — (2)

putting (2) in (1)

$200 - 2x + 5y - 10 = 200$

$-2x + 5y = 10$

$5y = 10 + 2x$

$y = \frac{10 + 2x}{5}$

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$x(2x+10) = 1000$

$2x^2 + 10x - 1000 = 0$

$x^2 + 5x - 500 = 0$

$0 = b^2 - 4ac$ $\quad x = \frac{-b \pm b^2 - 4ac}{2a}$

$= \frac{-5 + (5)^2 - 4(1)(-500)}{2}$, $\frac{-5 - (5)^2 - 4(1)(-500)}{2}$

$= \frac{2025}{2}$ $\frac{-5 + \sqrt{2025}}{2}$, $\frac{1690}{2}$ $\frac{-5 - \sqrt{2025}}{2}$

$= \frac{-5 + 45}{2}$, $\frac{-5 - 45}{2}$

$= \frac{40}{2}$ 20 , $\frac{-60}{2}$ -30

(rejected as cant be -ve).

∴ Original length of peice is 20m & original rate per metre is Rs 10.

(OR) (b.) 2 (length + breadth) = perimeter

length + breath = $\frac{1}{2}$ x 82.

length + breadth 41m

let length be x
& breadth = 41 - x .

area = $x(41-x^2)$

$400 = 41x - x^2$

$x^2 - 41 + 400 = 0$

$x^2 - 25x - 16x + 400 = 0$

$x(x-25) - 16(x-25) = 0$

$(x-16)(x-25) = 0$

$x = 16, x = 25.$

∴ length of rectangular feild is 16m & breadth is 25

OR

length of rectangular feild is 25m & breadth is 16m.

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15 Let first pipe take x hr to fill tank seperately
second pipe take $x+10$ hr - - - - -

ATQ

$$\frac{4}{x} + \frac{9}{x+10} = \frac{1}{2}$$

$$2[4x + 40 + 9x] = x^2 + 10x$$

$$80 + 26x = x^2 + 10x$$

$$x^2 + 10x - 26x - 80 = 0$$

$$x^2 - 16x - 80 = 0$$

$$x^2 - 20x + 4x - 80 = 0$$

$$(x-20)(x+4) = 0$$

$$x = 20, -4$$

(R)

Time taken by pipe of large dia = 20hr

" " " " smaller dia = 30hr

Section-D

16. $a+3d+a+d+a+d-d+a-3d=56$

$$4a=56$$
$$\boxed{a=14}$$

$$\frac{(a-3d)(a+3d)}{(a-d)(a-d)}=\frac{5}{6}$$

$$\frac{a^2-3d^2}{a^2-d^2}=\frac{5}{6}$$

$$\frac{14^2-9d^2}{14^2-d^2}=\frac{5}{6}$$

$$6(196-9d^2)=5(196-d^2)$$

$$1176-54d^2=980-5d^2$$

$$1176-980=-5d^2+54d^2$$

$$196=49d^2$$

$$4\frac{196}{49}=d^2$$

$$d^2=4$$
$$d=\pm 2.$$

∴ Four parts are 8, 12, 16 and 20.

(OR) Given $S_p = q$

$S_q = p$

Let first term a & common diff d'

$$S_p = \frac{p}{2}[2a + (p-1)d] = q$$

$$\Rightarrow 2a + (p-1)d = \frac{2q}{p} \quad \text{—(1)}$$

$$S_q = \frac{q}{2}[2a + (q-1)d] = p$$

$$\Rightarrow 2a + (q-1)d = \frac{2p}{q} \quad \text{—(2)}$$

Solve (1) & (2)

$$2a + (p-1)d = \frac{2q}{p}$$

$$2a + (q-1)d = \frac{2p}{q}$$

$$[(p-1)-(q-1)]d = \frac{2q}{p} - \frac{2p}{q}$$

$$(p-q)d = 2\left(\frac{q^2-p^2}{pq}\right)$$

$$d = \frac{2(q-p)(q+p)}{pq(p-q)}$$

$$= \frac{-2(p+q)(p-q)}{pq(p-q)}$$

$$= -\frac{2(p+q)}{pq}$$ put in (1)

(17) $2a + (p-1)\left(\frac{-2(p+q)}{pq}\right) = \frac{2q}{p}$

$$\frac{2apq - 2(p-1)(p+q)}{pq} = \frac{2q}{p}$$

$$2apq - 2(p^2+pq-p-q) = 2q^2$$

$$2apq - 2p^2 - 2pq + 2p + 2q = 2q^2$$

$$2apq = 2q^2 + 2p^2 + 2pq - 2p - 2q$$

$$2a = \frac{2p^2 + 2q^2 + 2pq - 2p - 2q}{pq}$$

$$2a = \frac{2.[p^2+q^2+pq-p-q]}{pq}$$

$$\therefore S_{p+q} = \frac{p+q}{2}\left[2a + (p+q-1)d\right]$$

$$= \frac{p+q}{2}\left[\frac{2[p^2+q^2+pq-p-q]}{pq} + \frac{(p+q-1)(-2(p+q))}{pq}\right]$$

$$= \frac{p+q}{2pq}\left[2[p^2+q^2+pq-p-q] - 2[p^2+pq-p+pq+q^2-q]\right]$$

$$= \frac{(p+q)}{2pq} \times 2\left[p^2+q^2+pq-p-q-p^2-pq+p-pq-q^2+q\right]$$

$$= \frac{p+q}{pq} \times -pq = -(p+q)$$

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(17)

$$D = 0$$

$$b^2 - 4ac = 0$$

$$4(ac+bd)^2 - 4(a^2+b^2)(c^2+d^2) = 0$$

$$4(a^2c^2 + b^2d^2 + 2abcd) - 4(a^2c^2 + a^2d^2 + b^2d^2 + b^2c^2) = 0$$

$$4a^2c^2 + 4b^2d^2 + 8abcd - 4a^2c^2 - 4a^2d^2 - 4b^2d^2 - 4b^2c^2 = 0$$

$$-4[a^2d^2 + b^2c^2 - 2abcd] = 0$$

$$-4[(ad - bc)^2] = 0$$

$$ad - bc = 0$$

$$ad = bc$$

$$\boxed{\frac{a}{c} = \frac{b}{d}}$$ Hence proved

Section - E

18. i. $a = 50$

$d = -2$

A.P is $50, 48, 46, 44, \ldots$

$a_n = a + (n-1)d$

$= 50 + (n-1)(-2)$

$= 50 - 2n + 2$

$a_n = 52 - 2n$.

$\therefore$ The ~~se~~ n^{th} term of AP is $52 - 2n$.

ii. $n = 4$

$a_4 = 52 - 2(4)$

$= 52 - 8$

$a_4 = 44$

$n = 12$.

$a_{12} = 52 - 2(12)$

$= 52 - 24$

$a_{12} = 28$.

$\Rightarrow a_4 - a_{12}$

$\Rightarrow 44 - 28$

$= 16$

$\therefore$ 12th row is 16 bricks shorter than 4th row.

iii. (a) $S_n = \frac{n}{2}[2a + (n-1)d]$

$= \frac{10}{2}[2 \times 50 + (10-1) - 2]$

$= \frac{10}{2}[100 + 9 \times -2]$

$= 5 \times 100 - 18$

$= 5 \times 82$

$S_n = 410$

(OR) (b) $S_n = 560$

$560 = \frac{n}{2}[2 \times 50 + (n-1)(-2)]$

$560 = \frac{n}{2}[102 - 2n]$

$560 = n[51 - n]$

$n^2 - 5n + 560 = 0$

$n^2 - 16n - 35n + 560 = 0$

$n(n-16) - 35(n-16) = 0$

$(n-35)(n-16) = 0$

$n = 35, n = 16.$

$a_{35} = 52 - 2(35)$

$= 52 - 70$

$= -18$ bricks (rejected)

$a_{16} = 52 - 2(16)$

$= 52 - 32$

$= 20$ bricks.

$\therefore$ 16 rows can be constructed with 560 bricks.

(19) Speed of Raj car x km/hr

Speed of Ajay car $x+5$ km/hr

(i) Dist. covered by Ajay car in 2 hrs

$= 2(x+5)$ km.

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

$400\left[\frac{x+5-x}{x(x+5)}\right] = 4$

$500 = x^2 + 5x$

$x^2 + 5x - 500 = 0$

(iii) $x^2 + 5x - 500 = 0$

$x^2 + 25x - 20x - 500 = 0$

$x(x+25) - 20(x+25) = 0$

$x = 20$ km/hr

OR Ajay Speed $= 25$ km/hr $\therefore$ Time to cover 400 km $= \frac{400}{25} = 16$ hrs