Section A

1. (D) $-6, 6$ 1

2. (B) -5 1

3. (D) From a point inside a circle only two tangents can be drawn 1

4. (A) 7 1

5. (B) 20 cm 1

6. (A) $11/9$ 1

7. (C) $140°$ 1

8. (B) $8x^2 - 20$ 1

9. (C) 30° 1

10. (B) Isosceles and similar 1

11. (A) Irrational and distinct 1

12. (C) $3/\sqrt{3}$ 1

13. (B) $\frac{594}{7}$ 1

14. (B) $3/8$ 1

15. (B) $(-4, 0)$ 1

16. (A) Median 1

17. (C) $(3, 0)$ 1

18. (D) $\frac{3}{26}$ 1

19. (B) 1

20. (D) 1

Section – B

21. (A) $480 = 2^5 \times 3 \times 5$

$720 = 2^4 \times 3^2 \times 5$ $\frac{1}{2}$

$\frac{1}{2}$

$L.C.M. = 2^5 \times 3^2 \times 5 = 1440$ $\frac{1}{2}$

$H.C.F. = 2^4 \times 3 \times 5 = 240$ $\frac{1}{2}$

22. (B) Total number of three-digit numbers = 900 ½

Numbers with hundredth digit 8 & Unit digit 5
are 805, 815, 825, ..., 895 1

Number of favourable outcomes = 10

$P(\text{selecting one such number}) = \frac{10}{900} = \frac{1}{90}$ ½

23. $= \frac{2\left[\frac{\sqrt{3}}{2}\right]^2 - \left[\frac{1}{\sqrt{3}}\right]^2}{(\sqrt{2})^2} = \frac{2 \times \frac{3}{\cancel{4}_2} - \frac{1}{3}}{2} = \frac{\frac{3}{2} - \frac{1}{3}}{2}$ 1½

$= \frac{\frac{9-2}{6}}{2} = \frac{7}{6} \times \frac{1}{2} = \frac{7}{12}$ ½

24. Let the required point be $(x, 0)$ ½

$$\sqrt{(8-x)^2+25} = \sqrt{41}$$ ½

$$(8-x)^2 = 41-25$$

$$8-x = \sqrt{16}$$

$$8-x = \pm 4$$

$$\therefore \quad x = 4, 12$$

Hence two points on the x-axis are $(4,0)$ & $(12,0)$ 1

25. $AB = \sqrt{(3+5)^2+(0-6)^2} = 10$ ½

$BC = \sqrt{(9-3)^2+(8-0)^2} = 10$ ½

$AC = \sqrt{(9+5)^2+(8-6)^2} = 10\sqrt{2}$ ½

Since $AB = BC$, so ΔABC is an isosceles triangle ½

26. (B) Since $PQ \parallel BC$ therefore $\Delta APR \sim \Delta ABD$ 1

$$\frac{AP}{AB} = \frac{PR}{BD} \quad \text{———} (1)$$

Also,

$\Delta AQR \sim \Delta ACD$

$$\frac{AQ}{AC} = \frac{RQ}{DC} \quad \text{———} (2)$$

and

$$\frac{AP}{AB} = \frac{AQ}{AC} \quad \text{———} (3)$$ 1

from eq. (1), (2) & (3),

$$\frac{PR}{BD} = \frac{RQ}{DC}$$

But, $BD = DC$

So, $PR = RQ$, Hence AD bisects PQ. 1

27. Let the numbers be x and $18-x$ ½

$$\frac{1}{x}+\frac{1}{18-x}=\frac{9}{40}$$ 1

$$\frac{18-\cancel{x}+\cancel{x}}{x(18-x)}=\frac{9}{40}$$

$$18\times 40 = 9\times x(18-x)$$

$$720 = 162x-9x^2$$

$$9x^2-162x+720=0$$

$$x^2-18x+80=0$$

$$x^2-10x-8x+80=0$$

$$(x-10)(x-8)=0$$ 1

So, $x=10, 8$

Hence two numbers are 8 and 10. ½

28. from given polynomial,

$$\alpha+\beta = \frac{5}{6} \quad \& \quad \alpha\beta = \frac{1}{6}$$ 1

Now

$$\alpha^2+\beta^2 = (\alpha+\beta)^2 - 2\alpha\beta$$

$$= \left(\frac{5}{6}\right)^2 - 2\times\frac{1}{6} = \frac{13}{36}$$ 1

and $$\alpha^2\beta^2 = \left(\frac{1}{6}\right)^2 = \frac{1}{36}$$ 1/2

$$x^2 - \frac{13}{36}x + \frac{1}{36}$$

Hence, required polynomial is $36x^2 - 13x + 1$ 1/2

29. $(\cos\theta + \sin\theta)^2 + (\cos\theta - \sin\theta)^2 = 2(\cos^2\theta + \sin^2\theta)$

$= 2 \times 1 = 2$ 1½

Now,

$(1)^2 + (\cos\theta - \sin\theta)^2 = 2$ 1

$(\cos\theta - \sin\theta)^2 = 1$

$\cos\theta - \sin\theta = \pm 1$ ½

30. (A) Angle described by minute hand in 5 min $= 30°$

Length of minute hand $= r = 18$ cm

Area swept by min. hand in 35 min. 2

$= \left[\frac{22}{7} \times 18 \times 18 \times \frac{30}{360}\right] \times 7 = 594 \text{ cm}^2$ 1

31. Let $\sqrt{3}$ be a rational number.

$\therefore \sqrt{3} = \frac{p}{q}$, (let p & q be co-prime.) ½

Squaring both sides

$$(\sqrt{3})^2 = \frac{p^2}{q^2}$$

$$3 = \frac{p^2}{q^2}$$

$$3q^2 = p^2$$

[$\because p^2$ is divisible by 3
$\therefore p$ is divisible by 3] — (1) 1

Let

$p = 3a$, where 'a' is any integer

Now

$$9a^2 = 3q^2$$
$$3a^2 = q^2$$

[$\therefore q^2$ is divisible by 3
$\therefore q$ is divisible by 3] — (2) 1

from eq. 1 & eq. 2

Our assumption 'p & q are co-prime' are wrong

Hence $\sqrt{3}$ is an irrational number. $\frac{1}{2}$

32. (B) Let 1st car starts from A with speed x km/h
and 2nd car starts from B with speed y km/hr

When cars are moving in same direction,
Distance cover by 1st car in 9 hrs = $9x$
Distance cover by 2nd car in 9 hrs = $9y$

Therefore, $9x - 9y = 180$
$x - y = 20$ —— (1) 2.

When cars moving in opposite direction,

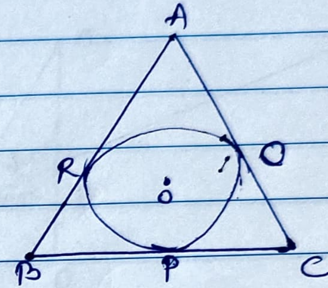
Distance Cover by 1^{st} car in 1 hr $= x$
Distance Cover by 2^{nd} car in 1 hr $= y$

Therefore, $x + y = 180$ —— ② 2.

From eq ① & ②, we get,

$x = 100$ km/hr
$y = 80$ km/hr 1

33. We know that,
"length of tangents drawn from external Point are equal"



1

$\therefore$ $AR = AQ = 7$ cm

$CP = CQ = 5$ cm

$BP = BR$

2

$\because$ $AB = 10$ cm & $AR = 7$ cm

$\therefore$ $BR = 3$ cm

1/2

Thus,

$BP = BR = 3$ cm

1/2

Now,

$BC = BP + CP$

1/2

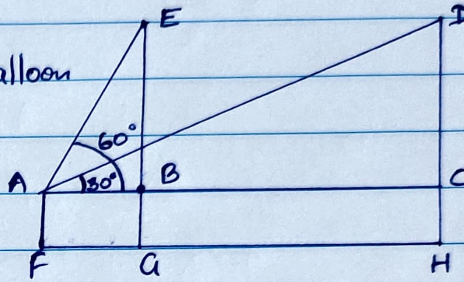
$BC = 3 + 5$

$\boxed{BC = 8 \text{ cm}}$

1/2

(34)

Given that a 1.35 m tall boy sees a balloon



Let

$AF = 1.35\, m$

Also $AF \parallel BG \parallel CH$

& $AF = BG = CH = 1.35$

Distance covered by balloon in 12 sec. $= 3 \times 12 = 36\, m$ 1

$BC = ED = 36\, m$

Now,

In right $\triangle ABE$,

$$\tan A = \frac{BE}{AB} \Rightarrow \tan 60^\circ = \frac{BE}{AB}$$

$$\Rightarrow \sqrt{3} = \frac{BE}{AB} \Rightarrow \boxed{AB = \frac{BE}{\sqrt{3}}}$$ 1

In right $\triangle DAC$,

$$\tan 30^\circ = \frac{CD}{AC} \Rightarrow \frac{1}{\sqrt{3}} = \frac{CD}{AC}$$

$$\boxed{AC = CD\sqrt{3}}$$ 1

But,

$$BE = CD$$

$$\therefore \quad AB = \frac{CD}{\sqrt{3}} \quad \& \quad AC = CD\sqrt{3}$$

Now,

$$BC = AC - AB$$

$$36 = CD\sqrt{3} - \frac{CD}{\sqrt{3}} \Rightarrow 36 = CD\left(\sqrt{3} - \frac{1}{\sqrt{3}}\right)$$

$$36 = CD\left(\frac{2}{\sqrt{3}}\right) \Rightarrow CD = 36 \times \frac{\sqrt{3}}{2}$$

$$CD = 18\sqrt{3} \Rightarrow CD = 18 \times 1.73$$

$$\boxed{CD = 31.14 \text{ m}}$$

Height of balloon $= CD + CH = 31.14 + 1.35$

$$= \boxed{32.49 \text{ m}}$$ 1

35

Monthly Expend.	f_i	x_i	$f_i x_i$
1000 – 1500	24	1250	30,000
1500 – 2000	40	1750	70,000
2000 – 2500	33	2250	74,250
2500 – 3000	$x = 28$	2750	77,000
3000 – 3500	30	3250	97,500
3500 – 4000	22	3750	82,500
4000 – 4500	16	4250	68,000
4500 – 5000	7	4750	33,250
	$\Sigma f_i = 200$		$\Sigma f_i x_i = 5{,}32{,}500$

2

Total no. of Families = 200

$24 + 40 + 33 + x + 30 + 22 + 16 + 7 = 200$ 1

$x = 200 - 172 = 28$

$$\text{Mean} = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{532500}{200} = \boxed{₹\ 2662.5}$$ 2

36.

i) The jars form an AP,

3, 6, 9 .... upto 8 terms. ½

First term, $a = 3$

Common difference, $d = 6 - 3 = 3$ ½

ii) $a_n = 34$

$a + (n-1)d = 34$

$3 + (n-1)3 = 34$ ½

$3n = 34$

$n = 11.33$

$\therefore$ 34 is not a term of AP. ½

iii) (A)

$$S_n = \frac{n}{2}[2a+(n-1)d]$$ ½

$$= \frac{n}{2}[2\times3+(n-1)3]$$

$$S_n = \frac{n}{2}[3+3n]$$ 1

Also,

$$S_8 = \frac{8}{2}[3+3\times8]$$

$$S_8 = 4\times27 = \boxed{108}$$ ½

iii) (B)

$$a_n = a+(n-1)d$$ ½

$$a_5 = 6+(5-1)\times3$$ [∵ New A.P. = 6, 9, 12 . . .] 1

$$a_5 = 6+12$$

$$\boxed{a_5 = 18}$$ ½

(37) i) Given,

$PQ \parallel EF$ & DE is transversal

$\therefore \angle DPQ = \angle DEF$ (Corresponding $\angle$s)

Similarly

$\angle PDQ = \angle EDF$ (Common)

$\therefore \triangle DPQ \sim \triangle DEF$ (AA similarity) 1

ii) $DE = DP + PE = 50 + 70 = 120$ cm ½

Now,

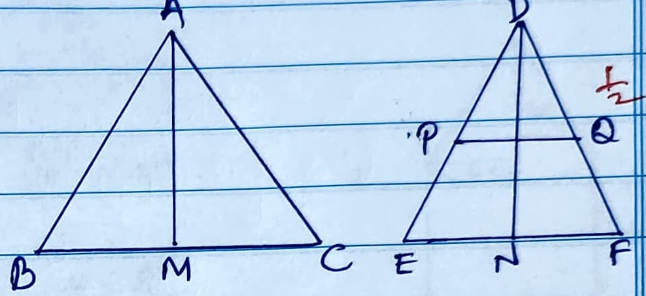
$$\frac{DP}{DE} = \frac{PQ}{EF} = \frac{50}{120} = \frac{5}{12}$$ ½

iii) (A) $$\frac{AB}{DE} = \frac{5}{2} = \frac{BC}{EF} = \frac{AC}{DF}$$ 1

$$\Rightarrow AB = \frac{5}{2} DE$$

$$\frac{\text{Perimeter of } \triangle ABC}{\text{Perimeter of } \triangle DEF} = \frac{\frac{5}{2}(DE+EF+FD)}{(DE+EF+FD)} = \frac{5}{2} = \text{Constant}$$ 1

iii) (B)



In ΔABM & ΔDEN

$$\frac{AB}{DE} = \frac{BC}{EF}$$

$$\frac{BC/2}{EF/2} = \frac{BM}{EN}$$

$$\therefore \quad \frac{AB}{DE} = \frac{BM}{EN} \quad \text{——— (1)}$$

Also,

$\Delta ABC \sim \Delta DEF$

$\therefore \quad \angle B = \angle E$ ——— (2)

1

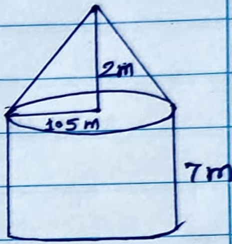
Hence, $\Delta ABM \sim \Delta DEN$ (SAS similarity rule) ½

Proved

38. i) Radius of cone = 1.5 m

Height of cone = 2 m

$\therefore$ Slant height $= \sqrt{h^2+r^2} = \sqrt{2^2+(1.5)^2}$ $\frac{1}{2}$



$= \sqrt{4+\left(\frac{3}{2}\right)^2} = \sqrt{4+\frac{9}{4}}$

$= \sqrt{\frac{25}{4}} = \frac{5}{2} = \boxed{2.5\ m}$ $\frac{1}{2}$

ii) C.S.A. of Cone $= \pi r l$ $\frac{1}{2}$

$= \frac{22}{7} \times 1.5 \times 2.5 = \frac{82.5}{7} = \boxed{11.78\ m^2}$ $\frac{1}{2}$

iii) Radius of Cylinder = 1.5 m

Height of Cylinder = 7 m

C.S.A of Cylinder $= 2\pi r h = 2 \times \frac{22}{7} \times 1.5 \times 7 = 66\ m^2$ 1

Cost of metal sheet for $1\ m^2$ = ₹ 2000

$\therefore$ Total cost for $66\ m^2 = 2000 \times 66 = \boxed{₹\ 1,32,000}$ 1.

or

B) Total Capacity = Volume of Cone + Volume of Cylinder

$$= \frac{1}{3}\pi r^2 h + \pi r^2 h \qquad \frac{1}{2}$$

$$= \pi r^2 \left(\frac{1}{3}h + h\right)$$

$$= \frac{22}{7} \times \left(\frac{3}{2}\right)^2 \left(\frac{1}{3} \times 2 + 7\right) \qquad 1$$

$$= \frac{22}{7} \times \frac{9}{4} \times \left(\frac{2}{3} + 7\right)$$

$$= \frac{99}{14} \times \frac{23}{3} = \frac{759}{14} = \boxed{54.21 m^3} \quad \frac{1}{2}$$

---x---