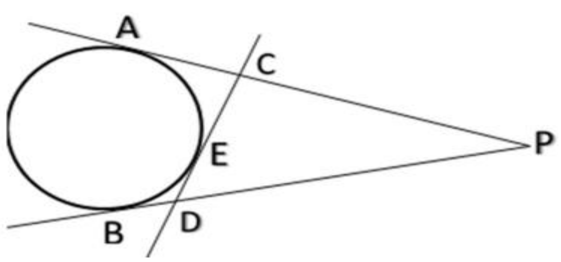
SET - 01

SAHODAYA PRE BOARD EXAMINATION – 2025-26

Sub.: BASIC MATHEMATICS (241)

MARKING SCHEME

	SECTION-A	
1	(D) 81	[1]
2	(D) 10	[1]
3	(A) 2	[1]
4	(B) at most two roots	[1]
5	(D) 15	[1]
6	$(A) - 320$	[1]
7	(A) -4	[1]
8	(A) $(0,-1)$	[1]
9	(B) $EF/RP = DE/PQ$	[1]
10	(D) 12 cm	[1]
11	(B)40^0	[1]
12	(D) -4	[1]
13	(A)3: 7	[1]
14	(A) 27	[1]
15	(C) $2\sqrt{3}$ cm	[1]
16	(B) 50°	[1]
17	(A) $154cm^2$	[1]
18	(C) $0 \le P(A) \le 1$	[1]
19	C) Assertion (A) is true and Reason (R) is false .	[1]
20	D) Assertion (A) is false but reason (R) is true	[1]
	SECTION-B	
21	(A) The given numbers 853 and 385 when divided by required number leave 7 as remainder in each case. This means that 853 – 7 = 846 and 385 – 7 = 378 are the numbers which are completely divisible by the required number. HCF of 846 and 378 is 18. $\therefore$ The required number is 18. **OR** (B) $12^n = 3^n \times 2^{2n}$ prime factorization of 12 contains 2 and 3 There is no prime number 5 other than 2 and 3 12^n cannot end with the digit zero.	[1] [1] [1] [1]
22		

	PA = PB; CA = CE; DE = DB [Tangents to a circle] Perimeter of ΔPCD = PC + CD + PD = PC + CE + ED + PD = PC + CA + BD + PD = PA + PB Perimeter of ΔPCD = PA + PA = 2PA = 2(10) = 20	[1] [1/2] [1/2]
23	$\alpha = 3, \beta = 2$ $\alpha + \beta = -\frac{b}{a}$ $\Rightarrow\ 3+2 = \frac{-p}{1}$ $\therefore\ p = -5$ and $\alpha\beta = \frac{c}{a}$ $3 \times 2 = \frac{q}{1}$ $\therefore\ q = 6$	[1] [1]
24	$x^2 - 8kx + 2k = 0$ (Given) For real and equal roots $b^2 - 4ac = 0$ $(-8k)^2 - 4 \times 1 \times 2k = 0$ $64k^2 - 8k = 0$ $8k(8k-1) = 0$ $8k = 0$ or $8k - 1 = 0$ $\therefore k = 0$ or $k = 1/8$ For k = 0 or 1/8, the quadratic equation $x^2 - 8kx + 2k = 0$ has real and equal roots.	[1/2] [1] [1/2]
25	(A) $\sin^3 60°.\cot 30° - 2\sec^2 45° + 6\cos 60° \tan 45°$. $= \left[\frac{\sqrt{3}}{2}\right]^3 \times \sqrt{3} - 2\left(\sqrt{2}\right)^2 + 6 \times \frac{1}{2} \times 1$ $= \frac{9}{8} - 4 + 3 = \frac{1}{8}$ OR (B) $\tan(A+B) = \sqrt{3} = \tan 60^0$: $\cot(A-B) = \sqrt{3} = \cot 30^0$ $A+B = 60^0$; $A-B = 30^0$ $A = 45^0$; $B = 15^0$	[1] [1] [1] [1]
	SECTION-C	
26	Let $\sqrt{7}$ be a rational number, then $\sqrt{7} = \frac{p}{q}$, where p, q are integers, q ≠ 0 and p, q have no common factors (except 1) $\Rightarrow 7 = \frac{p^2}{q^2} \Rightarrow p^2 = 7q^2$	[1]

	As 7 divides $7q^2$, so 7 divides p^2 but 7 is prime $\Rightarrow$ 7 divides p Let p = 7m, where m is an integer. Substituting this value of p in (i), we get $(7m)^2 = 7q^2 \Rightarrow 49m^2 = 7q^2 \Rightarrow 7m^2 = q^2$ As 7 divides $7m^2$, so 7 divides q^2 but 7 is prime $\Rightarrow$ 7 divides q Thus, p and q have a common factor 7. This contradicts that p and q have no common factors Hence, $\sqrt{7}$ is not a rational number. So, we conclude that $\sqrt{7}$ is an irrational number.	**[1]** **[1]**
27	(A)	

CI	*f*	*xi*	*fi xi*
0 – 10	5	5	25
10-20	P	15	15P
20-30	15	25	375
30-40	16	35	560
40-50	6	45	270

[1]

$$\bar{x} = \frac{\sum fi\ \ xi}{\sum fi}$$

[1]

$25 = \frac{1230+15P}{42+P}$

1050 + 25P = 1230 + 15P **[1]**

10P = 180, P = 18

OR

(B)

Class interval	Frequency (f)	Cumulative frequency (cf)
25-35	7	7
35-45	31	38
45-55	33	71

[1]

55-65	17	88
65-75	11	99
75-85	1	100

$n = 100$

$\frac{n}{2} = 50$

Median class=45-55

l =45, h=10, f=33, cf=38 **[1]**

Median= $l + \left(\frac{\frac{n}{2} - cf}{f}\right) \times h$

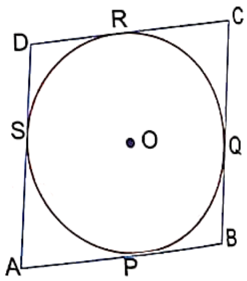
$= 45 + \left(\frac{50-38}{33}\right) \times 10 = 45 + \frac{120}{33} = 45 + 3.64 = 48.64$

[1]

28

Let $ABCD$ be a parallelogram such that its sides touch a circle with centre O.

We know that the tangents to a circle from an exterior point are equal in length. **Fig.[0.5]**



Therefore, we have

$AP = AS$ (Tangents from A) ... (i)

$BP = BQ$ (Tangents from B) ... (ii) **[0.5]**

$CR = CQ$ (Tangents from C) ... (iii)

And $DR = DS$ (Tangents from D) ... (iv)

Adding (i), (ii), (iii) and (iv), we have

$(AP + BP) + (CR + DR) = (AS + DS) + (BQ + CQ)$

$AB + CD = AD + BC$

$AB + AB = BC + BC$ ($\because$ $ABCD$ is a parallelogram $\therefore AB = CD, BC = DA$) **[1]**

$2AB = 2BC \Rightarrow AB = BC$

Thus, $AB = BC = CD = AD$

Hence, $ABCD$ is a rhombus. **[1]**

---

29 (A)

₹ x is the fixed charge for the first two days

₹ y is the additional charge for each

Latika paid ₹ 22 for a book kept for six days => x + 4y = 22---------(1) **[1]**

Anand paid ₹16 for a book kept for four days => x + 2y = 16------------(2) **[0.5]**

By solving both we get,=>2y = 6 => y = 3.

Substitute the value of y in (2), we get,

x + 2 x 3 = 16 =>x = 16 - 6 = 10 => x = 10.

x = 10., y = 3. **[1]**

Therefore, the fixed charge = ₹ 10 and the charge for each extra day = ₹ 3. **[0.5]**

(B)

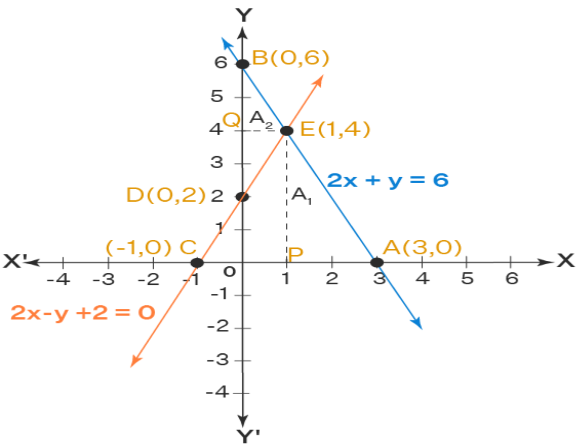
$2x + y = 6$

x	1	3
y	4	0

[1]

$2x - y + 2 = 0$

x	1	-1
y	4	0



[1.5]

Two lines meet at (1,4). So x=1, y=4 is the solution. **[0.5]**

30

LHS $= (\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2$

$= \sin^2 A + \operatorname{cosec}^2 A + 2\sin A \cdot \operatorname{cosec} A + \cos^2 A + \sec^2 A + 2\cos A \cdot \sec A$ **[1]**

$= (\sin^2 A + \operatorname{cosec}^2 A + 2) + (\cos^2 A + \sec^2 A + 2)$ $(\because \sin A \cdot \operatorname{cosec} A = 1$ & $\cos A \cdot \sec A = 1)$

$= (\sin^2 A + \cos^2 A) + (\operatorname{cosec}^2 A + \sec^2 A) + 4$ **[1]**

$= 1 + 1 + \cot^2 A + 1 + \tan^2 A + 4$ $(\because 1 + \cot^2 A = \operatorname{cosec}^2 A$ & $1 + \tan^2 A = \sec^2 A)$

$= 7 + \tan^2 A + \cot^2 A$

$=$ RHS **[1]**

31

$a_2 + a_7 = 30$

=>a+d + a+6d = 30 => 2a + 7d = 30 **[1]**

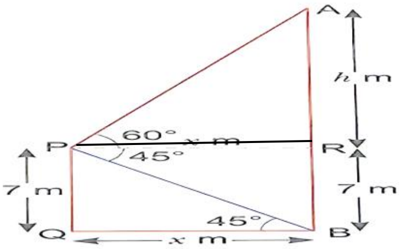
Also $a_{15} = 2a_8 - 1$ (given)

=>a+14d = 2a + 14d -1 => a = 1 **[1]**

Substituting a = 1 we get d=4

	Hence the A.P. is 1,5,9……………	[1]
	SECTION-D	
32	Statement Figure given, to prove, construction, Proof	[1] [2] [2]
33	(A) Usual Speed = x km / hr. New speed = (x+5) km / hr. $\frac{300}{x} - \frac{300}{x+5} = 2 \Rightarrow \frac{x+5-x}{x^2+5x} = \frac{1}{150} \Rightarrow x^2 + 5x = 750$ $x^2 + 5x - 750 = 0$ $x^2 + 30x - 25x - 750 = 0$ $x(x + 30) - 25(x + 30) = 0$ $(x + 30)(x - 25) = 0$ $x = 25,\ x = -30$ (Not possible) Usual speed is 25 km / hr. **OR** (B) Let the original number of persons be x. $\therefore$ Each person will get amount = ₹ $\frac{9000}{x}$ When 20 persons will increase $\therefore$ Each person will get = ₹ $\frac{9000}{x+20}$ ATQ, $\frac{9000}{x} - \frac{9000}{x+20} = 160$ $\Rightarrow 9000\left(\frac{1}{x} - \frac{1}{x+20}\right) = 160 \Rightarrow 9000\left(\frac{x+20-x}{x(x+20)}\right) = 160$ $\Rightarrow 180000 = 160(x^2 + 20x)$ $\Rightarrow x^2 + 20x = 1125 \Rightarrow x^2 + 20x - 1125 = 0$ $\Rightarrow x^2 + 45x - 25x - 1125 = 0 \Rightarrow x(x + 45) - 25(x + 45) = 0$ $\Rightarrow (x - 25)(x + 45) = 0$ $\Rightarrow x - 25 = 0 \quad \Rightarrow x \neq -45)$ $\therefore x = 25$ $\therefore$ Original number of persons is 25.	 [0.5] [0.5] [1] [1] [1] [1] [0.5] [0.5] [1] [1] [1] [1]

34 (A) Let PQ be the building height 7 metres and AB be the cable tower



[1]

Let $QB = x$ m, $AR = h$ m then, $PR = x$ m

Now, in ΔAPR, we have

$$\tan 60° = \frac{AR}{PR} \Rightarrow \sqrt{3} = \frac{h}{x}$$

$$\Rightarrow \sqrt{3}x = h \Rightarrow h = \sqrt{3}x \qquad ...(i)$$

[1]

Again, in ΔPBQ we have

$$\tan 45° = \frac{\hat{P}Q}{QB} \Rightarrow 1 = \frac{7}{x} \Rightarrow x = 7 \qquad ...(ii)$$

Putting the value of x in equation (i), we have [1]

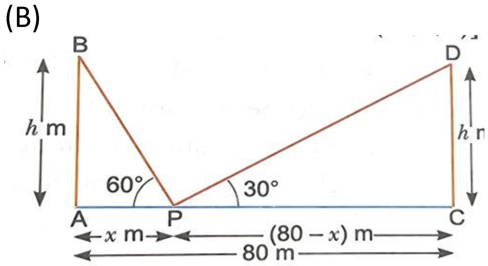
$$h = \sqrt{3} \times 7 = 7\sqrt{3}$$

i.e., $AR = 7\sqrt{3}$ metres

So, the height of tower $= AB = AR + RB = 7\sqrt{3} + 7 = 7(\sqrt{3} + 1)$ m. [1]

OR

(B)



[1]

Let AB and CD be two poles of equal heights `h′ metre and let P be any point between the poles, such that $\angle APB = 60^0$.

AP=x m, $then$ $PC = (80 - x)$m

Now, in ΔAPB, we have

$$\tan 60° = \frac{AB}{AP} = \frac{h}{x}$$

$$\Rightarrow \sqrt{3} = \frac{h}{x} \Rightarrow h = \sqrt{3}x \qquad ...(i)$$

[1]

Again in ΔCPD, we have

$$\tan 30° = \frac{DC}{PC} = \frac{h}{(80 - x)}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{80 - x} \Rightarrow h = \frac{80 - x}{\sqrt{3}} \qquad ...(ii)$$

From (i) and (ii), we have [1]

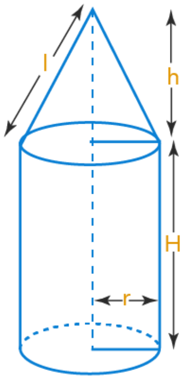
$$\sqrt{3}x = \frac{80 - x}{\sqrt{3}} \Rightarrow 3x = 80 - x$$

$$\Rightarrow 4x = 80 \Rightarrow x = \frac{80}{4} = 20 \text{ m}$$

Now, putting the value of x in equation (i), we have [1]

$$h = \sqrt{3} \times 20 = 20\sqrt{3} \text{ m}$$

Hence, the height of the pole is $20\sqrt{3}$ m and the distance of the point from first pole is 20 m and that of the second pole is 60 m. [1]

35	 We know, $l^2 = r^2 + h^2$ $(5)^2 = (3)^2 + h^2 \Rightarrow 25 = 9 + h^2 \Rightarrow h^2 = 25 - 9 \Rightarrow h^2 = 16$ $\Rightarrow h = 4$ cm Volume of the rocket = volume of cylinder + volume of cone <u>Volume of cylinder</u> = $\pi r^2 h$ = $(3.14)(3)^2(12) = 339.12$ cm³ <u>Volume of cone</u> = $(1/3)\pi r^2 h$ = $(3.14)(1/3)(3)^2(4) = 37.68$ cm³ Volume of rocket = 339.12 + 37.68 = 376.8 cm³ Therefore, the volume of the rocket is 376.8 cm³ Total surface area of rocket = curved surface area of cylinder + curved surface area of cone + area of base Curved surface area of cylinder = $2\pi rh = 2(3.14)(3)(12) = 226.08$ cm² Curved surface of cone = $\pi rl = 3.14(3)(5) = 47.1$ cm² Area of base = $\pi r^2 = (3.14)(3)^2 = 3.14(9) = 28.26$ cm² Total surface area of rocket = 226.08 + 47.1 + 28.26 = 301.44 cm² Therefore, the total surface area of the rocket is 301.44 cm².	[1] [0.5] [0.5] [1] [1] [1]
	SECTION-E	
36	(i) $\frac{3}{36}$ (ii) 0 (iii) (A) $\frac{33}{36}$ OR (B) $\frac{6}{36} = \frac{1}{6}$	[1] [1] [2]

37	(i)60^0 (ii) $\frac{\pi r^2}{6} = \frac{22}{7} \times \frac{21\times21}{6} = 231cm^2$ (iii) (A)$\frac{2\pi r}{6} + r = 2 \times \frac{22}{7} \times \frac{21}{6} + 21$ ==22+21=43cm **OR** (B) Area of the minor segment=$\frac{\pi r^2}{6} - \frac{\sqrt{3}}{4}a^2 = (231 - \frac{441\sqrt{3}}{4})cm^2$	**[1]** **[1]** **[2]** **[2]**
38	(i) (12,3) (ii) 10 units (iii) (A) $(y-3)^2 = 10^2 => y = 13\ or\ -7$, Coordinate of C(12,13) or (12,−7) OR (B) $m_1: m_2 = 1: 3$ Coordinate of P(7,3)	**[1]** **[1]** **[2]** **[2]**

*"**Alternate/alternative methods are accepted, and proportional marks are given if the method is correct**."