MARKING SCHEME BSEH PRACTICE PAPER 3,10TH MATHS(Standard) , March2024 (ENGLISH MEDIUM)		
Q. no.	**Expected solutions**	**marks**
	Section-A	
1	(d)2520	1
2	(d) p+1	1
3	(b) -10	
4	(a) $\frac{2}{3}$	1
5	(b) -6lmn	1
6	(b) 7	1
7	(b) 8cm	1
8	(a) 3cm	1
9	one	1
10	0	1
11	False	1
12	$\frac{25}{8}$	1
13	28cm	1
14	(b) $\frac{\theta}{360} \times \pi r^2$	1
15	(a) $4\pi r^2$	1
16	(b) 25	1
17	(b)Mode= 3median-2mean	1
18	(d)$\frac{17}{16}$	1
19	(a)Both Assertion(A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion(A).	1
20	(d) Assertion(A) is false but Reason(R) is true.	1
	SECTION-B	
21.	Here $a_1=3, b_1=-1, c_1=-5$ $a_2=6, b_2=-2, c_2=-k$	1/2

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	For no solution; $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ .... $$\Rightarrow \frac{3}{6} = \frac{-1}{-2} \neq \frac{-5}{-k}$$ $$\Rightarrow \frac{1}{2} \neq \frac{5}{k}$$ .... $$\Rightarrow k \neq 10$$	1/2 1/2 1/2
OR 21	x + y +40^0 = 180^0 [sum of all angles of a triangle] ⇒x + y = 140^0 ....(1) x - y = 30^0 .....(2) .... By solving the equation (1) y = 140^0 - x...(3) Substitute y = 40^0 - x in equation (2), we get x - (140^0 - x) = 30^0 2x - 140^0 = 30^0 .... 2x = 30^0 +140^0 2x =170^0 x = 85^0 .... Substituting x = 85^0 in equation (3), we get y = 140^0 - 85^0 y = 55^0 Thus, x = 85^0, y = 55^0	1/2 1/2 1/2 1/2
22.		

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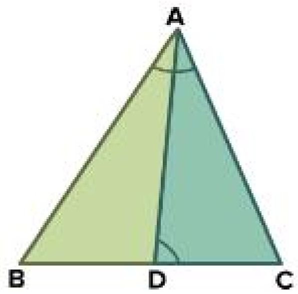
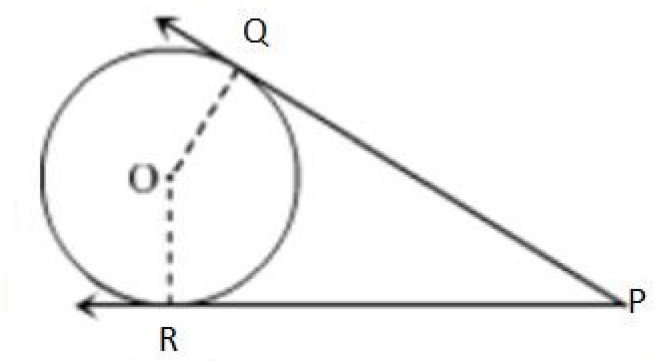
	 .... In ΔABC and ΔDAC ∠BAC = ∠ADC (Given in the statement) ∠ACB = ∠ACD (Common angles) ⇒ ΔABC ~ ΔDAC (AA criterion) .... If two triangles are similar, then their corresponding sides are proportional ⇒ CA / CD = CB / CA .... ⇒ $CA^2 = CB \times CD$ Hence, proved.	1/2 1/2 1/2 1/2
23.	 	1/2

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	.... Since tangent at a point to a circle is perpendicular to the radius through the point ∴OQ⊥QP &OR⊥RP ⇒∠OQP=90°&∠ORP=90° ⇒∠OQP+∠ORP=90°+90^0=180°−−−−(i)	1/2
	In quadrilateral, OQPR, ∠OQP+∠QPR+∠QOR+∠ORP=360^0 ⇒(∠QPR+∠QPR)+(∠OQP+∠ORP)=360° ⇒⇒∠QPR+∠QOR + 180^0= 360^0 (From(i)	1/2
	⇒∠QPR+∠QOR=180∘−−−−−−−(ii) From (i)&(ii), we can say that quadrilateral QORP is cyclic.	1/2
24.	$\frac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(1-\cos\theta)}=\frac{1-\sin^2\theta}{1-\cos^2\theta}$	1/2
	$=\frac{\cos^2\theta}{\sin^2\theta}=$	1/2
	$=\cot^2\theta$ $=\left(\frac{7}{8}\right)^2$	1/2
	$=\frac{49}{64}$	1/2
OR 24.	We know that $\sin^2\theta+\cos^2\theta=1$	1/2

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	.... Let us cube on both sides $(\sin^2\theta + \cos^2\theta)^3 = 1$	1/2
	.... By using the algebraic identity $(a + b)^3 = a^3 + b^3 + 3ab(a + b)$ $(\sin^2\theta)^3 + (\cos^2\theta)^3 + 3\sin^2\theta\cos^2\theta(\sin^2\theta + \cos^2\theta) = 1$	1/2
	.... So we get $\sin^6\theta + \cos^6\theta + 3\sin^2\theta\cos^2\theta = 1$ Therefore, it is proved.	1/2
25.	We have to find the area of the shaded region. From the figure, Here, radius = 21 cm Area of sector = $\pi r^2\theta/360°$ $\theta_1 + \theta_2 + \theta_3 + \theta_4 = 360°$	1/2
	.... Therefore area of shaded region = $\pi r_1^2\theta_1/360° + \pi r_2^2\theta_2/360° + \pi r_3^2\theta_3/360° + \pi r_4^2\theta_4/360°$	1/2
	.... $= \pi r^2(\theta_1 + \theta_2 + \theta_3 + \theta_4)/360°$ $\because r_1 = r_2 = r_3 = r_4$ $= (22/7)(21)^2(360°)/360°$	

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	= (22)(3)(21) .... Area of the shaded region = 1386 cm² Therefore, the area of the shaded region is 1386 cm²	1/2 1/2
	SECTION-C	
26.	Let's assume that $3 + 2\sqrt{5}$ is rational. .... If $3 + 2\sqrt{5}$ is rational that means it can be written in the form of a/b where a and b are integers that have no common factor other than 1 and $b \neq 0$. $3 + 2\sqrt{5} = a/b$ .... $b(3 + 2\sqrt{5}) = a$ $3b + 2\sqrt{5}b = a$ .... $2\sqrt{5}b = a - 3b$ $\sqrt{5} = (a - 3b)/2b$ .... Since (a - 3b)/2b is a rational number, then $\sqrt{5}$ is also a rational number. .... But, we know that $\sqrt{5}$ is irrational. Therefore, our assumption was wrong that $3 + 2\sqrt{5}$ is rational. Hence, $3 + 2\sqrt{5}$ is irrational.	1/2 1/2 1/2 1/2 1/2 1/2
27.	$x^2 + \frac{1}{6}x - 2 = \frac{1}{6}(6x^2 + x - 12) = \frac{1}{6}(3x-4)(2x+3)$ Hence, $\frac{4}{3}$ and $\frac{-3}{2}$ are the zeroes of the given polynomial. .... Sum of zeroes $= \frac{4}{3} + \left(\frac{-3}{2}\right) = \frac{-1}{6} = \frac{-\text{coefficient of } x}{\text{coefficient of } x^2}$	1 1

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	.... Product of zeroes = $\frac{4}{3} \times \left(\frac{-3}{2}\right) = -2 = \frac{\text{constant term}}{\text{coefficient of } x^2}$	1
28.	Given linear equations are: x – y +1 = 0 3x +2y -12=0 From eq. (i) y = x + 1 | x | -1 | 0 | | y | 0 | 1 | Points are (–1, 0) and (0, 1). .... From(ii), 3x +2y -12=0⇒ y= $\frac{12-3x}{2}$ | x | 4 | 0 | | y | 0 | 6 | Points are (4, 0) and (0, 6). .... We plot these points and draw the lines.	1 1

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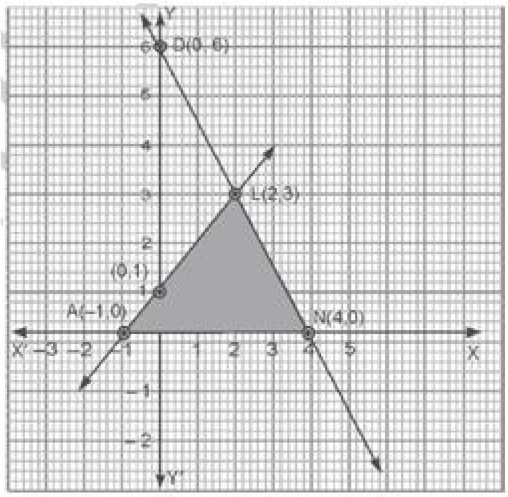

....

From the graph, we see that the vertices of the required triangle are

A(–1, 0), N(4, 0) and L(2, 3).
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<td>OR
28.</td>
<td>Let unit's digit be y and ten's digit be x.Then number is 10x+y and number obtained on reversing the digits is
10y+x
....

given x + y =9........(i)
....</td>
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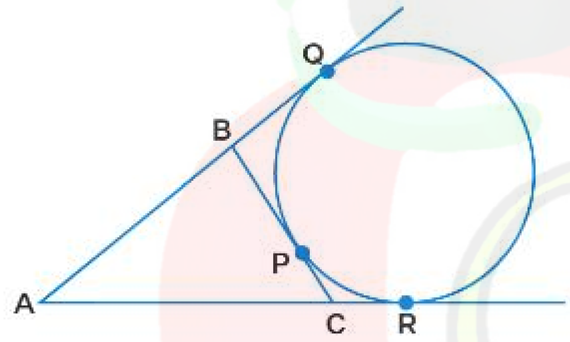
	and 9(10x+y) =2(10y+x) ⇒ 90x+9y=20y+2x ⇒ 88x-11y=0⇒8x-y=0...........(ii) .... Adding (i) and (ii),we get x+ y +8x-y=9+0 ⇒ 9x=9 ⇒ x=1 .... Substituting the value of x in (i),we get y=8 .... Hence, the number is 18.	1/2 1/2 1/2 1/2
29.	 .... Given: A circle touching the side BC of ΔABC at P and AB, AC produced at Q and R respectively. To Prove: AQ=1/2(Perimeter of ΔABC) .... Proof: Lengths of tangents drawn from an external point to a circle are equal. ⇒AQ = AR, BQ = BP, CP = CR. .... Perimeter of Δ ABC = AB + BC + CA = AB + (BP + PC) + (AR - CR) .... = (AB + BQ) + (PC) + (AQ - PC) [∵AQ = AR, BQ = BP, CP = CR] .... = AQ + AQ	1/2 1/2 1/2 1/2 1/2

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	= 2AQ ⇒AQ=1/2 (Perimeter of ΔABC) ∴AQ is the half of the perimeter of ΔABC.	1/2
30.	LHS= $\frac{\sin\theta-\cos\theta+1}{\sin\theta+\cos\theta-1}=\frac{\frac{\sin\theta-\cos\theta+1}{\cos\theta}}{\frac{\sin\theta+\cos\theta-1}{\cos\theta}}$ …………………………………………………………………………… $=\frac{\tan\theta-1+\sec\theta}{\tan\theta+1-\sec\theta}=$ …………………………………………………………………………… $=\frac{(\tan\theta+\sec\theta)-1}{(\tan\theta-\sec\theta)+1}$ $=\frac{\{(\tan\theta+\sec\theta)-1\}(\sec\theta-\tan\theta)}{\{(\tan\theta-\sec\theta)+1\}(\sec\theta-\tan\theta)}=$ …………………………………………………………………………… $=\frac{(\sec^2\theta-\tan^2\theta)-(\sec\theta-\tan\theta)}{(\tan\theta-\sec\theta+1)(\sec\theta-\tan\theta)}=$ …………………………………………………………………………… $=\frac{(1-\sec\theta+\tan\theta)}{(\tan\theta-\sec\theta+1)(\sec\theta-\tan\theta)}$ $\{\because\ \sec^2\theta-\tan^2\theta=1\}$ …………………………………………………………………………… $=\frac{1}{\sec\theta-\tan\theta}$	1/2 1/2 1/2 1/2 1/2 1/2
Or 30	We take the height of the flying kite as AB, the length of the string as AC, and the inclination of the string with the ground at ∠C.	

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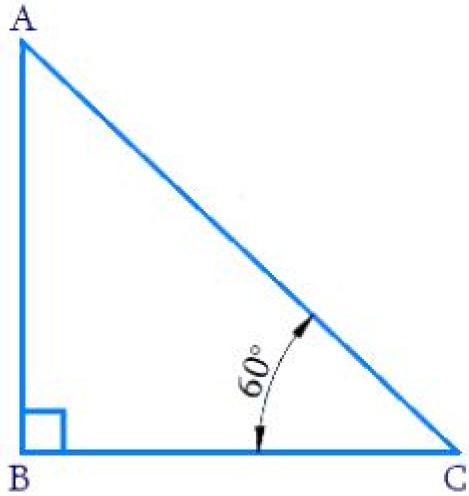
<tr><td></td><td>
</td><td>1/2</td></tr>
<tr><td></td><td>In ΔABC,
sin C = AB / AC
sin 60° = 60/AC</td><td>1/2</td></tr>
<tr><td></td><td>$\sqrt{3}/2 = 60/AC$</td><td>1/2</td></tr>
<tr><td></td><td>$AC = (60 \times 2/\sqrt{3})$</td><td>1/2</td></tr>
<tr><td></td><td>$= (120 \times \sqrt{3}) / (\sqrt{3} \times \sqrt{3})$
$= 120\sqrt{3}/3$</td><td>1/2</td></tr>
<tr><td></td><td>$= 40\sqrt{3}$
Length of the string AC = $40\sqrt{3}$ m.</td><td>1/2</td></tr>
<tr><td>31.</td><td>Total discs are 90,numbered from 1 to 90.</td><td></td></tr>
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	(i)Favourable two-digit numbered discs are 81(10,11,12,..........,90) ∴ probability of getting a two digit numbered disc = $\frac{81}{90} = \frac{9}{10}$	1
	(ii)Favourable cases for a perfect square number are 9 (1,4,9,16,25,36,49,64,81) ∴ probability of getting a perfect square numbered disc = $\frac{9}{90} = \frac{1}{10}$	1
	(iii) Favourable cases for a number divisible by 5 are 18 (5,10,15,.....,90) ∴ probability of getting a disc numbered divisible by 5 = $\frac{18}{90} = \frac{1}{5}$	1
	SECTION-D	
32.	In a right triangle, altitude is one of the sides. Let the base be x cm. The altitude will be (x - 7) cm.	1/2
	We can now apply the Pythagoras theorem to the given right triangle. Pythagoras theorem: $\text{Hypotenuse}^2 = (\text{side } 1)^2 + (\text{side } 2)^2$ $(13)^2 = x^2 + (x - 7)^2$	1
	$169 = x^2 + x^2 - 14x + 49$ $169 = 2x^2 - 14x + 49$ $2x^2 - 14x + 49 - 169 = 0$ $2x^2 - 14x - 120 = 0$ $(2x^2 - 14x - 120) / 2 = 0$ $x^2 - 7x - 60 = 0$	1
	$x^2 - 12x + 5x - 60 = 0$	1/2
	$x(x - 12) + 5(x - 12) = 0$	

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	$(x + 5)(x - 12) = 0$ $x - 12 = 0$ and $x + 5 = 0$ $x = 12$ and $x = -5$ .... We know that the value of the base cannot be negative. Therefore, Base = 12 cm, Altitude = 12 - 7 = 5 cm	1 1
OR 32.	Let Breadth = x. Given that length is twice its breadth. Length of the rectangle = 2x. And given that Area of rectangle = 800 m^2 .... But Area of rectangle = l x b = $2x \times x$ .... $\Rightarrow 2x^2 = 800m^2$ .... $\Rightarrow x^2 = 400m^2$ $\Rightarrow x = 20$ m (-20 is rejected.) .... ∴ Length of the rectangle = 2x = 40 m. Breadth of the rectangle = x = 20 m. .... ∴ It is possible to design a rectangular mango grove.	1 1/2 1 1 1 1/2

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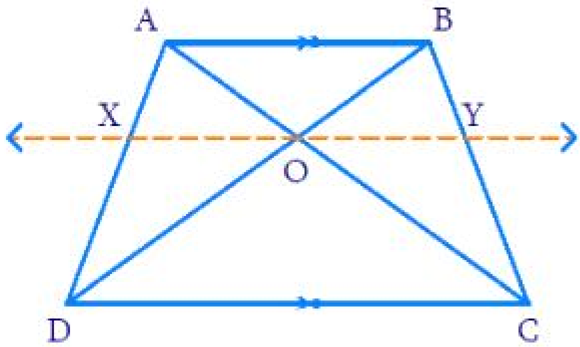
33.		1/2
	In trapezium ABCD, AB ‖ CD Also, AC and BD intersect at 'O'	1/2
	Construct XY parallel to AB and CD (XY ‖ AB, XY ‖ CD) through 'O'	1/2
	In ΔABC OY ‖ AB (construction) ∴ BY/CY = AO/OC................. (1) (Basic Proportionality Theorem)	1
	In ΔBCD OY ‖ CD (construction) BY/CY = OB/OD................. (2) (Basic Proportionality Theorem)	1
	From equations (1) and (2) OA/OC = OB/OD	1

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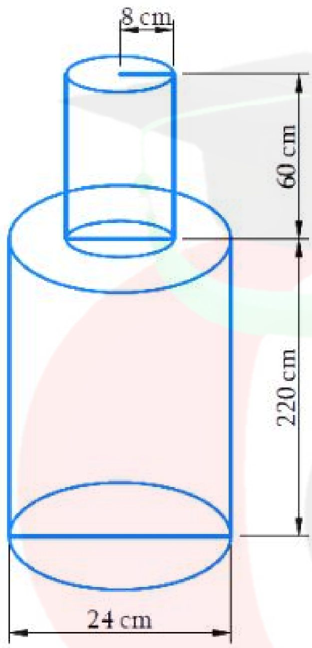
	$\Rightarrow OA/OB = OC/OD$ Hence proved.	1/2
34.	 .... Radius of bigger cylinder = 12 cm, height of bigger cylinder = 220 cm Radius of smaller cylinder = 8 cm, height of smaller cylinder = 60 cm .... Volume of bigger cylinder=$\pi r^2 h$ $=\pi\times 12^2\times 220$ $=31680\ \pi cm^3$ .... Volume of smaller cylinder=$\pi r^2 h$ $=\pi\times 8^2\times 60$ $=3840\pi\ cm^3$	1/2 1/2 1 1

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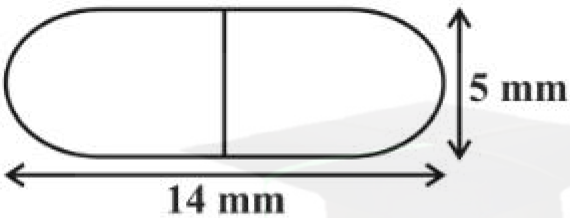
	.... Volume of the solid iron pole = volume of bigger cylinder + volume of smaller cylinder $=31680\pi+3840\pi=35520\pi$ cm^3	1
	Mass of the pole =Density × Volume=$8\times35520\pi = 8\times 35520 \times 3.14$ $=892262.4$ gm=892.3kg	1
OR 34		1/2
	.... Diameter of the capsule, d = 5 mm Radius of the hemisphere, r = d/2 = 5/2 mm Radius of the cylinder, r = 5/2 mm	1/2
	Length of the cylinder = Length of the capsule - 2 × radius of the hemisphere h = 14 mm - 2 × 5/2 mm = 9 mm	1
	Surface area of the capsule = 2 × CSA of hemispherical part + CSA of cylindrical part $= 2 \times 2\pi r^2 + 2\pi rh$	1

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	$= 2\pi r\,(2r + h)$ $= [2 \times 22/7 \times 5/2 \text{ mm} \times (2 \times 5/2 \text{ mm} + 9 \text{ mm})]$ .... $= 110/7 \text{ mm} \times 14 \text{ mm}$ $= 220 \text{ mm}^2$ Thus, the surface area of the capsule is 220 mm^2.	1 1
35.	(table below) ....[1]...................................$\left[\frac{1}{2}\right]$.................[1].......... mean$=\bar{x} = \frac{\sum f_i x_i}{\sum f_i}$ .... $= \frac{2.96}{30}$ .... = 0.099 ppm. (approx.)	$2\frac{1}{2}$ 1 1/2 1
	SECTION-E	
36.	$a_6 = 16000$, $a_9 = 22600$	

Concentration of SO_2 (in ppm)	Mid-point (x_i)	Frequency (f_i)	$f_i x_i$
0.00-0.04	0.02	4	0.08
0.04-0.08	0.06	9	0.54
0.08-0.12	0.10	9	0.90
0.12-0.16	0.14	2	0.28
0.16-0.20	0.18	4	0.72
0.20-0.24	0.22	2	0.44
		$\sum f_i = 30$	$\sum f_i x_i = 2.96$

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	$\Rightarrow$ a + 5d = 16000-----(1) a + 8d = 22600 ------(2) Substitute a = 1600 -5d from (1) into (2) 16000-5d + 8d = 22600 $\Rightarrow$3d = 22600-16000 $\Rightarrow$ 3d = 6600 $\Rightarrow$ d = 6600/3 = 2200 Using value of d in (1),we get a = 16000 - 5(2200) $\Rightarrow$ a = 16000 - 11000 $\Rightarrow$a = 5000 (i) The production during 8th year,a_8 = a+(8-1)d = a+7d=5000+ 7×2200= 5000+15400= = 20400	1
	(ii)Total production in first 3 years= $\frac{n}{2}\{2a + (n-1)d\} =$ $= \frac{3}{2}(2 \times 5000 + 2 \times 2200)$=3(5000+2200)=21600	1
	(iii) a_6 = 16000, a_9 = 22600 $\Rightarrow$ a + 5d = 16000-----(1) a + 8d = 22600 ------(2) Substitute a = 1600 -5d from (1) into (2) 16000-5d + 8d = 22600 $\Rightarrow$3d = 22600-16000 $\Rightarrow$ 3d = 6600 $\Rightarrow$ d = 6600/3 = 2200 Using value of d in (1),we get a = 16000 - 5(2200) $\Rightarrow$ a = 16000 - 11000 $\Rightarrow$a = 5000 .... Let production in nth year be a_n = 29200, a = 5000, d = 2200 an = a + (n-1)d 29200 = 5000 + (n – 1)2200 29200 - 5000 = 2200n - 2200 24200 + 2200 = 2200n 26400 = 2200n n = 264/22 n = 12 ∴ the production in 12th year was 29200 .	1 1

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	OR (iii) $a_6 = 16000$, $a_9 = 22600$ $\Rightarrow a + 5d = 16000$-----(1) $a + 8d = 22600$ ------(2) Substitute a = 1600 -5d from (1) into (2) $16000-5d + 8d = 22600$ $\Rightarrow 3d = 22600-16000$ $\Rightarrow 3d = 6600$ $\Rightarrow d = 6600/3 = 2200$ Using value of d in (1),we get $a = 16000 - 5(2200)$ $\Rightarrow a = 16000 - 11000$ $\Rightarrow a = 5000$ .... $a_4 = a+3d = 5000 + 3 (2200) = 5000 + 6600 = 11600$ .... $a_7 = a+6d = 5000 + 6 \times 2200 = 5000 + 13200 = 18200$ .... $a_7 - a_4 = 18200 - 11600 = 6600$	1/2 1/2 1/2 1/2

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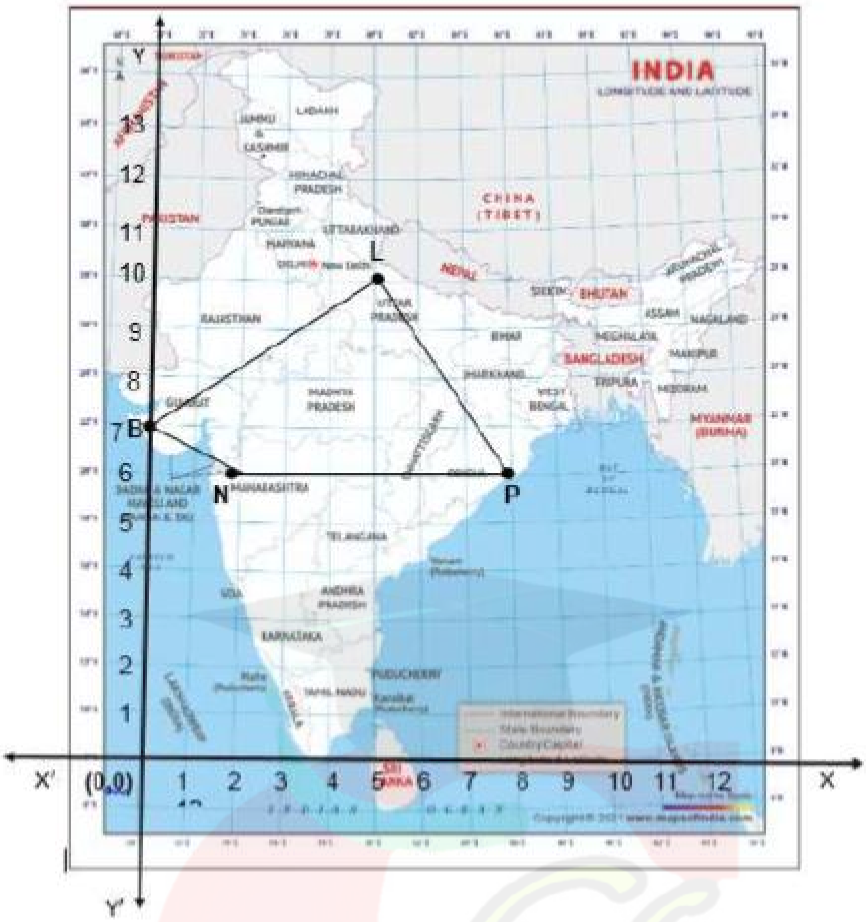
37.		
	(i)LB = $\sqrt{(0-5)^2+(7-10)^2}$ =$\sqrt{(5)^2+(3)^2}$ = $\sqrt{25+9}$ = $\sqrt{34}$ km	1/2 1/2
	(ii)Coordinates of Kota (k)= $\left(\frac{3\times0+2\times5}{3+2}, \frac{3\times7+2\times10}{3+2}\right)$ =$\left(\frac{0+10}{5}, \frac{21+20}{5}\right)$ $= (2, \frac{41}{5})$	 1/2 1/2
	(iii)L(5,10) ,N(2,6),P(8,6) LN=$\sqrt{(2-5)^2+(6-10)^2}$ =$\sqrt{(-3)^2+(-4)^2}$ = $\sqrt{9+16}$ = $\sqrt{25}$ =5	 1/2

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	NP= $\sqrt{(8-2)^2+(6-6)^2}$ =$\sqrt{(6)^2+(0)^2}$ = 6 ………………………………………………………………………………………… PL= $\sqrt{(8-5)^2+(6-10)^2}$ =$\sqrt{(3)^2+(-4)^2}$ = $\sqrt{9+16}$ = $\sqrt{25}$ = 5 ………………………………………………………………………………………… As LN= PL ≠ NP, so ΔLNP is an isosceles triangle. …………………………………………………………………………………………	1/2 1/2 1/2
	OR (iii)Let A(0,y) be a point on the y-axis then AL=AP ………………………………………………………………………………………… ⇒ $\sqrt{(5-0)^2+(10-y)^2}$ = $\sqrt{(8-0)^2+(6-y)^2}$ ⇒ $(5-0)^2+(10-y)^2$ = $(8-0)^2+(6-y)^2$ ………………………………………………………………………………………… ⇒ $25+100-20y + y^2 = 64 +36 -12y + y^2$ ⇒ $8y=25$ ⇒ $y=\frac{25}{8}$ ………………………………………………………………………………………… So, the coordinates of point on y-axis are $(0, \frac{25}{8})$	1/2 1/2 1/2 1/2

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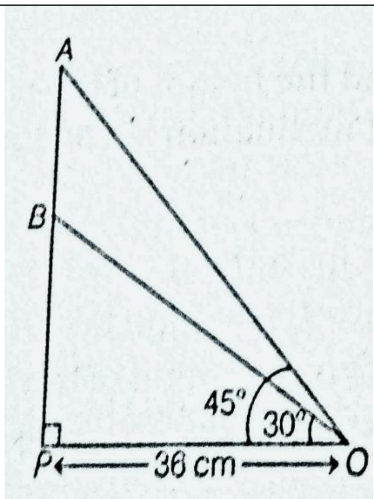
38.		
	(i)In right angled ΔOPB, $\cos 30^0 = \frac{OP}{OB} = \frac{36}{OB}$ $\Rightarrow$ OB $= \frac{36}{\cos 30°}$ .... $= \frac{36}{\frac{\sqrt{3}}{2}} = \frac{72}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$ $\Rightarrow$ OB$=24\sqrt{3}$ cm	1/2 1/2
	(ii) In right angled ΔAPO, $\tan 45^0 = \frac{AP}{OP} \Rightarrow 1 = \frac{AP}{OP}$ .... $\Rightarrow$ AP=OP $\Rightarrow$ AP =36cm ∴ Height of the section A from base of the tower = AP =36cm	1/2 1/2
	(iii) In right angled ΔOPB, $\tan 30^0 = \frac{BP}{OP}$ $\Rightarrow \frac{72}{\sqrt{3}} = \frac{BP}{36}$ $\Rightarrow$ BP$= \frac{36}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = 12\sqrt{3}$ cm .... In right angled ΔAPO, $\tan 45^0 = \frac{AP}{OP} \Rightarrow 1 = \frac{AP}{OP}$	1

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	$\Rightarrow$ AP=OP $\Rightarrow$ AP =36cm .... $\therefore$ Distance AB = AP-BP = 36 -12$\sqrt{3}$ = 12(3-$\sqrt{3}$) cm	1/2 1/2
	OR (iii) In right angled ΔOPB, tan30^0 = $\frac{BP}{OP}$ $\Rightarrow$ BP= OP tan30^0 = 36$\times \frac{1}{\sqrt{3}}$ = 12$\sqrt{3}$ cm .... $\therefore$ Area of $\Delta OPB = \frac{1}{2} \times OP \times BP = \frac{1}{2} \times 36 \times 12\sqrt{3} = 216\sqrt{3}$ cm^2	 1 1

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MARKING SCHEME, BSEH PRACTICE PAPER 3,10TH गणित (मानक), March 2024 (हिंदी माध्यम)		
Q. no.	Expected solutions	marks
	खण्ड-क	
1	(d)2520	1
2	(d) p+1	1
3	(b) -10	1
4	(a) $\frac{2}{3}$	1
5	(b) -6lmn	1
6	(b) 7	1
7	(b) 8cm	1
8	(a) 3cm	1
9	एक	1
10	0	1
11	गलत	1
12	$\frac{25}{8}$	1
13	28 cm	1
14	(b) $\frac{\theta}{360} \times \pi r^2$	1
15	(a) $4\pi r^2$	1
16	(b) 25	1
17	(b) बहुलक = 3 माध्यक - 2 माध्य	1
18	(d)$\frac{17}{16}$	1
19	(a) अभिकथन (A) और तर्क (R) दोनों सही हैं और तर्क (R), अभिकथन (A) की सही व्याख्या करता है।	1
20	(d) अभिकथन (A) ग़लत है, परन्तु तर्क (R) सही है।	1

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	खण्ड -ख	
21.	यहाँ $a_1=3, b_1=-1, c_1=-5$ $a_2=6, b_2=-2, c_2=-k$ .... कोई हल नहीं के लिए ; $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ .... $\Rightarrow \frac{3}{6} = \frac{-1}{-2} \neq \frac{-5}{-k}$ $\Rightarrow \frac{1}{2} \neq \frac{5}{k}$ .... $\Rightarrow k \neq 10$	1/2 1/2 1/2 1/2
अथवा21	$x + y + 40^0 = 180^0$ [त्रिभुज के सभी कोणों का योग] $\Rightarrow x + y = 140^0$ ....(1) $x - y = 30^0$ .....(2) .... समीकरण (1) को हल करके $y = 140^0 - x$...(3) समीकरण (2) में $y = 40^0 - x$ रखने पर हमें प्राप्त होता है $x - (140^0 - x) = 30^0$ $2x - 140^0 = 30^0$ .... $2x = 30^0 + 140^0$ $2x = 170^0$ $x = 85^0$ .... समीकरण (3) में $x = 85^0$ प्रतिस्थापित करने पर, हमें प्राप्त होता है $y = 140^0 - 85^0$ $y = 55^0$	1/2 1/2 1/2 1/2

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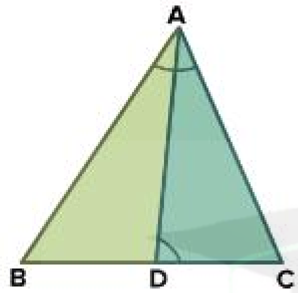
	अत :, $x = 85^0$, $y = 55^0$	

22.	 .... ΔABC और ΔDAC में ∠BAC = ∠ADC (दिया है) ∠ACB = ∠ACD (उभयनिष्ठ कोण) ⇒ ΔABC ~ ΔDAC (AA कसौटी) .... यदि दो त्रिभुज समरूप हों तो उनकी संगत भुजाएँ समानुपाती होती हैं ⇒ CA / CD = CB / CA	1/2 1/2 1/2

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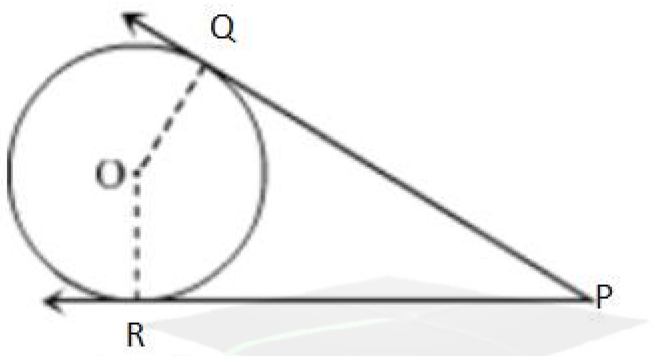
	$\Rightarrow CA^2 = CB \times CD$ अत: सिद्ध हुआ।	1/2
23.	 .... चूँकि वृत्त के एक बिंदु पर स्पर्श रेखा उस बिंदु से गुजरने वाली त्रिज्या पर लंबवत होती है $\therefore OQ \perp QP$ & $OR \perp RP$ $\Rightarrow \angle OQP = 90^\circ \& \angle ORP = 90^\circ$ $\Rightarrow \angle OQP + \angle ORP = 90^\circ + 90^0 = 180^\circ$----(i) .... चतुर्भुज OQPRमें, $\angle OQP + \angle QPR + \angle QOR + \angle ORP = 360^0$ $\Rightarrow (\angle QPR + \angle QPR) + (\angle OQP + \angle ORP) = 360\circ$ $\Rightarrow \Rightarrow \angle QPR + \angle QOR + 180^0 = 360^0$ (समीकरण(i)से) .... $\Rightarrow \angle QPR + \angle QOR = 180^\circ$-------(ii) समीकरण(i) और (ii)से	1/2 1/2 1/2 1/2

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	हम कह सकते हैं कि चतुर्भुज QORP चक्रीय है।	
24.	$\frac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(1-\cos\theta)} = \frac{1-\sin^2\theta}{1-\cos^2\theta}$ .... $= \frac{\cos^2\theta}{\sin^2\theta} =$ .... $= \cot^2\theta = \left(\frac{7}{8}\right)^2$ .... $= \frac{49}{64}$	1/2 1/2 1/2 1/2
अथवा 24.	हम जानते हैं कि $\sin^2\theta + \cos^2\theta = 1$ .... दोनों तरफ घन करने पर $(\sin^2\theta + \cos^2\theta)^3 = 1$ .... बीजीय सर्वसमिका $(a + b)^3 = a^3 + b^3 + 3ab(a + b)$ का उपयोग करने पर $(\sin^2\theta)^3 + (\cos^2\theta)^3 + 3\sin^2\theta\cos^2\theta(\sin^2\theta + \cos^2\theta) = 1$ .... हमें मिलता है $\sin^6\theta + \cos^6\theta + 3\sin^2\theta\cos^2\theta = 1$	1/2 1/2 1/2 1/2

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	यही सिद्ध करना था।	
25.	चारों शीर्षों पर चार त्रिज्यखण्ड बने हैं जिनमें प्रत्येक की त्रिज्या r = 21 cm तथा शीर्ष केन्द्रीय कोण ∠A, ∠B, ∠C एवं ∠D हैं। [∴ ∠A+ ∠B + ∠C+ ∠D = 360° चतुर्भुज के शीर्ष कोणों का योग] .... छायांकित क्षेत्र का क्षेत्रफल= $\pi r_1^2\theta_1/360° + \pi r_2^2\theta_2/360° + \pi r_3^2\theta_3/360° + \pi r_4^2\theta_4/360°$ .... $= \pi r^2 (\theta_1 + \theta_2 + \theta_3 + \theta_4) /360°$ $\because r_1 = r_2 = r_3 = r_4$ $= \pi r^2 (360°)/360°$ $= \pi r^2$ .... $= 227 (21)^2$ = 22 x 63 = 1386 cm^2 . अतः छायांकित क्षेत्र का अभीष्ट क्षेत्रफल = 1386 cm^2 है।	1/2 1/2 1/2 1/2
	खण्ड -ग	
26.	आइए मान लें कि 3 + 2√5 परिमेय है। .... यदि 3 + 2√5 परिमेय है तो इसका अर्थ है कि इसे a/b के रूप में लिखा जा सकता है जहां a और b पूर्णांक हैं जिनका 1 और b ≠ 0 के अलावा कोई सांझा गुणनखंड नहीं है। 3 + 2√5 = a/b .... b(3 + 2√5) = a	1/2 1/2 1/2

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	3b + 2√5b = a .... 2√5b = a - 3b √5 = (a - 3b)/2b .... चूँकि (a - 3b)/2b एक परिमेय संख्या है, तो √5 भी एक परिमेय संख्या है। लेकिन, हम जानते हैं कि √5 अपरिमेय है। .... इसलिए, हमारी धारणा गलत थी कि 3 + 2√5 परिमेय है। अतः, 3 + 2√5 अपरिमेय है।	1/2 1/2 1/2
27.	$x^2 + \frac{1}{6}x - 2 = \frac{1}{6}(6x^2 + x - 12) = \frac{1}{6}(3x-4)(2x+3)$ अतः, $\frac{4}{3}$ and $\frac{-3}{2}$ दिए गए बहुपद के शून्यक हैं। .... शुन्यकों का योगफल = $\frac{4}{3} + \left(\frac{-3}{2}\right) = \frac{-1}{6} = \frac{-x \text{ का गुणांक}}{x^2 \text{ का गुणांक}}$ .... शुन्यकों का गुणनफल = $\frac{4}{3} \times \left(\frac{-3}{2}\right) = -2 = \frac{\text{अचर पद}}{x^2 \text{ का गुणांक}}$	1 1 1
28.	दिए गए रैखिक समीकरण हैं:	

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	x - y +1 = 0..........(i) 3x +2y -12=0........(ii) समीकरण (i) से y = x + 1 <table><tr><td>x</td><td>-1</td><td>0</td></tr><tr><td>y</td><td>0</td><td>1</td></tr></table> सम्बंधित बिंदु (-1, 0) और (0, 1)हैं .... समीकरण(ii)से , 3x +2y -12=0⇒ y= $\frac{12-3x}{2}$ <table><tr><td>x</td><td>4</td><td>0</td></tr><tr><td>y</td><td>0</td><td>6</td></tr></table> सम्बंधित बिंदु (4, 0) और (0, 6)हैं .... हम इन बिंदुओं को आलेखित करते हैं और रेखाएँ खींचते हैं।	1 1

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	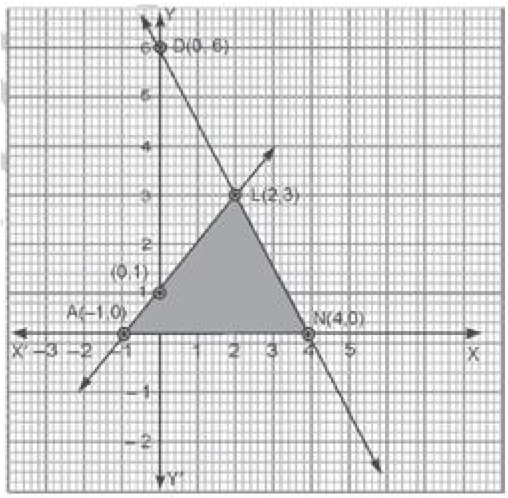 .... ग्राफ़ से, हम देखते हैं कि अभीष्ट त्रिभुज के शीर्ष A(-1, 0),N(4, 0) और L(2, 3)हैं।	1/2 1/2
अथवा 28.	माना इकाई का अंक y है और दहाई का अंक x है। तब संख्या 10x+y है और अंकों को उलटने पर प्राप्त संख्या =10y+x .... दिया है x + y =9........(i) .... और 9(10x+y) =2(10y+x) ⇒ 90x+9y=20y+2x ⇒ 88x-11y=0⇒8x-y=0...........(ii) .... (i) और (ii) जोड़ने पर, हमें प्राप्त होता है x+ y +8x-y=9+0	1/2 1/2 1/2 1/2

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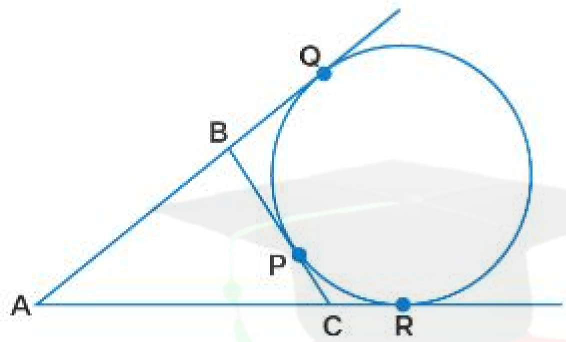
	⇒ 9x=9 ⇒ x=1 .... (i) में x का मान प्रतिस्थापित करने पर, हमें y=8 प्राप्त होता है .... अत: संख्या 18 है।	1/2 1/2
29.	 .... दिया है: एक वृत्त ΔABC की भुजा BC को P पर और AB तथा AC को क्रमशः Q और R तक बढ़ाने पर स्पर्श करता है। सिद्ध करना है : AQ=1/2(ΔABC का परिमाप) .... प्रमाण: किसी बाहय बिंदु से वृत्त पर खींची गई स्पर्श रेखाओं की लंबाई बराबर होती है। ⇒AQ = AR, BQ = BP, CP = CR. .... ΔABC का परिमाप = AB + BC + CA = AB + (BP + PC) + (AR - CR) .... = (AB + BQ) + (PC) + (AQ - PC) [∵AQ = AR, BQ = BP, CP = CR] .... = AQ + AQ = 2AQ ⇒AQ=1/2 (ΔABC का परिमाप) ∴AQ ,ΔABC के परिमाप का आधा है।	1/2 1/2 1/2 1/2 1/2 1/2

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30.	LHS$=\frac{\sin\theta-\cos\theta+1}{\sin\theta+\cos\theta-1}=\frac{\frac{\sin\theta-\cos\theta+1}{\cos\theta}}{\frac{\sin\theta+\cos\theta-1}{\cos\theta}}$ …………………………………………………………………… $=\frac{\tan\theta-1+\sec\theta}{\tan\theta+1-\sec\theta}=$ …………………………………………………………………… $=\frac{(\tan\theta+\sec\theta)-1}{(\tan\theta-\sec\theta)+1}$ $=\frac{\{(\tan\theta+\sec\theta)-1\}(\sec\theta-\tan\theta)}{\{(\tan\theta-\sec\theta)+1\}(\sec\theta-\tan\theta)}=$ …………………………………………………………………… $=\frac{(\sec^2\theta-\tan^2\theta)-(\sec\theta-\tan\theta)}{(\tan\theta-\sec\theta+1)(\sec\theta-\tan\theta)}=$ …………………………………………………………………… $=\frac{(1-\sec\theta+\tan\theta)}{(\tan\theta-\sec\theta+1)(\sec\theta-\tan\theta)}$ $\{\because\ \sec^2\theta-\tan^2\theta=1\}$ …………………………………………………………………… $=\frac{1}{\sec\theta-\tan\theta}$	1/2 1/2 1/2 1/2 1/2 1/2
अथवा 30.	हम उड़ती पतंग की ऊंचाई AB, डोर की लंबाई AC और जमीन के साथ डोर का झुकाव ∠C पर लेते हैं।	

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	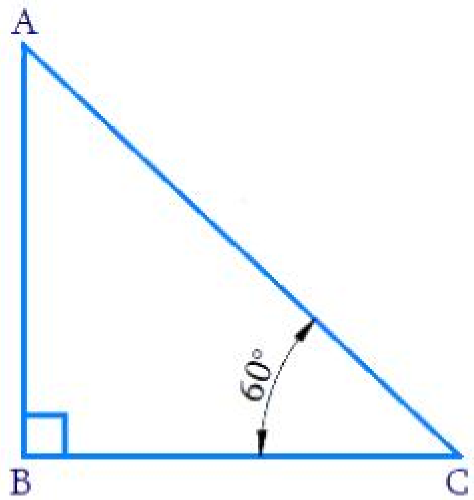	1/2
	ΔABC में , sin C = AB / AC sin 60° = 60/AC	1/2
	⇒√3/2 = 60/AC	1/2
	AC = (60 × 2/√3)	1/2
	= (120 × √3) / (√3 × √3) = 120√3/3	1/2
	= 40√3 डोरी की लंबाई AC = 40√3 m.	1/2
31.	(i) कुल डिस्क 90 हैं, जिनकी संख्या 1 से 90 तक है। अनुकूल दो-अंकीय क्रमांकित डिस्क 81(10,11,12,...........,90) हैं ∴ दो अंकीय क्रमांकित डिस्क प्राप्त होने की प्रायिकता = $\frac{81}{90}=\frac{9}{10}$	1

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	(ii) पूर्ण वर्ग संख्या के लिए अनुकूल स्थितियाँ 9 (1,4,9,16,25,36,49,64,81) हैं ∴ एक पूर्ण वर्ग क्रमांकित डिस्क प्राप्त करने की प्रायिकता = $\frac{9}{90}$ $= \frac{1}{10}$	1
	(iii) 5 से विभाज्य संख्या के लिए अनुकूल स्थितियाँ 18 (5,10,15,......,90) हैं ∴ 5 से विभाज्य संख्या वाली डिस्क मिलने की प्रायिकता = $\frac{18}{90}$ $= \frac{1}{5}$	1
	. **खण्ड-घ**	
32.	एक समकोण त्रिभुज में ऊँचाई एक भुजा होती है। माना कि आधार x सेमी है। ऊँचाई (x - 7) सेमी होगी। .... अब हम पाइथागोरस प्रमेय को दिए गए समकोण त्रिभुज पर लागू कर सकते हैं। पाइथागोरस प्रमेय: $(\text{कर्ण})^2 = (\text{भुजा}1)^2 + (\text{भुजा } 2)^2$ $(13)^2 = x^2 + (x - 7)^2$ .... $169 = x^2 + x^2 - 14x + 49$ $169 = 2x^2 - 14x + 49$ $2x^2 - 14x + 49 - 169 = 0$ $2x^2 - 14x - 120 = 0$	1/2 1 1

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	$(2x^2 - 14x - 120) / 2 = 0$ $x^2 - 7x - 60 = 0$ .... $x^2 - 12x + 5x - 60 = 0$ .... $x(x - 12) + 5(x - 12) = 0$ $(x + 5)(x - 12) = 0$ $x - 12 = 0$ and $x + 5 = 0$ $x = 12$ and $x = -5$ .... हम जानते हैं कि आधार का मान ऋणात्मक नहीं हो सकता। इसलिए, आधार = 12 सेमी, ऊंचाई = 12 - 7 = 5 सेमी	 1/2 1 1
अथवा 32.	माना चौड़ाई = x. दिया गया है कि लंबाई इसकी चौड़ाई से दोगुनी है। आयत की लंबाई = 2x. और दिया गया है कि आयत का क्षेत्रफल = 800 m^2 है .... लेकिन आयत का क्षेत्रफल = l x b = 2x × x	 1 1/2

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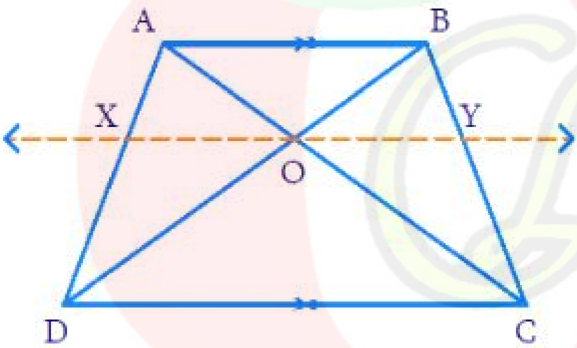
	.... ⇒ $2x^2 = 800m^2$ .... ⇒ $x^2 = 400m^2$ ⇒ x = 20 m (-20 अस्वीकृत है.) .... ∴ आयत की लंबाई = 2x = 40 मीटर। आयत की चौड़ाई = x = 20 मीटर. .... ∴ एक आयताकार आम के बगीचे का डिज़ाइन बनाना संभव है।	1 1 1 1/2
33.	 .... समलंब ABCD में, AB || CD साथ ही, AC और BD 'O' पर प्रतिच्छेद करते हैं .... AB और CD के समानांतर O से गुजरने वाले XY की रचना करें (XY || AB, XY || CD)	1/2 1/2 1/2

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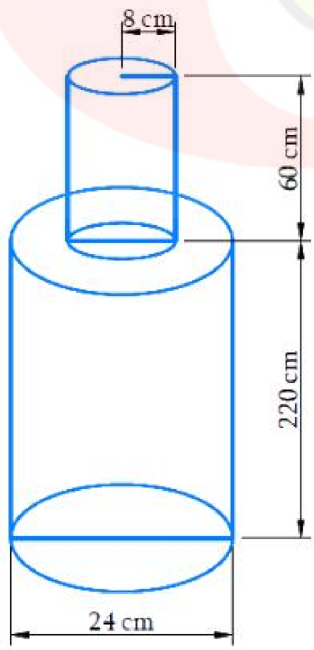
	ΔABC में OY ‖ AB (रचना से) ∴ BY/CY = AO/OC................. (1) (आधारभूत समानुपातिकता प्रमेय)	1
	ΔBCD में OY ‖ CD (रचना से) BY/CY = OB/OD................. (2) (आधारभूत समानुपातिकता प्रमेय)	1
	समीकरण (1) और (2) से OA/OC = OB/OD	1
	⇒ OA/OB = OC/OD अत: सिद्ध हुआ |	1/2
34.		1/2

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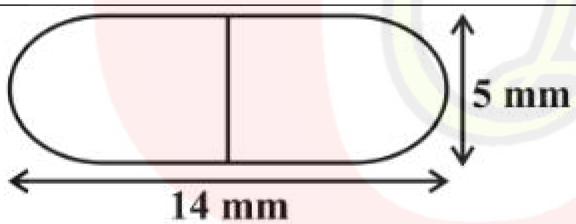
	बड़े बेलन की त्रिज्या = 12 सेमी, बड़े बेलन की ऊंचाई = 220 सेमी छोटे बेलन की त्रिज्या = 8 सेमी, छोटे बेलन की ऊंचाई = 60 सेमी .... बड़े बेलन का आयतन $=\pi r^2 h$ $=\pi\times12^2\times220$ $=31680\,\pi cm^3$ .... छोटे बेलन का आयतन $=\pi r^2 h$ $=\pi\times8^2\times60$ $=3840\pi\ cm^3$ .... ठोस लोहे के खंभे का आयतन = बड़े बेलन का आयतन + छोटे बेलन का आयतन= $31680\pi+3840\pi=35520\pi\ cm^3$ .... खंभे का द्रव्यमान =घनत्व × आयतन $=8\times35520\pi = 8\times 35520\times 3.14$ =892262.4gm=892.3kg	1/2 1 1 1 1
अथवा 34.	 .... अर्धगोले की त्रिज्या, r = d/2 = 5/2 मिमी बेलन की त्रिज्या, r = 5/2 मिमी .... बेलन की लंबाई = कैप्सूल की लंबाई - 2 × अर्धगोले की त्रिज्या h = 14 mm - 2 × 5/2 mm = 9 mm	 1/2 1/2 1

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कैप्सूल का पृष्ठीय क्षेत्रफल = 2 × अर्धगोलाकार भाग का वक्र पृष्ठीय क्षेत्रफल + बेलनाकार भाग का वक्र पृष्ठीय क्षेत्रफल 1

$= 2 \times 2\pi r^2 + 2\pi rh$

....

$= 2\pi r\,(2r + h)$

$= [2 \times 22/7 \times 5/2 \text{ mm} \times (2 \times 5/2 \text{ mm} + 9 \text{ mm})]$ 1

....

$= 110/7 \text{ mm} \times 14 \text{ mm}$ 1

$= 220 \text{ mm}^2$

35.

SO_2 की सांद्रता (पीपीएम में)	वर्ग चिन्ह (x_i)	बारंबारता(f_i)	f_ix_i
0.00-0.04	0.02	4	0.08
0.04-0.08	0.06	9	0.54
0.08-0.12	0.10	9	0.90
0.12-0.16	0.14	2	0.28
0.16-0.20	0.18	4	0.72
0.20-0.24	0.22	2	0.44
		$\sum f_i$= 30	$\sum f_ix_i$= 2.96

[1] $\left[\frac{1}{2}\right]$ [1] $2\frac{1}{2}$

....

माध्य सांद्रता $= \bar{x} = \frac{\sum f_ix_i}{\sum f_i}$ 1

....

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	$=\frac{2.96}{30}$ .... = 0.099 ppm. (लगभग)	$\frac{1}{2}$ 1
	खण्ड-ङ	
36.	a_6 = 16000, a_9 = 22600 ⇒ a + 5d = 16000-----(1) a + 8d = 22600 ------(2) (1) से (2) में a = 1600 -5d रखने पर 16000-5d + 8d = 22600 ⇒3d = 22600-16000 ⇒ 3d = 6600 ⇒ d = 6600/3 = 2200 (1) में d के मान का उपयोग करने पर, हमें प्राप्त होता है a = 16000 - 5(2200) ⇒ a = 16000 - 11000 ⇒a = 5000 (i) आठवें वर्ष के दौरान उत्पादन,a_8 = a+(8-1)d = a+7d=5000+ 7×2200= 5000+15400= = 20400	 1
	(ii) पहले 3 वर्षों में कुल उत्पादन $=\frac{n}{2}\{2a+(n-1)d\}$ = $=\frac{3}{2}(2\times 5000+2\times 2200)$=3(5000+2200)=21600	1
	(iii) a_6 = 16000, a_9 = 22600 ⇒ a + 5d = 16000-----(1) a + 8d = 22600 ------(2) (1) से (2) में a = 1600 -5d रखने पर 16000-5d + 8d = 22600 ⇒3d = 22600-16000 ⇒ 3d = 6600	

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	⇒ d = 6600/3 = 2200 (1) में d के मान का उपयोग करने पर, हमें प्राप्त होता है a = 16000 - 5(2200) ⇒ a = 16000 - 11000 ⇒a = 5000 .... माना nवें वर्ष में उत्पादन a_n = 29200, a = 5000, d = 2200 an = a + (n-1)d 29200 = 5000 + (n – 1)2200 29200 - 5000 = 2200n - 2200 24200 + 2200 = 2200n 26400 = 2200n n = 264/22 n = 12 ∴ 12वें वर्ष में उत्पादन 29200 था |	1 1
	OR (iii) a_6 = 16000, a_9 = 22600 ⇒ a + 5d = 16000-----(1) a + 8d = 22600 ------(2) (1) से (2) में a = 1600 -5d रखने पर 16000-5d + 8d = 22600 ⇒3d = 22600-16000 ⇒ 3d = 6600 ⇒ d = 6600/3 = 2200 (1) में d के मान का उपयोग करने पर, हमें प्राप्त होता है a = 16000 - 5(2200) ⇒ a = 16000 - 11000 ⇒a = 5000 .... a_4 = a+3d = 5000 + 3 (2200) = 5000 + 6600 = 11600 .... a_7 = a+6d = 5000 + 6 x 2200 = 5000 + 13200 = 18200 .... a_7 - a_4 = 18200 - 11600 = 6600	1/2 1/2 1/2 1/2

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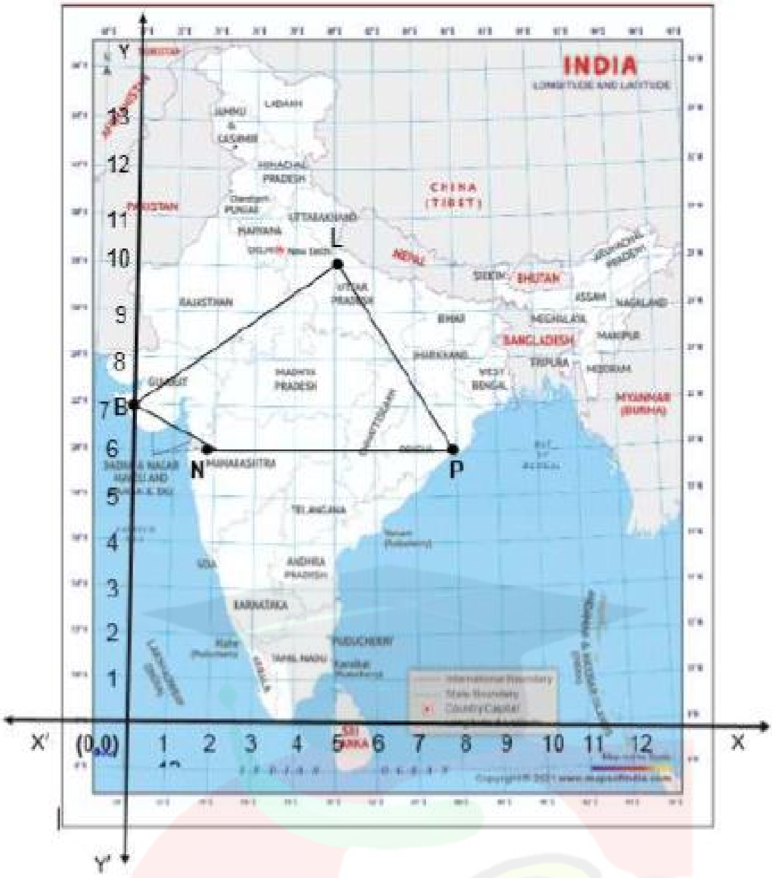
37.		
	(i)LB = $\sqrt{(0-5)^2+(7-10)^2}$ =$\sqrt{(5)^2+(3)^2}$	1/2
	.... = $\sqrt{25+9}$ = $\sqrt{34}$ km	1/2
	(ii) कोटा (K) के निर्देशांक= $\left(\frac{3\times0+2\times5}{3+2}, \frac{3\times7+2\times10}{3+2}\right)$ =$\left(\frac{0+10}{5}, \frac{21+20}{5}\right)$	1/2
	.... $= (2, \frac{41}{5})$	1/2
	(iii) L(5,10) ,N(2,6),P(8,6) LN=$\sqrt{(2-5)^2+(6-10)^2}$ =$\sqrt{(-3)^2+(-4)^2}$ = $\sqrt{9+16}$ = $\sqrt{25}$ =5	1/2
	.... NP= $\sqrt{(8-2)^2+(6-6)^2}$ =$\sqrt{(6)^2+(0)^2}$ = 6	1/2
	.... PL= $\sqrt{(8-5)^2+(6-10)^2}$ =$\sqrt{(3)^2+(-4)^2}$ = $\sqrt{9+16}$ = $\sqrt{25}$ = 5	1/2

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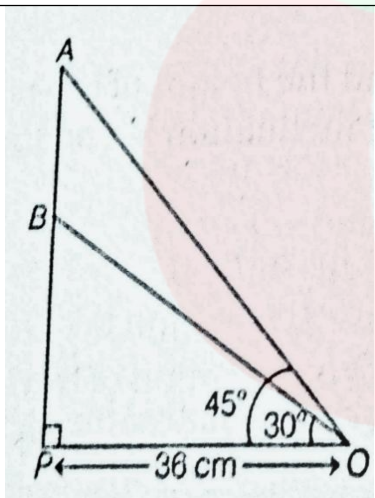
	क्योंकि LN= PL $\neq$ NP, इसलिए ΔLNP एक समद्विबाहु त्रिभुज है।	1/2
	OR (iii) मान लीजिए कि A(0,y) y-अक्ष पर एक बिंदु है तब AL=AP .... $\Rightarrow \sqrt{(5-0)^2+(10-y)^2} = \sqrt{(8-0)^2+(6-y)^2}$ $\Rightarrow (5-0)^2+(10-y)^2 = (8-0)^2+(6-y)^2$ .... $\Rightarrow$ 25+100-20y + y^2 = 64 +36 -12y + y^2 $\Rightarrow$ 8y=25 $\Rightarrow$ y= $\frac{25}{8}$ .... इसलिए, y-अक्ष पर बिंदु के निर्देशांक (0, $\frac{25}{8}$)हैं।	1/2 1/2 1/2 1/2
38.	 (i) समकोण ΔOPB में, $\cos 30^0 = \frac{OP}{OB} = \frac{36}{OB}$ $\Rightarrow OB = \frac{36}{\cos 30°}$ .... $= \frac{36}{\frac{\sqrt{3}}{2}} = \frac{72}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$	1/2

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	$\Rightarrow$ OB=$24\sqrt{3}$ cm	1/2
	(ii)) समकोण ΔAPO में, $\tan 45^0 = \frac{AP}{OP} \Rightarrow 1 = \frac{AP}{OP}$ .... $\Rightarrow$ AP=OP $\Rightarrow$ AP =36cm ∴ टावर के आधार से खंड A की ऊंचाई = AP =36cm	1/2 1/2
	(iii) समकोण ΔOPB में, $\tan 30^0 = \frac{BP}{OP}$ $\Rightarrow \frac{72}{\sqrt{3}} = \frac{BP}{36}$ $\Rightarrow BP = \frac{36}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = 12\sqrt{3}$ cm .... समकोण ΔAPO में, $\tan 45^0 = \frac{AP}{OP} \Rightarrow 1 = \frac{AP}{OP}$ $\Rightarrow$ AP=OP $\Rightarrow$ AP =36cm .... ∴ दूरी AB = AP-BP = 36 -$12\sqrt{3}$ = $12(3-\sqrt{3})$ cm	1 1/2 1/2
	OR (iii) समकोण ΔOPB में, $\tan 30^0 = \frac{BP}{OP}$ $\Rightarrow$ BP= OP $\tan 30^0 = 36 \times \frac{1}{\sqrt{3}} = 12\sqrt{3}$ cm .... ∴ ΔOPB का क्षेत्रफल $= \frac{1}{2} \times OP \times BP = \frac{1}{2} \times 36 \times 12\sqrt{3} = 216\sqrt{3}$ cm^2	1 1

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