	MARKING SCHEME, H.O.S.,SAMPLE PAPER 1, 10^{TH} MATHS(Standard) , (2026-27) (ENGLISH MEDIUM)	
Q. no.	**Expected solutions**	**marks**
	Section-A	
1.	(b) 2 :1	1
2.	(b) 9	1
3.	(c) $\frac{2}{3}, \frac{2\sqrt{2}}{3}$	1
4.	(c)$\frac{15}{4}$	1
5.	(a) 4	1
6.	(c) 2 distinct real roots	1
7.	(b) 3	1
8.	(b) 3	1
9.	(c) n^2	1
10.	(a) -12	1
11.	(c)x = $\frac{ay}{a+b}$	1
12.	(d) Equilateral triangle	1
13.	(b) 15cm	1
14.	Secant	1
15.	7 cm	1
16.	(c) $\frac{\sqrt{b^2-a^2}}{b}$	1
17.	$\frac{\sqrt{3}+1}{2}$	1
18.	60°	1
19.	(c) 1 : 4	1
20.	22 cm	1
21.	3:1	1
22.	median (माध्यक)	1
23.	$\frac{1}{7}$	1
24.	(b)0 and 1	

	SECTION-B	
25.	क्या संख्या 6^n ,जहाँ n एक प्राकृत संख्या है, अंक 5 पर समाप्त हो सकती है? कारण दीजिए । Can the number 6^n, n being a natural number , end with the digit 5 ? Give	

	reasons. No, Here $6^n = (2 \times 3)^n = 2^n \times 3^n$, ………………………………………………………………………………………………. 2 and 3 are the only primes in the factorisation of 6^n, and not 5. ………………………………………………………………………………………………. Therefore, it cannot end with the digit 5.	1 1/2 1/2
26.	द्विघात बहुपद $x^2 + \frac{1}{6}x - 2$ के शून्यक ज्ञात कीजिए तथा शून्यकों एवं गुणांकों के बीच संबंध सत्यापित कीजिए। Find the zeroes of the quadratic polynomial $x^2 + \frac{1}{6}x - 2$ and verify the relationship between the zeroes and the coefficients. Solution: Given, the polynomial is $x^2 + (\frac{1}{6})x - 2 = \frac{1}{6}(6x^2+x-12) = \frac{1}{6}[6x^2 + 9x - 8x - 12]$ $= \frac{1}{6}[3x(2x + 3) - 4(2x + 3)]$ $= \frac{1}{6}(3x - 4)(2x + 3)$ Therefore,the zeros of the polynomial are 4/3 and -3/2. ………………………………………………………………………………………………. For given polynomial $x^2 + (\frac{1}{6})x - 2$ Sum of the roots: $\alpha + \beta$ =4/3 + (-3/2) = (8 - 9)/6 = -1/6= -coefficient of x/coefficient of x^2 = -1/6 ………………………………………………………………………………………………. Product of the roots $\alpha \beta$ = (4/3)(-3/2) = -12/6 = -2 = constant term/coefficient of x^2	1 1/2 1/2
27.(a)	यदि सरिता को 30 अंकों के गणित के टेस्ट में 10 अंक और मिले होते, तो इन अंकों का 9 गुना उसके वास्तविक अंकों का वर्ग होता। उसे टेस्ट में कितने अंक मिले? Had Sarita scored 10 more marks in her mathematics test out of 30 marks , 9 times these marks would have been the square of her actual marks.How many marks did she get in the test? Solution:	

	Let the actual marks be x Given, $9(x + 10) = x^2$ $9x + 90 = x^2$ $x^2 - 9x - 90 = 0$	1/2
	On factoring, $x^2 - 15x + 6x - 90 = 0$ $x(x - 15) + 6(x - 15) = 0$ $(x + 6)(x - 15) = 0$	1/2
	Now, $x + 6 = 0$ $x = -6$ Also, $x - 15 = 0$ $x = 15$	1/2
	Negative term $x = -6$ is neglected. So, $x = 15$ Therefore, Sarita scored 15 marks in the examination.	1/2

OR 27.(b)	द्विघात समीकरण $\sqrt{2}\,x^2 + 7x + 5\sqrt{2} = 0$ के मूल ज्ञात कीजिए। Find the roots of the quadratic equation $\sqrt{2}\,x^2 + 7x + 5\sqrt{2} = 0$. Solution: $\sqrt{2}x^2 + 7x + 5\sqrt{2} = 0$ $\sqrt{2}x^2 + 5x + 2x + 5\sqrt{2} = 0$ $\sqrt{2}x^2 + 2x + 5x + 5\sqrt{2} = 0$ $(\sqrt{2}x + 5)(x + \sqrt{2}) = 0$	1
	$\sqrt{2}x + 5 = 0$ or $x + \sqrt{2} = 0$ $\sqrt{2}x = -5$ or $x = -\sqrt{2}$ $x = -5/\sqrt{2}$ or $x = -\sqrt{2}$ Therefore, roots are: $-5/\sqrt{2}, -\sqrt{2}$	1
28.	बिंदु (-4, 6), बिंदुओं A (-6, 10) और B (3, -8) को मिलाने वाले रेखाखंड को किस अनुपात में विभाजित करता है? In what ratio does the point (-4,6) divide the line segment joining the points A (-6,10) and B(3,-8)? Solution: Let the ratio in which the line segment joining A(- 6, 10) and B(3, - 8) be divided by point C(- 4, 6) be k : 1.	1/2
	By Section formula, $C(x, y) = [(mx_2 + nx_1) / m + n, (my_2 + ny_1) / m + n]$ $m = k, n = 1$	1/2
	Therefore, $-4 = (3k - 6) / (k + 1)$ and $6 = (-8k + 10) / (k + 1)$	1/2

....

- 4k - 4 = 3k - 6 and 6k+6 = -8k + 10

-7k = -2 and 14k = 4 1/2

k = 2 / 7 and k = 4/14 = 2/ 7

Hence, the point C divides line segment AB in the ratio 2 : 7.

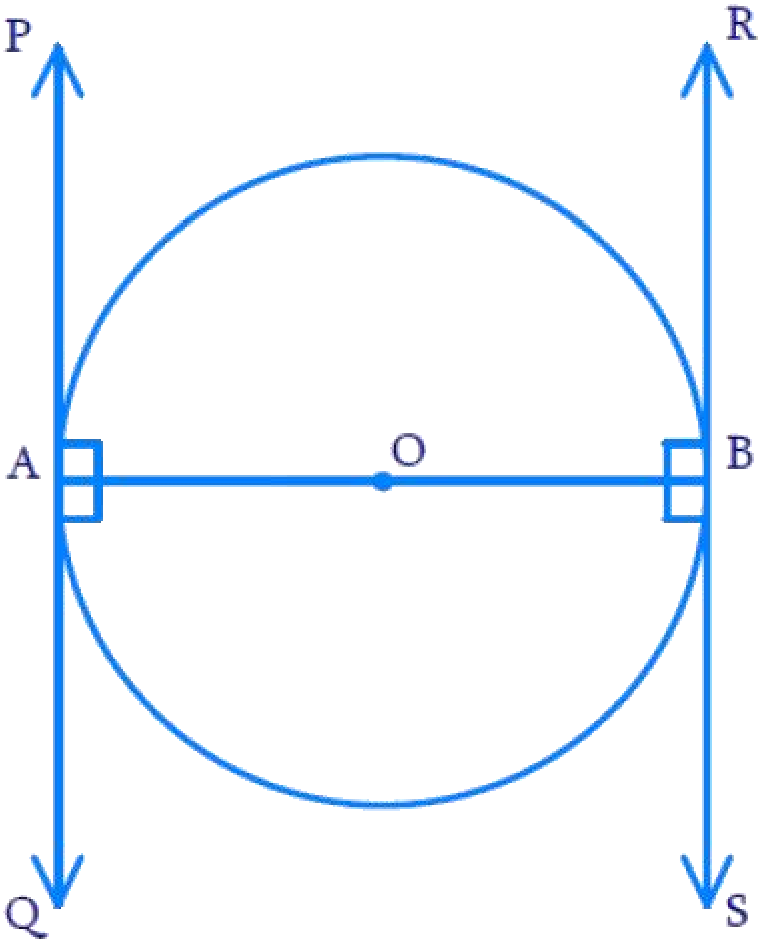
29. सिद्ध कीजिए कि किसी वृत्त के व्यास के सिरों पर खींची गई स्पर्श रेखाएँ समांतर होती हैं।

Prove that the tangents drawn at the ends of a diameter of a circle are parallel.

Proof:

A tangent to a circle is a line that intersects the circle at only one point.

Let's draw the tangents PQ and RS to the circle at the ends of the diameter AB.



1/2

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According to Theorem 10.1: The tangent at any point of a circle is perpendicular to the radius through the point of contact.

We know that radius is perpendicular to the tangent at the point of contact. 1/2

Thus, OA ⊥ PQ and OB ⊥ RS

....

Since the tangents are perpendicular to the radius,

∠PAO = 90°, ∠RBO = 90°

and ∠OAQ = 90°, ∠OBS = 90° 1/2

Here ∠OAQ I= ∠OBR and ∠PAO = ∠OBS, which are two pairs of alternate interior angles.

....

$\Rightarrow$ PQ || RS 1/2

Hence, it is proved that tangents drawn at the ends of a diameter of a circle are parallel.

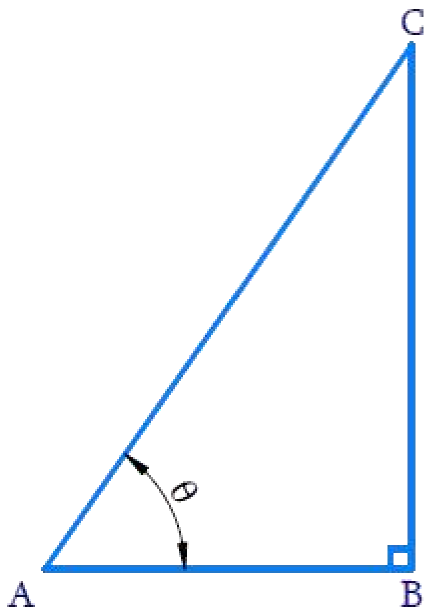
30. यदि cot θ = $\frac{7}{8}$ है, तो $\frac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(1-\cos\theta)}$ का मान ज्ञात कीजिए

If cot θ = $\frac{7}{8}$, then evaluate $\frac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(1-\cos\theta)}$

Solution:

We will use the basic concepts of trigonometric ratios to solve the problem.

Consider ΔABC as shown below where angle B is a right angle.



cot θ = side adjacent to θ / side opposite to θ = AB/BC = 7/8

Let AB = 7k and BC = 8k, where k is a positive integer.

By applying Pythagoras theorem in Δ ABC, we get

$AC^2 = AB^2 + BC^2$

$= (7k)^2 + (8k)^2$

$= 49k^2 + 64k^2$

$= 113k^2$

AC = $\sqrt{113}$k 1/2

....

Therefore, sin θ = side opposite to θ / hypotenuse = BC/AC = 8k/$\sqrt{113}$k= 8/$\sqrt{113}$

cos θ = side adjacent to θ / hypotenuse = AB/AC = 7k/$\sqrt{113}$k = 7/$\sqrt{113}$ 1/2

....

	$(1 + \sin\theta)(1 - \sin\theta) / (1 + \cos\theta)(1 - \cos\theta) = (1 - \sin^2\theta) / (1 - \cos^2\theta)$ [Since, $(a + b)(a - b) = (a^2 - b^2)$] $= [1 - (8/\sqrt{113})^2] / [1 - (7/\sqrt{113})^2]$ $= (1 - 64/113) / (1 - 49/113)$ $= (49/113) / (64/113)$ $= 49/64$	1
31.(a)	सिद्ध कीजिए कि $(\sin^4\theta - \cos^4\theta + 1)\,\text{cosec}^2\theta = 2$ Prove that $(\sin^4\theta - \cos^4\theta + 1)\,\text{cosec}^2\theta = 2$ Proof: We know that LHS $= (\sin^4\theta - \cos^4\theta + 1)\,\text{cosec}^2\theta$ $= [(\sin^2\theta + \cos^2\theta)(\sin^2\theta - \cos^2\theta) + 1]\,\text{cosec}^2\theta$ $= [\sin^2\theta - \cos^2\theta + 1]\,\text{cosec}^2\theta$ …………………………………………………………………… [Using $a^2 - b^2 = (a + b)(a - b)$ and $\sin^2\theta + \cos^2\theta = 1$] …………………………………………………………………… $= 2\sin^2\theta\,\text{cosec}^2\theta$ …………………………………………………………………… $= 2\sin^2\theta \cdot 1/\sin^2\theta$ $= 2$ = RHS Therefore, it is proved.	1/2 1/2 1/2 1/2
OR 31.(b)	31. (b)सिद्ध कीजिए कि $(\text{cosec}\theta - \cot\theta)^2 = \frac{1-\cos\theta}{1+\cos\theta}$ Prove that $(\text{cosec}\theta - \cot\theta)^2 = \frac{1-\cos\theta}{1+\cos\theta}$We use the standard identities of trigonometric and Proof: L.H.S $= (\text{cosec}\theta - \cot\theta)^2 = (1/\sin\theta - \cos\theta/\sin\theta)^2$ $= (1 - \cos\theta)^2/(\sin\theta)^2$ …………………………………………………………………… $= (1 - \cos\theta)^2/\sin^2\theta$ $= (1 - \cos\theta)^2/(1 - \cos^2\theta)$ (By Identity $\sin^2 A + \cos^2 A = 1$ Hence, $1 - \cos^2 A = \sin^2 A$) -- $= (1 - \cos\theta)^2\,(1 - \cos\theta)(1 + \cos\theta)$ [Using $a^2 - b^2 = (a + b)(a - b)$] $= (1 - \cos\theta)/(1 + \cos\theta)$ = RHS	1/2 1 1/2
32.	32.किसी कार के दो वाइपर हैं, परस्पर कभी आच्छादित नहीं होते हैं । प्रत्येक वाइपर की पत्ती की लंबाई 25 cm है और 115° के कोण तक घूम कर सफाई कर सकता है । पत्तियों के प्रत्येक बुहार के साथ साफ होने वाला कुल क्षेत्रफल ज्ञात कीजिए। A car has two wipers which do not overlap.Each wiper has a blade of length 25 cm sweeping through an angle of 115° . Find the total area cleaned at each sweep of the blades.	

<table>
<tr><td></td><td>Solution:

∴ Total area cleaned at each sweep of the blades = 2 × Area cleaned at the sweep of each wiper.
Area cleaned at the sweep of each wiper = Area of the sector of a circle with radius 25 cm at an angle of 115°
$= \theta/360° \times \pi r^2$

$= 115°/360° \times \pi \times 25 \times 25$
$= 23/72 \times 625\pi\ \ cm^2$

There are two identical blade-length wipers.
∴ Total area cleaned at each sweep of the blades = $2 \times 23/72 \times 625\pi$

………………………………………………
$= 2 \times 23/72\ \times 625 \times 22/7$
$= (23 \times 11 \times 625)/(18 \times 7)$
$= 158125/126\ cm^2$
$= 1254.96\ cm^2$</td><td>1/2

1/2

1/2

1/2</td></tr>
<tr><td></td><td>SECTION-C</td><td></td></tr>
<tr><td>33.</td><td>सिद्ध कीजिए कि $3 + 2\sqrt{5}$ एक अपरिमेय संख्या है।
Prove that $3 + 2\sqrt{5}$ is irrartional.

Let's assume that $3 + 2\sqrt{5}$is rational ⇒ $3 + 2\sqrt{5}$ = a/b where a and b are integers that have no common factor other than 1 and b ≠ 0.
----
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 √5 is also a rational number.
But, we know that √5 is irrational.
Therefore, our assumption is wrong that 3 + 2√5 is rational. Hence, 3 + 2√5 is irrational.</td><td>1

1

1</td></tr>
<tr><td>34.(a)</td><td>एक त्रिभुज के कोण x, y और 40° हैं। दो कोणों x और y के बीच का अंतर 30° है। x और y ज्ञात कीजिए।
The angles of a triangle are x,y and 40° . The difference between the two angles x and y is 30°.Find x and y .
Solution:

Since the is 180°
x + y + 40° = 180° (sum of all the angles of a triangle)
x + y = 140°------------(1)</td><td>1</td></tr>
</table>

	.... x-y = 30°--------------(2)	1
	.... Adding (1) and (2), we get, 2x =170° x = 85°	1/2
	-- Substituting x = 85° in (1), we get, 85° + y = 140° y = 55°. x = 85° y = 55°. Therefore, the values of x and y are 85° and 55°, respectively.	1/2
OR 34.(b)	रैखिक समीकरणों के निम्नलिखित युग्म को हल कीजिए: $\frac{3x}{2} - \frac{5y}{3} = -2$ और $\frac{x}{3} + \frac{y}{2} = \frac{13}{6}$ Solve the following pair of linear equations: $\frac{3x}{2} - \frac{5y}{3} = -2$; $\frac{x}{3} + \frac{y}{2} = \frac{13}{6}$ Solution : Given, pair of linear equations are	
	$\frac{3x}{2} - \frac{5y}{3} = -2 \Rightarrow$ 9x- 10y = - 12.........(i)	1/2
	.... $\frac{x}{3} + \frac{y}{2} = \frac{13}{6} \Rightarrow 2x + 3y = 13$...........(ii)	1/2
	.... Now, adding 3×eq. (i) and 10×eq. (ii), we get 27x+20x = -36+130 ⇒ 47 x = 94	1/2
	.... $\Rightarrow x = 94/47 = 2$	1/2
	.... Now, put the value of x in eq. (i), we get 9× 2 - 10 y = -12 ⇒ 10y = 18 +12	1/2
	.... ⇒ 10y = 30⇒ y = 3 Hence, the required values of x and y are 2and 3, respectively.	1/2
35.(a)	यदि बिंदुओं A(3,4) और B(k,6) को मिलाने वाले रेखाखंड का मध्य-बिंदु P(x,y) है और	

	x + y - 10 = 0 है, तो k का मान ज्ञात कीजिए। If the mid-point of the line segment joining the points A (3, 4) and B (k, 6) is P (x, y) and x + y – 10 = 0, find the value of k Solution: The midpoint of the line segment joining the points A(3, 4) and B(k, 6) is P(x, y) [(3 + k)/2, (4 + 6)/2] = (x, y) -- [(3 + k)/2, (10)/2] = (x, y) [(3 + k)/2, 5] = (x, y) So, x = 3 + k/2 and y = 5 -- Put the value of x and y in the given equation of the line, (3 + k)/2 + 5 - 10 = 0 (3 + k)/2 - 5 = 0 (3 + k)/2 = 5 3 + k = 10 k = 10 - 3 k = 7 Therefore, the value of k is 7.	1 1 1
OR 35.(b)	निर्धारित कीजिए कि बिंदु (1,5), (2,3) और (-2,-11) संरेख हैं या नहीं। Determine if the points (1, 5), (2, 3) and (- 2, - 11) are collinear Solution: To find AB, the Distance between the Points A (1, 5) and B (2, 3), let $x_1 = 1, y_1 = 5, x_2 = 2, y_2 = 3$ ∴ AB = $\sqrt{(2 - 1)^2 + (3 - 5)^2} = \sqrt{5}$ (using distance formula) …… To find BC Distance between Points B (2, 3) and C (- 2, - 11), let $x_1 = 2, y_1 = 3, x_2 = - 2, y_2 = - 11$ Therefore, BC = $\sqrt{(-2 - 2)^2 + (-11 - 3)^2}$ (using distance formula) = $\sqrt{(- 4)^2 + (-14)^2}$ = $\sqrt{16 + 196}$ = $\sqrt{212}$ …… To find AC Distance between Points A (1, 5) and C (-2, -11), let $x_1 = 1, y_1 = 5, x_2 = -2, y_2 = -11$	1/2 1/2

Therefore, CA = $\sqrt{(-2-1)^2+(-11-5)^2}$ (using distance formula)

= $\sqrt{(-3)^2+(-16)^2}$ = $\sqrt{9+256}$ 1/2

= $\sqrt{265}$

……

AB = $\sqrt{5}$, BC = $\sqrt{212}$, CA = $\sqrt{265}$

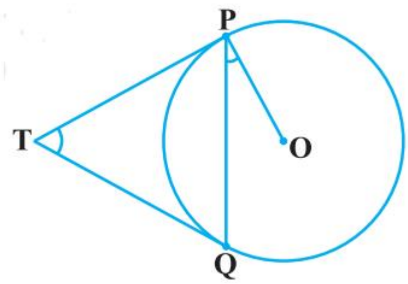
Since AB + AC ≠ BC and BC + AC ≠ AB and AB + BC ≠ AC, therefore, the points (1, 5), (2, 3), and (- 2, - 11) are not collinear. $1\frac{1}{2}$

36. केंद्र O वाले एक वृत्त पर, एक बाहरी बिंदु T से दो स्पर्श रेखाएँ TP और TQ खींची गई हैं। सिद्ध कीजिए कि ∠PTQ = 2 ∠OPQ है।

Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that $\angle\mathrm{PTQ} = 2\,\angle\mathrm{OPQ}$.

Solution :

Let $\angle\mathrm{PTQ} = \theta$ 1/2



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Now , by theorem 10 . 2 , TP = TQ .So, TPQ is an isosceles triangle 1/2

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$$\Rightarrow \angle TPQ = \angle TQP = \frac{1}{2}(180° - \theta) = 90° - \frac{1}{2}\theta$$ 1/2

……

$$\Rightarrow \angle OPQ = \angle OPT - \angle TPQ = 90° - \left(90° - \frac{1}{2}\theta\right) = \frac{1}{2}\theta = \frac{1}{2}\angle\mathrm{PTQ}$$ 1

……

$$\Rightarrow \angle\mathrm{PTQ} = 2\,\angle\mathrm{OPQ}$$ 1/2

37. एक बक्से में 90 डिस्क हैं, जिन पर 1 से 90 तक की संख्याएँ अंकित हैं। यदि बक्से में से यादृच्छया

एक डिस्क निकाली जाती है, तो इसकी प्रायिकता ज्ञात कीजिए कि इस पर अंकित संख्या (i) दो अंकों की संख्या है (ii) एक पूर्ण वर्ग संख्या है (iii) 5 से विभाज्य संख्या है।

A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random from a box, find the probability that it bears (i) a two - digit number (ii) a perfect square number (iii) a number divisible by 5 .

Solution:

Total discs are 90 , numbered 1 to 90.

(i)Favourable two-digit numbered discs are 10,11,.............,89,90

∴ Probability of getting a two-digit numbered disc $= \frac{81}{90} = \frac{9}{10}$ 1/2+1/2

....

(ii)Favourable cases for a perfect square number are 1,4,9,16,25,36,49,64,81

∴ Probability of getting a perfect square numbered disc $= \frac{9}{90} = \frac{1}{10}$ 1/2+1/2

....

(iii)Favourable cases for a number divisible by 5 are 5,10,15,20,.....................,90

∴ Probability of getting a disc numbered divisible by 5 $= \frac{18}{90} = \frac{1}{5}$ 1/2+1/2

SECTION-D

38.(a) समीकरण हल कीजिए : 1 + 4 + 7 + 10 + ... + x = 287

Solve the equation : 1 + 4 + 7 + 10 +...+ x =287

Solution:

The is given by 1

Here, first term, a = 1

Common difference, d = 4 - 1 = 3

----

sum of the first n terms of an AP 1

$S_n = n/2[2a + (n-1)d]$

So, 287 = n/2[2(1) + (n - 1)3]

----

287 = n/2[2 + 3n - 3]

287 = n/2[3n - 1]

574 = n(3n - 1) 1

$3n^2 - n = 574$

$3n^2 - n - 574 = 0$

....

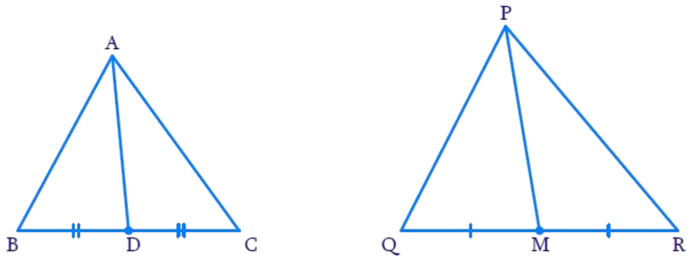
	Using the quadratic formula, n = $\frac{-b \pm \sqrt{b^2-4ac}}{2a}$ Here, a = 3, b = -1 and c = -574 n = $[-(-1)\pm\sqrt{(-1)^2-4(3)(-574)}]/2(3)$ = $1\pm\sqrt{(1+6888)}/6$ = $1\pm\sqrt{6889}/6$ n = $(1\pm83)/6$ Now, n = (1+83)/6 = 84/6 = 14 n = (1-83)/6 = -82/6 = -41/3 Since a negative term is not possible, n = -41/3 is neglected. So, n = 14 --- The nth term of the series in AP is given by $a_n = a + (n - 1)d$ So, x = 1 + (14 - 1)(3) = 1 + 13(3) = 1 + 39 = 40 Therefore, the value of x is 40.	1 1
OR 38.(b)	संख्याओं की उस सूची के पहले 24 पदों का योग ज्ञात कीजिए, जिसका n-वाँ पद इस प्रकार दिया गया है: Find the sum of first 24 terms of the list of numbers whose nth term is given by $a_n = 3 + 2n$ Solution: The nth term is given as an =3+2n. The first term a= a_1 =3+2(1)=3+2=5. --- 24th term = a_{24} =3+2(24)=3+48=51. .... Sum of first n terms of an AP is given by: $S_n = \frac{n}{2}(a_1 + a_n)$ .... ∴ the sum of first 24 terms: $S_{24} = \frac{24}{2}(5+51)$ --- =12×56=672	1 1 1 1 1
39.(a)	एक त्रिभुज ABC की भुजाएँ AB और BC तथा माध्यिका AD, क्रमशः त्रिभुज PQR की भुजाओं PQ और QR तथा माध्यिका PM के समानुपाती हैं (चित्र देखिए)। दर्शाइए कि △ABC ~ △PQR है।	

Sides AB and BC and median AD of a triangle ABC are respectively proportional to sides PQ and QR and median PM of $\triangle PQR$(See Fig.)Show that $\triangle ABC \sim \triangle PQR$.

Sides AB and BC and median AD of a triangle ABC are respectively proportional to sides PQ and QR and median PM of another triangle PQR .

Show that $\triangle \mathrm{ABC} \sim \triangle \mathrm{PQR}$.

Proof:



…. ……………………………………………………………………………………

In ΔABC and ΔPQR

1/2

AB/PQ = BC/QR = AD/PM [given]

………………………………………………………………………………………

AD and PM are median of ΔABC and ΔPQR respectively

⇒ BD/QM = (BC/2)/(QR/2) = BC/QR

1

………………………………………………………………………………………………………

Now, in ΔABD and ΔPQM

AB/PQ = BD/QM = AD/PM

⇒ ΔABD ~ ΔPQM [SSS criterion]

1

………………………………………………………………………………………………

Now, in ΔABC and ΔPQR

AB/PQ = BC/QR [given in the statement]

∠ABC = ∠PQR [∵ ΔABD ~ ΔPQM]

$1\frac{1}{2}$

…………………………………………………………………………………………………

⇒ ΔABC~ ΔPQR [SAS criterion]

1

OR

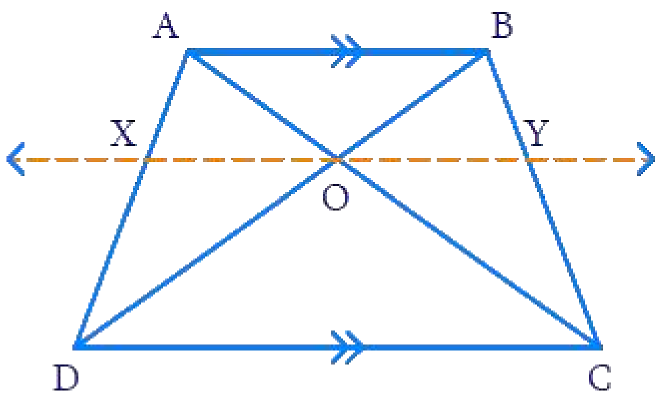
39.(b)

ABCD एक समलंब है जिसमें AB|| DC है, और इसके विकर्ण एक-दूसरे को बिंदु O पर प्रतिच्छेद करते हैं। दर्शाइए कि $\frac{\mathrm{AO}}{\mathrm{BO}} = \frac{\mathrm{CO}}{\mathrm{DO}}$ है।

ABCD is a trapezium in which AB|| DC and its diagonals intersect each other at the point O.Show that $\frac{AO}{BO} = \frac{CO}{DO}$.

Solution:

Consider the trapezium ABCD as shown below.



1

……………………………………………………………………………………………………

In trapezium ABCD,

AB || CD 1

Also, AC and BD intersect at point O.

Construct XY parallel to AB and CD (XY || AB, XY || CD) through point O

……………………………………………………………………………………………………

In ΔABC

OY || AB (construction) 1

According to Basic Proportionality Theorem

BY/CY = AO/OC................ (1)

……………………………………………………………………………………………………

In ΔBCD

OY || CD (construction) 1

According to Basic Proportionality Theorem

BY/CY = OB/OD................ (2)

……………………………………………………………………………………………………

From equations (1) and (2) 1/2

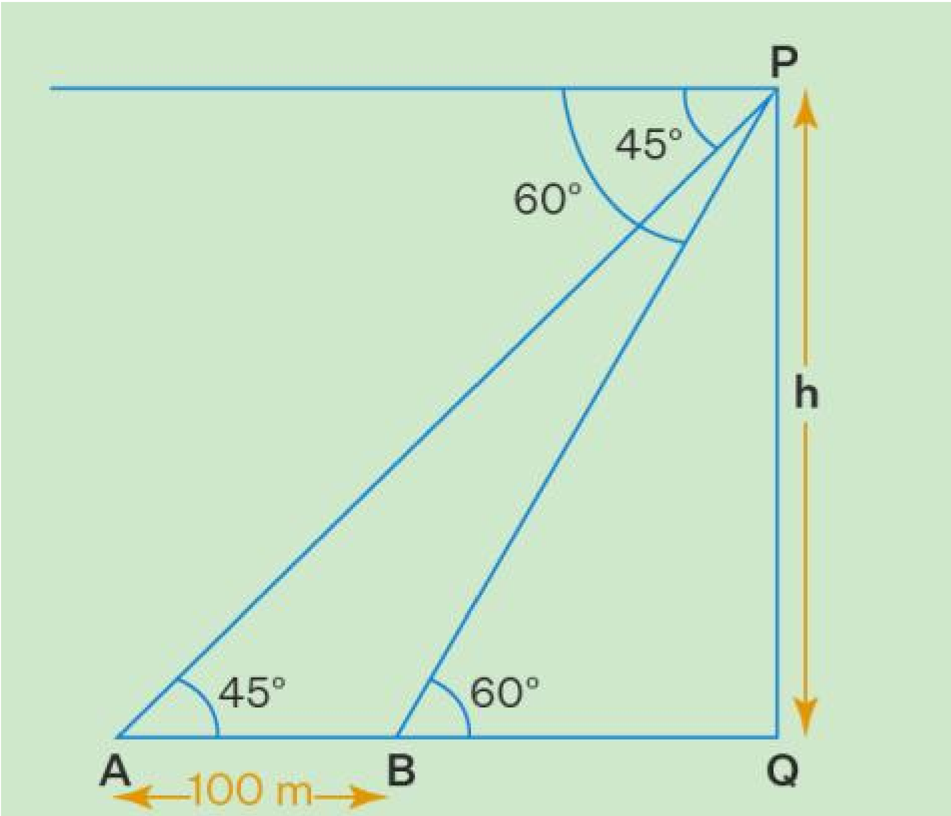
OA/OC = OB/OD

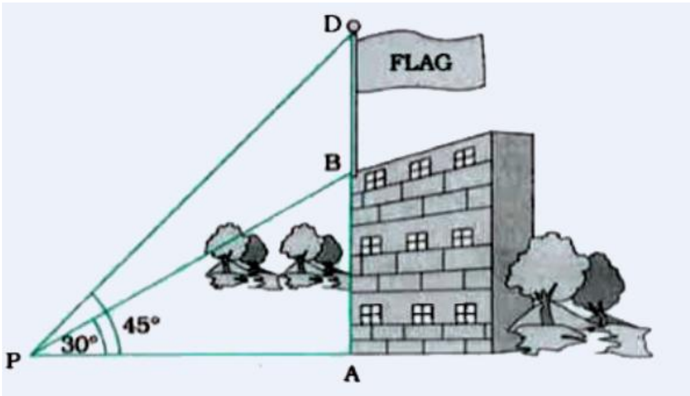
……………………………………………………………………………………………………

1/2

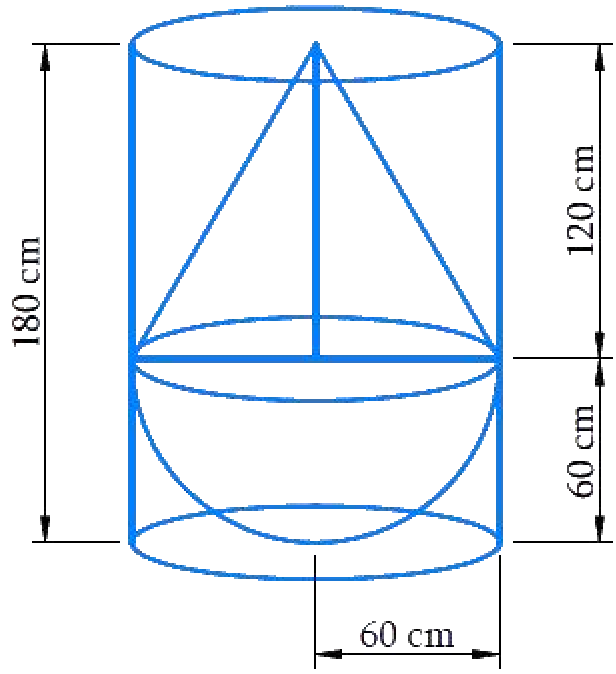
⇒ OA/OB = OC/OD

Hence proved.

40.(a)	एक सीधी सड़क के ठीक ऊपर एक गुब्बारे से, किसी क्षण दो कारों के अवनमन कोण 45° और 60° पाए जाते हैं। यदि कारों के बीच की दूरी 100 m है, तो गुब्बारे की ऊँचाई ज्ञात कीजिए। From a balloon vertically above a straight road, the angles of depression of two cars at an instant are found to be 45° and 60°. If the cars are 100 m apart, find the height of the balloon Solution: Consider the height of the balloon at P be h meters. Consider A and B as the two cars. So AB = 100 m. In ΔPAQ, AQ = PQ = h	1/2
		1/2
	In ΔPBQ, PQ/BQ = tan 60° =$\sqrt{3}$	1
	-- From the figure h/ (h - 100) = $\sqrt{3}$	1/2
	-- By cross multiplication h =$\sqrt{3}$(h - 100)	1/2
	-- So we get h = 100$\sqrt{3}$/ ($\sqrt{3}$ - 1)	1/2

	.... Let us multiply and divide by $(\sqrt{3} + 1)$ $= [100\sqrt{3}/ (\sqrt{3}- 1)]x[(\sqrt{3} + 1)/ (\sqrt{3} + 1)]$ By further calculation $= (100 \times 3 + 100 \sqrt{3})/ (3 - 1)$ $= 100 (3 + \sqrt{3})/ 2$	1
	-- So we get $= 50(3 + \sqrt{3})$ m Therefore, the height of the balloon is $50(3 + \sqrt{3})$ m.	1/2
OR 40.(b)	जमीन पर एक बिंदु P से 10 मीटर ऊंची इमारत के शीर्ष का उन्नयन कोण 30° है। एक **ध्वज** इमारत के ऊपर फहराया गया है और P से ध्वज के ऊपर का उन्नयन कोण 45° है। **ध्वजदंड** की लंबाई और बिंदु P से इमारत की दूरी **ज्ञात कीजिए** । (आप $\sqrt{3} = 1.732$ ले सकते हैं।) From a point P on the ground the angle of elevation of the top of a 10 m tall building is 30°. A flag is hoisted at the top of the building and the angle of elevation of the top of the flagstaff from P is 45°. Find the length of the flagstaff and the distance of the building from the point P . (You may take $\sqrt{3} = 1.732$)  In Figure, AB = height of the building, BD = the flagstaff , ... In right triangle PAB ,$\tan 30° = \frac{AB}{AP}$	1
	.... $\Rightarrow \frac{1}{\sqrt{3}} = \frac{10}{AP}$	1/2
	.... $\Rightarrow AP= 10\sqrt{3}$	1/2
	.... ∴ the distance of the building from P = $10\sqrt{3}$ = 10 × 1.732 = 17.32 m	1/2
	.... In right triangle PAD , $\tan 45° = \frac{AD}{AP} = \frac{10+ DB}{10\sqrt{3}}$	

	--	1
	$\Rightarrow 1 = \frac{10+ DB}{10\sqrt{3}}$	1/2
	--	
	$\Rightarrow$ DB = $10\sqrt{3} + 10$ = $10(\sqrt{3} - 1)$	1/2
	--	
	= 10 (1.732 - 1)= 7.32 m $\Rightarrow$ the length of the flagstaff = 7.32 m	1/2
41.(a)	लकड़ी का एक खिलौना रॉकेट, जैसा कि चित्र में दिखाया गया है, एक बेलन के ऊपर लगे शंकु के आकार का है। पूरे रॉकेट की ऊँचाई 26 cm है, जबकि शंकु वाले भाग की ऊँचाई 6 cm है। शंकु वाले भाग के आधार का व्यास 5 cm है, जबकि बेलनाकार भाग के आधार का व्यास 3 cm है। यदि शंकु वाले भाग को नारंगी रंग से और बेलनाकार भाग को पीले रंग से रंगा जाना है, तो इन दोनों रंगों से रंगे जाने वाले रॉकेट के भाग का क्षेत्रफल ज्ञात कीजिए। (π = 3.14 लीजिए) A wooden toy rocket is in the shape of a cone mounted on a cylinder , as shown in Figure.The height of the entire rocket is 26 cm , while the height of the conical part is 6 cm . The base of the conical portion has a diameter of 5 cm , while the base diameter of the cylindrical portion is 3 cm . If the conical portion is to be painted orange and the cylindrical portion yellow , find the area of the rocket painted with each of these colours . (Take $\pi = 3.14$)	
	Solution: Radius of base, r = 5 cm / 2 = 2.5 cm Height of cone, h´ = 6 cm Height of cylinder, h = 26 cm - 6 cm = 20 cm	1/2
	.... The slant height l of the cone is given by: l=$\sqrt{r^2 + h^2}$ =$\sqrt{(2.5)^2 + (6)^2}$ =$\sqrt{6.25 + 36}$ =$\sqrt{42.25}$ =6.5 cm	1
	.... Orange painted area = CSA of Cone + Base area of cone - Base area of cylinder $= \pi r\, l + \pi\, r^2 - \pi(r')^2$	1
	.... = $\pi[(2.5 \times 6.5) + (2.5)^2 - (1.5)^2]$cm^2	
	....	1/2
	= $\pi[20.25]$ = 3.14×20.25 = 63.585 cm^2	1/2
	....	

	Yellow painted area = CSA of cylinder + Base area of cylinder $= 2\ \pi r'\ h' + \pi(r')^2$ $= \pi r'(2\ h' + r')$ …… $= 3.14\times 1.5(\ 2\times 20 + 1.5\ )$ = 195.465 cm^2	1 1/2
OR 41.(b)	एक ठोस, जिसमें 120 cm ऊँचाई और 60 cm त्रिज्या वाला एक लंब वृत्तीय शंकु है, जो 60 cm त्रिज्या वाले एक अर्धगोले पर टिका हुआ है, उसे पानी से भरे एक लंब वृत्तीय बेलन में सीधा रखा जाता है, ताकि वह बेलन के तल को स्पर्श करे। बेलन में बचे हुए पानी का आयतन ज्ञात कीजिए, यदि बेलन की त्रिज्या 60 cm और उसकी ऊँचाई 180 cm है। A solid consisting of a right circular cone of height 120 cm and radius 60 cm standing on a hemisphere of radius 60 cm is placed upright in a right circular cylinder full of water such that it touches the bottom. Find the volume of water left in the cylinder, if the radius of the cylinder is 60 cm and its height is 180 cm Solution: A figure is drawn below in accordance with the given information to visualize effectively.  Radius of hemispherical part = Radius of conical part = Radius of cylinder = r = 60 cm Height of the conical part of solid = h = 120 cm Height of the cylinder, = H = 180 cm -- Volume of the water left in the cylinder = volume of the cylinder - volume of the hemisphere - volume of the cone	 1/2 1/2

	$= \pi r^2 H - 2/3\pi r^3 - 1/3\pi r^2 h$	1
	$= (1/3)\pi r^2 (3H - h - 2r)$	1/2
	= 1/3 × 22/7 × 60 cm × 60 cm × (3 × 180 cm - 120 cm - 2 × 60 cm)	1
	= 1/3 × 22/7 × 60 cm × 60 cm × 300 cm = 7920000/7 cm^3	1
	= 1131428.57/1000000 m^3 = 1.13142657 m^3 Thus, the volume of water left in the cylinder is 1.131 m^3.	1/2

42.(a) नीचे दिया गया बंटन एक इलाके के बच्चों के दैनिक जेब खर्च को दर्शाता है। जेब खर्च का माध्य ₹ 18 है। लुप्त बारंबारता f ज्ञात कीजिए।

दैनिक जेब खर्च (₹ में)	11-13	13-15	15-17	17-19	19-21	21-23	23-25
बच्चों की संख्या	7	6	9	13	f	5	4

The following distribution shows the daily pocket allowance of children of a locality.The mean pocket allowance is ₹ 18 . Find the missing frequency f .

Daily pocket allowance(in ₹)	11-13	13-15	15-17	17-19	19-21	21-23	23-25
Number of children	7	6	9	13	f	5	4

The following distribution shows the daily pocket allowance of children of a locality. The mean pocket allowance is Rs18. Find the missing frequency f

Solution:

Daily pocket allowance(in ₹)(C.I.)	Number of chidren(f_i)	Class Mark (x_i)	$u_i = \frac{x_i - a}{h}$	$f_i u_i$
11-13	7	12	-3	-21
13-15	6	14	-2	-12
15-17	9	16	-1	-9
17-19	13	18 = a	0	0
19-21	f	20	1	f
21-23	5	22	2	10
23-25	4	24	3	12
	$\sum f_i$= 44+ f			$\sum f_i u_i = -20 + f$

	[1/2] [1/2] [1/2] [1]	$2\frac{1}{2}$
	Here a = 18, h = 2	1/2
	Using the step- deviation method, Mean = a + $\frac{\sum f_i u_i}{\sum f_i} \times 2$	1
	18= $18 + \frac{-20+f}{44+f} \times 20$	1/2
	⇒ -20+f = 0 ⇒ f = 20	1/2
OR 42.(b)	निम्नलिखित आँकड़ों , 225 बिजली उपकरणों के प्रेक्षित जीवनकाल (घंटों में) के बारे में जानकारी देते है:	

जीवनकाल (घंटों में)	0-20	20-40	40-60	60-80	80-100	100-120
बारंबारता	10	35	52	61	38	29

उपकरणों का बहुलक जीवनकाल ज्ञात कीजिए।

The following date gives the information on the observed lifetimes (in hours) of 225 electrical components:

Lifetimes (in hours)	0-20	20-40	40-60	60-80	80-100	100-120
Frequency	10	35	52	61	38	29

Determine the modal lifetimes of the components.

Solution:

C.I.	Frequency
0-20	10
20-40	35
40-60	52
60-80	**61**
80-100	38
100-120	29

$\rightarrow Modal\ class$

Maximum frequency (f_1)= 61 1
∴ Modal class is 60-80

………

Here , l = 60 , f_1= 61, f_0= 52. f_2=38, h= 20 1

………

∴ Mode = l + $\left(\frac{f_1-f_0}{2f_1-f_0-f_2}\right)\times h$ 1

= 60 + $\left(\frac{61-52}{122-52-38}\right)\times 20$ 1

= 60+5.625 1

= 65.625 hours.