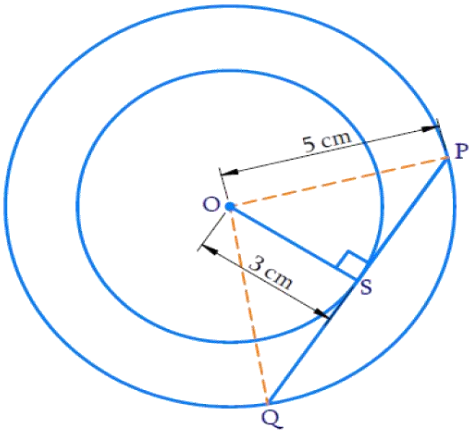
	MARKING SCHEME, H.O.S.,SAMPLE PAPER 1, 10TH MATHS(BASIC) , (2026-27) (ENGLISH MEDIUM)	
Q. no.	**Expected solutions**	**marks**
	Section-A	
1.	(c) 3, 420	1
2.	(b) -10	1
3.	(d) $\frac{2}{3}, \frac{-1}{7}$	1
4.	(d) no solution	1
5.	(a) 75	1
6.	(b) 32	1
7.	(c) $\frac{b^2}{a}$	1
8.	(d) 2	1
9.	(a) 629	1
10.	(d) 3 units	1
11.	(d) 10 cm	1
12.	(a) 50°	1
13.	(a) △PQR ~ △CAB	1
14.	Point of contact (स्पर्श बिंदू)	1
15.	50°	1
16.	$\frac{3}{4}$	1
17.	(b) $\sqrt{2}$	1
18.	45°	1
19.	(c) πr^2	1
20.	4π cm or 12.56 cm	1
21.	(b) $3^{2/3}$	1
22.	mean (माध्य)	1
23.	$\frac{2}{7}$	1
24.	0	
	Section-B	
25.	व्याख्या कीजिए कि 7×11×13+13 और 7×6×5×4×3×2×1+5 भाज्य संख्याएँ क्यों हैं। Explain why $7 \times 11 \times 13 + 13$ and $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 + 5$ are composite numbers.	

	Solution: $7 \times 11 \times 13 + 13 = 13 (7 \times 11 + 1)$ $= 13(77 + 1)$ $= 13 \times 78$ $= 13 \times 13 \times 6 \times 1$ $= 13 \times 13 \times 2 \times 3 \times 1$ -- The given number has 2, 3, 13, and 1 as its factors. Therefore, it is a composite number. -- Now, $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 + 5 = 5 \times (7 \times 6 \times 4 \times 3 \times 2 \times 1 + 1)$ $= 5 \times (1008 + 1)$ $= 5 \times 1009 \times 1$ -- 1009 cannot be factorized further. Therefore, the given expression has 5,1009 and 1 as its factors. Hence, it is a composite number.	1/2 1/2 1/2 1/2
26.	द्विघात बहुपद $6x^2 - 3 - 7x$ के शून्यक ज्ञात कीजिए और शून्यकों तथा गुणांकों के बीच के संबंध की सत्यता की जाँच कीजिए। Find the zeroes of the quadratic polynomial $6x^2 - 3 - 7x$ and verify the relationship between the zeroes and the coefficients. Solution: $6x^2 - 3 - 7x$ $6x^2 - 7x - 3 = 0$ $6x^2 - 9x + 2x - 3 = 0$ $3x(2x - 3) + 1(2x - 3) = 0$ $(2x - 3)(3x + 1) = 0$ $x = 3/2$, $x = - 1/3$ are the zeroes of the polynomial. Thus, $\alpha = 3/2$ and $\beta = -1/3$ -- Sum of zeroes = $3/2 + (-1/3) = 7/6 = - (-7) / 6$ = - coefficient of x / coefficient of x^2 -- - Now, Product of zeroes $=3/2 \times (- 1/3) = -1/2= (- 3) / 6 =$ =constant term / coefficient of x^2 Hence verified.	1 1/2 1/2

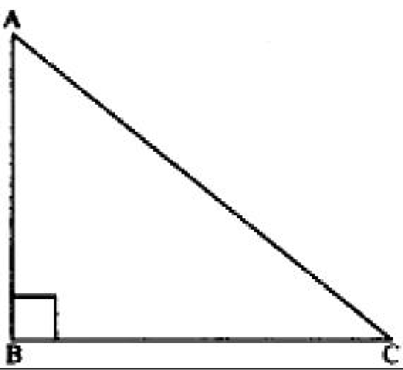
27.(a)	एक ऐसी प्राकृत संख्या ज्ञात कीजिए, जिसके वर्ग में से 84 घटाने पर प्राप्त मान, उस संख्या से 8 अधिक मान के तीन गुने के बराबर हो। Find a natural number whose square diminised by 84 is equal to thrice of 8 more than the given number. Solution: Let the natural number be x. So, $x^2 - 84 = 3(x + 8)$ -- $x^2 - 84 = 3x + 24$ $x^2 - 3x - 24 - 84 = 0$ $x^2 - 3x - 108 = 0$ -- On factoring, $x^2 - 12x + 9x - 108 = 0$ $x(x - 12) + 9(x - 12) = 0$ $(x + 9)(x - 12) = 0$ -- Now, $x + 9 = 0$ $x = -9$ Also, $x - 12 = 0$ $x = 12$. Since a natural number cannot be negative, $x = -9$ is neglected. Therefore, the natural number is $x = 12$.	1/2 1/2 1/2 1/2
OR 27.(b)	द्विघात समीकरण $2x^2 - x + \frac{1}{8} = 0$ के मूल ज्ञात कीजिए। Find the roots of the quadratic equation $2x^2 - x + \frac{1}{8} = 0$. Solution: $2x^2 - x + \frac{1}{8}$ Multiplying both sides of the equation by 8: $2(8)x^2 - 8(x) + (8)(1/8) = (0)8$ $16x^2 - 8x + 1 = 0$ -- $16x^2 - 4x - 4x + 1 = 0$ -- $4x(4x - 1) - 1(4x - 1) = 0$ $(4x - 1)(4x - 1) = 0$	1/2 1/2 1/2

	--- $4x - 1 = 0$ or $4x - 1 = 0$ $x = 1/4$ and $x = 1/4$ Roots are: 1/4, 1/4	1/2
28.	x और y के बीच एक ऐसा संबंध ज्ञात कीजिए, जिससे बिंदु (x,y) बिंदुओं (7,1) और (3,5) से समदूरस्थ हो। Find a relation between x and y such that the point (x,y) is equidistant from the points (7,1) and (3,5). Solution: Let point P (x, y) be equidistant from points A (7,1) and B (3,5). Since they are equidistant, PA = PB Hence by applying the distance formula for PA = PB, we get $\sqrt{(x-7)^2+(y-1)^2} = \sqrt{(x-3)^2+(y-5)^2}$	1/2
	--- By squaring, we get $PA^2 = PB^2$ $(x-7)^2+(y-1)^2 = (x-3)^2+(y-5)^2$	1/2
	--- $x^2 + 49 - 14x + y^2 + 1 - 2y = x^2 + 9 - 6x + y^2 + 25 - 10y$	1/2
	--- [On further simplifying] $x - y = 2$ Thus, the relation between x and y is given by $x - y - 2 = 0$	1/2
29.	दो संकेंद्रित वृत्तों की त्रिज्याएँ 5 cm और 3 cm हैं। बड़े वृत्त की उस जीवा की लंबाई ज्ञात कीजिए जो छोटे वृत्त को स्पर्श करती है। Two concentric circles are of radii 5 cm and 3 cm . Find the length of the chord of the larger circle which touches the smaller circle. Solution:	

<table>
<tr>
<td></td>
<td>


....

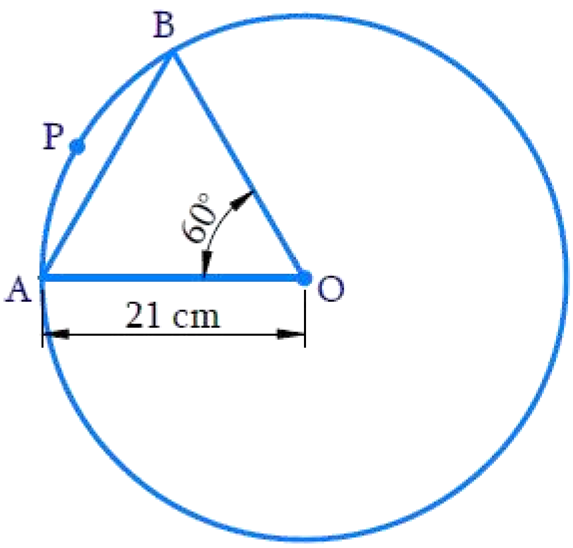
PQ is a chord of a larger circle and a tangent of a smaller circle.
Tangent PQ is perpendicular to the radius at the point of contact S.
Therefore, $\angle OSP = 90°$

In ΔOSP (Right-angled triangle)
By the Pythagoras Theorem,
$OP^2 = OS^2 + SP^2$
$5^2 = 3^2 + SP^2$
$SP^2 = 25 - 9$
$SP^2 = 16$
$SP = \pm 4$
SP is the length of the tangent and cannot be negative
Hence, SP = 4 cm.
....
QS = SP (Perpendicular from center bisects the chord considering QP to be the larger circle's chord)
Therefore, QS = SP = 4cm
Length of the chord PQ = QS + SP = 4 + 4
PQ = 8 cm
Therefore, the length of the chord of the larger circle is 8 cm.
</td>
<td>1/2
1/2
1/2
1/2</td>
</tr>
<tr>
<td>30.</td>
<td>
एक समकोण त्रिभुज ABC में, जिसमें कोण B समकोण है, यदि tan A = 1 है, तो सत्यापित कीजिए कि 2 sin A cos A = 1 है।


In a right triangle ABC , right - angled at B, if tan A = 1 , then verify
that 2 sin A cos A = 1 .
Solution
</td>
<td></td>
</tr>
</table>

	In $\triangle ABC$, $\tan A = \frac{BC}{AB} = 1$ $\Rightarrow$BC = AB Let AB = BC = k ,where k is a positive number …………………………………………………………… Now AC = $\sqrt{AB^2 + BC^2}$ = $\sqrt{k^2 + k^2}$ = k $\sqrt{2}$ …… Therefore , 2sin A cosA = 2 $\left(\frac{BC}{AC}\right)\left(\frac{AB}{AC}\right)$= ……… = 2 $\left(\frac{1}{\sqrt{2}}\right)\left(\frac{1}{\sqrt{2}}\right)$= 1 Hence verified.	1/2 1/2 1/2 1/2
31.(a)	यदि sinθ+cosθ=$\sqrt{3}$ है, तो सिद्ध कीजिए कि tanθ+ cotθ=1 है। If $\sin\theta + \cos\theta = \sqrt{3}$, then prove that $\tan\theta + \cot\theta = 1$ Proof: $\sin\theta+\cos\theta= \sqrt{3}$ $\Rightarrow(\sin\theta+\cos\theta)^2=3$ $\Rightarrow\sin^2\theta+\cos^2\theta+2\sin\theta\cos\theta=3$ ………………………………………………………………………………… $\Rightarrow1+2\sin\theta\cos\theta=3$ $\Rightarrow2\sin\theta\cos\theta=2$ $\Rightarrow\sin\theta\cos\theta=1$ ……………………………………………………………………………… $\Rightarrow\sin\theta\cos\theta=\sin^2\theta+\cos^2\theta$ $\Rightarrow1= \frac{\sin^2\theta+\cos^2\theta}{\sin\theta\cos\theta}$	1/2 1/2 1/2

	-- $\Rightarrow \tan\theta + \cot\theta = 1$	1/2
OR31. (b)	सिद्ध कीजिए कि $\sqrt{\frac{1+\sin A}{1-\sin A}}$ = sec A + tan A Prove that $\sqrt{\frac{1+\sin A}{1-\sin A}} = secA + tan A$ Proof: LHS = $\sqrt{\frac{1+\text{sinA}}{1-\text{sinA}}} =$ $= \sqrt{\frac{1+sinA}{1-sinA} \times \frac{1+sinA}{1+sinA}}$ .... $= \frac{1+\text{sinA}}{\sqrt{1-\sin^2 A}}$ .... $= \frac{1+\text{sinA}}{\sqrt{\cos^2 A}}$ .... $= \frac{1+\text{sinA}}{\text{cosA}}$ = secA +tanA = RHS	1/2 1/2 1/2 1/2
32.	21 cm त्रिज्या वाले एक वृत्त में, एक चाप केंद्र पर 60° का कोण बनाती है। ज्ञात कीजिए: (i) चाप की लंबाई (ii) चाप द्वारा बने त्रिज्यखंड का क्षेत्रफल। In a circle of radius 21 cm , an arc subtends an angle of 60° at the centre . Find: (i)the length of the arc (ii) area of the sector formed by the arc. Solution:	



Here, r = 21 cm, θ = 60°

(i) Length of the Arc, APB = θ/360° × 2πr 1/2

= 60°/360° × 2 × 22/7 × 21 cm

= 22 cm 1/2

(ii) Area of the sector, AOBP = θ/360° x πr^2 1/2

= 60°/360° × 22/7 × 21 × 21 cm^2 1/2

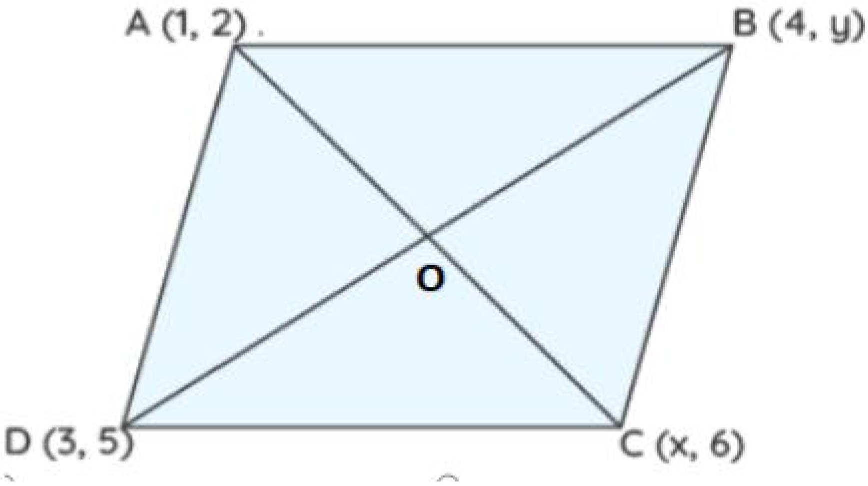
= 231 cm^2

	SECTION-C	
33.	सिद्ध कीजिए कि $\sqrt{3}$ एक अपरिमेय संख्या है। Prove that $\sqrt{3}$ is irrational. Proof: Let, if possible, $\sqrt{3}$ be a rational no. --- $\therefore \sqrt{3} = \frac{p}{q}$, where p and q are co-prime integers and $q \neq 0$. ---	 1/2 1/2

	$\Rightarrow 3 = \frac{p^2}{q^2}$ $\Rightarrow p^2 = 3q^2$ ....(i) $\Rightarrow$3 divides p^2 $\Rightarrow$3divides p also. -- Let p = 3m,...............................(ii) where m is any integer. $\Rightarrow p^2 = 9m^2$...............................(iii) -- From (ii) and (iii) $3q^2 = 9m^2$ $\Rightarrow q^2 = 3m^2$ $\Rightarrow$ 3 divides q^2 $\Rightarrow$3 divides q also. $\Rightarrow$ q = 3n....................................(iv) --- From (i) and (iv) , p and q have 3 as common factor. ∴ p and q are not co-prime. Hence our supposition is wrong. ∴ $\sqrt{3}$ is an irrational number.	1/2 1/2 1/2 1/2
34.(a)	दो संख्याएँ 5 : 6 के अनुपात में हैं। यदि प्रत्येक संख्या में से 8 घटा दिया जाए, तो अनुपात 4 : 5 हो जाता है। संख्याएँ ज्ञात कीजिए। Two numbers are in ratio 5 : 6 . If 8 is subtracted from each of the numbers , the ratio becomes 4 : 5 . Find the numbers. Solution: Let the numbers be 5x and 6x. -- Given that, if 8 is subtracted from each of the numbers, the ratio becomes 4 : 5. (5x - 8) : (6x - 8) = 4 : 5 -- (5x - 8) / (6x - 8) = 4 / 5 5(5x - 8) = 4(6x - 8)	 1/2 1/2

	25x - 40 = 24x - 32 25x - 24x = 40 - 32 x = 8 --- the first number = 5x = 5 × (8) = 40 the second number = 6x = 6 × (8) = 48 Thus, the numbers are 40 and 48 which are in the ratio 5 : 6.	1 1
OR 34.(b)	रैखिक समीकरण - युग्म $\frac{x}{2}+\frac{2y}{3}=-1$और $x-\frac{y}{3}=3$को हल कीजिए: Solve the following pair of linear equations $\frac{x}{2}+\frac{2y}{3}=-1$ and $x-\frac{y}{3}=3$ Solution: x/2 + 2y/3 = - 1 ....(1) x - y/3 = 3 ....(2) Multiplying equation (1) by 6 and equation (2) by 3 [x/2 + 2y/3 = -1] × 6 3x + 4y = - 6 ...(3) …… [x - y/3 = 3] × 3 3x - y = 9 ....(4) …… By subtracting equation (4) from equation (3) (3x + 4y) - (3x - y) = - 6 - 9 3x + 4y - 3x + y = - 15 5y = - 15 y = - 15/5 y = - 3 …… Substitute y = - 3 in equation (2) x - (-3)/3 = 3 x + 1 = 3 x = 3 - 1 x = 2	 1/2 1/2 1 1
35.(a)	बिंदुओं P(-1,3) और Q(2,5) को मिलाने वाले रेखाखंड पर स्थित बिंदु R के निर्देशांक ज्ञात कीजिए, ताकि PR = $\frac{3}{5}$ PQ हो। Find the coordinates of the point R on the line segment joining the points P(-1,3)and Q(2,5) such that PR = $\frac{3}{5}$ PQ . Solution: Given, that PR = 3/5 PQ.	

	PR/PQ = 3/5 On rearranging, PQ/PR = 5/3 We know that PQ = PR + QR So, (PR + QR) / PR = 5/3 PR/PR + QR/PR = 5/3 1 + QR/PR = 5/3 QR/PR = 5/3 - 1 QR/PR = 5-3/3 QR/PR = 2/3 Again rearranging, PR/QR = 3/2 PR : QR = 3 : 2 Therefore, the point R divides the line segment PQ in the ratio 3:2	1
	The coordinates of the point P which divides the line segment joining the points A (x_1 , y_1) and B (x_2 , y_2) internally in the ratio $m_1 : m_2$ are $[(m_1x_2 + m_2x_1)/(m_1 + m_2) , (m_1y_2 + m_2y_1)/(m_1 + m_2)]$ Here, $m_1 : m_2 = 3 : 2$, $(x_1 , y_1) = (-1, 3)$ and $(x_2 , y_2) = (2, 5)$	1
	Let the coordinate of R = (x, y) (x, y) = [(3(2) + 2(-1))/(3 + 2), (3(5) + 2(3))/(3 + 2)] (x, y) = [(6 - 2)/5, (15 + 6)/5]	1/2
	(x, y) = [4/5, 21/5] Therefore, the coordinates of point R are (4/5, 21/5).	1/2
OR 35.(b)	यदि (1,2), (4,y), (x,6) और (3,5) एक समांतर चतुर्भुज के क्रमानुसार लिए गए शीर्ष हैं, तो x और y के मान ज्ञात कीजिए। If (1,2),(4,y),(x,6)and (3,5)are the vertices of a parallelogram taken in order , find the values x and y. Solution:	



1/2

Let A (1, 2), B (4, y), C(x, 6), and D (3, 5) be the vertices of a parallelogram ABCD. Since the diagonals of a parallelogram bisect each other. The intersection point O of diagonal AC and BD also divides these diagonals in the ratio 1:1. Therefore, O is the mid-point of AC and BD.

According to the mid point formula,

$O(x, y) = [(x_1 + x_2) / 2, (y_1 + y_2) / 2]$ 1/2

If O is the mid-point of AC, then the coordinates of O are

$[(1 + x) / 2, (2 + 6) / 2]$

$\Rightarrow [(x + 1) / 2, 4]$ ----- (1)

…………………………………………………………………………………………

If O is the mid-point of BD, then the coordinates of O are

$[(4 + 3) / 2, (5 + y) / 2]$

$\Rightarrow [7/2, (5 + y) / 2]$ ------ (2) 1/2

…………………………………………………………………………………………

Since both the coordinates are of the same point O, so, $(x + 1) / 2 = 7 / 2$ and $4 = (5 + y) / 2$ [From equation(1) and (2)] 1/2

…………………………………………………………………………………………

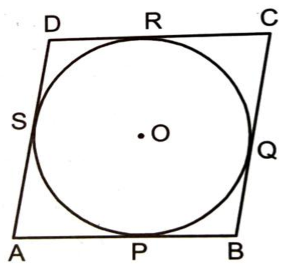
$\Rightarrow x + 1 = 7$ and $5 + y = 8$ (By cross multiplying & transposing)

$\Rightarrow x = 6$ and $y = 3$ 1

36. एक चतुर्भुज ABCD एक वृत्त के परिगत बनाया गया है (चित्र देखें)।

सिद्ध कीजिए कि AB + CD = AD + BC

A quadrilateral ABCD is drawn to circumscribe a circle (see fig.). Prove that AB +CD = AD +BC

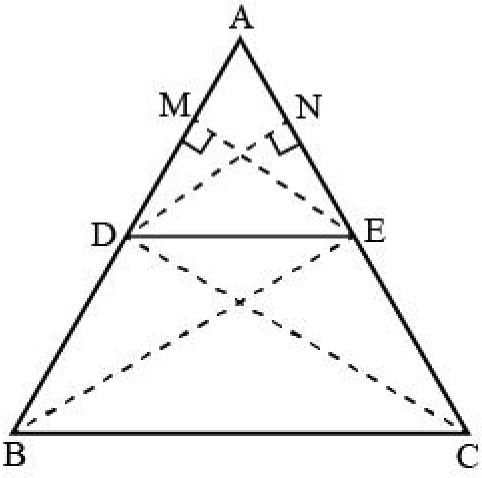


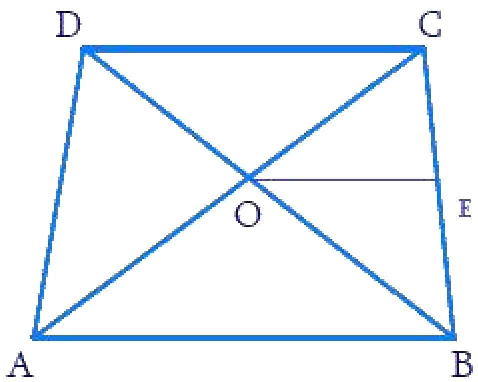
Proof:

	We have AS = AP; BP =BQ; CQ = CR and DR= DS(Lengths of tangents from external point are equal) …………………………………………………………………………………. Therefore , AB + CD = (AP + PB) + (CR + RD) ……… =AS + BQ + CQ + DS ……. =(AS + DS) +(BQ + CQ) =AD + BC . (Hence proved)	1 1/2 1/2 1
37.	52 पत्तों की अच्छी तरह से फेंटी गई एक गड्डी में से एक पत्ता निकाला जाता है। निम्नलिखित के प्राप्त होने की प्रायिकता ज्ञात कीजिए: (i) लाल रंग का बादशाह (ii) एक फेस कार्ड (iii) एक हुकुम का पत्ता One card is drawn from a well-shuffled deck of 52 cards.Find the probability of getting (i)a king of red colour (ii) a face card (iii) a spade Solution: (i) Probability of getting a king of red colour = Number of red colour king/Total number of outcomes We will have 2 red kings (Heart and Diamond) = 2/52 = 1/26 --- (ii) Probability of getting a face card = Number of face cards/Total number of outcomes 12/52 = 3/13 -- (iii) Probability of getting a spade card = Number of spade cards/Total number of outcomes = 13/52 = 1/4	 1 1 1
	SECTION-D	
38.(a)	एक AP के पहले तीन पदों का योग 33 है। यदि पहले और तीसरे पद का गुणनफल, दूसरे पद से 29 अधिक है, तो वह AP ज्ञात कीजिए। The sum of the first three terms of an AP is 33 . If the product of the first and the third term exceeds the second term by 29, find the AP.	

	Solution: Let the three terms in AP be a - d, a, a + d. -- $a - d + a + a + d = 33$ $a = 11.$ -- $(a - d)(a + d) = a + 29.$ -- Since, $a^2 - b^2 = (a + b)(a - b)$, we have, $a^2 - d^2 = a + 29$ $121 - d^2 = 11 + 29$ -- $d^2 = 81$ $d = \pm 9$ -- Hence, there will be two APs They are 2, 11, 20, ... and 20, 11, 2, ... Therefore, the two APs are 2, 11, 20, ... and 20, 11, 2, ...	1/2 1 1 1 1/2 1
OR 38.(b)	एक AP का पहला और अंतिम पद क्रमशः 17 और 350 हैं। यदि इसका सार्व अंतर 9 है, तो इसमें कितने पद हैं और उनका योग क्या है? The first and the last terms of an AP are 17 and 350 respectively . If the common difference is 9 , how many terms are there and what is their sum? Solution: Given, First term, $a = 17$ Last term, $l = 350$	1/2

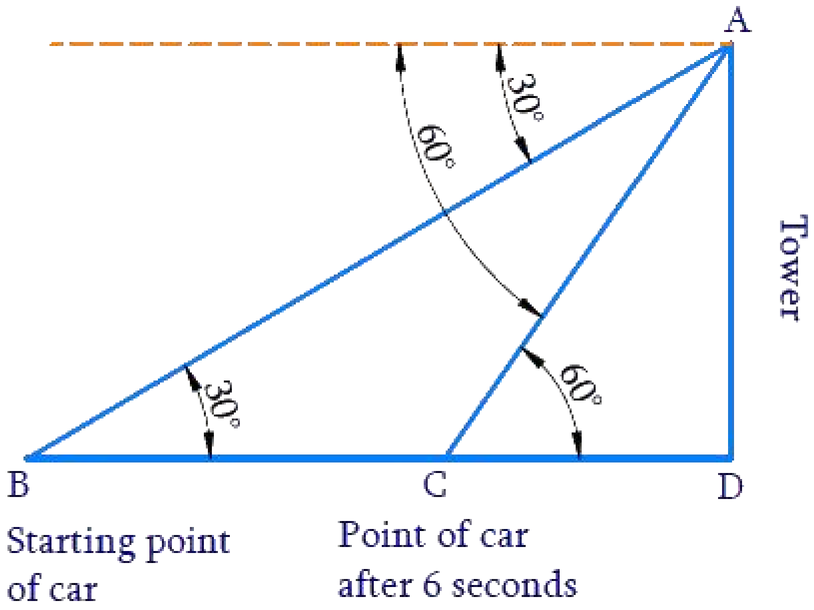
	Common difference, d = 9 --- We know that nth term of an AP, $l = a_n = a + (n - 1)d$ --- $350 = 17 + (n - 1) 9$ --- $333 = (n - 1) 9$ $(n - 1) = 37$ $n = 38$ --- Sum of n terms of AP, $S_n = n/2 [a + l]$ --- $S_{38} = 38/2 (17 + 350)$ --- $= 19 \times 367$ $= 6973$ --- Thus, this A.P. contains 38 terms and the sum of the terms of this A.P. is 6973.	1 1/2 1 1 1/2 1/2
39.(a)	यदि किसी त्रिभुज की एक भुजा के समांतर एक रेखा खींची जाए जो अन्य दो भुजाओं को भिन्न-भिन्न बिंदुओं पर प्रतिच्छेद करे, तो सिद्ध कीजिए कि अन्य दो भुजाएँ समान अनुपात में विभाजित होती हैं। If a line is drawn parallel to one side of a triangle to intersect the other two sides	

	in distinct points then prove that the other two sides are divided in the same ratio.	
	Given: In ΔABC, DE‖BC ……………………………………………………  …………………………………………………………………………………………	1/2
	To prove: $\frac{\mathbf{AD}}{\mathbf{DB}} = \frac{\mathbf{AE}}{\mathbf{EC}}$ --	1/2
	Construction : Draw EM⊥AB and DN⊥AC. Join B to E and C to D ---	1/2
	Proof: In ΔADE and ΔBDE	
	$\frac{\textbf{Area of}\Delta\textbf{ADE}}{\textbf{Area of }\Delta\textbf{BDE}} = \frac{\frac{1}{2}\times\textbf{AD}\times\textbf{EM}}{\frac{1}{2}\times\textbf{DB}\times\textbf{EM}} = \frac{\textbf{AD}}{\textbf{DB}}$--------------(i) --	1
	In ΔADE and ΔCDE	

	$\dfrac{\textbf{Area of}\Delta\textbf{ADE}}{\textbf{Area of }\Delta\textbf{CDE}}=\dfrac{\frac{1}{2}\times \textbf{AE}\times \textbf{DN}}{\frac{1}{2}\times \textbf{EC}\times \textbf{DN}} = \dfrac{\textbf{AE}}{\textbf{EC}}$ --------------(ii)	1
	--	
	Since, DE‖BC [Given]	
	∴ ar(ΔBDE) = ar(ΔCDE) ------------------------------------- (iii)	1/2
	[Δs on the same base and between the same parallel sides are equal in area]	
	--	
	From eq. (i), (ii) and (iii)	
	: $\dfrac{\textbf{AD}}{\textbf{DB}} = \dfrac{\textbf{AE}}{\textbf{EC}}$ Hence proved.	1
OR 39.(b)	एक चतुर्भुज ABCD के विकर्ण एक-दूसरे को बिंदु O पर इस प्रकार प्रतिच्छेद करते हैं कि $\frac{\mathrm{AO}}{\mathrm{BO}} = \frac{\mathrm{CO}}{\mathrm{DO}}$ है। दर्शाइए कि ABCD एक समलंब है। The diagonals of a quadrilateral ABCD intersect each other at the point O such that $\frac{\mathrm{AO}}{\mathrm{BO}} = \frac{\mathrm{CO}}{\mathrm{DO}}$ .Show that ABCD is a trapezium. Proof:  	1/2

	In quadrilateral ABCD as shown above, Diagonals AC, BD intersect at 'O' Draw OE || AB ………………………………………………………………………………………	1/2
	In ΔABC, OE || AB ⇒ OA/OC = BE/CE (Basic Proportionality Theorem) ---------- (1) ………………………………………………………………………………………	1
	But, OA/OB = OC/OD (given) ⇒ OA/OC = OB/OD ----------- (2) ………………………………………………………………………………………	1/2
	From equations (1) and (2) OB/OD = BE/CE ………………………………………………………………………………………	1/2
	In ΔBCD, OB/OD = BE/CE OE || CD (Converse of Basic proportionality theorem) ………………………………………………………………………………………	1
	We know that, OE || AB and OE || CD Thus, AB || CD ………………………………………………………………………………………	1/2
	Hence we can say ABCD is a trapezium as one pair of opposite sides AB and CD are parallel.	1/2
40.(a)	एक सीधी सड़क एक टावर के आधार तक जाती है। टावर के शिखर पर खड़ा एक व्यक्ति एक कार को 30° के अवनमन कोण पर देखता है, जो एक समान चाल से टावर के आधार की ओर आ रही है। छह सेकंड बाद, कार का अवनमन कोण 60° पाया जाता है। इस बिंदु से टावर के आधार तक पहुँचने में कार द्वारा लिया गया समय ज्ञात कीजिए। A straight highway leads to the foot of a tower. A man standing at the top of the tower observes a car at an angle of depression of 30° , which is approaching the foot of the tower with a uniform speed.Six seconds later, the angle of depression of the car is found to be 60° . Find the time taken by the car to reach the foot of	

	the tower from this point. Solution:	



Let the height of the tower be AD and the starting point of the car be at point B and after 6 seconds let the car be at point C. The angles of the depression of the car from the top A of the tower at point B and C are 30° and 60° respectively. 1/2

In ΔABD,
tan 30° = AD/BD
1/√3 = AD/BD
BD = AD√3 ....(1) 1

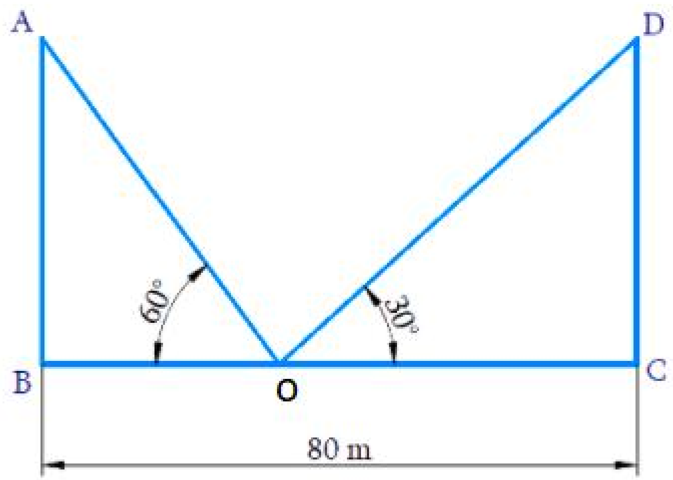
In ΔACD,
tan 60° = AD/CD
√3 = AD/CD
AD = CD√3 ....(2) 1

From equation (1) and (2)
BD = CD√3 × √3
BC + CD = 3CD [∵ BD = BC + CD]
BC = 2CD ....(3) 1

Distance travelled by the car from the starting point towards the tower in 6 seconds = BC
Speed of the car to cover distance BC in 6 seconds = Distance/Time
= BC/6
= 2CD/6 [from (3)] 1/2
= CD/3
Speed of the car = CD/3 m/s

<table>
<tr><td></td><td>---
Distance travelled by the car from point C, towards the tower = CD
Time to cover distance CD at the speed of CD/3 m/s
Time = Distance/speed
= CD / CD/3
= CD × 3 / CD
= 3
The time taken by the car to reach the foot of the tower from point C is 3 seconds.</td><td>1</td></tr>
<tr><td>OR
40.(b)</td><td>समान ऊँचाइयों के दो खंभे एक 80 m चौड़ी सड़क के दोनों ओर एक-दूसरे के सम्मुख खड़े हैं। सड़क पर इन दोनों खंभों के बीच स्थित एक बिंदु से, खंभों के शिखरों के उन्नयन कोण क्रमशः 60° और 30° हैं। खंभों की ऊँचाई और उस बिंदु की खंभों से दूरियाँ ज्ञात कीजिए।
Two poles of equal heights are standing opposite each other on either side of the road ,which is 80 m wide. From a point between them on the road , the angles of elevation of the top of the poles are 60° and 30° , respectively . Find the height of the poles and the distances of the point from the poles.
Solution:

Solution:



Let us consider the two poles of equal heights as AB and DC and the distance between the poles as BC.

From a point O, between the poles on the road, the angle of elevation of the top of the poles AB and CD are 60° and 30° respectively.

Let the height of the poles be x

Therefore AB = DC = x

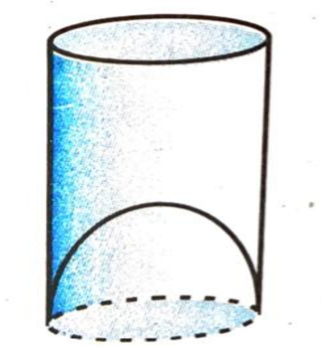
---</td><td>1/2

1/2</td></tr>
</table>

	In ΔAOB, $\tan 60° = AB/BO$ $\sqrt{3} = x / BO$ $BO = x / \sqrt{3}$ ....(i)	1
	In ΔOCD, $\tan 30° = DC / OC$ $1/\sqrt{3} = x / (BC - OB)$ $1/\sqrt{3} = x / (80 - x/\sqrt{3})$ [from (i)]	1
	$80 - x/\sqrt{3} = \sqrt{3}x$ $x/\sqrt{3} + \sqrt{3}x = 80$ $x (1/\sqrt{3} + \sqrt{3}) = 80$ $x (1 + 3) / \sqrt{3} = 80$ $x (4/\sqrt{3}) = 80$ $x = 80\sqrt{3} / 4$ $x = 20\sqrt{3}$ Height of the poles $x = 20\sqrt{3}$ m.	1
	Distance of the point O from the pole AB $BO = x/\sqrt{3}$ $= 20\sqrt{3}/\sqrt{3}$ $= 20$ m	1/2
	Distance of the point O from the pole CD $OC = BC - BO$ $= 80 - 20 = 60$ m	1/2

The height of the poles is 20√3 m and the distance of the point from the poles is 20 m and 60 m.

41.(a) एक जूस बेचने वाला अपने ग्राहकों को चित्र में दिखाए गए गिलासों में जूस परोस रहा था। बेलनाकार गिलास का भीतरी व्यास 5 cm था, लेकिन गिलास के तल में एक अर्धगोलाकार उभरा हुआ भाग था, जिससे गिलास की धारिता कम हो गई थी। यदि गिलास की ऊँचाई 10 cm थी, तो गिलास की आभासी धारिता और उसकी वास्तविक धारिता ज्ञात कीजिए। (π = 3.14 का प्रयोग कीजिए)



A juice seller was serving his customers using glasses as shown in Fig. The inner diameter of the cylindrical glass was 5 cm , but the bottom of the glass had a hemispherical raised portion which reduced the capacity of the glass. If the height of a glass was 10 cm , find the apparent capacity of the glass and its actual capacity. (Use $\pi = 3.14$)

Solution:

Since the inner diameter of the glass = 5 cm and height = 10 cm 1/2

The apparent capacity of the glass = $\pi r^2 h$ 1/2

$$= 3.14 \times 2.5 \times 2.5 \times 10 \ cm^3$$ 1/2

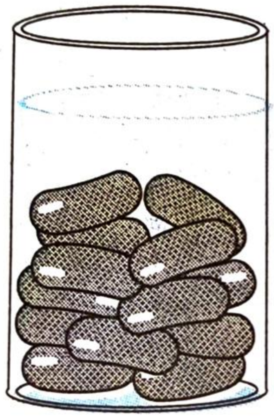
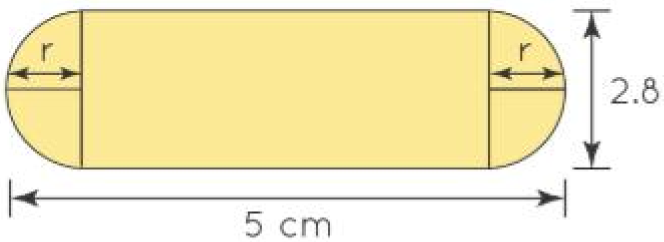
$$= 196.25 \ cm^3$$ 1/2

Volume of hemispherical portion $= \frac{2}{3}\pi r^3$ 1/2

-

$$= \frac{2}{3} \times 3.14 \times 2.5 \times 2.5 \times 2.5 \ cm^3 =$$ 1/2

$$= 32.71 cm^3$$ 1/2

	-- The actual capacity of the glass = apparent capacity of the glass - volume of the hemisphere -- = 196.25 cm^3 - 32.71cm^3= 163.54cm^3	1/2 1
OR 41.(b)	एक गुलाब जामुन में उसके आयतन की लगभग 30% चीनी की चाशनी होती है। ज्ञात कीजिए कि ऐसे 45 गुलाब जामुनों में लगभग कितनी चाशनी होगी, जिनमें से प्रत्येक बेलनाकार आकार का है तथा उसके दोनों सिरे अर्धगोलाकार हैं, जिनकी लंबाई 5 cm और व्यास 2.8 cm है। (चित्र देखिए) A gulab jamun, contains sugar syrup up to about 30% of its volume. Find approximately how much syrup would be found in 45 gulab jamuns , each shaped like a cylinder with two hemispherical ends with length 5 cm and diameter 2.8 cm .(See Fig.)  Solution: Let's visualize the shape of Gulab jamun as shown below.  From the above figure, we can see that, Length of cylindrical part = Length of a Gulab jamun - 2 × radius of the hemispherical part Diameter of Gulab jamun = diameter of the cylindrical part Radius of cylindrical part = radius of hemispherical part Volume of sugar syrup = 30% of the volume of 45 gulab jamuns. Diameter of the Gulab jamun, d = 2.8 cm Radius of cylindrical part = radius of hemispherical part r = d/2 = 2.8/2 cm = 1.4 cm Length of cylindrical part, h = 5 cm - 2 × 1.4 cm = 2.2 cm	 1/2

	Volume of one Gulab jamun = volume of cylindrical part + 2 × volume of the hemispherical parts	1/2
	$= \pi r^2 h + 2 \times 2/3\ \pi r^3$ $= \pi r^2 h + 4/3\ \pi r^3$ $= \pi r^2 (h + 4r/3)$	1
	$= 22/7 \times 1.4\text{ cm} \times 1.4\text{ cm} \times (2.2\text{ cm} + (4/3) \times 1.4\text{ cm})$ $= [22/7 \times 1.4\text{ cm} \times 1.4\text{ cm} \times (12.2/3\text{ cm})]$ $= 75.152/3\text{ cm}^3$	1
	Volume of 45 Gulab jamuns = 45 × volume of one Gulab jamun $= 45 \times 75.152/3\text{ cm}^3$ $= 15 \times 75.152\text{ cm}^3$ $= 1127.28\text{ cm}^3$	1
	Volume of sugar syrup in 45 Gulab jamuns = 30% of volume of 45 Gulab jamun $= 30/100 \times 1127.28\text{cm}^3$ $= 338.184\text{ cm}^3$ Thus, the volume of sugar syrup in 45 cylindrical shaped gulab jamuns is 338 cm^3 (approximately).	1

42.(a)	यदि दिए गए बंटन का माध्यक 28.5 है, तो x और y के मान ज्ञात कीजिए।	

वर्ग अंतराल	0-10	10-20	20-30	30-40	40-50	50-60	कुल
बारंबारता	5	x	20	15	y	5	60

If the median of the distribution given is 28.5, find the values of x and y .

Class Interval	0-10	10-20	20-30	30-40	40-50	50-60	Total
Frequency	5	x	20	15	y	5	60

Solution:

Solution:

Class interval	Frequency	Cummulative Frequency
0-10	5	5
10-20	x	5+x
20-30	20	25+x
30-40	15	40 +x
40-50	y	40 + x + y
50-60	5	45 +x + y
Total	60	

1

……
We have 45 + x + y = 60 ⟹ x + y = 15 ……………..(i) 1/2

…….

Median class is 20 - 30 as median is 28 . 5 (given) 1/2

……

$\frac{N}{2} = \frac{60}{2} = 30,$ l = 20, cf = 5 + x , f = 20 , h = 10 1/2

……

Median = $l + \left(\frac{\frac{N}{2} - cf}{f}\right) \times h$ 1/2

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

$\Rightarrow 28.5 = 20 + \frac{30-(5+x)}{20} \times 10$ 1

……

$\Rightarrow 17 = 25 - x \Rightarrow x = 8$ 1/2

………

Substituting this value of x in (i), we get y = 7 | 1/2

OR 42.(b)

42.(b) एक कारखाने के 50 श्रमिकों की दैनिक मजदूरी के निम्नलिखित बंटन पर विचार कीजिए।

दैनिक मज़दूरी (₹ में)	500-520	520-540	540-560	560-580	580-600
मज़दूरों की संख्या	12	14	8	6	10

किसी उपयुक्त विधि का प्रयोग करके फैक्ट्री के मज़दूरों की माध्य दैनिक मज़दूरी ज्ञात कीजिए।

Consider the following distribution of daily wages of 50 workers of a factory.

Daily wages(in ₹)	500-520	520-540	540-560	560-580	580-600
Number of workers	12	14	8	6	10

Find the mean daily wages of the workers of the factory by using an appropriate method.

Solution:

Daily wages(in ₹)(C.I.)	Number of workers(f_i)	Class Mark (x_i)	$u_i = \frac{x_i - a}{h}$	$f_i u_i$
500-520	12	510	-2	-24
520-540	14	530	-1	-14
540-560	8	550 = a	0	0
560-580	6	570	1	6
580-600	10	590	2	20
	$\sum f_i = 50$			$\sum f_i u_i = -12$

[1/2] [1/2] [1] | 2

………

Here a = 550, h = 20 | 1/2

………

Using the step- deviation method,

Mean = a + $\frac{\sum f_i u_i}{\sum f_i} \times h$ | 1

……

	$= 550 + \frac{-12}{50} \times 20$ …… $= 550 - 4.8 =$ ₹ 545.20	1/2 1