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FOR HARYANA CLASS 9 PREPARATION

HBSE Class 9 Sample Paper 2027 Mathematics Marking Scheme

EXAM	YEAR	TYPE	SUBJECT
Haryana Class 9	2027	Answer Key	Maths

MARKING SCHEME, HBSE, SAMPLE PAPER 1, 9TH MATHS,

(2026-27)
(ENGLISH MEDIUM)

Q. no.	Expected solutions	marks
	Section-A	
1.	(d) $\frac{5}{4}$	1
2.	(d) $\frac{27\sqrt{15}}{9\sqrt{3}}$	1
3.	(d) not defined	1
4.	(c) $x^2 + \frac{3x^{3/2}}{\sqrt{x}}$	1
5.	(d) 1	1
6.	(c) infinitely many solutions	1
7.	(c) 10	1
8.	(b)2	1
9.	equal(बराबर)	1
10.	obtuse angle(अधिक कोण)	1
11.	(a) 10°	1
12.	(c) SSA	1
13.	(a) DF = 7cm, ∠E = 60°	1
14.	$\angle OAB = 40°$,	1
15.	(a) 50°	1
16.	सत्य	1
17.	$\sqrt{32} = 4\sqrt{2}$ cm	1
18.	$r = 7cm$	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.(a)	सरल कीजिए : $\left[5\left(8^{1/3} + 27^{1/3}\right)^3\right]^{1/4}$ Simplify : $\left[5\left(8^{1/3} + 27^{1/3}\right)^3\right]^{1/4}$ Solution: $\left[5\left(8^{1/3} + 27^{1/3}\right)^3\right]^{1/4} = \left[5\left(\left(2^3\right)^{1/3} + \left(3^3\right)^{1/3}\right)^3\right]^{1/4} =$	1/2

	$= \left[5(2+3)^3\right]^{\frac{1}{4}}$	1/2
	$= \left[5(5)^3\right]^{\frac{1}{4}}$	1/2
	$= \left[(5)^4\right]^{\frac{1}{4}}$	
	= 5	1/2
OR 21.(b)	21.(b) $0.4\overline{7}$ को $\frac{p}{q}$ के रूप में व्यक्त कीजिए, जहाँ p और q पूर्णांक हैं और q ≠ 0 है। Express $0.4\overline{7}$ in $\frac{p}{q}$ form where p and q are integers and q ≠ 0. Solution: Let x = $0.4\overline{7}$ = 0.4777…… .....(1)	1/2
	We multiply both sides of equation (1) by 10. 10x = 4.777 .....(2)	1/2
	We will subtract equation (1) from equation (2). 10x - x = 4.777……. - 0.4777……	1/2
	9x = 4.3	1/2
	9x = 43/10 x = 43/90 Thus, 0.47 = 43/90	1/2
22.	22. यदि बिंदु C, दो बिंदुओं A और B के बीच इस प्रकार स्थित है कि AC = BC है, तो सिद्ध कीजिए कि AC = $\frac{1}{2}$ AB है। चित्र बनाकर समझाइए। If a point C lies between two points A and B such that AC = BC , prove that AC = $\frac{1}{2}$ AB . Explain by drawing the figure. Solution:	



1/2

AC = BC (Given)
Adding AC on both sides, we get (According to Euclid's axioms, we know that when equals are added to equals, the wholes are equal.)

1/2

⇒ AC + AC = BC + AC (BC + AC coincides with AB)
⇒ 2 AC = AB

1/2

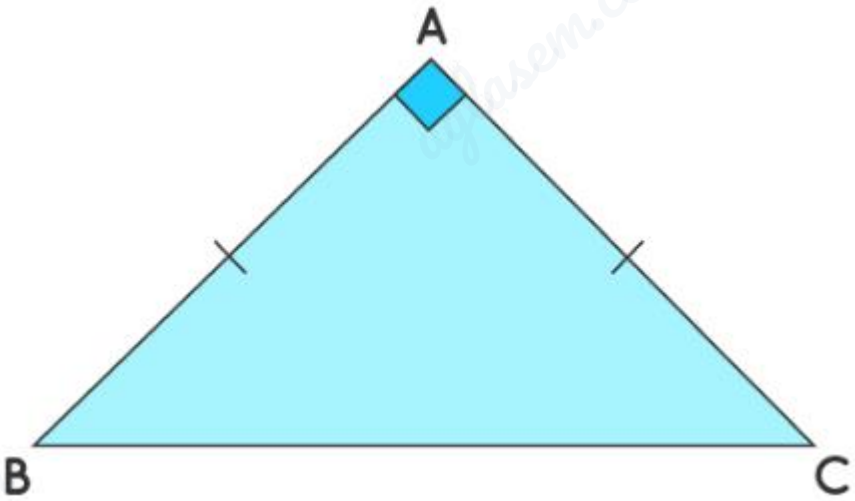
⇒ AC = 1/2 AB (According to Euclid's axioms, things which are halves of the same thing are equal to one another)

1/2

23. ABC एक समकोण त्रिभुज है ,जिसमें AB=AC और $\angle A = 90^0$ है | ∠B और ∠C ज्ञात कीजिए ।

ABC is a right angled triangle in which AB=AC and $\angle A = 90^0$. Find ∠B and ∠C

Solution:



It is given that,

AB = AC
∴ ∠C = ∠B (Angles opposite to equal sides are also equal)

1/2

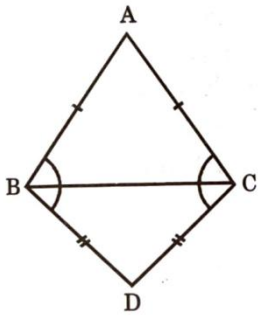
Let ∠B = ∠C = x

In ΔABC,
∠A + ∠B + ∠C = 180° (Angle sum property of a triangle)
90°+ x + x = 180° 1

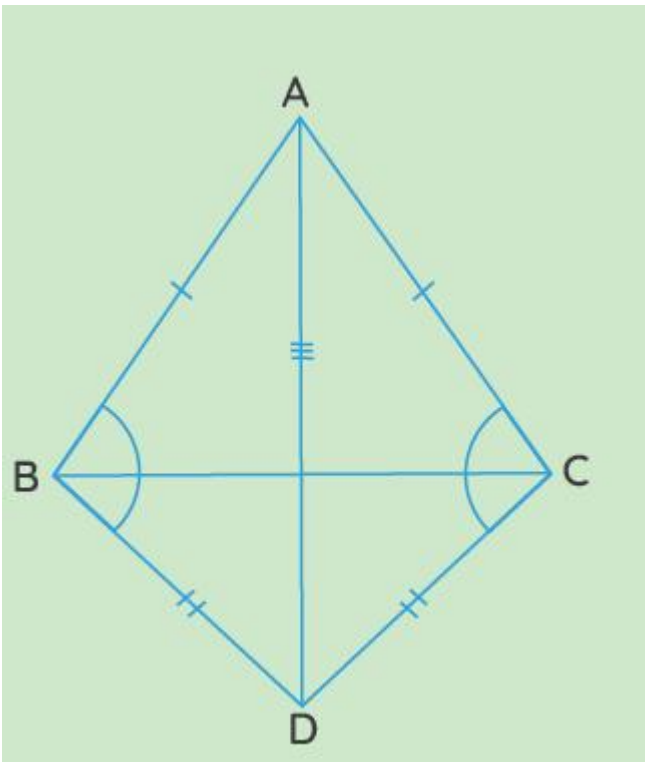
90°+ 2x = 180°
2x = 90°
x = 45°
∴ ∠B = ∠C = 45° 1/2

24.(a) ABC और DBC एक ही आधार BC पर बने दो समद्विबाहु त्रिभुज हैं (चित्र देखें)। दर्शाइए कि ∠ABD = ∠ACD है।

ABC and DBC are two isosceles triangles on the same base BC(See fig.)Show that ∠ABD = ∠ACD.

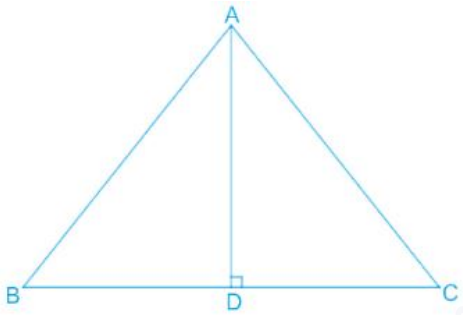


Solution:
Given: ABC and DBC are isosceles triangles
To Prove: ∠ABD = ∠ACD
Let's join point A and point B.



In △DAB and △DAC,
AB = AC (Given)
BD = CD (Given)
AD = AD (Common side) 1/2

……

	∴ △ ABD ≅ △ ACD (By SSS congruence rule) --- ∴ ∠ABD = ∠ACD (By CPCT)	1 1/2
OR 24.(b)	AD एक समद्विबाहु त्रिभुज ABC का शीर्षलंब है, जिसमें AB = AC है। दर्शाइए कि (i) AD, BC को समद्विभाजित करता है (ii) AD, ∠A को समद्विभाजित करता है। AD is an altitude of an isosceles triangle ABC in which AB = AC. Show that (i)AD bisects BC (ii)AD bisects $\angle A$. Solution: Given: AB = AC Let's construct an isosceles triangle ABC in which AB = AC as shown below.  (i) In ΔBAD and ΔCAD, ∠ADB = ∠ADC (Each 90° as AD is an altitude) AB = AC (Given) AD = AD (Common) ∴ ΔBAD ≅ ΔCAD (By RHS Congruence rule) --- ∴ BD = CD (By CPCT) Hence, AD bisects BC. --- (ii) Since, ΔBAD ≅ ΔCAD By CPCT, ∠BAD = ∠CAD Hence, AD bisects ∠A.	1 1/2 1/2
25.	अलग-अलग जनगणना वर्षों में दिल्ली राज्य की जनसंख्या नीचे दी गई है:	

जनगणना वर्ष	1961	1971	1981	1991	2001
जनसंख्या (लाखों में)	30	55	70	110	150

ऊपर दी गई जानकारी को दंड आलेख के रूप मे निरूपित कीजिए ।

The population of Delhi State in different census years is as given below:

Census year	1961	1971	1981	1991	2001
Population in Lakhs	30	55	70	110	150

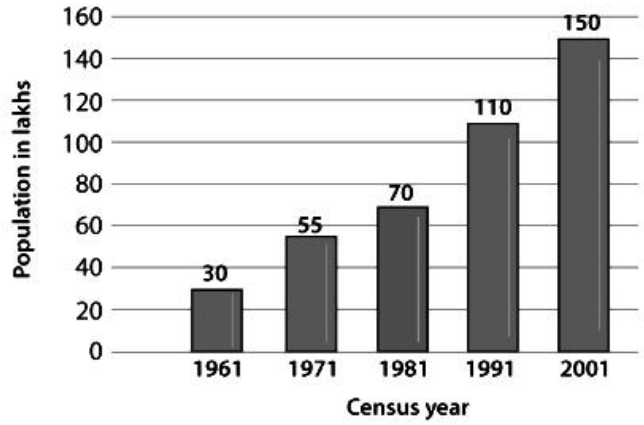
Represent the above information with the help of a bar graph.

Solution:

Let us consider the horizontal and vertical axes represent the years and population in lakhs respectively. The heights of the rectangles are proportional to the population in lakhs. 1/2

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Bar Graph:



$1\frac{1}{2}$

SECTION-C

26.(a) यदि $2x^3 - ax^2 - bx - 14$ का एक गुणनखंड $x + 2$ है और इसे $x + 3$ से भाग देने पर शेषफल - 26 बचता है, तो a और b के मान ज्ञात कीजिए।

If $2x^3 - ax^2 - bx - 14$ has $x + 2$ as a factor and leaves remainder - 26 when divided by $x + 3$, find values of a and b .

Solution:

$x+2$ is a factor of $2x^3 - ax^2 - bx - 14$

$\therefore 2(-2)^3 - a(-2)^2 - b(-2) - 14 = 0 \Rightarrow -16-4a+2b-14=0$ 1/2

$\Rightarrow -4a+2b-30 = 0$ 1/2

$\Rightarrow 2a-b = -15$----------(i)

$2x^3 - ax^2 - bx - 14$ leaves remainder - 26 when divided by $x + 3$

$\therefore 2(-3)^3 - a(-3)^2 - b(-3) - 14 = -26$ 1/2

$\Rightarrow -54-9a+3b-14 = -26 \Rightarrow -9a+3b = 42 \Rightarrow 3a-b = -14$-------(ii) 1/2

Subtract Equation (i) from Equation (ii) to eliminate b

(3a-b)-(2a-b)=-14-(-15)
(3a-2a=-14+15
a=1

1/2

Now, substitute a = 1 back into Equation (i) to find b
2(1)-b=-15
2-b=-15
-b= -15-2
-b=-17
b=17

1/2

OR 26.(b) गुणनखंड कीजिए : $x^3 + 13x^2 + 32x + 20$

Factorize : $x^3 + 13x^2 + 32x + 20$

Solution:

Let $p(x) = x^3 + 13x^2 + 32x + 20$

We shall find a factor of p(x) by using some trial value of x, say x = -1. (Since all the terms are positive.)

p(-1) = (-1)3 + 13(-1)2 + 32(-1) + 20
= -1 + 13 - 32 + 20 = 0

Since the remainder of p(-1) = 0, by factor theorem we can say x + 1 is a factor of $p(x) = x^3 + 13x^2 + 32x + 20$.

1/2

Now dividing p(x) by x + 1 using long division,

$$
\begin{array}{r}
x^2+12x+20 \\
x+1\overline{)\,x^3+13x^2+32x+20} \\
x^3+x^2 \\
\hline
12x^2+32x \\
12x^2+12x \\
\hline
20x+20 \\
20x+20 \\
\hline
0
\end{array}
$$

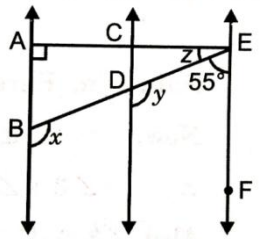
1/2

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	Therefore, $x^3 + 13x^2 + 32x + 20 = (x + 1)(x^2 + 12x + 20)$ --- - Now splitting the middle term of the given polynomial, $x^2 + 12x + 20 = x^2 + 10x + 2x + 20$ $= x(x + 10) + 2(x + 10)$ $= (x + 10)(x + 2)$ --- Therefore, $x^3 + 13x^2 + 32x + 20 = (x + 1)(x + 10)(x + 2)$	1/2 1 1/2
27.	यदि बिंदु (2,1) समीकरण $2x + ky = 7$ का हल है, तो k का मान ज्ञात कीजिए। k का मान प्राप्त करके और उसे दिए गए समीकरण में रखकर, समीकरण के चार और हल ज्ञात कीजिए। Find the value of k if point (2,1) is a solution of the equation 2x+ ky = 7 . After getting and putting the value of k in given equation ,find four more solutions of the equation. Solution: Since (2,1) is a solution to the equation 2x + ky = 7, substitute x = 2and y = 1 into it: 2(2)+k(1)=7 4+k =7 k=7-4 k= 3 --- Substituting k = 3 back into the original expression gives the complete linear equation: 2x+3y =7 --- To find more solutions, substitute arbitrary values for x and solve for y **Solution 1:** Let x = 5 2(5)+3y=7⇒10+3y=7⇒ 3y= -3⇒ y= -1 Point: (5, -1) --- **Solution 2:** Let x = -1 2(-1)+3y=7implies -2+3y=7⇒ 3y=9⇒ y=3 Point: (-1, 3) --- **Solution 3:** Let x = 8 2(8)+3y=7implies 16+3y=7implies 3y = -9⇒ y= -3 Point: (8, -3) --- **Solution 4:** Let x = -4 2(-4)+3y=7implies -8+3y=7⇒ 3y=15⇒ y=5 Point: (-4, 5)	1/2 1/2 1/2 1/2 1/2

28. संलग्न आकृति में, AB‖CD और CD‖EF हैं। साथ ही, EA⊥ AB. है। यदि ∠BEF=55°है, तो x, y और z के मान ज्ञात कीजिए।

In the adjoining figure, AB‖CD and CD‖EF. Also,EA⊥ AB. If ∠BEF=55°,find the values of x,y and z.



Solution:
The required values are x = 125°, y = 125°, and z = 35°

Finding y:
The lines CD ‖ EF are cut by the transversal line BE. The consecutive interior angles on the same side of a transversal are supplementary (add up to 180°: 1/2

---

y+55°=180° 1/2
y=180-55=125°

Finding x:
Since AB ‖ CD, the angles x and y are equal because they are corresponding angles: 1/2

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x = y =125° 1/2

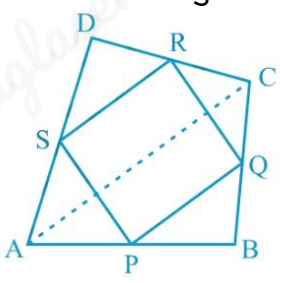
Finding z:
Since AB ‖ EF and EA ⊥ AB, the line EA is also perpendicular to EF ∠ AEF = 90°. 1/2
angle ∠ AEF is the sum of z and angle BEF:

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z+55°=90°
z=90-55=35° 1/2

29. ABCD एक चतुर्भुज है जिसमें P,Q,R और S भुजाओं AB,BC,CD और DA के मध्य बिंदु हैं। AC एक विकर्ण है. दिखाएँ कि (i) SR‖AC और SR= $\frac{1}{2}$AC (ii)PQ=SR (iii) PQRS एक समांतर चतुर्भुज है।

ABCD is a quadrilateral in which P,Q,R and S are mid points of the sides AB,BC,CD and DA. AC is a diagonal. Show that (i) SR‖AC and SR= $\frac{1}{2}$AC (ii)PQ=SR (iii) PQRS is a parallelogram.



Solution:
We will use the mid-point theorem here. It that states that the line segment joining the mid-points of any two sides of the triangle is parallel to the third side and is half of it.
(i) In ΔADC, S and R are the mid-points of sides AD and CD respectively. Thus, by using the mid-point theorem
∴ SR || AC and SR = 1/2AC ... (1) 1

(ii) In ΔABC, P and Q are mid-points of sides AB and BC. Therefore, by using the mid-point theorem,
PQ || AC and PQ = 1/2 AC ... (2) 1/2

Using Equations (1) and (2), we obtain PQ || SR and PQ = SR ... (3)
∴ PQ = SR 1/2

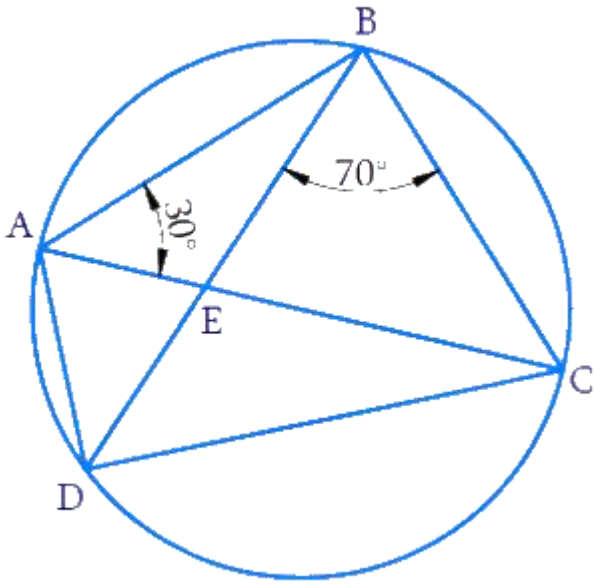
(iii) From Equation (3), we obtained PQ || SR and PQ = SR
Clearly, one pair of opposite sides of quadrilateral PQRS is parallel and equal. Hence, PQRS is a parallelogram. 1

30.(a)

30(a).ABCD एक चक्रीय चतुर्भुज है जिसके विकर्ण एक बिंदु E पर प्रतिच्छेद करते हैं । यदि $\angle DBC = 70^0$ और $\angle BAC = 30^0$ हो , तो $\angle BCD$ ज्ञात कीजिए। पुनः यदि AB=BC ,तब $\angle ECD$ ज्ञात कीजिए ।

ABCD is a cyclic quadrilateral whose diagonals intersect at point E. If $\angle DBC = 70^0$, $\angle BAC = 30^0$ then find $\angle BCD$. Further, if AB=BC, find $\angle ECD$.

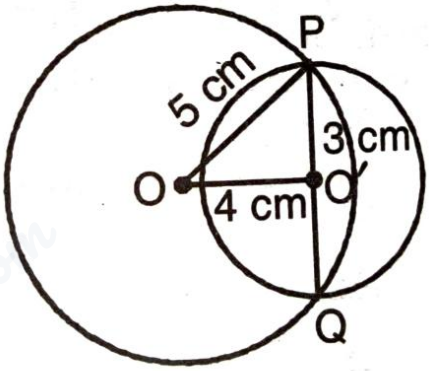
Solution:



In the triangles, ABD and BCD, ∠CAD = ∠CBD = 70°. (Angles in the same segment are equal) 1/2

Hence, ∠BAD = ∠CAB + ∠DAC
= 30° + 70° = 100°
Thus, ∠BAD = 100° 1/2

Since ABCD is a cyclic quadrilateral, the sum of either pair of opposite angles of a cyclic quadrilateral is 180º.
∠BAD + ∠BCD = 180°
∠BCD = 180° - 100°
= 80° 1

	Thus, $\angle BCD = 80°$ --- Also given AB = BC. So, $\angle BCA = \angle BAC = 30°$ (Base angles of isosceles triangle are equal) --- $\angle ECD = \angle BCD - \angle BCA$ $= 80° - 30°$ $= 50°$ Thus, $\angle ECD = 50°$	1/2 1/2
OR 30.(b)	5 cm और 3 cm त्रिज्या वाले दो वृत्त दो बिन्दुओं पर प्रतिच्छेद करते हैं तथा उनके केन्द्रों के बीच की दूरी 4 cm है । उभ्यनिष्ठ जीवा की लम्बाई ज्ञात कीजिए । Two circles of radii 5 cm and 3cm intersect at two points and the distance between their centres is 4 cm. Find the length of the common chord. Solution:Let O and O' be the centres of the circles with radii 5 cm and 3 cm respectively. And PQ be the common chord. In triangle OMA (right triangle): OP = 5 cm (radius of first circle),O'P = 3 cm (radius of second circle)and O'O = 4 cm[Given]  --- Since $5^2 = 4^2 + 3^2 \Rightarrow (OP)^2 = (O O')^2 + (O'P)^2$ $\Rightarrow \triangle O O' P$ is a right angled triangle. $\Rightarrow \angle O O' P = 90° \Rightarrow O \Rightarrow O O' \perp PQ$ --- Thus O' lies on the common chord PQ and $O O' \perp PQ$ $\Rightarrow$O O' bisects PQ --- $\Rightarrow O'P = O'Q = 3$ cm --- $\Rightarrow PQ = 2\, O'Q = 2 \times 3 = 6$ cm	1/2 1 1/2 1/2 1/2
31.	शंकु के आकार का एक तंबू 10 m ऊँचा है और उसके आधार की त्रिज्या 24 m है । ज्ञात कीजिए : (i)तंबू की तिर्यक ऊँचाई (ii)तंबू में लगे केनवास की लागत ,यदि 1 m^2 केनवास की लागत 70 रूपए है । A conical tent is 10 m high and the radius of its base is 24 m. Find (i) slant height of the tent (ii) cost of the canvas required to make the tent, if the cost of 1 m^2 canvas is Rs 70.	

Solution:
The total surface area of the cone is the sum of the curved surface area and area of the base which is a circle.
Curved surface area of a right circular cone of base radius, 'r' and slant height, 'l' is πrl
Slant height, l = √r² + h² where h is the height of the cone and r is the radius of the base.
i) Radius, r = 24 m
Height, h = 10 m
Slant height, l = $\sqrt{r^2 + h^2}$
= $\sqrt{(24)^2 + (10)^2}$
= $\sqrt{576 + 100}$
= $\sqrt{676}$
= 26 m

1

---

ii) Curved surface area of the cone = πrl
= 22/7 × 24 m × 26 m
= 13728/7 m²

1

The cost of the canvas required to make the tent, at ₹ 70 per m² = 70 × Curved surface area of the cone
= 13728/7 × 70
= ₹ 137280
Thus, slant height of the tent is 26 m and the cost of the canvas is ₹ 137280.

1

Section –D

32.(a)

यदि a और b परिमेय संख्याएँ हैं और $\frac{\sqrt{11}-\sqrt{7}}{\sqrt{11}+\sqrt{7}} = a - b\sqrt{77}$ है, तो a और b के मान ज्ञात कीजिए।

If a and b are rational numbers and $\frac{\sqrt{11}-\sqrt{7}}{\sqrt{11}+\sqrt{7}} = a - b\sqrt{77}$,find the values of a and b .

Solution: LHS= $\frac{\sqrt{11}-\sqrt{7}}{\sqrt{11}+\sqrt{7}} = \frac{\sqrt{11}-\sqrt{7}}{\sqrt{11}+\sqrt{7}} \times \frac{\sqrt{11}-\sqrt{7}}{\sqrt{11}-\sqrt{7}}$

1

$= \frac{(\sqrt{11}+\sqrt{7})^2}{(\sqrt{11})^2-(\sqrt{7})^2}$

1

$= \frac{11 + 7 - 2\sqrt{77}}{11 - 7}$

1/2

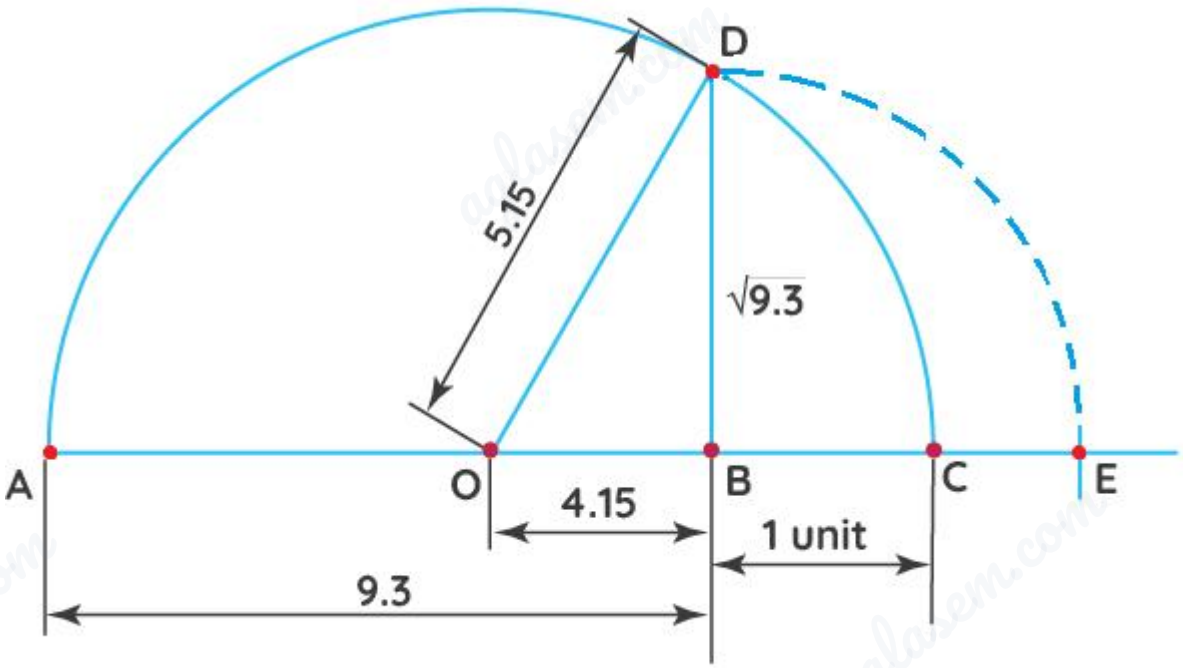
$= \frac{18 - 2\sqrt{77}}{4} =$

1/2

$= \frac{18}{4} - \frac{2}{4}\sqrt{77}$

1

$= \frac{9}{2} - \frac{1}{2}\sqrt{77} = a - b\sqrt{77}$ = RHS (given)

	$\Rightarrow a = \frac{9}{2}$ and $b = \frac{1}{2}$	1
OR 32.(b)	संख्या रेखा पर $\sqrt{9.3}$ को निरूपित करें। $\frac{1}{3}$ और $\frac{1}{2}$ के बीच चार परिमेय संख्याएँ भी ज्ञात कीजिए। Represent $\sqrt{9.3}$ on the number line.Also,write down four rational numbers between $\frac{1}{3}$ and $\frac{1}{2}$. Solution: Let's look into the steps below to represent √9.3 on the number line. Step I: Draw a line and take AB = 9.3 units on it. Step II: From B, measure a distance of 1 unit and mark C on the number line. Mark the midpoint of AC as O. Step III: With 'O' as center and OC as radius, draw a semicircle. Step IV: At B, draw a perpendicular to cut the semicircle at D. Step V: With B as a center and BD as radius draw an arc to cut the number line at E. Thus, taking B as the origin the distance BE = √9.3 Therefore, point E represents √9.3 on the number line.  	$1\frac{1}{2}$ $1\frac{1}{2}$
	Further ,$\frac{1}{3}$ and $\frac{1}{2} = \frac{1}{3} \times \frac{2}{2}$ and $\frac{1}{2} \times \frac{3}{3}$. $= \frac{2}{6}$ and $\frac{3}{6} = \frac{2}{6} \times \frac{5}{5}$ and $\frac{3}{6} \times \frac{5}{5}$.	1

	$= \frac{10}{30}$ and $\frac{15}{30}$.	
	Four rational numbers between $\frac{1}{3}$ and $\frac{1}{2}$ or $\frac{10}{30}$ and $\frac{15}{30}$ are $\frac{11}{30}, \frac{12}{30}, \frac{13}{30}$ and $\frac{14}{30}$	1
33.(a)	(i) गुणनखंड कीजिए : $4x^2 + y^2 + z^2 - 4xy - 2yz + 4xz$ (ii) यदि $a + b + c = 5$ और $ab + bc + ca = 10$ है, तो दर्शाइए कि $a^3 + b^3 + c^3 - 3abc = -25$ (i)Factorise : $4x^2 + y^2 + z^2 - 4xy - 2yz + 4xz$ (ii) If $a + b + c = 5$ and $ab + bc + ca = 10$, then show that $a^3 + b^3 + c^3 - 3abc = -25$	
	The expression $4x^2 + y^2 + z^2 - 4xy - 2yz + 4xz$ To find : To factorise the expression Formula: Solution : $4x^2 + y^2 + z^2 - 4xy - 2yz + 4xz$ $=(2x)^2+(-y)^2+z^2+2.2x.(-y)+2.(-y).z+2.2x.z$	1
	[using $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$]	1/2
	$=(2x-y+z)^2$ $=(2x-y+z)(2x-y+z)$	1/2
	(ii)Solution: Given, $a + b + c = 5$ and $ab + bc + ca = 10$ We have to prove that $a^3 + b^3 + c^3 - 3abc = -25$. Using the algebraic identity, $x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$ $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - (ab + bc + ca))$ $= 5(a^2 + b^2 + c^2 - (10))$	1
	To find $a^2 + b^2 + c^2$, by using the algebraic identity, $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$ $(5)^2 = a^2 + b^2 + c^2 + 2(10)$ $25 = a^2 + b^2 + c^2 + 20$ $a^2 + b^2 + c^2 = 25 - 20$ $a^2 + b^2 + c^2 = 5$	1
	Now, $a^3 + b^3 + c^3 - 3abc = 5(a^2 + b^2 + c^2 - (10))$ $= 5(5 - 10)$ $= 5(-5)$	1

	= - 25 Therefore, $a^3 + b^3 + c^3 - 3abc = -25$	
OR 33.(b)	$3x^2 - x - 4$ का गुणनखंड कीजिए और उपयुक्त सर्वसमिका का उपयोग करके $(998)^3$ का मान ज्ञात कीजिए। Factorise $3x^2 - x - 4$ and evaluate $(998)^3$ using suitable identity. Solution: $3x^2 - x - 4 = 3x^2 + 3x - 4x - 4$ --- $= 3x(x + 1) - 4(x + 1)$ --- $= (x + 1)(3x - 4)$ --- $(998)^3 = (1000 - 2)^3$ --- Identity: $(x - y)^3 = x^3 - y^3 - 3xy(x - y)$ --- Let us substitute $x = 1000, y = 2$ $(998)^3 = (1000)^3 - (2)^3 - 3(1000)(2)(1000 - 2)$ --- $= 1000000000 - 8 - 6000 \times 998$ --- $= 999999992 - 5988000$ $= 994011992$	1 1/2 1/2 1/2 1 1/2 1/2 1/2
34.(a)	34.(a) USA और कनाडा जैसे कुछ देशों में तापमान को फ़ारेनहाइट में मापा जाता है, जबकि भारत में इसे सेल्सियस में मापा जाता है। सेल्सियस और फ़ारेनहाइट तापमान के बीच संबंध इस प्रकार है: $F = \left(\frac{9}{5}\right) C + 32.$ (i) यदि तापमान 30°C है, तो फ़ारेनहाइट में तापमान क्या होगा? (ii) यदि तापमान 95°F है, तो सेल्सियस में तापमान क्या होगा? (iii) समुद्र तल पर पानी 100°C पर उबलता है। यदि आप इसे फ़ारेनहाइट में बदलें, तो तापमान क्या होगा? (iv) किस तापमान पर सेल्सियस और फ़ारेनहाइट डिग्री संख्यात्मक रूप से बराबर होते हैं?	

(v) दिए गए समीकरण को aC + bF + c = 0 के रूप में लिखें और a, b और c के मान लिखें।

34.(a)In some countries like USA and Canada,temperature is measured in Fahrenheit,whereas in India,it is measured in Celsius.The relation between Celsius and Fahrenheit temperature is given by :

$F=\left(\frac{9}{5}\right)C+32$.

(i)If the temperature is 30° C,then what will be the temperature in Fahrenheit?

(ii)If the temperature is 95° F,then what will be the temperature in Celsius?

(iii)Water boils at 100°C at sea level. If you convert this to Fahrenheit,then what will be the temperature?

(iv)At what temperature both Celsius and Fahrenheit degree are numerically equal?

(v)Express given equation as a C + b F +c = 0 and write down the values of a,b and c .

Solution:

(i) Given: Temperature = 30°C

To find: F = ?

We know that, F = (9/5)C + 32

By Substituting the value of C = 30° C in the equation above,

F = (9/5)C + 32

= (9/5)30 + 32

= 54 + 32 1

= 86

Therefore, the temperature in Fahrenheit is 86° F .

……..

(ii) Given, Temperature = 95° F

To find, C = ?

We know that, F = (9/5)C + 32

By Substituting the value of temperature in the above equation,

95 = (9/5)C + 32

95 - 32 = (9/5)C

63 = (9/5)C 1

C = (63 × 5)/9

C = 35

Therefore, the temperature in Celsius is 35° C.

……..

(iii) We know that, F = (9/5)C + 32

If C = 100°, then by substituting this value in the above equation,

F = (9/5)100 + 32

F = 180 + 32 1

F = 212

Therefore, if C = 100°, then F = 212°

…….

(iv) We know that, F = (9/5)C + 32

Let us consider, F = C

By Substituting this value in the equation above,

F = (9/5)C + 32

(9/5 - 1)F + 32 = 0

(4/5)F = - 32

F = (- 32 × 5)/4

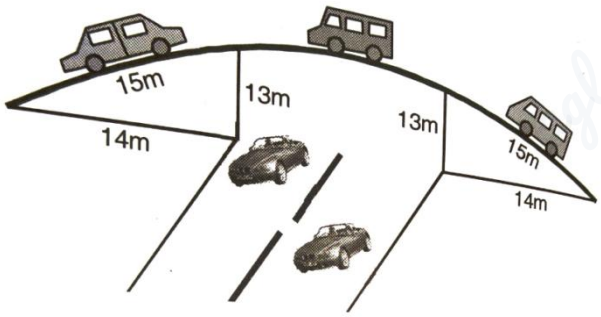
Hence, F = - 40

	Yes, there is a temperature, -40°, which is numerically the same for both Fahrenheit and Celsius. --- (v)F= $\left(\frac{9}{5}\right)$ C+32. ⇒ 5F = 9C + 160 ⇒ -9C + 5F - 160 = 0 Comparing with a C + b F +c = 0, we get a = -9 , b = 5 , c = -160	1 1
OR 34.(b)	34.(b) सोनिया ने अपने जन्मदिन पर एक अनाथालय में चॉकलेट बांटीं। उसने हर बच्चे को 5 चॉकलेट और बड़ों को कुल 20 चॉकलेट दीं। मान लीजिए बच्चों की संख्या x है और बांटी गई चॉकलेट की संख्या y है। (i) दो चरों x और y में रैखिक समीकरण ज्ञात कीजिए। साथ ही, समीकरण को ax + by + c = 0 के रूप में लिखिए और a, b तथा c के मान बताइए। (ii) यदि उसने 145 चॉकलेट बांटीं, तो अनाथालय में कितने बच्चे थे? (iii) यदि 20 बच्चे थे, तो बांटी गई चॉकलेट की संख्या ज्ञात कीजिए। (iv) यदिy = 205 है, तोx का मान ज्ञात कीजिए। 34.(b) On her birthday, Sonia distributed chocolates at an orphanage . She gave each child 5 chocolates and the adults a total of 20 chocolates.Let the number of children be x and the number of chocolates distributed be y. (i)Find linear equation in two variables x and y . Also,express the equation in the form ax +by + c = 0 and write down the values of a,b and c . (ii)If she distributed 145 chocolates , how many children were there in the orphanage. (iii)If there were 20 children , find the number of chocolates distributed. (iv) If y = 205 ,find the value of x. Solution:(i)The number of chocolates given to children is 5x, and the number of chocolates given to adults is 20. The total number of chocolates is the sum of these. Therefore, the linear equation is y = 5x + 20 --- ⇒.-5x+ y - 20 = 0 Comparing with ax+ by + c =0, we get a= -5, b= 1 , c = -20 --- (ii)Substitute y = 145 into the equation y = 5x + 20 we get ,145 = 5x + 20 ⇒ 125 = 5x ⇒ x = 25. ∴ 25 children were there in the orphanage. --- (iii)Substitute x = 20 into the equation y = 5x + 20⇒ y = 5(20) + 20 = 100 + 20 = 120. y= 120 ∴the number of chocolates distributed= 120 ---	1 1 1 1

	(iv)Substitute y = 205 into the equation y = 5x + 20 we get 205 = 5x + 20 ⇒ 185 = 5x ⇒ x = 37	1
35.(a)	35.(a) रामपाल के पास एक त्रिभुजाकार खेत है जिसकी भुजाओं का अनुपात 5 : 12 : 13 है और इसका परिमाप 300 मीटर है। वह इसमें दो अलग-अलग तरह की फसलें उगाना चाहता है। इसलिए, उसने सबसे लंबी भुजा के सामने वाले शीर्ष से उस भुजा पर एक लंब खींचकर खेत को दो भागों में बांटने का फैसला किया। हीरोन के सूत्र का उपयोग करके लंब की लंबाई ज्ञात कीजिए। Rampal has a triangular field whose sides are in the ratio 5 : 12 : 13 and its perimeter is 300 m . He wants to grow two different types of crops in it . So, he decided to divide the field into two parts by drawing a perpendicular line from opposite vertex to the side whose length is longest.Find the length of the perpendicular using Heron's Formula. Solution: Given sides of triangles are in the ratio 5:12:13 Let the sides of triangle are 5x, 12x and 13x Perimeter of triangle = 300 m ⇒ 5x + 12x + 13x = 300 ⇒ 30x = 300 ⇒ x = 10	1/2
	--- Therefore, sides of the given triangle are ⇒5x = 5 × 10 = 50 m, ⇒12x = 12 × 10 = 120 m ⇒13x = 13 × 10 = 130 m	1/2
	--- Notice that $130^2 = 50^2 + 120^2$ ⇒ 16900 = 2500 + 14400 = 16900 ⇒16900= 2500 + 14400 ⇒ 16900 = 16900 Thus the given triangle is a right angled triangle with hypotenuse 130 m and the perpendicular sides are 50 m and 120 m.	1/2
	--- ∴Area of triangle = (1/2) × base × height. Here, the base is 130 m. = (1/2) × 130 × h m^2 ----------(i)	1/2
	--- Use the formula for the area of the triangle using the sides: Calculate the semi-perimeter (s): s = (50 + 120 + 130) / 2 = 300 / 2 = 150 m.	1/2
	--- Use Heron's formula to find the area: Area = $\sqrt{[s(s-a)(s-b)(s-c)]}$ = √[150(150 - 50)(150 - 120)(150 - 130)]	

	$= \sqrt{[150 \times 100 \times 30 \times 20]}$.	
	$= \sqrt{[9000000]} = 3000$ m².	1

	$\Rightarrow 3000 = (1/2) \times 130 \times h$. [using (i)]	1/2
	:	

	$\Rightarrow 3000 = 65h \Rightarrow h = 3000 / 65 = 46.15$ m (approximately).	1
OR 35.(b)	35(b).एक फ्लाईओवर की त्रिकोणीय साइड की दीवारों का इस्तेमाल विज्ञापनों के लिए किया गया है। दीवारों की भुजाएँ 13 मीटर, 14 मीटर और 15 मीटर हैं। विज्ञापनों से प्रति वर्ष ₹2000 प्रति वर्ग मीटर की कमाई होती है। एक कंपनी ने 6 महीने के लिए इसकी एक दीवार किराए पर ली। उसने कितना किराया दिया? 	
	The triangular side walls of a flyover have been used for advertisements. The sides of the walls are 13 m ,14 m and 15 m .The advertisements yield an earning of ₹ 2000 per m² per year. A company hired one of its walls for 6 months. How much rent did it pay?	
	Solution:	
	Solution:	
	Let a = 13 m b = 14 m c = 15 m	
	By Heron's formula, Area of triangle = $\sqrt{s(s-a)(s-b)(s-c)}$	1
	----------	
	where s = semiperimeter s = (a + b + c)/2 So, s = (13 + 14 + 15)/2 = 42/2 s = 21 m	1

	Area = $\sqrt{\sqrt{21(21-13)(21-14)(21-15)}}$ $= \sqrt{21(8)(7)(6)}$ $= \sqrt{7 \times 3 \times 4 \times 2 \times 7 \times 3 \times 2}$ $= 7 \times 3 \times 2 \times 2$ $= 21 \times 4$ Area = 84 m²	1

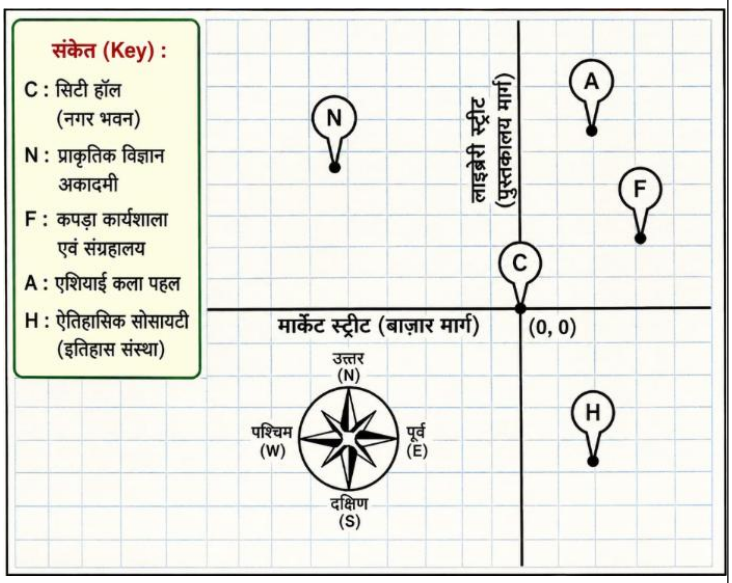
	Cost of advertising per year for 1 m² = Rs. 2000 Advertisement cost per year for 84 m² = 2000 × 84	1

= Rs.168000

Rent paid by the company for 6 months = 168000/2
= Rs. 84000
Therefore, the rent paid by the company is Rs. 84000/- 1

SECTION E

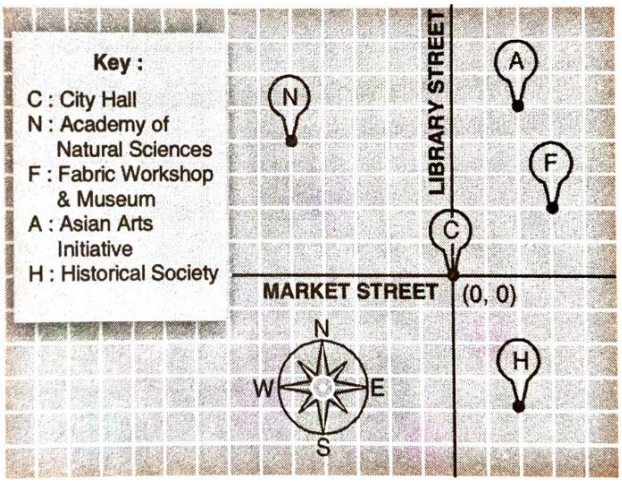
36. 36. निम्नलिखित आंकड़ा एक विश्वविद्यालय की योजना को दर्शाता है। इस योजना में, बाजार मार्ग और पुस्तकालय मार्ग एक दूसरे के लंबवत हैं। कुछ स्थानों के संदर्भ बिंदु आंकड़े में चिह्नित हैं। दी गई जानकारी के आधार पर, नीचे दिए गए सवालों के जवाब दें:



(i) प्राकृतिक विज्ञान अकादमी , x-अक्ष से कितनी दूरी पर स्थित है?
(ii) दिए गए स्थानों में से कौन सा स्थान मूल बिंदू पर स्थित है?
(iii) ऐतिहासिक सोसायटी के स्थान के निर्देशांक लिखें?
(iv)चुंबकीय कंपास किस चतुर्थांश में स्थित है?

[नोट :- कृपया अंग्रेजी माध्यम वाले चित्र को ज्यादा सही मानें]

36.The following figure indicates a University 's plan.In this plan , the Market Street and Library Street are perpendicular to each other.The reference points of certain places are marked in the figure. Based on the given information, answer the following:



(i)At what distance is Academy of Natural Sciences located from x-axis.
(ii)Which of the given places is located at origin?
(iii)Write the coordinates of the location of Historical Society?
(iv)In which quadrant does the magnetic compass lie?
Solution:

(i) Distance of Academy of Natural Sciences from x-axis = 4 units. 1

(ii) Place located at the origin is City Hall. 1

(iii) Coordinates of Historical Society are (2,-4) 1

(iv)The Magnetic Compass lies in 3rd quadrant. 1

37. 37. आरव को उसके जन्मदिन पर उसकी दादी से उपहार में एक खिलौना मिला। यह खिलौना एक सम-वृत्तीय बेलन (right circular cylinder) के आकार का है, जिसके निचले सिरे पर एक अर्धगोला और ऊपरी सिरे पर एक शंकु लगा है। बेलनाकार भाग की ऊँचाई और त्रिज्या क्रमशः 13 cm और 5 cm हैं। अर्धगोलाकार और शंक्वाकार भागों की त्रिज्याएँ बेलनाकार भाग की त्रिज्या के समान ही हैं और शंक्वाकार भाग की ऊँचाई 12 cm है।

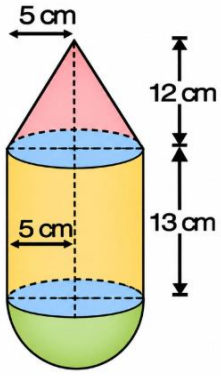
ऊपर दी गई जानकारी के आधार पर निम्नलिखित प्रश्नों के उत्तर दीजिए:

(i) खिलौने के शंक्वाकार भाग की तिर्यक ऊँचाई (slant height) ज्ञात कीजिए।

(ii)(a) बेलन का वक्र पृष्ठीय क्षेत्रफल ज्ञात कीजिए।

या (ii)(b) अर्धगोले का वक्र पृष्ठीय क्षेत्रफल ज्ञात कीजिए।

(iii) खिलौने का कुल पृष्ठीय क्षेत्रफल ज्ञात कीजिए।



36.Aarav got a toy as a gift on his birthday from his grandmother. The toy is in the shape of a right circular cylinder with a hemisphere on the lower end and a cone on the upper end. The height and radius of the cylindrical part are 13cm and 5 cm respectively. The radii of the hemispherical and conical parts are the same as that of the cylindrical part and height of the conical part is 12 cm.

Based on the above information answer the following questions:

(i) Find the slant height of the conical part of the toy.

(ii) (a)Find the curved surface area of the cylinder.

OR (ii)(b)Find the curved surface area of the hemisphere .

(iii) Find the total surface area of the toy .

Solution:

(i)Slant height of cone, l = $\sqrt{r^2 + h^2}$ 1/2

$l=\sqrt{5^2 + 12^2}=\sqrt{25 + 144}=\sqrt{169}=13$ cm 1/2

(ii)(a) Curved surface area of cylinder = $2\pi rH= 2\times 22/7 \times 5 \times 13$ 1/2

$=\frac{2860}{7}$ = 408.57 cm^2 1/2

	OR (ii)(b)Curved surface area of hemisphere = $2\pi r^2 = 2\times 22/7 \times 5 \times 5$	1/2

	$= \frac{1100}{7} = 157.14\ cm^2$	1/2

	(iii)Surface area of toy(S) = Curved surface area of cylinder + Curved surface area of hemisphere + Curved surface area of cone. $S=2\pi rH+2\pi r^2+\pi rl = \pi r(2H+2r+l)$	1
	$=22/7 \times 5\times(2\times13+2\times5+13)$	

	$=7110 \times(26+10+13)=110/7 \times49=110\times7=770\ cm^2$. Hence, the surface area of the toy is 770 cm^2.	1
38.	38. COVID-19 महामारी, जिसे कोरोना वायरस महामारी के रूप में भी जाना जाता है, गंभीर तीव्र श्वसन सिंड्रोम कोरोना वायरस 2 (SARS-CoV-2) के कारण हुई थी। इसे पहली बार दिसंबर 2019 में चीन के वुहान में पहचाना गया था। सर्वे के दौरान, शहर के एक अस्पताल में भर्ती COVID से संक्रमित 80 रोगियों की आयु दर्ज की गई और एकत्र किए गए डेटा को आवृत्ति वितरण तालिका में दर्शाया गया है।	

आयु (वर्षों में)	5-15	15-25	25-35	35-45	45-55	55-65
रोगियोंकी संख्या	6	11	21	23	14	5

ऊपर दी गई जानकारी के आधार पर, नीचे दिए गए सवालों के जवाब दें:

(i) किस वर्ग अंतराल की बारंबारता सबसे अधिक है?

(ii) कौन सा आयु वर्ग सबसे कम प्रभावित हुआ? [1]

(iii)(a)दिए गए आँकड़ों के लिए आयतचित्र बनाइए। [2]

अथवा

(iii) (b) दिए गए आँकड़ों के लिए बारंबारता बहुभुज बनाइए। [2]

38.The COVID-19 pandemic, also known as the corona virus pandemic was caused by severe acute respiratory syndrome corona virus 2 (SARS-CoV-2).It was first identified in December 2019 in Wuhan , China.During survey , the ages of 80 patients infected by COVID and admitted in the one of the city hospital were recorded and the collected data is represented in the frequency distribution table .

Age(in years)	5-15	15-25	25-35	35-45	45-55	55-65
No. of patients	6	11	21	23	14	5

Based on the above the above information , answer the following questions:

(i) Which class interval is of highest frequency? [1]

(ii)Which age group was affected the least ? [1]

(iii)(a)Draw histogram for the given data.

OR (iii) (b) Draw frequency polygon for the given data. [2]

Solution:

(i) The class interval with the highest frequency is 35-45 years with 23 patients. 1

(ii)

The class interval with the lowest frequency is 55-65 years with 5 patients. 1

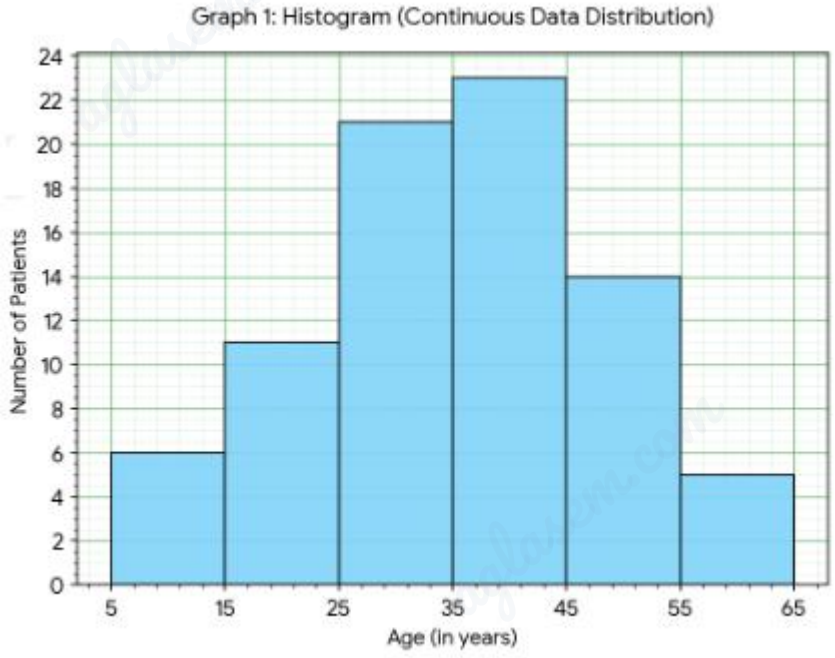
(iii) Draw histogram for the above data. (2 marks)

To draw a histogram:

The x-axis represents the age intervals (5-15, 15-25, etc.).

The y-axis represents the number of patients (frequency).

Each bar's height corresponds to the frequency of the respective age group. 1/2



$1\frac{1}{2}$

(iv) Draw frequency polygon for the above data. (2 marks)

To draw a frequency polygon:

Find the class marks (mid-values) for each interval:

5-15: (5+15)/2 = 10

15-25: (15+25)/2 = 20

25-35: (25+35)/2 = 30

35-45: (35+45)/2 = 40

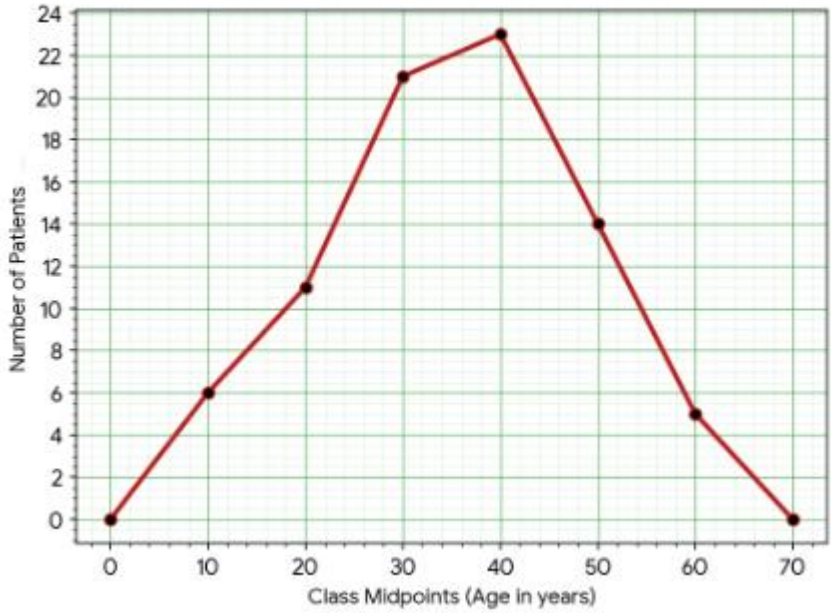
45-55: (45+55)/2 = 50

55-65: (55+65)/2 = 60

Plot the points (class mark, frequency): (10,6), (20,11), (30,21), (40,23), (50,14), (60,5)

Join the points with straight lines.

Optionally, add points at the beginning and end with frequency 0 for closure: (0,0) and (70,0). 1/2

	Graph 2: Frequency Polygon (Midpoint Trends)  	$1\frac{1}{2}$