केंद्रीय विद्यालय संगठन ,बेंगलरु, संभाग

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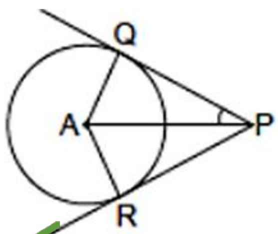
प्रथम प्री-बोर्ड परीक्षा (२०२४-२५)

FIRST PRE-BOARD EXAMINATION (2024-25)

CLASS: X **MAX.MARKS:80**
SUBJECT: MATHEMATICS (STANDARD) **TIME: 3 Hrs.**
CODE: 041

General Instructions:

1. This question paper contains 38 questions.
2. This Question Paper is divided into 5 Sections A, B, C, D and E.
3. In Section A, Question No 1-18 are MCQs and Q No19 and 20 are Assertion-Reason based questions of 1 mark each.
4. In Section B Question no 21-25 are very short answer (VSA) type questions, carrying 2 marks each.
5. In Section C, Question no. 26-31 are short answer (SA) type questions, carrying 3 marks each.
6. In Section D Question no 32-35 are long answer (LA) type questions carrying 5 marks each.
7. In Section E, question no 36-38 are case based questions carrying 4 marks each with sub parts of the values of 1,1 and 2 marks each respectively.
8. All Questions are compulsory. However, an internal choice in 2 Qs of Section B, 2 Questions of Section C and 2 Questions of Section D has been provided. An internal choice has been provided in all the 2 marks questions of Section E.
9. Draw neat and clean figures wherever required.
10. Take π=22/7 wherever required if not stated
11. Use of calculators is not allowed

	SECTION-A	
	Section A consists of 20 questions of 1 mark each	
1.	The zeroes of the quadratic polynomial $x^2 + 25x + 156$ are (a) both positive (b) both negative (c) one positive and one negative (d) can't be determined	1
2.	The pair of linear equations $\frac{3}{2}x + \frac{5}{3}y = 7$ and $9x + 10y = 14$ is (a) consistent (b) inconsistent (c) consistent with one solution (d) consistent with many solutions	1
3.	In figure, PQ and PR are tangents to a circle with centre A. If ∠QPA = 27°, then ∠QAR equals to  (a) 63° (b) 153° (c) 126° (d) 117°	1
4.	The next term of the AP:√18 ,√50, √98, ….. is (a) √146 (b) √128 (c) √162 (d) √200	1

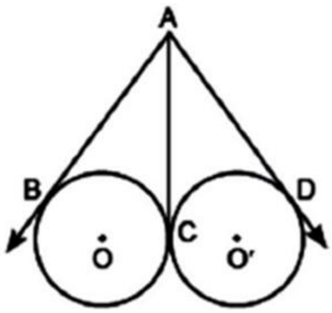
5. Volumes of two spheres are in the ratio 64 : 27. The ratio of their surface areas is — 1

(a) 3 : 4 (b) 4 : 3 (c) 9 : 16 (d) 16 : 9

6. If $tanA = \frac{5}{12}$, then find the value of $(sinA + cosA).secA$ — 1

12/5 (b) 17/12 (c) 7/12 (d) None of these

7. In the given figure AB, AC and AD are tangents to the circle. If AB =5 cm , then AD is equal to — 1



(a) 5 cm (b) 6 cm (c) 9 cm (d) 10 cm

8. If zeroes of p(x) = $2x^2 - 7x + k$ are reciprocal of each other, then value of k is — 1

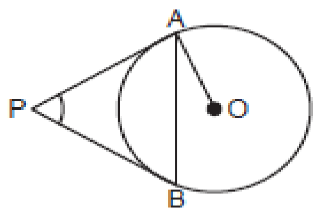
(a) 1 (b) 2 (c) 3 (d) 4

9. The median class of the following marks of 100 students is: — 1

Marks	0-10	10-20	20-30	30-40	40-50	50-60
Number of students	8	10	12	22	30	18

(a) 20 – 30 (b) 30 – 40 (c) 40 – 50 (d) 50 – 60

10. In the figure PA and PB are tangents to the circle with centre O. If ∠APB = 60°, then ∠OAB is



(*a*) 30° (*b*) 60° (*c*) 90° (*d*) 15° — 1

11. The nature of the roots of the quadratic equation $9x^2 - 6x - 2 = 0$ — 1

(a) Irrational and distinct (b) Not real
(c) Real and distinct (d) Real and equal

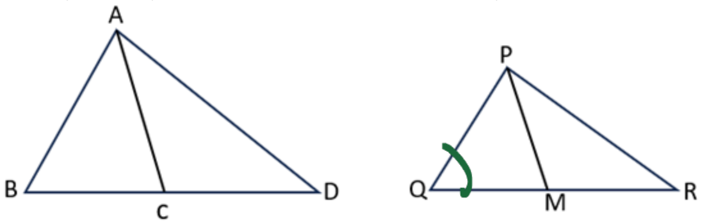
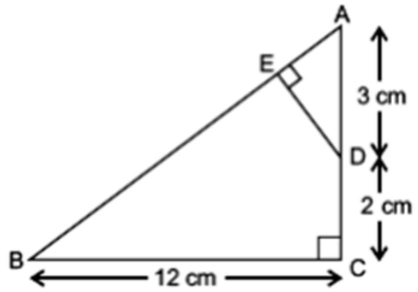
12. If 3 cot θ = 2, then the value of tan θ — 1

(a) $\frac{2}{3}$ (b) $\frac{3}{2}$ (c) $\frac{3}{\sqrt{13}}$ (d) $\frac{2}{\sqrt{13}}$

13. A toy is in the form of a cone of radius r cm mounted on a hemisphere of the same radius. The total height of the toy is (r + h) cm, then the volume of the toy is — 1

(a) π (2r +h) cm^3 (b) $\pi r^2(2r + h)$ cm^3
(c) $\frac{1}{3}\pi r^2(2r + h)$ cm^3 (d) $\frac{1}{3}\pi r^2 (r + h)$ cm^3

14.	17 cards numbered 1,2,3……,17 are put in a box and mixed thoroughly. One person draws a card from the box. Find the probability that the number on the card is: a prime number (a) $\frac{5}{17}$ (b) $\frac{6}{17}$ (c) $\frac{7}{17}$ (d) $\frac{8}{17}$	1
15.	If P $(\frac{a}{3}, 4)$ is the mid-point of the line segment joining the points Q (– 6, 5) and R (–2, 3), then the value of a is (a) –12 (b) – 4 (c) 12 (d) –6	1
16.	Using the empirical formula, find the mode of a distribution whose mean is 8.32 and the median is 8.05. (a) 24.51 (b) 8.32 (c) 8.05 (d) 7.51	1
17.	Three vertices of a parallelogram ABCD are A(1, 4), B(–2, 3) and C(5, 8). The ordinate of the fourth vertex D is (a) 9 (b) 8 (c) 7 (d) 6	1
18.	The probability that a non-leap year has 53 Sundays, is (a) $\frac{2}{7}$ (b) $\frac{5}{7}$ (c) $\frac{6}{7}$ (d) $\frac{1}{7}$	1
	DIRECTION: In the question number 19 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R).** Choose the correct option: (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A). (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A). (c) Assertion (A) is true but reason (R) is false. (d) Assertion (A) is false but reason (R) is true.	
19.	**Assertion (A):** If LCM of two numbers is 2475 and their product is 12375, then their HCF is 5 **Reason (R):** HCF (a, b) × LCM (a, b) = a × b. (a)	1
20.	**Assertion (A):** The length of the minute hand of a clock is 7 cm. Then the area swept by the minute hand in 5 minute is $\frac{77}{6}$ cm^2 . **Reason (R):** The length of an arc of a sector of angle θ and radius r is given by (b) $l = \frac{\theta}{360°} \times 2\pi r$	1
	SECTION-B	
	Section B Consists of 5 questions of 2 marks each	
21.	Find the HCF and LCM of 96 and 404 using prime factorisation method. **OR** The HCF of 65 and 117 is expressible in the form 65m-117. Find the value of m.	2
22.	A box contains 5 red marbles, 8 white marbles and 4 green marbles. One marble is taken out of the box at random. What is the probability that the marble taken out will be (i) red? (ii) not green? **OR**	

	A lot consists of 144 ball pens of which 20 are defective and the others are good. Nuri will buy a pen if it is good, but will not buy if it is defective. The shopkeeper draws one pen at random and gives it to her. What is the probability that (i) She will buy it ? (ii) She will not buy it	2
23.	Evaluate: $\frac{5cos^2 60°+4sec^2 30°-tan^2 45°}{sin^2 30°+cos^2 30°}$	2
24.	Find the point on x-axis which is equidistant from the points (2, – 5) and (–2, 9).	2
25.	If the point C (–1, 2) divides the line segment AB in the ratio 3 : 4, where the coordinates of A are (2, 5), find the coordinates of B.	2
	SECTION-C	
	Section C consists of 6 questions of 3 marks each	
26.	Sides AB and BD and median AC of a triangle ABD are respectively proportional to sides PQ and QR and median PM of Δ PQR. Show that ΔABD~ΔPQR.  **OR** In figure, ΔABC is right angled at C and DE ⊥ AB. Prove that ΔABC ~ ΔADE and hence find the lengths of AE and DE.  	3
27.	The sum of two numbers is 34. If 3 is subtracted from one number and 2 is added to another, the product of these two numbers becomes 260, Find the numbers.	3
28.	If α *and* β are the zeroes of the polynomial $6y^2 - 7y + 2$, find a quadratic polynomial whose zeroes are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$.	3
29.	If x = a cos θ – b sin θ and y = a sin θ + b cos θ, then prove that $a^2 + b^2 = x^2 + y^2$	3
30.	A chord of a circle of radius 15 cm subtends an angle of 60° at the centre. Find the areas of the corresponding minor segment of the circle. (Use π = 3.14 and √3 = 1.73) **OR**	

A brooch is made with silver wire in the form of a circle with diameter 35 mm. The wire is also used in making 5 diameters which divide the circle into 10 equal sectors as shown in fig find:

(i) The total length of the silver wire required.
(ii) The arc of each sector of the brooch

[3]

31. Prove that $\sqrt{5}$ is irrational [3]

SECTION - D

Section D consists of 4 questions of 5 marks each

32. Solve the following system of equations graphically

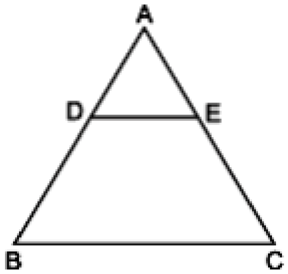
$$x + 3y = 6$$
$$2x - 3y = 12$$

and hence find the value of a,
If $4x + 3y = a$

OR

The area of a rectangle gets reduced by 9 square units, if its length is reduced by 5 units and breadth is increased by 3 units. If we increase the length by 3 units and the breadth by 2 units, the area increases by 67 square units. Find the dimensions of the rectangle. [5]

33. Prove that if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then other two sides are divided in the same ratio.
Use this theorem to find the value of x in the following question
In ΔABC, DE || BC. If BD = x – 3, AB = 2x, CE = x – 2 and AC = 2x + 3.



[5]

34. A 1.2 m tall girl spots a balloon moving with the wind in a horizontal line at a height of 88.2 m from the ground. The angle of elevation of the balloon from the eyes of the girl at any instant is 60°. After some time, the angle of elevation reduces to 30°. Find the distance travelled by the balloon during the interval. [5]

35. If the median of the distribution given below is 868, find the values of x and y.

Class interval	Frequency
800-820	7
820-840	14
840-860	**x**
860-880	25
880-900	**y**
900-920	10
920-940	5
Total	100

OR

During a medical check-up of 35 students, their weights were recorded as follows:

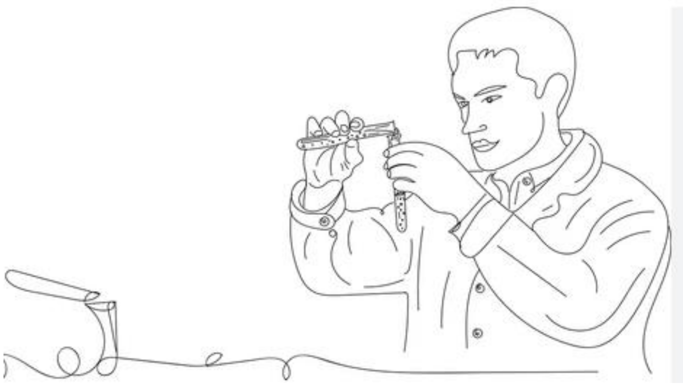
Weight in kgs	No. of students
Below 40	3
Below 42	5
Below 44	9
Below 46	14
Below 48	28
Below 50	31
Below 52	35

Compute the modal weight. 5

SECTION-E

Section E consists of 3 Case Based Questions of 4 marks each

36. In a pathology lab, a culture test has been conducted. In the test, the number of bacteria taken into consideration in various samples is all 3- digit numbers that are divisible by 7, taken in order



On the basis of above information, answer the following questions

(a) How many bacteria are considered in the fifth sample? 1

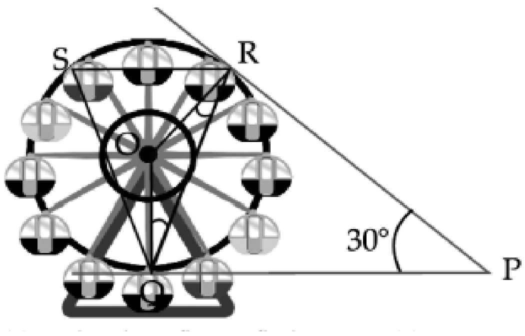
(b) How many samples should be taken into consideration? 1

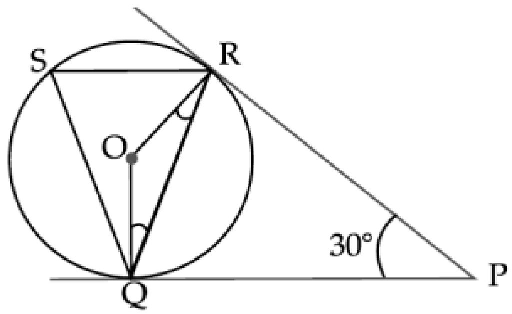
(c) Find the total number of bacteria in first 10 samples. 2

OR

(d) How many bacteria are there in the 7th sample from the last.

37. A Ferris wheel is an amusement ride (temporarily fixed during festivals) consisting of a rotating upright wheel with multiple passengers carrying components attached to the rim in such a way that as the wheel turns, they are kept upright, usually by gravity. After taking a ride in Ferris wheel, Monika came out from the crowd and was observing her friends who were enjoying the ride. She was curious about the different angles and measures that the wheel will form. She forms the figure as given below.





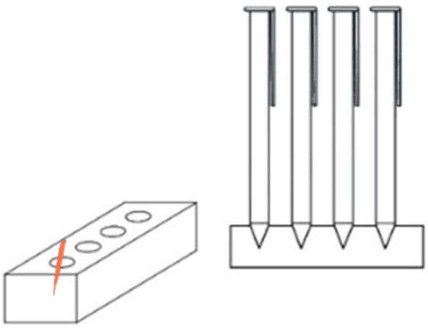
Observe the figure carefully and answer the following questions giving reason:

(a) What is the measure of ∠ROQ? 1
(b) Find the measure of ∠RQP. 2
(c) Find measure of ∠RSQ. 1

OR

(d) Find the sum of ∠ORP and ∠OQP.

38. A pen stand made of wood is in the shape of a cuboid with four conical depressions to hold pens. The dimensions of the cuboid are 15 cm by 10 cm by 3.5 cm. The radius of each of the depressions is 0.5 cm and the depth is 1.4 cm. Find the volume of wood in the entire stand.



Based on the above information, answer the following questions.
(a) Find the volume of pen stand without any conical depression. 1
(b) Find the volume of one conical depression. 1
(c) Find the volume of wood in pen stand with four conical depressions 2

OR

(d) Find the total surface area of wood stand without any conical depression.

Section - E

36) 105, 112, 119, ... 994 forms an AP with
$a = 105, d = 7, a_n = 994$

(a) $a_5 = a + 4d = 105 + 28 = 133$ bacteria

(b) $n = ?$

$a_n = a + (n-1)d$

$\Rightarrow 994 = 105 + (n-1)7$

$\Rightarrow \frac{889}{7} = n - 1$

$\Rightarrow n - 1 = 127$

$n = 128$

Thus, 128 samples are taken into consideration

(c) $S_n = \frac{n}{2}[2a + (n-1)d]$

$S_{10} = \frac{10}{2}[2 \times 105 + 9 \times 7]$

$= 5[210 + 63] = 5 \times 273$

$= 1365$ bacteria

(d) n^{th} term from last term

$= l - (n-1)d$

7^{th} term from the last $= 994 - 6 \times 7$

$= 994 - 42$

$= 952$ bacteria

37) (a) $\angle ORP = 90°$ ⎫ radius ⊥ tangent
$\angle OQP = 90°$ ⎭ through the pt. of contact

Using angle sum property in quad. ORPQ,

$\angle ROQ = 360° - (90° + 90° + 30°) = 360° - 210° = 150°$

(b) PQ = PR [tangents drawn from an external point are equal in lengths]

$\Rightarrow \angle PRQ = \angle PQR$ [angles opposite to equal sides]

Using angle sum property in $\triangle RQP$,

$$\angle RQP = \frac{180^\circ - 30^\circ}{2} = \frac{150^\circ}{2} = \underline{\underline{75^\circ}}$$

(c) $\angle RSQ = \frac{1}{2}\angle ROQ = \frac{1}{2} \times 150^\circ = \underline{\underline{75^\circ}}$

[angle subtended by arc RQ at O is double the angle subtended it at S]

(d) $\angle ORP = \angle OQP = 90^\circ$

$\therefore \angle ORP + \angle OQP = 180^\circ$

38) Cuboid :- $l = 15$ cm, $b = 10$ cm, $h = 3.5$ cm | Cone :- $r = 0.5$ cm, $H = 1.4$ cm

(a) volume of pen stand without cones

$= V_{cuboid} = l \times b \times h = 15 \times 10 \times 3.5$

$= \underline{\underline{525 \text{ cm}^3}}$

(b) volume of 1 cone $= \frac{1}{3}\pi r^2 H$

$$= \frac{1}{3} \times \frac{\cancel{22}^{11}}{\cancel{7}_1} \times \frac{\cancel{5}^1}{\cancel{10}_2} \times \frac{\cancel{5}^1}{10} \times \frac{\cancel{14}^2}{\cancel{10}_5}$$

$= \frac{\cancel{11}^{3.66}}{\cancel{30}_{10}} \approx \underline{\underline{0.366 cm^3}}$

(c) volume of pen stand

$= V_{cuboid} - 4 \times V_{cone}$

$= 525 - 4 \times \frac{11}{30} = 525 - \frac{\cancel{44}^{14.66}}{\cancel{30}_{10}}$

$= 525 - 1.466 \approx \underline{\underline{523.534 cm^3}}$

(d) $TSA_{cuboid} = 2(lb + bh + hl)$

$= 2(15 \times 10 + 10 \times 3.5 + 3.5 \times 15)$

$= 2(150 + 35 + 52.5)$

$= 2 \times 237.5 = \underline{\underline{475 cm^2}}$

$\boxed{\text{SECTION-D}}$

32) $x + 3y = 6$

$3y = 6 - x$

$y = \frac{6 - x}{3}$

x	3	0	6
y	1	2	0

$2x - 3y = 12$

$2x - 12 = 3y$

$y = \frac{2x - 12}{3}$

x	0	6	-3
y	-4	0	-6

(graph)

$x = 6$

$y = 0$

$4x + 3y = a$

$\Rightarrow 24 + 0 = a$

$\therefore \underline{\underline{a = 24}}$

OR Let the length and breadth of the rectangle be x units and y units respt.

area = $l \times b$

ATQ, $(x-5)(y+3) = xy - 9$

$\Rightarrow \cancel{xy} + 3x - 5y - 15 = \cancel{xy} - 9$

$3x - 5y = 6 \longrightarrow (1)$

Also, $(x+3)(y+2) = xy + 67$

$\Rightarrow \cancel{xy} + 2x + 3y + 6 = \cancel{xy} + 67$

$\Rightarrow \quad 2x + 3y = 61 \longrightarrow (2)$

(1) × 2 $\Rightarrow \cancel{6x} - 10y = 12$

(2) × 3 $\Rightarrow \overset{(-)}{\cancel{6x}} \overset{(-)}{+} 9y \overset{(-)}{=} 183$

$-19y = -171$

$\boxed{y = 9}$

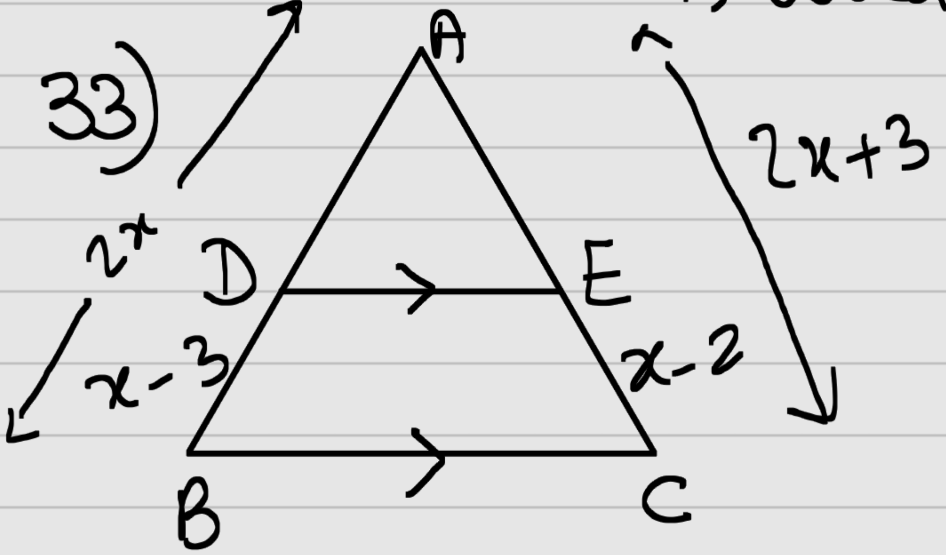
From eq:- (2), $2x + 27 = 61$

$$2x = 34$$

$$\boxed{x = 17}$$

Hence, the dimensions of rectangle are 17 units and 9 units

33)



Using Thales theorem, since $DE \parallel BC$, in $\triangle ABC$, $\dfrac{AD}{DB} = \dfrac{AE}{EC}$

$$\Rightarrow \frac{AB - DB}{DB} = \frac{AC - EC}{EC}$$

$$\Rightarrow \frac{2x - x + 3}{x - 3} = \frac{2x + 3 - x + 2}{x - 2}$$

$$\Rightarrow \frac{x + 3}{x - 3} = \frac{x + 5}{x - 2}$$

$$\Rightarrow (x+3)(x-2) = (x+5)(x-3)$$

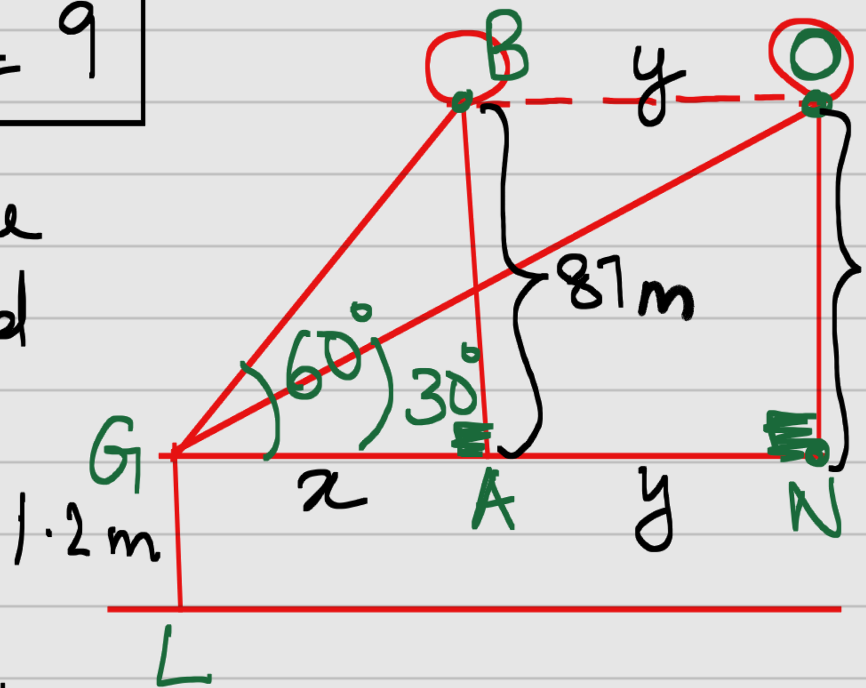
$$\Rightarrow \cancel{x^2}+x-6 = \cancel{x^2}+2x-15$$

$$\Rightarrow x-2x = -15+6$$

$$\therefore -x = -9$$

$$\boxed{x = 9}$$

34) Let BO be the distance travelled by the balloon.



To find:- BO

In rt. ΔBAG,

$$\tan 60° = \frac{BA}{GA}$$

$$\Rightarrow \sqrt{3} = \frac{87}{x}$$

$$\Rightarrow \boxed{x = \frac{87}{\sqrt{3}}}$$

In rt. ΔONG,

$$\tan 30° = \frac{ON}{GN}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{87}{x+y}$$

$$\Rightarrow x+y = 87\sqrt{3}$$

$$\Rightarrow \frac{87}{\sqrt{3}}+y = 87\sqrt{3}$$

$$\Rightarrow y = 87\sqrt{3} - \frac{87}{\sqrt{3}}$$

$$= \frac{87\times3-87}{\sqrt{3}}$$

$$= \frac{174\times\sqrt{3}}{\sqrt{3}\times\sqrt{3}} = \frac{\overset{58}{\cancel{174}}\sqrt{3}}{\cancel{3}\,1}$$

$$= 58\times1.732$$

$$\approx 100.456m$$

Hence, the distance travelled by the balloon = 100.456m (approx.)

35)

C.I	f	c.f
800-820	7	7
820-840	14	21
840-860	x	$21+x$
$\boxed{860-880}$	25	$46+x$
880-900	y	$46+x+y$
900-920	10	$56+x+y$
920-940	5	$61+x+y$
	100	

$$61+x+y = 100$$

$$x+y = 39 \longrightarrow (1)$$

median = 868

median class = 860-880

$f = 25$; $c.f = 21+x$; $h = 20$; $l = 860$

$$\text{median} = l + \frac{\frac{n}{2} - c.f}{f} \times h$$

$$868 = 860 + \frac{50 - 21 - x}{\cancel{25}\ 5} \times \cancel{20}^{4}$$

$$\cancel{8}^{2} = (29 - x) \times \frac{\cancel{4}^{1}}{5}$$

$$29 - x = 10$$

$$\boxed{x = 19}$$

$$\boxed{y = 20}$$

OR

C.I	C.f	f
38-40	3	3
40-42	5	2
42-44	9	4
44-46	14	5
$\boxed{46-48}$	28	$\underline{\underline{14}}$
48-50	31	3
50-52	35	4

modal class = 46-48

$f_0 = 5$ | $h = 2$

$f_1 = 14$ | $l = 46$

$f_2 = 3$

$$\text{modal weight} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$$

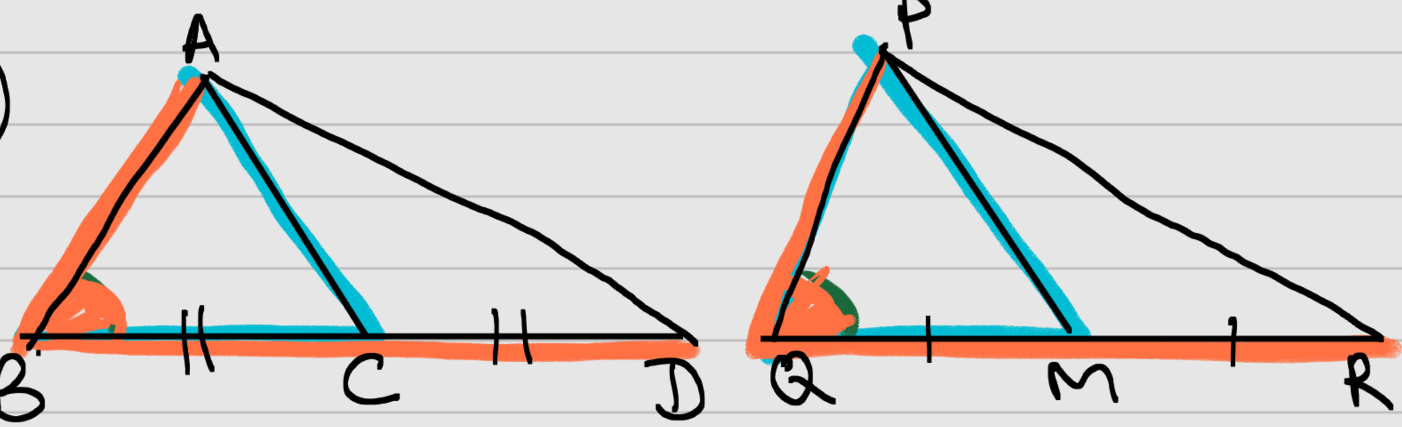
$$= 46 + \frac{14 - 5}{28 - 5 - 3} \times 2$$

$$= 46 + \frac{9}{\cancel{20}\,10} \times \cancel{2}\,1 = 46 + 0.9$$

$$= \underline{\underline{46.9\,kg}}$$

$\boxed{\text{SECTION C}}$

26)



Given:- $\frac{AB}{PQ} = \frac{BD}{QR} = \frac{AC}{PM} \longrightarrow (1)$

To prove:- $\triangle ABD \sim \triangle PQR$

Proof:- In $\triangle ABC$ and $\triangle PQM$,

from eq.(1), $\frac{AB}{PQ} = \frac{\frac{1}{2}BD}{\frac{1}{2}QR} = \frac{AC}{PM}$ [$\because$ AC and PM are the medians]

$$\Rightarrow \frac{AB}{PQ} = \frac{BC}{QM} = \frac{AC}{PM}$$

$\therefore \triangle ABC \sim \triangle PQM$ (SSS similarity)

Thus, $\angle ABC = \angle PQM$ (corresponding angles of similar $\triangle$s are equal)

$\Rightarrow \angle B = \angle Q \rightarrow (2)$

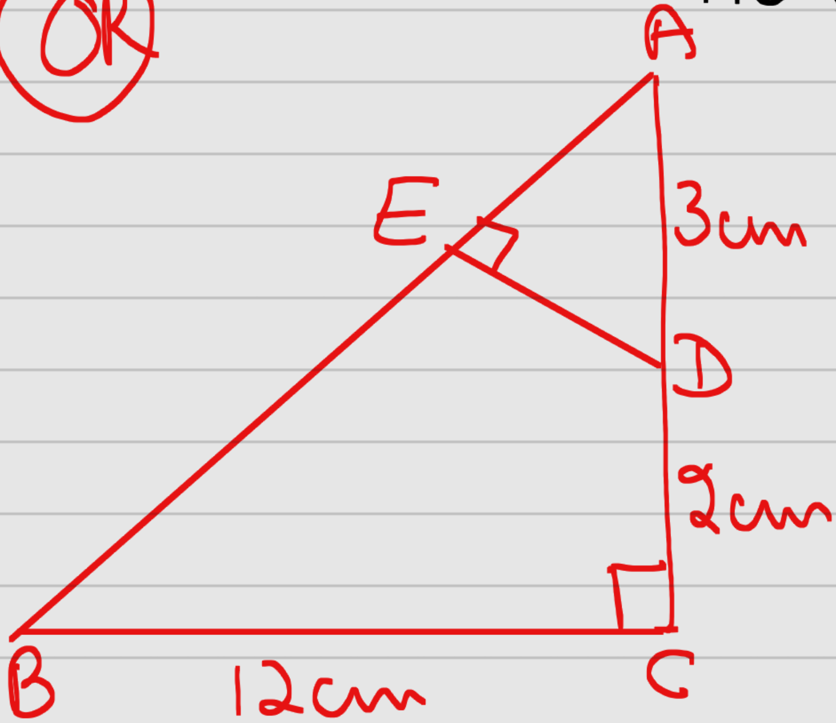
In $\triangle ABD$ and $\triangle PQR$, $\frac{AB}{PQ} = \frac{BD}{QR}$

$\angle B = \angle Q$ [from eq: (2)]

$\therefore \triangle ABD \sim \triangle PQR$ [SAS similarity]

Hence Proved.

OR



Given :- $\angle ACB = 90°$

$\angle AED = 90°$

To prove :-

$\triangle ABC \sim \triangle ADE$

Proof :- In $\triangle ABC$ and $\triangle ADE$,

$\angle ACB = \angle AED$ (each 90°)

$\angle BAC = \angle EAD$ (common angle)

$\therefore \triangle ABC \sim \triangle ADE$ (AA similarity)

Thus, $\frac{AB}{AD} = \frac{BC}{DE} = \frac{AC}{AE}$ (Corresponding sides of similar $\triangle$s are in proportion)

Hence proved

$$\Rightarrow \frac{\boxed{AB}}{3} = \frac{12}{DE} = \frac{5}{AE} \longrightarrow (1)$$

Using Pythagoras theorem in $\triangle ACB$, $AB^2 = 25 + 144 = 169$

$AB = 13\text{ cm}$

from eq:-(1), $\frac{13}{3} = \frac{12}{DE}$

$13DE = 36$

$DE = \frac{36}{13} = \underline{\underline{2.76\text{ cm}}}$

from eq:-(1), $\frac{13}{3} = \frac{5}{AE}$

$13AE = 15$

$AE = \frac{15}{13} = \underline{\underline{1.15\text{ cm}}}$

27) The sum of two no.s is 34. If 3 is subtracted from one no. and 2 is added to another, the product of these two no.s becomes 260. Find the numbers.

Let the no.s be x and $34-x$

ATQ, $(x-3)(34-x+2)=260$

$\Rightarrow (x-3)(36-x)=260$

$\Rightarrow 36x-x^2-108+3x=260$

$\Rightarrow x^2-39x+368=0$

$-23, -16$

$\Rightarrow (x-23)(x-16)=0$

$x = 23, 16$

When $x=23$, the no.s are 23 and 11

When $x=16$, the no.s are 16 and 18

28) If α and β are the zeroes of $6y^2-7y+2$, find a quadratic polynomial whose zeroes are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$.

$a=6, b=-7, c=2$

$\alpha+\beta = -\frac{b}{a} = \frac{7}{6}$

$\alpha\beta = \frac{c}{a} = \frac{2}{6} = \frac{1}{3}$

For new quadratic polynomial,

Sum of zeroes $= \frac{1}{\alpha}+\frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta} = \frac{\frac{7}{\cancel{6}}}{\frac{2}{\cancel{6}}} = \frac{7}{2}$

Product of zeroes $= \frac{1}{\alpha\beta} = \frac{1}{1/3} = 3$

$\therefore$ The required polynomial is

$k[y^2 - (\text{sum of zeroes})y + \text{product of zeroes}]$

where k is any non-zero real no.

$= k\left[y^2 - \frac{7}{2}y + 3\right]$

$= \frac{k}{2}\left[2y^2 - 7y + 6\right]$

$= \underline{\underline{2y^2 - 7y + 6}}$; where $k = 2$

29) If $x = a\cos\theta - b\sin\theta \rightarrow (1)$

$y = a\sin\theta + b\cos\theta \rightarrow (2)$

P.T $a^2 + b^2 = x^2 + y^2$

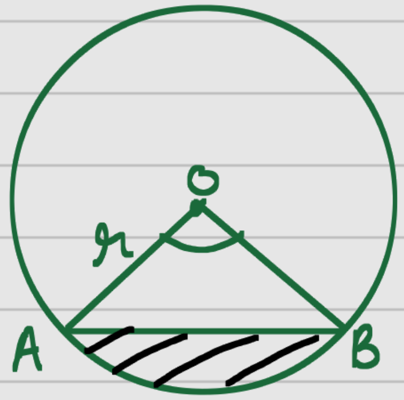
$(1)^2 \Rightarrow \quad x^2 = a^2\cos^2\theta + b^2\sin^2\theta - \cancel{2ab\cos\theta\sin\theta}$

$(2)^2 \Rightarrow \quad y^2 = a^2\sin^2\theta + b^2\cos^2\theta + \cancel{2ab\sin\theta\cos\theta}$

$(+) \Rightarrow x^2 + y^2 = a^2(\cos^2\theta + \sin^2\theta) + b^2(\sin^2\theta + \cos^2\theta)$

$\therefore \quad x^2 + y^2 = a^2 + b^2 \quad [\because \sin^2\theta + \cos^2\theta = 1]$

30)



$r = 15\text{cm}$

$\theta = 60°$

find the area of minor segment $[\pi = 3.14, \sqrt{3} = 1.73]$

area of minor segment = area of sector − area of $\triangle OAB$

area of sector $= \frac{\theta}{360°} \times \pi r^2$

$= \frac{\cancel{60°}^{1}}{\cancel{360°}_{\cancel{6}\,\cancel{3}\,1}} \times \cancel{3.14}^{1.57} \times \cancel{15}^{5} \times 15 \quad = 117.75\text{cm}^2$

area $(\Delta AOB) = \frac{\sqrt{3}r^2}{4} = \frac{1.73 \times \cancel{15}^{7.5} \times \cancel{15}^{7.5}}{\cancel{4}\,\cancel{2}\,1} = 97.3125$ cm^2

$\therefore$ area of minor segment $= 117.75 - 97.3125$

$= \underline{\underline{20.4375 cm^2}}$

OR

diameter = 35mm.

find

(i) total length of the silver wire used

(ii) area of each sector.

$r = \frac{35}{2}$ mm

$\theta = \frac{360°}{10} = \underline{\underline{36°}}$

(i) Total length of wire used $= 5 \times 2r + 2\pi r$

$= 2r(5+\pi)$

$= 2 \times \frac{35}{2}\left(5 + \frac{22}{7}\right)$

$= \cancel{35}^{5} \times \frac{57}{\cancel{7}\,1} = \underline{\underline{285 mm}}$

(ii) area of each sector $= \frac{\theta}{360°} \times \pi r^2$

$= \frac{\cancel{36}^{1}}{\cancel{360}_{\cancel{10}\,\cancel{2}\,1}} \times \frac{\cancel{22}^{\cancel{11}\,5.5}}{\cancel{7}\,1} \times \frac{\cancel{35}^{\cancel{5}\,1}}{\cancel{2}} \times \frac{\cancel{35}^{17.5}}{\cancel{2}\,1}$

$= \underline{\underline{96.25 mm^2}}$

31) P.T $\sqrt{5}$ is irrational.

SECTION-B

21) Find the HCF and LCM of 96 and 404 using prime factorisation method.

$96 = 3 \times 2^5$

$404 = 2^2 \times 101$

$HCF = 2^2 = \underline{\underline{4}}$

$LCM = 2^5 \times 3 \times 101$

$= \underline{\underline{9696}}$

$$\begin{array}{r|l} 3 & 96 \\ \hline 2 & 32 \\ \hline 2 & 16 \\ \hline 2 & 8 \\ \hline 2 & 4 \\ \hline & 2 \end{array} \qquad \begin{array}{r|l} 2 & 404 \\ \hline 2 & 202 \\ \hline & 101 \end{array}$$

OR

Find HCF of 65 and 117. Hence find the value of m if HCF is of the form 65m − 117.

$65 = 5 \times 13$

$117 = 3^2 \times 13$

$$\begin{array}{r|l} 5 & 65 \\ \hline & 13 \end{array} \qquad \begin{array}{r|l} 3 & 117 \\ \hline 3 & 39 \\ \hline & 13 \end{array}$$

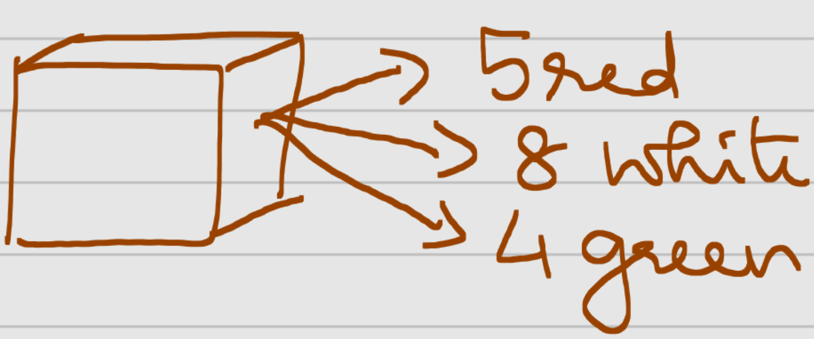
$HCF = 13$

$65m - 117 = 13$

$\Rightarrow 65m = 130$

$$m = \frac{130}{65} = \underline{\underline{2}}$$

22)



Find the probability that the selected marble is (i) red

(ii) not green

Total no. of outcomes $= 5+8+4 = \underline{\underline{17}}$

$$P(E) = \frac{\text{no. of favourable outcomes}}{\text{Total no. of outcomes}}$$

(i) no. of favourable outcomes $= 5$

$$\therefore P(\text{red}) = \underline{\underline{\frac{5}{17}}}$$

(ii) no. of favourable outcomes $= 5+8$

$= 13$

$$\therefore P(\text{not green}) = \underline{\underline{\frac{13}{17}}}$$

OR

lot

144 ball pens

20 defective ——— good

What is the probability that

(i) she will buy?

(ii) She will not buy?

Total no. of ball pens = 144

no. of defective pens = 20

no. of good pens = 144 - 20

= 124

$$P(E) = \frac{\text{no. of favourable outcomes}}{\text{Total no. of outcomes}}$$

(i) no. of favourable outcomes = 124

$$P(\text{She will buy}) = \frac{\cancel{124}^{62}}{\cancel{144}_{72}} = \frac{31}{36}$$

(ii) $P(\text{she will not buy}) = 1 - P(\text{She will buy})$

$$= 1 - \frac{31}{36} = \frac{5}{36}$$

23) Evaluate $\dfrac{5\cos^2 60^\circ + 4\sec^2 30^\circ - \tan^2 45^\circ}{\sin^2 30^\circ + \cos^2 30^\circ}$

$\cos 60^\circ = \frac{1}{2}$, $\sec 30^\circ = \frac{2}{\sqrt{3}}$, $\tan 45^\circ = 1$

$\sin 30^\circ = \frac{1}{2}$, $\cos 30^\circ = \frac{\sqrt{3}}{2}$

$$\frac{5 \times \frac{1}{4} + 4 \times \frac{4}{3} - 1}{\left(\frac{1}{4} + \frac{3}{4}\right)}$$

$= \frac{5}{4}^{\times 3} + \frac{16}{3}^{\times 4} - 1^{\times 12}$

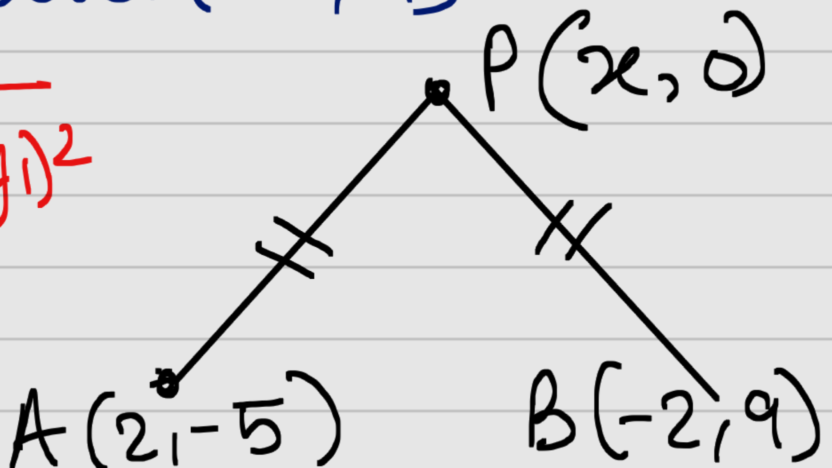
$= \frac{15 + 64 - 12}{12}$

$= \underline{\underline{\frac{67}{12}}}$

24) Find the point on x-axis which is equidistant from the points $(2,-5)$ and $(-2,9)$

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$PA = PB$



$\Rightarrow PA^2 = PB^2$

$(2+x)^2$

$\Rightarrow (2-x)^2 + (-5-0)^2 = (-2-x)^2 + (9-0)^2$

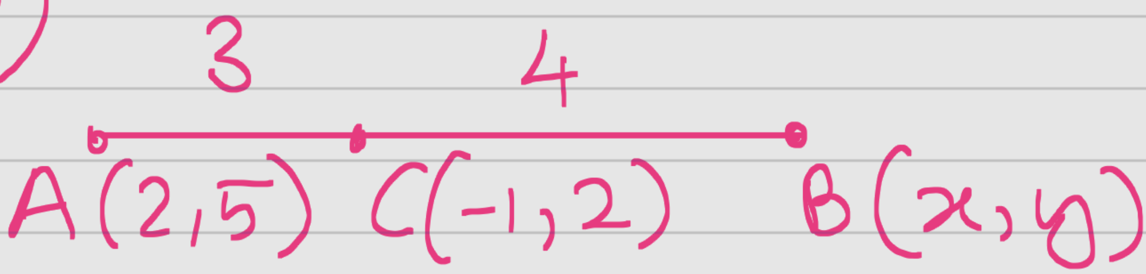
$\Rightarrow \cancel{4} - 4x + \cancel{x^2} + 25 = \cancel{4} + 4x + \cancel{x^2} + 81$

$\Rightarrow \quad -8x = 56$

$$\boxed{x = -7}$$

Hence, the required point is $(-7, 0)$

25)



$$C(x,y) = C\left(\frac{m_1x_2 + m_2x_1}{m_1+m_2}, \frac{m_1y_2 + m_2y_1}{m_1+m_2}\right)$$

$$(-1, 2) = \left(\frac{3x+8}{7}, \frac{3y+20}{7}\right)$$

$3x + 8 = -7$

$3x = -15$

$x = -5$

$3y + 20 = 14$

$3y = -6$

$y = -2$

$$\therefore B(x, y) = B(-5, -2) \,//$$