Syllabus:(Ch. 1 , 9(theorem,1,2 , 13.1 13.2)

MATHEMATICS (SCIENCE) **-019-(OBJECTIVE)** **Paper: (Objective Type)**

Time allowed: 15 Minutes **Maximum Marks: 12**

Note: You have four choices for each objective type questions as A, B, C and D. The choice which you think is correct fill that circle to front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question.

Q.1	QUESTIONS	(A)	(B)	(C)	(D)
1.	An equation which contains the square of unknown (variable) quantity, but no higher power is present called:	Linear Equation	Quadratic Equation	3rd degree Equation	None of these
2.	Pure quadratic equation is:	$x^2 - 7x + 6 = 0$	$4x + 5 = 0$	$4x^2 = 7$	$x = 16$
3.	The number of methods to solve a quadratic equation is:	1	2	3	4
4.	Which equation is called exponential equation?	$2(2x-1) + \frac{3}{2x-1} = 5$	$5^{1+x} + 5^{1-x} = 26$	$2x^4 - 5x^3 - 4x^2 - 5x + 2 = 0$	None of these
5.	A solution of equation which does not satisfy the equation is called:	Real root	Extraneous root	Imaginary root	Unequal root
6.	An equation in which variable occurs under radical sign is called:	Exponential Equation	Reciprocal Equation	Radical Equation	Variable Equation
7.	The standard form of $\frac{2x+1}{x+2} - \frac{x-2}{x+4} = 0$ is:	$x^2 + 9x + 8 = 0$	$x^2 - 9x + 8 = 0$	$x^2 + 9x - 8 = 0$	$x^2 - 9x - 8 = 0$
8.	The solution set of equation $25x^2 - 1 = 0$ is:	$\{\pm 1\}$	$\left\{\frac{1}{\pm 3}\right\}$	$\left\{\frac{1}{\pm 5}\right\}$	$\left\{\frac{1}{\pm 7}\right\}$
9.	The quadratic formula of $ax^2 + bx + c = 0$ is:	$x = \frac{-b \pm \sqrt{b-4ac}}{2a}$	$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$	$x = \frac{-b \pm \sqrt{b+4ac}}{2a}$	$x = \frac{b \pm \sqrt{b^2-4ac}}{2a}$
10.	An equation of the form $2x^4 - 5x^3 + 14x^2 - 5x + 2 = 0$ is called:	Exponential Equation	Reciprocal Equation	Radical equation	Variable equation
11.	A circle of radius "r" has a circumference of::	πr^2	$2\pi r$	$2\pi r^2$	$\frac{1}{2}\pi r$
12.	A circle of radius "r" has a area:	πr^2	$2\pi r$	$2\pi r^2$	$\frac{1}{2}\pi r$
13	The distance of any point of the circle to its Centre is called:	Radius	Diameter	A Chord	An arc
14	How many escribed circles of a triangle can be drawn?	One	Two	Three	Four
15	A line intersecting a circle is called:	Tangent	Secant	Chord	Boundary

	A B C D		A B C D		A B C D		A B C D		A B C D
1	A ● C D	4	A ● C D	7	● B C D	10	A ● C D	13	● B C D
2	A ● C D	5	A ● C D	8	A B ● D	11	A ● C D	14	A B ● D
3	A B ● D	6	A B ● D	9	A ● C D	12	● B C D	15	A ● C D

نوٹ: معروضی سوال نامے کو توجہ سے پڑھیں اور ہر MCQ کی درست آپشن A,B,C,D کو پین کی سیاہی یا مارکر سے اس طرح پُر کریں کہ سیاہی دائرے سے باہر نہ نکلے۔ ایک سے زیادہ دائروں کو پُر کرنے یا کاٹ کر پُر کرنے کی صورت میں مذکورہ جواب غلط تصور ہوگا۔

Syllabus:(Ch. 1 , 9(theorem,1,2 , 13.1 13.2)

MATHEMATICS (SCIENCE)

Paper : II (Essay Type) -019(10^{th} Class) **Time Allowed; 2:10 hours**

Maximum Marks: 60

(PART – 1)

2. Write short answer to any SIX (6) questions: 12

i. Solve $3y^2 = y(y-5)$ by factorization.
ii. Write the standard form of quadratic equation in y variable.
iii. Solve $x^2 + 2x - 2 = 0$ by quadratic formula.
iv. Write the names of the methods for solving a quadratic equation.
v. Solve $\sqrt{3}\,x^2 + x = 4\sqrt{3}$ by quadratic formula.
vi. Differentiate between reciprocal and exponential equation.
vii. Write the difference between circumference, diameter and chords.
viii. Differentiate between major arc and minor arc.
ix. What is the difference between arc and segment of the circle?

3. Write short answer to any SIX (6) questions: 12

i. Solve $\sqrt{3x+100} - x = 4$.
ii. Solve $5^{1+x} + 5^{1-x} = 26$.
iii. Solve $x^{\frac{2}{3}} + 54 = 15x^{\frac{1}{3}}$.
iv. What is extraneous root?
v. Solve $2^x + 64.2^{-x} - 20 = 0$.
vi. How to make the inscribed an equilateral triangle in a given circle?
vii. If $|\overline{AB}| = 3.5\text{cm}$ and $|\overline{BC}| = 5\text{cm}$ are the lengths of two chords of an arc, then locate the Centre of the arc.
viii. Calculate the length of a chord which stands at a distance 5cm from the center of a circle whose radius is 9cm.
ix. Differentiate between a sector and a segment of a circle.

4. Write short answer to any SIX (6) questions: 12

i. Solve $2x + 5 = \sqrt{7x+16}$.
ii. Define and draw the sector of a circle.
iii. Write $\frac{x+3}{x+4} - \frac{x-5}{x} = 1$ in the standard form and point out pure quadratic equation.
iv. Solve $x^4 - 13x^2 + 36 = 0$.
v. Divide an arc of any length into three equal parts
vi. Solve by factorization $x^2 - 11x = 152$
vii. Solve the following equation $3x^{-2} + 5 = 8x^{-1}$
viii. Prove that, the diameters of a circle bisect each other
ix. Differentiate between Interior and Exterior of a circle?

(PART – 2)

Note:Attempt THREE questions in all. But question No.9 is compulsory.

Q. 5 (a) Solve $lx^2 + mx + n = 0,\ l \neq 0$ bycompleting square. 4
(b) Solve $7(x+2a)^2 + 3a^2 = 5a(7x + 23a)$ by completing square. 4

Q. 6 (a) Solve $\sqrt{4a+x} - \sqrt{a-x} = \sqrt{a}$. 4
(b) Solve $\sqrt{x^2+3x+9} + \sqrt{x^2+3x+4} = 5$. 4

Q. 7 (a) Solve$(x-1)(x-2)(x-8)(x+5)+360=0$ 4
(b) Solve the equation using quadratic formula $-(l+m)-lx^2+(2l+m)x=0$. 4

Q. 8 (a) If $|\overline{AB}| = 4\text{cm}$, and $|\overline{BC}| = 6\text{cm}$, such that $\overline{AB}$ is perpendicular to $\overline{BC}$, construct a circle through points A, B and C. Also measure its radius. 4
(b) Solve the equation $x^4-2x^3-2x^2+2x+1$ 4

Q.9. Prove that one and only one circle can pass through three non-collinear points. 8

OR

Prove that A Straight line, drawn from the centre of a circle to bisect a chord (Which is not a diameter) is Perpendicular to the chord.

MATHEMATICS (SCIENCE)

(PART - I)

Question : 2

Write short answer to any six (6) questions:

(i) Solve $3y^2 = y(y-5)$ by factorization.

$$3y^2 = y(y-5)$$
$$3y^2 = y^2 - 5y$$
$$3y^2 - y^2 + 5y = 0$$
$$2y^2 + 5y = 0$$
$$y(2y+5) = 0$$

$y = 0$, $2y + 5 = 0$

$$2y = -5$$
$$y = -\frac{5}{2}$$

Hence $\left\{0, -\frac{5}{2}\right\}$ is the solution set.

(ii) Write the standard form of quadratic equation in y variable.

The standard form of quadratic equation in y variable is

$$ay^2 + by + c = 0$$

(iii) Solve $x^2 + 2x - 2 = 0$ by quadratic equation.

$$x^2 + 2x - 2 = 0$$

Here

$$a = 1, \quad b = 2, \quad c = -2$$

Using quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Putting the values, we get

$$x = \frac{-2 \pm \sqrt{(2)^2 - 4(1)(-2)}}{2(1)}$$

$$x = \frac{-2 \pm \sqrt{4+8}}{2}$$

$$x = \frac{-2 \pm \sqrt{12}}{2}$$

$$x = \frac{-2 \pm 2\sqrt{3}}{2}$$

$$x = \frac{\cancel{2}(-1 \pm \sqrt{3})}{\cancel{2}}$$

$$x = -1 \pm \sqrt{3}$$

Hence $\{-1+\sqrt{3}, -1-\sqrt{3}\}$ is the solution set.

(iv) Write the names of methods for solving a quadratic equation.

Following methods are used for solving a quadratic equation:

1. Factorization
2. Completing square
3. Quadratic formula

(v) Solve $\sqrt{3}x^2 + x = 4\sqrt{3}$ by quadratic formula.

$$\sqrt{3}x^2 + x = 4\sqrt{3}$$

$$\sqrt{3}x^2 + x - 4\sqrt{3} = 0$$

Here

$$a = \sqrt{3} \quad , \quad b = 1 \quad , \quad c = -4\sqrt{3}$$

Using quadratic equation

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Putting the values, we get

$$x = \frac{-1 \pm \sqrt{1-(\sqrt{3})4(-4\sqrt{3})}}{2(\sqrt{3})}$$

$$x = \frac{-1 \pm \sqrt{1+16(3)}}{2\sqrt{3}}$$

$$x = \frac{-1 \pm \sqrt{49}}{2\sqrt{3}}$$

$$x = \frac{-1 \pm 7}{2\sqrt{3}}$$

$$x = \frac{-1+7}{2\sqrt{3}} \quad , \quad x = \frac{-1-7}{2\sqrt{3}}$$

$$x = \frac{\cancel{6}\,3}{\cancel{2}\sqrt{3}} \quad , \quad x = \frac{-\cancel{8}\,4}{\cancel{2}\sqrt{3}}$$

$$x = \frac{3}{\sqrt{3}} \quad , \quad x = -\frac{4}{\sqrt{3}}$$

$$x = \sqrt{3}$$

Hence

Solution set $= \{\sqrt{3}, -\frac{4}{\sqrt{3}}\}$

(vi) Differentiate between reciprocal and exponential equation.

Reciprocal Equation:-

An equation is said to be a reciprocal equation, if it remains unchanged, when x is replaced by $1/x$.

Exponential Equation:-

In exponential equations variable occurs in exponent.

(vii) Write the difference between circumference, diameter and chords.

Circumference :-

Boundary traced by the moving point is called circumference of the circle.

Diameter :-

A chord which passes through the centre of the circle is called diameter of the circle.

Chord :-

The join of any two points on the circumference of the circle is called its chord.

(viii) Differentiate between major arc and minor arc.

Major Arc :-

An arc greater than half of the circumference is called major arc of the circle.

Minor Arc :-

An arc smaller than half of the circumference is called minor arc of the circle.

(ix) What is the difference between arc and segment of the circle?

Arc :-

A part of circumference of a circle is called an arc.

Segment :-

A segment is the portion of a circle bounded by an arc and a corresponding chord.

Question : 3

Write short answer to any six (6) questions :

(i) Solve $\sqrt{3x+100} - x = 4$

$$\sqrt{3x+100} = 4 + x$$

Taking square on both sides

$$(\sqrt{3x+100})^2 = (4+x)^2$$

$$3x + 100 = 16 + 8x + x^2$$

$0 = x^2 + 8x - 3x + 16 - 100$

$\Rightarrow x^2 + 5x - 84 = 0$

$x^2 + 12x - 7x - 84 = 0$

$x(x+12) - 7(x+12) = 0$

$(x-7)(x+12) = 0$

$x - 7 = 0 \quad , \quad x + 12 = 0$

$x = 7 \quad , \quad x = -12$

Hence

Solution set $= \{7, -12\}$

(ii) **Solve $5^{1+x} + 5^{1-x} = 26$**

$5^{1+x} + 5^{1-x} = 26$

$5^1 \cdot 5^x + 5^1 \cdot 5^{-x} = 26 \quad \text{—— (1)}$

Let $5^x = y$

Then equation (1) becomes

$5y + 5y^{-1} = 26$

$5y + \frac{5}{y} - 26 = 0$

$5y^2 + 5 - 26y = 0$

$5y^2 - 26y + 5 = 0$

$5y^2 - 25y - y + 5 = 0$

$5y(y-5) - 1(y-5) = 0$

$(y-5)(5y-1) = 0$

$y - 5 = 0 \quad , \quad 5y - 1 = 0$

$y = 5 \quad , \quad 5y = 1$

$y = \frac{1}{5}$

put $y = 5^x$

$5^x = 5$, $5^x = \frac{1}{5}$

$x = 1$, $5^x = 5^{-1}$

$x = -1$

Hence the solution set is $\{1, -1\}$

(iii) **Solve $x^{2/3} + 54 = 15x^{1/3}$**

$x^{2/3} + 54 = 15x^{1/3}$ ——— ①

Let $x^{1/3} = y$

then $x^{2/3} = y^2$

Equation ① becomes

$y^2 + 54 = 15y$

$y^2 - 15y + 54 = 0$

$y^2 - 9y - 6y + 54 = 0$

$y(y-9) - 6(y-9) = 0$

$(y-9)(y-6) = 0$

$y - 9 = 0$, $y - 6 = 0$

$y = 9$, $y = 6$

put $y = x^{1/3}$

$x^{1/3} = 9$, $x^{1/3} = 6$

$(x^{1/\cancel{3}})^{\cancel{3}} = (9)^3$, $(x^{1/\cancel{3}})^{\cancel{3}} = (6)^3$

$x = 729$, $x = 216$

Hence

Solution Set $= \{729, 216\}$

(iv) What is extraneous roots?

Extraneous Roots :-

A roots of an equation which do not satisfy the equation are called extraneous roots.

(v) Solve $2^x + 64 \cdot 2^{-x} - 20 = 0$

$$2^x + 64 \cdot 2^{-x} - 20 = 0$$

Let

$$2^x = y$$

$$y + 64y^{-1} - 20 = 0$$

$$y + \frac{64}{y} - 20 = 0$$

$$y\left(y + \frac{64}{y} - 20\right) = y(0)$$

$$y^2 + 64 - 20y = 0$$

$$y^2 - 20y + 64 = 0$$

$$y^2 - 4y - 16y + 64 = 0$$

$$y(y-4) - 16(y-4) = 0$$

$$(y-4)(y-16) = 0$$

$y - 4 = 0$, $y - 16 = 0$

$y = 4$, $y = 16$

put $y = 2^x$

$2^x = 4$, $2^x = 16$

$2^x = 2^2$, $2^x = 2^4$

$x = 1$, $x = 4$

Hence

Solution set is $\{1, 4\}$

(vi) **How to make the inscribe an equilateral triangle in a given circle?**

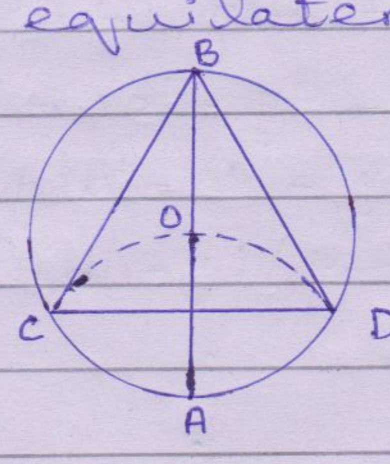
Given circle at point O (centre).

1- Draw any diameter $\overline{AB}$ of the circle.

2- Draw an arc of radius OA from point A. The arc cuts the circle at points C and D.

3- Join the points B, C and D to form straight line segments $\overline{BC}$, $\overline{CD}$ and $\overline{BD}$.

Triangle BCD is the required inscribed equilateral triangle.



(vii) **If $|\overline{AB}| = 3.5$ cm and $|\overline{BC}| =$ 5cm are the lengths of two chords of an arc, then** locate the centre of the arc.

Given:

$\widehat{ABC}$ is an arc in which $m\overline{AB} = 3.5cm$ and measure chord $\overline{BC} = 5cm$

Required:

To locate the centre of the arc $\widehat{ABC}$

Construction:

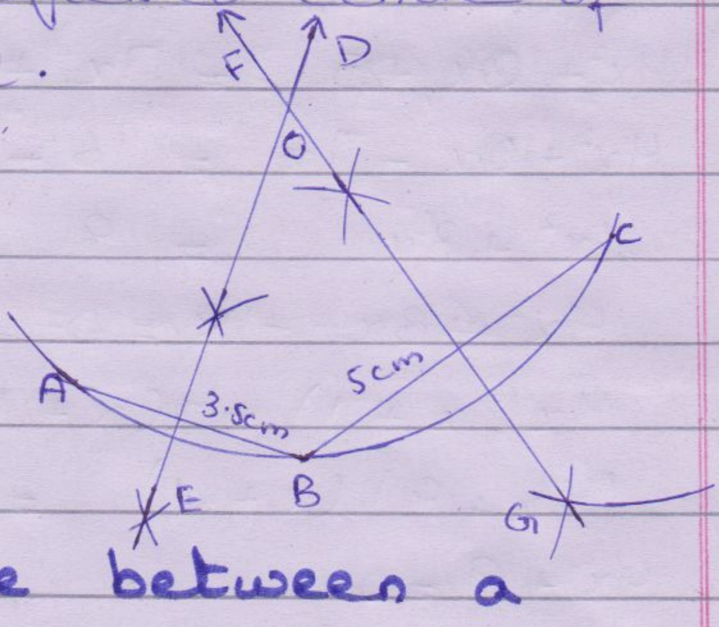
1- Draw right bisector $\overleftrightarrow{DE}$ of $\overline{AB}$.

2- Draw right bisector $\overleftrightarrow{DE}$ of $\overline{BC}$.

3- $\overleftrightarrow{DE}$ and $\overleftrightarrow{FG}$ intersect at point O.

Result:

O is the required centre of the arc $\widehat{ABC}$.



(viii) **Differentiate between a sector and a segment of a circle.**

Sector :-

A sector of a circle

is the plane figure bounded by two radii and the arc intercepted between them.

Segment :-

A segment is the portion of a circle bounded by an arc and a corresponding chord.

Question : 4

Write short answer to any six (6) questions:

(i) Solve $2x + 5 = \sqrt{7x + 16}$

$$2x + 5 = \sqrt{7x+16}$$

Taking square on both sides

$$(2x+5)^2 = (\sqrt{7x+16})^2$$

$$4x^2 + 20x + 25 = 7x + 16$$

$$4x^2 + 20x - 7x + 25 - 16 = 0$$

$$4x^2 + 13x + 9 = 0$$

$$4x^2 + 4x + 9x + 9 = 0$$

$$4x(x+1) + 9(x+1) = 0$$

$$(4x+9)(x+1) = 0$$

$4x + 9 = 0$, $x + 1 = 0$

$4x = -9$ $\quad$ $x = -1$

$$x = -\frac{9}{4}$$

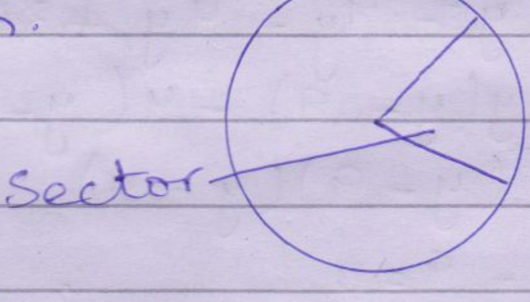
Hence

Solution set $= \{-\frac{9}{4}, -1\}$

(ii) Define and draw the sector of a circle.

Sector of a circle:-

A sector of a circle is an area bounded by two radii and the arc intercepted between them.



(iii) Write $\frac{x+3}{x+4} - \frac{x-5}{x} = 1$ in the standard form and point out pure quadractic equation.

$$\frac{x+3}{x+4} - \frac{x-5}{x} = 1$$

$$\frac{x(x+3)-(x+4)(x-5)}{x(x+4)} = 1$$

$$\frac{x^2+3x-(x^2-5x+4x-20)}{x^2+4x} = 1$$

$$\cancel{x^2}+3x-\cancel{x^2}+5x-4x+20 = x^2+4x$$

$$4x+20 = x^2+4x$$

$$0 = x^2+\cancel{4x}-\cancel{4x}-20$$

$$\implies x^2-20=0$$

$$x^2+0x-20=0$$

Hence pure quadratic equation.

(iv) Solve $x^4 - 13x^2 + 36 = 0$

$$x^4 - 13x^2 + 36 = 0 \quad \text{--- (1)}$$

Let $x^2 = y$

then $x^4 = y^2$

Equation (1) becomes

$$y^2 - 13y + 36 = 0$$

$$y^2 - 9y - 4y + 36 = 0$$

$$y(y-9) - 4(y-9) = 0$$

$$(y-9)(y-4) = 0$$

$y - 9 = 0$, $y - 4 = 0$

$y = 9$, $y = 4$

put $y = x^2$

$x^2 = 9$, $x^2 = 4$

$\sqrt{x^2} = \sqrt{9}$, $\sqrt{x^2} = \sqrt{4}$

$x = \pm 3$, $x = \pm 2$

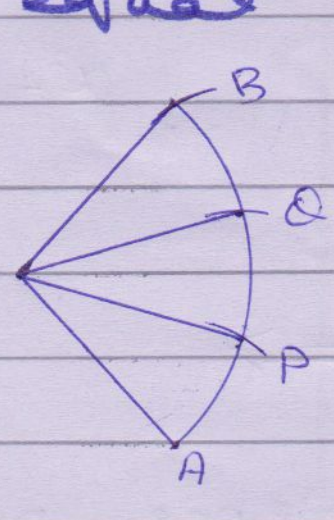
Hence the solution set is

$\{\pm 2, \pm 3\}$

(v) Divide an arc of any length into three equal parts.

By hit and trial method, we find point P, Q that

$m\widehat{AP} = m\widehat{PQ} = m\widehat{QB}$



(vi) Solve by factorization

$x^2 - 11x = 152.$

$$x^2 - 11x = 152$$

$$x^2 - 11x - 152 = 0$$

$$x^2 - 19x + 8x - 152 = 0$$

$$x(x-19) + 8(x-19) = 0$$

$$(x-19)(x+8) = 0$$

$$x - 19 = 0 \quad , \quad x + 8 = 0$$

$$x = 19 \quad , \quad x = -8$$

Hence solution set is

$\{-8, 19\}$

(vii) Solve the following equation

$3x^{-2} + 5 = 8x^{-1}$

$$3x^{-2} + 5 = 8x^{-1} \quad \text{——— } ①$$

Let $x^{-1} = y$

then $x^{-2} = y^2$

Equation ① becomes

$$3y^2 + 5 = 8y$$

$$3y^2 - 8y + 5 = 0$$

$$3y^2 - 3y - 5y + 5 = 0$$

$$3y(y-1) \mp 5(y-1) = 0$$

$$(y-1)(3y \mp 5) = 0$$

$$y - 1 = 0 \quad , \quad 3y \mp 5 = 0$$

$$y = 1 \quad , \quad 3y = +5$$

$$y = +\frac{5}{3}$$

put $y = x^{-1}$

$x^{-1} = 1$, $x^{-1} = \frac{5}{3}$

$x = 1$, $x = \frac{3}{5}$

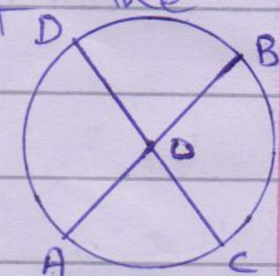
Hence

Solution set $= \{1, \frac{3}{5}\}$

(viii) **Prove that, the diameters of a circle bisect each other.**

Given:

A circle with centre O and having $\overline{AB}$, $\overline{CD}$, that pass through the centre O of the circle.



To prove:

$\overline{AB}$ and $\overline{CD}$ diameters bisect each other.

Proof:

Statements	Reasons
$\overline{AB}$ is diameter that passes through centre O of three circle.	
$\therefore m\overline{OA} = m\overline{OB}$ —— (1)	
Similarly	

$m\overline{OC} = m\overline{OD}$ —— ②	
Now $m\overline{OA} = m\overline{OC}$ —— ③	(Radii of the same centre)
From ①, ② and ③	
$m\overline{OA} = m\overline{OB} = m\overline{OC} = m\overline{OD}$	

i.e $\overline{AB}$ and $\overline{CD}$ are intersecting chords which bisect each other.

(ix) **Differentiate between Interior andexterior of a circle.**

Interior of a circle :-

The area bounded by the circumference of the circle is its interior.

Exterior of a circle :-

The area outside the circumference of the circle is called exterior of a circle.

(PART - 2)

Attempt three questions in all. But question No. 9 is compulsory.

Question : 5(a)

Solve $lx^2 + mx + n = 0$, $l \neq 0$ by completing square.

$$lx^2 + mx + n = 0$$

Dividing both sides by l

$$\frac{\cancel{l}x^2}{\cancel{l}} + \frac{mx}{l} + \frac{n}{l} = \frac{0}{l}$$

$$x^2 + \frac{m}{l}x + \frac{n}{l} = 0$$

$$x^2 + \frac{m}{l}x = -\frac{n}{l}$$

Adding $\left(\frac{m}{2l}\right)^2$ on both sides

$$x^2 + \frac{m}{l}x + \left(\frac{m}{2l}\right)^2 = \frac{-n}{l} + \left(\frac{m}{2l}\right)^2$$

$$\left(x + \frac{m}{2l}\right)^2 = -\frac{n}{l} + \frac{m^2}{4l^2}$$

$$\left(x + \frac{m}{2l}\right)^2 = \frac{-4nl + m^2}{4l^2}$$

$$\left(x + \frac{m}{2l}\right)^2 = \frac{m^2 - 4nl}{4l^2}$$

Taking square root on both sides

$$x + \frac{m}{2l} = \pm \frac{\sqrt{m^2 - 4nl}}{2l}$$

$$x = -\frac{m}{2l} \pm \frac{\sqrt{m^2 - 4nl}}{2l}$$

$$x = \frac{-m \pm \sqrt{m^2 - 4nl}}{2l}$$

Hence

Solution set $= \left\{ \frac{-m \pm \sqrt{m^2 - 4nl}}{2l} \right\}$

Question : 5(b)

Solve $7(x+2a)^2 + 3a^2 = 5a(7x+23a)$ by completing square.

$$7(x+2a)^2 + 3a^2 = 5a(7x+23a)$$

$$7(x^2 + 4a^2 + 4ax) + 3a^2 = 35ax + 115a^2$$

$$7x^2 + 28a^2 + 28ax + 3a^2 = 35ax + 115a^2$$

$$7x^2 + 28ax - 35ax + 31a^2 - 115a^2 = 0$$

$$7x^2 - 7ax - 84a^2 = 0$$

Dividing both sides by 7

$$\frac{\cancel{7}x^2}{\cancel{7}} - \frac{\cancel{7}ax}{\cancel{7}} - \frac{84a^2}{7} = \frac{0}{7}$$

$$x^2 - ax - 12a^2 = 0$$

$$x^2 - ax = 12a^2$$

Adding $\left(\frac{a}{2}\right)^2$ on both sides

$$x^2 - ax + \left(\frac{a}{2}\right)^2 = 12a^2 + \left(\frac{a}{2}\right)^2$$

$$\left(x - \frac{a}{2}\right)^2 = 12a^2 + \frac{a^2}{4}$$

$$\left(x - \frac{a}{2}\right)^2 = \frac{48a^2 + a^2}{4}$$

$$\left(x - \frac{a}{\ }\right)^2 = \frac{49a^2}{\ }$$

Taking square root of both sides

$$\sqrt{\left(x-\frac{a}{2}\right)^{\cancel{2}}} = \sqrt{\frac{49a^2}{4}}$$

$$x-\frac{a}{2} = \pm\frac{7a}{2}$$

$$x-\frac{a}{2} = \frac{7a}{2}, \quad x-\frac{a}{2} = -\frac{7a}{2}$$

$$x = \frac{7a}{2}+\frac{a}{2}, \quad x = -\frac{7a}{2}+\frac{a}{2}$$

$$= \frac{7a+a}{2}, \quad = \frac{-7a+a}{2}$$

$$= \frac{\overset{4}{\cancel{8}}a}{\cancel{2}}, \quad = -\frac{\overset{3}{\cancel{6}}a}{\cancel{2}}$$

$$= 4a, \quad = -3a$$

Hence

Solution set $= \{4a, -3a\}$

Question : 6(a)

Solve $\sqrt{4a+x} - \sqrt{a-x} = \sqrt{a}$.

$$\sqrt{4a+x} - \sqrt{a-x} = \sqrt{a} \quad \text{——— (1)}$$

Taking square on both sides

$$\left(\sqrt{4a+x} - \sqrt{a-x}\right)^2 = \left(\sqrt{a}\right)^2$$

$$\left(\sqrt{4a+x}\right)^{\cancel{2}} + \left(\sqrt{a-x}\right)^{\cancel{2}} - 2\sqrt{(4a+x)(a-x)} = a$$

$$4a+\cancel{x}+a-\cancel{x}-2\sqrt{(4a+x)(a-x)} = a$$

$$5a-2\sqrt{(4a+x)(a-x)} = a$$

$$-2\sqrt{(4a+x)(a-x)} = a-5a$$
$$-2\sqrt{(4a+x)(a-x)} = -4a$$
$$\sqrt{(4a+x)(a-x)} = -\frac{4a}{2}$$
$$\sqrt{(4a+x)(a-x)} = -2a$$

Taking square on both sides

$$\left(\sqrt{(4a+x)(a-x)}\right)^2 = (-2a)^2$$
$$(4a+x)(a-x) = 4a^2$$
$$\cancel{4a^2} - 4ax + ax - x^2 = \cancel{4a^2}$$
$$-x^2 - 3ax = 0$$
$$-x(x+3a) = 0$$
$$-x = 0 \quad , \quad x+3a = 0$$
$$x = 0 \quad , \quad x = -3a$$

Checking

put $x=0$ in eq (1)

$$\sqrt{4a} - \sqrt{a} = \sqrt{a}$$
$$2\sqrt{a} - \sqrt{a} = \sqrt{a}$$
$$\sqrt{a}(2-1) = \sqrt{a}$$
$$\sqrt{a} = \sqrt{a}$$

Now put $x=-3a$ in eq (1)

$$\sqrt{4a-3a} - \sqrt{a+3a} = \sqrt{a}$$
$$\sqrt{a} - \sqrt{4a} = \sqrt{a}$$
$$\sqrt{a} - 2\sqrt{a} = \sqrt{a}$$
$$-\sqrt{a} \neq \sqrt{a}$$

Hence

Solution set $= \{0\}$

Question : 6(b)

Solve $\sqrt{x^2+3x+9}+\sqrt{x^2+3x+4}=5.$

$$\sqrt{x^2+3x+9}+\sqrt{x^2+3x+4}=5 \quad \text{---} \quad (1)$$

$$\sqrt{x^2+3x+9}=5-\sqrt{x^2+3x+4}$$

Taking square on both sides

$$\left(\sqrt{x^2+3x+9}\right)^{\cancel{2}}=\left(5-\sqrt{x^2+3x+4}\right)^2$$

$$\cancel{x^2}+\cancel{3x}+9=25-10\sqrt{x^2+3x+4}+\cancel{x^2}+\cancel{3x}+4$$

$$9=29-10\sqrt{x^2+3x+4}$$

$$9-29=-10\sqrt{x^2+3x+4}$$

$$\cancel{-}20=\cancel{-}10\sqrt{x^2+3x+4}$$

$$\frac{\overset{2}{\cancel{20}}}{\cancel{10}}=\sqrt{x^2+3x+4}$$

$$2=\sqrt{x^2+3x+4}$$

Taking square on both sides again

$$(2)^2=\left(\sqrt{x^2+3x+4}\right)^{\cancel{2}}$$

$$\cancel{4}=x^2+3x+\cancel{4}$$

$$0=x^2+3x$$

$$\Rightarrow \quad x^2+3x=0$$

$$x(x+3)=0$$

$x=0$, $x+3=0$

$x=-3$

Checking

put $x=0$ in eq (1)

$$\sqrt{9}+\sqrt{4}=5$$

$$3+2=5$$

$$5 = 5$$

Now put $x = -3$ in eq ①

$$\sqrt{9-9+9} + \sqrt{9-9+4} = 5$$

$$\sqrt{9} + \sqrt{4} = 5$$

$$3 + 2 = 5$$

$$5 = 5$$

Hence

Solution set $= \{0, -3\}$

Question : 7(a)

Solve $(x-1)(x-2)(x-8)(x+5) + 360 = 0$.

$$(x-1)(x-2)(x-8)(x+5) + 360 = 0$$

$$[(x-1)(x-2)][(x-8)(x+5)] + 360 = 0$$

$$(x^2 - 3x + 2)(x^2 - 3x - 40) + 360 = 0 \quad \text{①}$$

Let

$$x^2 - 3x = y$$

then eq ① becomes

$$(y+2)(y-40) + 360 = 0$$

$$y^2 - 38y - 80 + 360 = 0$$

$$y^2 - 38y + 280 = 0$$

$$y^2 - 10y - 28y + 280 = 0$$

$$y(y-10) - 28(y-10) = 0$$

$$(y-10)(y-28) = 0$$

$$y - 10 = 0 \quad , \quad y - 28 = 0$$

$$y = 10 \quad , \quad y = 28$$

$$\text{put } y = x^2 - 3x$$

$$x^2 - 3x = 10 \quad , \quad x^2 - 3x = 28$$

$$x^2 - 3x - 10 = 0 \quad , \quad x^2 - 3x - 28 = 0$$

$$x^2 - 5x + 2x - 10 = 0 \quad , \quad x^2 - 7x + 4x - 28 = 0$$

$$x(x-5) + 2(x-5) = 0 \quad , \quad x(x-7) + 4(x-7) = 0$$

$$(x-5)(x+2) = 0 \quad , \quad (x-7)(x+4) = 0$$

$$x - 5 = 0 \, , \, x + 2 = 0 \quad , \quad x - 7 = 0 \, , \, x + 4 = 0$$

$$x = 5 \, , \, x = -2 \quad , \quad x = 7 \, , \, x = -4$$

Hence

Solution set $= \{5, -2, 7, -4\}$

Question : 7(b)

Solve the equation using quadratic formula

$$-(l+m) - lx^2 + (2l+m)x = 0$$

$$+(l+m) + lx^2 \mp (2l+m)x = 0$$

Here $a = l$

$b = -(2l+m)$

$c = l+m$

Using quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Putting values, we get

$$x = \frac{(2l+m) \pm \sqrt{[(2l+m)]^2 - 4l(l+m)}}{2l}$$

$$= \frac{(2l+m) \pm \sqrt{4l^2 + 4lm + m^2 - 4l^2 - 4lm}}{}$$

$$x = \frac{(2l+m) \pm \sqrt{m^2}}{2l}$$

$$x = \frac{2l+m \pm m}{2l}$$

$$x = \frac{2l+m+m}{2l} \quad , \quad x = \frac{2l+m-m}{2l}$$

$$x = \frac{2l+2m}{2l} \quad , \quad x = \frac{\cancel{2l}}{\cancel{2l}}$$

$$x = \frac{\cancel{2}(l+m)}{\cancel{2}l} \quad , \quad x = 1$$

$$x = \frac{l+m}{l}$$

Hence

Solution Set $= \left\{ \frac{l+m}{l}, 1 \right\}$

Question : 8(a)

If $|AB| = 4cm$ and $|\overline{BC}| = 6cm$, such that $\overline{AB}$ is perpendicular to $\overline{BC}$, construct a circle through points A, B and C. Also measure its radius.

Steps of Construct :-

(i) Draw $\overline{AB} = 4cm$ long.

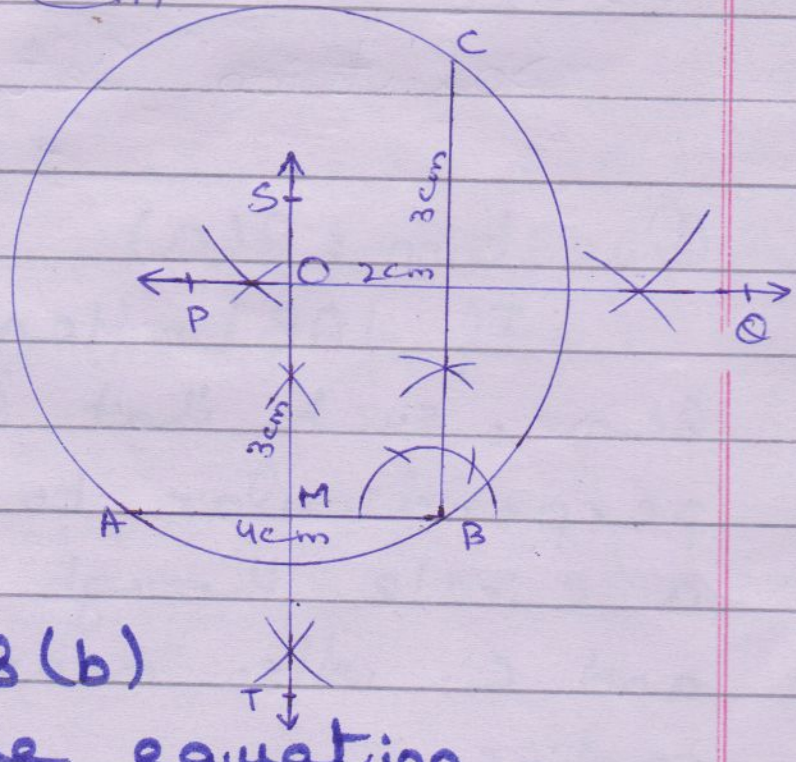
(ii) Take $\overline{BC} \perp \overline{AB}$ at B and cut off $m\overline{BC} = 6cm$.

(iii) Draw $\overline{ST} \perp \overline{AB}$ and $\overline{PQ} \perp \overline{BC}$, $\overline{ST}$ and $\overline{PQ}$ point O.

(iv) Take O as centre and draw a circle with radius of the circle $\overline{OB}$.

This passes through A, B, C. $\overline{OB}$ is radius of the circle. Now, in right angled triangle OMB.

$$m\overline{OB} = \sqrt{(m\overline{OM})^2 + (m\overline{MB})^2}$$
$$= \sqrt{(3)^2 + (2)^2}$$
$$= \sqrt{9+4}$$
$$= \sqrt{13}\text{ cm}$$



Question : 8(b)

Solve the equation

$$x^4 - 2x^3 - 2x^2 + 2x + 1 = 0$$

$$x^4 - 2x^3 - 2x^2 + 2x + 1 = 0$$

Dividing by x^2, we get

$$x^2 - 2x - 2 + \frac{2}{x} + \frac{1}{x^2} = 0$$

$$\left(x^2+\frac{1}{x^2}\right)-2\left(x-\frac{1}{x}\right)-2=0 \quad \text{—— (1)}$$

Let $x-\frac{1}{x}=y$

$$x^2+\frac{1}{x^2}-2=y^2$$

$$x^2+\frac{1}{x^2}=y^2+2$$

then eq (1) becomes

$$y^2+2-2y-2=0$$
$$y^2-2y=0$$
$$y(y-2)=0$$

$y=0$, $y-2=0$

$y=2$

put $y=x-\frac{1}{x}$

$x-\frac{1}{x}=0$, $x-\frac{1}{x}=2$

$\frac{x^2-1}{x}=0$, $\frac{x^2-1}{x}=2$

$x^2-1=0$, $x^2-1=2x$

$x^2=1$, $x^2-2x-1=0$

$x=\pm 1$, Here

$a=1$, $b=-2$, $c=-1$

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$x = \frac{2 \pm \sqrt{(-2)^2 - 4(1)(-1)}}{2(1)}$$

$$x = \frac{2 \pm \sqrt{4+4}}{2}$$

$$x = \frac{2 \pm \sqrt{8}}{2}$$

$$x = \frac{2 \pm 2\sqrt{2}}{2}$$

$$x = \frac{\cancel{2}(1 \pm \sqrt{2})}{\cancel{2}}$$

$$x = 1 \pm \sqrt{2}$$

Hence

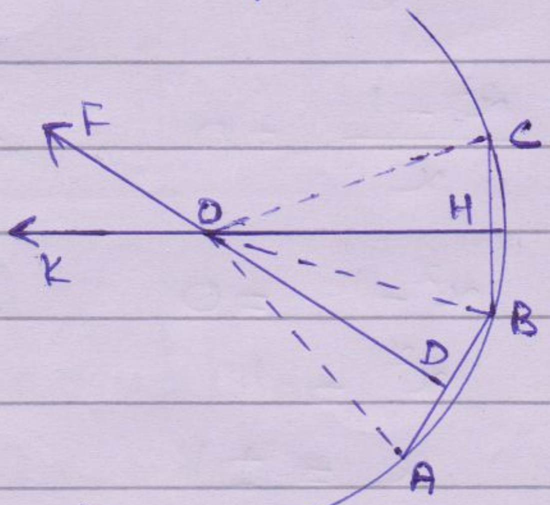
Solution set $= \{\pm 1, 1 \pm \sqrt{2}\}$

Question: 9

Prove that one and only one circle can pass through three non-collinear points.

Given:

A, B and C are three non collinear points in a plane.



To prove:

One and only one circle can pass through three non-collinear points A, B and C.

Construction:

Join A with B and B with C. Draw $\overline{DF} \perp$ bisector to $\overline{AB}$ and $\overline{HK} \perp$ bisector to $\overline{BC}$. So, $\overline{DF}$ and $\overline{HK}$ are not parallel and they intersect each other at point O. Also join A, B and C with point O.

Proof:

Statements	Reasons
Every point on $\overline{DF}$ is equidistant from A and B.	$\overline{DF} \perp$ bisector to $\overline{AB}$. (Construction)
In particular $m\overline{OA} = m\overline{OB}$ —— (1)	
Similarly every point on $\overline{HK}$ is equidistant from B and C.	$\overline{HK}$ is $\perp$ bisector to $\overline{BC}$ (construction)
In particular $m\overline{OB} = m\overline{OC}$ —— (2)	
Now O is the only point common to $\overline{DF}$ and $\overline{HK}$ which	

is equidistant from A, B and C. i.e. $m\overline{OA} = m\overline{OB} = m\overline{OC}$	Using 1 and 2
However there is no such other point expect O.	

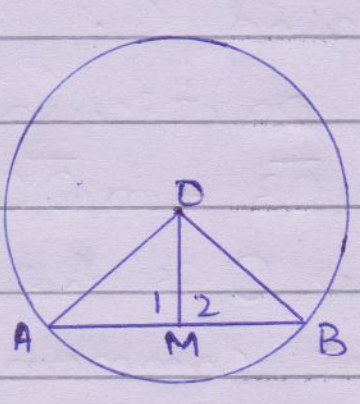
Hence a circle with centre O and radius OA will pass through A, B and C. Ultimately there is only one circle which passes through three given points A, B and C.

OR

Prove that A straight line, drawn from the centre of a circle to bisect a chord (Which is not a diameter) is perpendicular to the chord.

Given:

M is the mid point of any chord $\overline{AB}$ of a circle with centre at O. Where chord $\overline{AB}$ is not



diameter of the circle.

To prove:

$\overline{OM} \perp$ the chord $\overline{AB}$.

Construction:

Join A and B with centre O. Write $\angle 1$ and $\angle 2$ as shown in the figure.

Proof:

Statements	Reasons
In $\Delta OAM \leftrightarrow \Delta OBM$	
$m\overline{OA} = m\overline{OB}$	Radii of the same circle
$m\overline{AM} = m\overline{BM}$	Given
$m\overline{OM} = m\overline{OM}$	Common
$\therefore \Delta OAM \cong \Delta OBM$	$S.S.S \cong S.S.S$
$\Rightarrow m\angle 1 = m\angle 2$ — (1)	Corresponding sides of congruent triangles
i.e., $m\angle 1 + m\angle 2 = m\angle AMB = 180^\circ$ — (2)	Adjacent supplementary angles
$\therefore m\angle 1 = m\angle 2 = 90^\circ$	From (1) and (2)
i.e., $\overline{OM} \perp \overline{AB}$	