**TEST-2**
**Syllabus:**

**(Ch# 2,4,7.2,11,(SQ) 12(Theorem #-4,5,6) Define Ch. 2,4,11,12)**

**MATHEMATICS (SCIENCE)** **-019 ($9^{TH}$ CLASS)** **PAPER: II (OBJECTIVE TYPE)**
**TIME ALLOWED: 20 Min** **Marks: 15**

**Note: Four possible answers A, B, C and D to each question are given. The choice which you think is correct fill that circle in front of that question with marker or Pen ink in the answer-book. Cutting or filling two or more circle will result in zero mark in that question.**

1.1 $i^2$ ______.
A. 1 B. -1 C $i$ D. $-i$

2 A pure imaginary number is the square root of ______ real number.
A. Positive B. Negative C. Every D. None

3. The right bisectors of an obtuse angle triangle intersect each other ______ the triangle.
A. Inside B. Outside C. On hypotenuse of D. Corner of

4. The bisectors of angles of a triangle are ______
A. Congruent B. Concurrent C. Equal D. All of these

5. Point of concurrency is point of ______ of each median of triangle.
A. Bisection B. Trisection C. Both A & B D. None

6. Any point on the ______ bisector of a line segment is equidistant from its end points
A. Side B. Angle C. Right D. Both A & C

7. Every real number is ______ number.
A. Positive B. Negative C. Complex D. Rational

8. Real part of $2ab(i+i^2)$ is ______
A. $2ab$ B. $-2ab$ C. $2abi^2$ D. Both B& C

9. ______ was first to use symbol $i$ for number $\sqrt{-1}$.
A. Al-Khwarizmi B. John Napier C. Henry Briggs D. Leonard Euler

10. If a = b, then b = a, ∀ a, b ∈ R is ______ property.
A. Reflexive B. Transitive C. Symmetric D. Cancellation

11. Conjugate of $-6i+i^2$ is ______
A. $-i^2+6i$ B. $1+6i$ C. $-1-6i$ D. $-1+6i$

12. The line segment, joining the midpoints of two sides of a triangle, is parallel to third side and is equal to ____ times of its length.
A. 3 B. 2 C. $\frac{3}{2}$ D. $\frac{1}{2}$

13. The leading coefficient of the polynomial $8x+9x^2y^2+2x^4y^3$ is ______
A. 8 B. 2 C. 9 D. 19 7

14. Degree of $5x^8+2x^5y^4+3x^2y^3$ is ______
A. 8 B. 6 C. 1 D. 9

15. ______ is a surd
A. $\sqrt[3]{3}$ B. $\sqrt{\sqrt{17}}$ C. $\sqrt{49}$ D. All

**TEST-2**
**Syllabus:**

**(Ch# 2,4,7.2,11,(SQ) 12(Theorem #-4,5,6) Define Ch. 2,4,11,12)**

**MATHEMATICS (SCIENCE)** **-019 ($9^{TH}$ CLASS)** **PAPER: II (ESSAY TYPE)**
**TIME ALLOWED: 2:10 hours** **Maximum Marks: 60**

**( PART – I )**

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

(i) Express $(2-\sqrt{-4})(3-\sqrt{-4})$ in standard form $a+bi$.
(ii) Express $\frac{2+3i}{4-i}$ in the standard form $a+bi$.
(iii) Evaluate $(-i)^8$
(iv) Simplify:$5^{2^3} \div (5^2)^3$
(v) Simplify $\sqrt[3]{\frac{-8}{27}}$
(vi) If $x=\sqrt{3}+2$ then find $x+\frac{1}{x}$
(vii) Solve of x.$|2x+5|=11$
(viii) Define Polynomial.
(ix) Factorize.$x^3-y^3-x+y$.

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

(i) Simplify $\sqrt[5]{243x^5y^{10}z^{15}}$
(ii) Simplify $(\sqrt{x}+\sqrt{y})(\sqrt{x}-\sqrt{y})(x+y)(x^2+y^2)$
(iii) Define rational expression.
(iv) Simplify: $\frac{9x^2-(x^2-4)^2}{4+3x-x^2}$
(v) Define irrational numbers.
(vi) Represent on number line. $-2\frac{5}{8}$
(vii) Evaluate. $\frac{x^3y-2z}{xz}$ for $x=3, y=-1, z=-2$
(viii) Express as rational number $\frac{p}{q}$, $0.\overline{23}$
(ix) Simplify.$\frac{x}{x-y}-\frac{y}{x+y}-\frac{2xy}{x^2-y^2}$.

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

(i). Give rational number between $\frac{3}{4}$ $and$ $\frac{5}{9}$.
(ii) Find solution Set $|x+2|-3=5-|x+2|$
(iii) Define trichotomy and transitive property.
(iv) One angle of a parallelogram is 130°. Find the measures of its remaining angles.
(v) What is bisector of an angle?
(vi) Solve for real x and y. $(2-3i)(x+yi)=4+i$.
(vii) Show that $\left(\frac{x^a}{x^b}\right)^{a+b}\times\left(\frac{x^b}{x^c}\right)^{b+c}\times\left(\frac{x^c}{x^a}\right)^{c+a}=1$
(viii) If $z=2+i$, then calculate $z-\bar{z}$.
(ix) Simplify $\frac{4(3)^n}{3^{n+1}-3^n}$.

**( PART – II )**

**Note: Attempt any THREE questions in all. But question No. 9 is Compulsory.**

5. (a) If $x=\frac{\sqrt{5}-\sqrt{2}}{\sqrt{5}+\sqrt{2}}$, then find value of $x^3+\frac{1}{x^3}$.
4

(b) Solve for real x and y ,$(3+4i)^2-2(x-yi)=x+yi$.
4

6. (a) Express $2i^2+6i^3+3i^{16}-6i^{19}+4i^{25}$ in standard form $x+yi$.
4

(b) The distance of the point of concurrency of the medians of the triangle from its vertices are
4
respectively 1.2cm, 1.4cm and 1.6cm. Find the lengths of its medians.

7. (a) Simplify $\frac{1}{a-\sqrt{a^2-x^2}}-\frac{1}{a+\sqrt{a^2-x^2}}$.
4

(b) If $m+n+p=10, mn+np+mp=27$, then find $m^2+n^2+p^2$.
4

8. (a) Simplify $\frac{2^{\frac{1}{3}}\times(27)^{\frac{1}{3}}\times(60)^{\frac{1}{2}}}{(180)^{\frac{1}{2}}\times(4)^{\frac{-1}{3}}\times(9)^{\frac{1}{4}}}$.
4

(b) If $z=2+3i$ and $w=5-4i$, then show that $\overline{zw}=\bar{z}\,\bar{w}$.
4

9. **Prove that any point on the bisector of an angle is equidistant from its arms. ~~Prove.~~**
8

**OR**

**Prove that “any point inside an angle equidistant from its arms is on the bisector of it”.**

# MATHEMATICS (COMPULSORY)

## (PART - I)

Question : 2

Write short answers to any 6 question:

(i) Express $(2-\sqrt{-4})(3-\sqrt{-4})$ in standard form $a+bi$.

$= (2-\sqrt{-4})(3-\sqrt{-4})$

$= 2(3-\sqrt{-4}) - \sqrt{-4}(3-\sqrt{-4})$

$= 6 - 2\sqrt{-4} - 3\sqrt{-4} + (-4)$

$= 6 - 5\sqrt{-4} - 4$

$= 2 - 5\sqrt{-4}$

$= 2 - 5\times 2\sqrt{-1}$

$= 2 - 10i$ Ans

(ii) Express $\frac{2+3i}{4-i}$ in the standard form $a+bi$.

$= \frac{2+3i}{4-i} \times \frac{4+i}{4+i}$

$= \frac{(2+3i)(4+i)}{4^2 - i^2}$

$= \frac{8+2i+12i+3i^2}{16-(-1)}$

$= \frac{8+14i-3}{16+1} = \frac{5+14i}{17}$

$= \frac{5}{17} + \frac{14}{17} i$ Ans.

(iii) Evaluate $(-i)^8$

$= +i^8$

$= (i^2)^4$

$= (-1)^4$

$= 1$ Ans.

(iv) Simplify: $5^{2^3} \div (5^2)^3$

$= 5^{2^3} \div (5^2)^3$

$= 5^8 \div 5^6$

$= \frac{5^8}{5^6}$

$= 5^8 \cdot 5^{-6}$

$= 5^{8-6}$

$= 5^2 = 25$ Ans.

(v) Simplify $\sqrt[3]{\frac{-8}{27}}$

$= \left(\frac{-8}{27}\right)^{1/3}$

$= \left(\frac{-2^3}{3^3}\right)^{1/3}$

$= -\frac{2^{\cancel{3} \times 1/\cancel{3}}}{3^{\cancel{3} \times 1/\cancel{3}}}$

$= -\frac{2}{3}$ Ans.

(vi) If $x = \sqrt{3} + 2$ then find $x + \frac{1}{x}$

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

$$\frac{1}{x} = \frac{1}{\sqrt{3} + 2}$$

$$= \frac{1}{\sqrt{3} + 2} \times \frac{\sqrt{3} - 2}{\sqrt{3} - 2}$$

$$= \frac{\sqrt{3} - 2}{(\sqrt{3})^2 - 2^2}$$

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

$$= \frac{\sqrt{3} - 2}{1} = \sqrt{3} - 2$$

$$x + \frac{1}{x} = \sqrt{3} + \cancel{2} + \sqrt{3} - \cancel{2}$$

$$x + \frac{1}{x} = 2\sqrt{3} \quad \text{Ans.}$$

(vii) Solve of $x$. $|2x + 5| = 11$

$$|2x + 5| = 11$$

$$2x + 5 = \pm 11$$

$$2x + 5 = 11 \qquad\qquad 2x + 5 = -11$$

$$2x = 11 - 5 \qquad\qquad 2x = -11 - 5$$

$$2x = 6 \qquad\qquad 2x = -16$$

$$x = \frac{6}{2} \qquad\qquad x = \frac{-16}{2}$$

$$x = 3 \qquad\qquad x = -8$$

Hence the solution set is

$\{-8, 3\}$. Ans

(viii) Define Polynomial.

Polynomial :-

A polynomial in the variable $x$ is an algebraic expression of the form

$P(x) = a_n x^n + a_{n-1} x^{n-1} + \cdots + a_1 x + a_0,$

$a_n \neq 0$

where $n$ is the power of $x$.

(ix) Factorize $x^3 - y^3 - x + y$

$= x^3 - y^3 - x + y$

$= (x^3 - x)(y - y^3)$

$= x(x^2-1)y(1-y^2)$

$= xy(x+1)(x-1)(1+y)(1-y)$ Ans

Question : 3

Write short answers to any six questions :

(i) Simplify

$\sqrt[5]{243 x^5 y^{10} z^{15}}$

$= (243 x^5 y^{10} z^{15})^{1/5}$

$= (3^5 x^5 y^{10} z^{15})^{1/5}$

$= 3^{\cancel{5} \times 1/\cancel{5}} x^{\cancel{5} \times 1/\cancel{5}} y^{\cancel{10}^{2} \times 1/\cancel{5}} z^{\cancel{15}^{3} \times 1/\cancel{5}}$

$= 3xy^2 z^3$ Ans

(ii) Simplify $(\sqrt{x}+\sqrt{y})(\sqrt{x}-\sqrt{y})(x+y)(x^2+y^2)$

$= [(\sqrt{x})^2 - (\sqrt{y})^2](x+y)(x^2+y^2)$

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

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

$= [(x^2)^2 - (y^2)^2]$

$= x^4 - y^4$ Ans.

(iii) Define rational expression.

Rational Expression :-

The quotient $\frac{p(x)}{q(x)}$ of two polynomials $p(x)$ and $q(x)$, where $q(x)$ is a non-zero polynomial is called a rational expression.

(iv) Simplify: $\frac{9x^2-(x^2-4)^2}{4+3x-x^2}$

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

$= \frac{(3x+x^2-4)\cancel{(3x-x^2+4)}}{\cancel{(4+3x-x^2)}}$

$= 3x+x^2-4$ Ans.

(v) Define irrational numbers.

Irrational Numbers :-

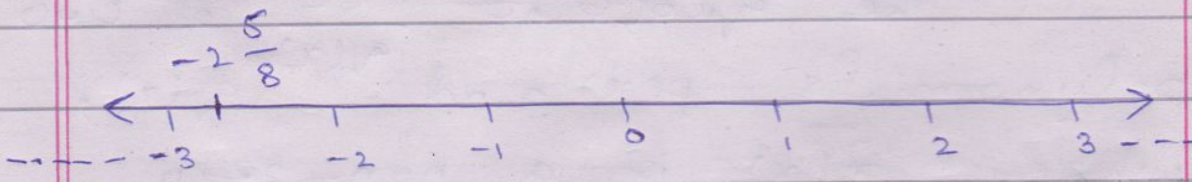
The numbers which

cannot be expressed as quotient of integers are called irrational numbers.

(vi) Represent on number line

$-2\frac{5}{8}$

$= -2\frac{5}{8} = -\frac{21}{8} = -2.6$




(vii) Evaluate. $\frac{x^3y - 2z}{xz}$ for $x = 3$

$y = -1$ , $z = -2$

$= \frac{x^3y - 2z}{xz}$

putting values

$= \frac{(3^3)(-1) - 2(-2)}{(3)(-2)}$

$= \frac{-27+4}{-6} = \frac{+23}{+6}$

$= \frac{23}{6}$ Ans.

(viii) Express as rational number

P/a) . $0.\overline{23}$

Let $x = 0.\overline{23}$

we multiply both sides by 100

$$100x = 23.\overline{23}$$
$$100x = 23 + 0.\overline{23}$$
$$100x = 23 + x$$
$$100x - x = 23$$
$$99x = 23$$
$$x = \frac{23}{99}$$

Thus $0.\overline{23} = \frac{23}{99}$ is a rational number.

Ans.

(ix) Simplify: $\frac{x}{x-y} - \frac{y}{x+y} - \frac{2xy}{x^2-y^2}$

$$= \frac{x}{x-y} - \frac{y}{x+y} - \frac{2xy}{(x+y)(x-y)}$$
$$= \frac{x(x+y) - y(x-y) - 2xy}{(x+y)(x-y)}$$
$$= \frac{x^2 + \cancel{xy} - \cancel{xy} + y^2 - 2xy}{x^2 - y^2}$$
$$= \frac{x^2 + y^2 - 2xy}{(x+y)(x-y)}$$
$$= \frac{(x-y)^{\cancel{2}}}{(x+y)\cancel{(x-y)}}$$

$= \frac{x - y}{x + y}$ Ans

## Question : 4

Write short answers to any six questions:

(i) Give rational number between $\frac{3}{4}$ and $\frac{5}{9}$.

$= \frac{3 \times 9}{4 \times 9} , \frac{5 \times 4}{9 \times 4}$

$= 27/36 , 20/36$

$= \frac{47/2}{36} = \frac{47}{2} \div 36 = \frac{47}{2} \times \frac{1}{36}$

$= \frac{47}{72}$

(ii) Find solution set

$|x+2| - 3 = 5 - |x+2|$

$|x+2| + |x+2| = 5 + 3$

$2|x+2| = 8$

$|x+2| = \frac{\cancel{8}^{4}}{\cancel{2}}$

$|x+2| = 4$

$x + 2 = 4 , \quad x + 2 = -4$

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

$x = 2 , \quad x = -6$

Solution set $= \{-6, 2\}$

(iii) Define trichotomy and transitive property.

Trichotomy property:-

$\forall\ a, b \in R$

$a < b$ or $a = b$ or $a > b$

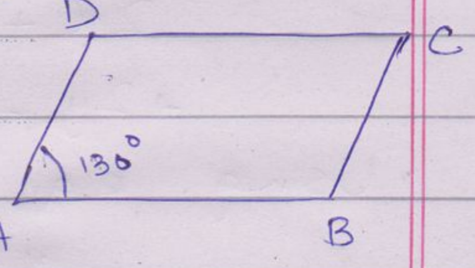
Transitive property:-

$\forall\ a, b, c \in R$

(a) $a < b$ and $b < c \Rightarrow a < c$

(b) $a > b$ and $b > c \Rightarrow a > c$

(iv) One angle of a parallelogram is $130°$. Find the measures of its remaining angles.




ABCD is a parallelogram

$m\angle A = 130°$

$m\angle A = m\angle C$ (opposite angle in parallelogram)

$m\angle C = 130°$

$m\angle A + m\angle D = 180°$

$130° + m\angle D = 180°$

$m\angle D = 180° - 130°$

$m\angle D = 50°$

$m\angle D = m\angle B$

$m\angle B = 50^\circ$

(v) What is bisector of an angle?

Bisector of an angle :-

Angle bisector is the ray which divides an angle into two equal parts.

(vi) Solve for real x and y.

$(2-3i)(x+yi) = 4+i$

$2x + 2yi - 3xi - 3yi^2 = 4+i$

$(2x+3y) + i(+2y-3x) = 4+i$

Comparing real and imaginary parts of above equation

$2x + 3y = 4$ —— ①

$+2y - 3x = 1$ —— ②

Using eq ①

$x = \dfrac{4-3y}{2}$ —— ③

put in ②

$+2y - 3\left(\dfrac{4-3y}{2}\right) = 1$

$+2y + \dfrac{-12+9y}{2} = 1$

$\dfrac{+4y - 12 + 9y}{2} = 1$

$$\frac{13y-12}{2} = 1$$

$$13y - 12 = 2$$

$$13y = 2 + 12$$

$$13y = 14$$

$$\boxed{y = \frac{14}{13}}$$

Put $y = 14/13$ in eq ③

$$x = \frac{4 - 3\left(\frac{14}{13}\right)}{2}$$

$$= \frac{4 - \frac{42}{13}}{2}$$

$$= \frac{\frac{52-42}{13}}{2}$$

$$= \frac{\cancel{10}\,5}{13 \times \cancel{2}}$$

$$\boxed{x = \frac{5}{13}}$$ Ans

(vii) Show that $\left(\frac{x^a}{x^b}\right)^{a+b} \times \left(\frac{x^b}{x^c}\right)^{b+c} \times \left(\frac{x^c}{x^a}\right)^{c+a} = 1$

L.H.S

$$= (x^{a-b})^{a+b} \times (x^{b-c})^{b+c} \times (x^{c-a})^{c+a}$$

$$= x^{a^2-b^2} \times x^{b^2-c^2} \times x^{c^2-a^2}$$

$$= x^{a^2-b^2+b^2-c^2+c^2-a^2}$$

$$= 1 = \text{R.H.S}$$

$L.H.S = R.H.S$

Hence proved

(viii) If $z = 2+i$ then calculate $z-\bar{z}$

$z = 2+i$

$\bar{z} = \overline{2+i}$

$= 2-i$

$z-\bar{z} = (2+i)-(2-i)$

$= 2+i-2+i$

$= 2i$ Ans.

(ix) Simplify: $\dfrac{4(3)^n}{3^{n+1}-3^n}$

$= \dfrac{\cancel{(3)^n}\,4}{\cancel{3^n}(3-1)}$

$= \dfrac{\cancel{4}\,2}{\cancel{2}}$

$= 2$ Ans.

(PART – II)

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

Question : 5(a)

If $x = \dfrac{\sqrt{5}-\sqrt{2}}{\sqrt{5}+\sqrt{2}}$ then find value of $x^3 + \frac{1}{x^3}$

$$x = \frac{\sqrt5 - \sqrt2}{\sqrt5 + \sqrt2}$$

$$\frac{1}{x} = \frac{1}{\frac{\sqrt5 - \sqrt2}{\sqrt5 + \sqrt2}}$$

$$= \frac{\sqrt5 + \sqrt2}{\sqrt5 - \sqrt2}$$

$$x + \frac{1}{x} = \frac{\sqrt5 - \sqrt2}{\sqrt5 + \sqrt2} + \frac{\sqrt5 + \sqrt2}{\sqrt5 - \sqrt2}$$

$$= \frac{(\sqrt5 - \sqrt2)^2 + (\sqrt5 + \sqrt2)^2}{(\sqrt5 + \sqrt2)(\sqrt5 - \sqrt2)}$$

$$= \frac{5 + 2 - 2\cancel{\sqrt{10}} + 5 + 2 + 2\cancel{\sqrt{10}}}{\sqrt5^{\cancel{2}} - \sqrt2^{\cancel{2}}}$$

$$= \frac{14}{3} \quad \text{——— } (1)$$

Taking sq on both sides

$$\left(x + \frac{1}{x}\right)^2 = \left(\frac{14}{3}\right)^2$$

$$x^2 + \frac{1}{x^2} + 2 = \frac{196}{9}$$

$$x^2 + \frac{1}{x^2} = \frac{196}{9} - 2$$

$$= \frac{196 - 18}{9}$$

$$x^2 + \frac{1}{x^2} = \frac{178}{9}$$

Taking cube on both sides of eq ①

$$\left(x+\frac{1}{x}\right)^3 = \left(\frac{14}{3}\right)^3$$

$$x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right) = \frac{2744}{27}$$

$$x^3+\frac{1}{x^3}+\cancel{3}\left(\frac{14}{\cancel{3}}\right) = \frac{2744}{27}$$

$$x^3+\frac{1}{x^3}+14 = \frac{2744}{27}$$

$$x^3+\frac{1}{x^3} = \frac{2744}{27}-14$$

$$= \frac{2744-378}{27}$$

$$\boxed{x^3+\frac{1}{x^3} = \frac{2366}{27}}$$ Ans.

Question : 5 (b)

Solve

$$(3+4i)^2-2(x-yi) = x+yi$$

$$9+16i^2+24i-2x+2yi = x+yi$$

$$9+16(-1)-2x+i(24+2y) = x+yi$$

$$(-7-2x)+i(24+2y) = x+yi$$

Comparing real and imaginary parts

$$-7-2x = x \quad \text{——} ①$$

$$24 + 2y = y \quad \text{—— (2)}$$

Using eq (1)

$$-7 - 2x = x$$

$$-7 = x + 2x$$

$$-7 = 3x$$

$$\frac{-7}{3} = x$$

$$\Longrightarrow \boxed{x = -\frac{7}{3}}$$

Using eq (2)

$$24 + 2y = y$$

$$24 = y - 2y$$

$$24 = -y$$

$$-24 = y$$

$$\Longrightarrow \boxed{y = -24}$$ Ans

## Question : 6 (a)

$$= 2i^2 + 6i^3 + 3i^{16} - 6i^{19} + 4i^{25}$$

$$= 2(-1) + 6i^2 \cdot i + 3(i^2)^8 - 6(i^2)^9 i + 4(i^2)^{12} i$$

$$= -2 + 6(-1)i + 3(-1)^8 - 6(-1)^9 i + 4(-1)^{12} i$$

$$= -2 - \cancel{6i} + 3 + \cancel{6i} + 4i$$

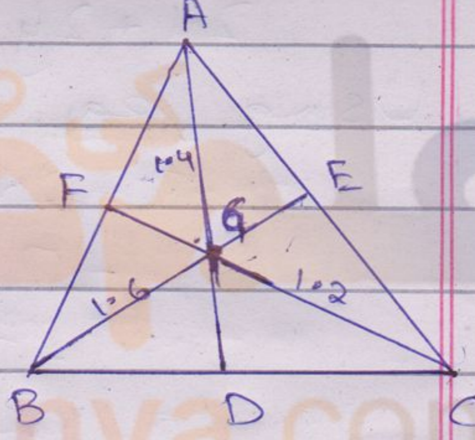
$$= -2 + 3 + 4i$$

$$= 1 + 4i$$ Ans

## Question : 6(b)

$\overline{BE} = \overline{BG} + \overline{GE}$

$\overline{GE} = \frac{1.6}{2}$




$\overline{BE} = 1.6 + \frac{1.6}{2}$

$= 1.6 + 0.8$

$= 2.4$

$\overline{FG} = \frac{1.2}{2}$

$\overline{FC} = \overline{FG} + \overline{GC}$

$= \frac{1.2}{2} + 1.2$

$= 0.6 + 1.2$

$\overline{FC} = 1.8$

$\overline{AD} = \overline{AG} + \overline{GD}$

$= 1.4 + \frac{1.4}{2}$

$= 1.4 + 0.7$

$\overline{AD} = 2.1$

Ans.

$$100 = (m^2+n^2+p^2)+54$$
$$100-54 = m^2+n^2+p^2$$
$$46 = m^2+n^2+p^2$$
$$\boxed{m^2+n^2+p^2 = 46}$$ Ans.

Question : 8(a)

$$= \frac{2^{1/3} \times (27)^{1/3} \times (60)^{1/2}}{(180)^{1/2} \times (4)^{-1/3} \times (9)^{1/4}}$$

$$= \frac{2^{1/3} \times (3^{\cancel{3}})^{1/\cancel{3}} \times (2^2 \times 5 \times 3)^{1/2}}{(2^2 \times 5 \times 3^2)^{1/2} \times (2^2)^{-1/3} \times (3^2)^{1/4}}$$

$$= \frac{2^{1/3} \times 3 \times 2^{\cancel{2} \times 1/\cancel{2}} \times 5^{1/2} \times 3^{1/2}}{2^{\cancel{2} \times 1/\cancel{2}} \times 5^{1/2} \times 3^{\cancel{2} \times 1/\cancel{2}} \times 2^{2 \times -1/3} \times 3^{\cancel{2} \times 1/\cancel{4}_2}}$$

$$= \frac{2^{1/3} \times \cancel{3} \times \cancel{2} \times \cancel{5^{1/2}} \times \cancel{3^{1/2}}}{\cancel{2} \times \cancel{5^{1/2}} \times \cancel{3} \times 2^{-2/3} \times \cancel{3^{1/2}}}$$

$$= 2^{1/3} \times 2^{2/3}$$
$$= 2^{1/3 + 2/3}$$
$$= 2^{\cancel{3}/\cancel{3}}$$
$$= 2$$ Ans.

Question : 8(b)

$$z = 2+3i$$

$$w = 5-4i$$

$$\text{L.H.S} = \overline{zw}$$

$$= \overline{(2+3i)(5-4i)}$$

$$= \overline{2(5-4i)+3i(5-4i)}$$

$$= \overline{10-8i+15i-12i^2}$$

$$= \overline{10+12+7i}$$

$$= \overline{22+7i}$$

$$= 22-7i$$

$$\text{R.H.S} = \bar{z}\,\bar{w}$$

$$= (\overline{2+3i})(\overline{5-4i})$$

$$= (2-3i)(5+4i)$$

$$= 2(5+4i)-3i(5+4i)$$

$$= 10+8i-15i-12i^2$$

$$= 10+12-7i$$

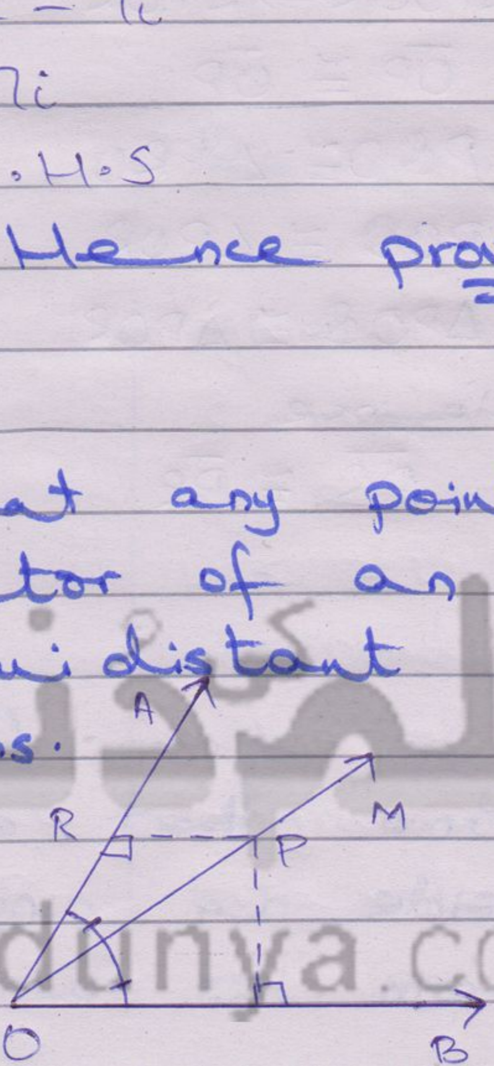
$$= 22-7i$$

$$\text{L.H.S} = \text{R.H.S}$$

Hence proved.

## Question: 9

Prove that any point on the bisector of an angle is equidistant from its arms.



**Given:**

A point P is on $\overrightarrow{OM}$, the bisector of $\angle AOB$.

**To prove:**

$\overline{PQ} \cong \overline{PR}$ i.e., P is equidistant from $\overrightarrow{OA}$ and $\overrightarrow{OB}$

**Construction:**

Draw $\overline{PR} \perp \overrightarrow{OA}$ and $\overline{PQ} \perp \overrightarrow{OB}$

**Proof:**

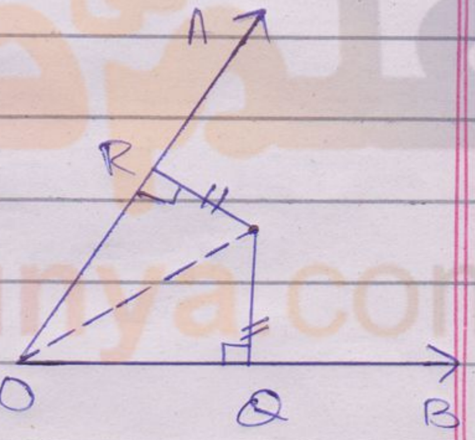
| Statements | Reasons |
|---|---|
| In | |
| $\Delta POQ \longleftrightarrow \Delta POR$ | |
| $\overline{OP} \cong \overline{OP}$ | Common |
| $\angle PQO \cong \angle PRO$ | Construction |
| $\angle POQ \cong \angle POR$ | given |
| $\therefore \Delta POQ \cong \Delta POR$ | $S.A.A \cong S.A.A$ |
| Hence $\overline{PQ} \cong \overline{PR}$ | Corresponding sides of congruent triangles |

OR

Prove that any point inside an angle equidistant from its arms is on the bisector of it

**Given:**

Any point P lies inside $\angle AOB$ such that $\overline{PQ} \cong \overline{PR}$ where $\overline{PQ} \perp \overrightarrow{OB}$ and $\overline{PR} \perp \overrightarrow{OA}$.




**To prove:**

Point P is on the bisector of $\angle AOB$.

**Construction:**

Join P to O.

**Proof:**

| Statements | Reasons |
|---|---|
| In $\Delta POQ \leftrightarrow \Delta POR$ | |
| $\angle PQO \cong \angle PRO$ | given |
| $\overline{PO} \cong \overline{PO}$ | common |
| $\overline{PQ} \cong \overline{PR}$ | given |
| $\therefore \Delta POQ \cong \Delta POR$ | H.S $\cong$ H.S |
| Hence $\angle POQ \cong \angle POR$ i.e., P is on the bisector of $\angle AOB$. | Corresponding angles of Congruent triangles. |