Qus: write down the classification of number system

1 Ans:

- Number
  - Real Number
    - Rational
      - Integer
        - Negative
        - Zero
        - Positive/ Natural
          - prime
          - Neither prime Non Composite
          - Composite
      - Fraction
        - proper
        - Improper
        - mixed
    - Irrational
  - Complex Number
    - purely Real
    - purely imaginary

Qus: Find the prime factorization of 540 using tree

2| Ans: 540

2 270

2 135

3 45

3 15

3 5

Therefore, The prime factorization of 540 is $= 2^2 . 3^3 . 5$

Ans

3| Find ~~the~~ out the all factors of 540.

Ans:-
$$\begin{array}{r|l} 2 & 540 \\ \hline 2 & 270 \\ \hline 3 & 135 \\ \hline 3 & 45 \\ \hline 3 & 15 \\ \hline & 5 \end{array}$$

Therefore, the prime factorization of 540 is $= 2^2 . 3^3 . 5$

So, the total number of factors of 540 is $= (2+1)(3+1)(1+1)$

$= 3 . 4 . 2$

$= 24$

calculation for all factors,

$540 = 1 \times 540$
$= 2 \times 270$
$= 3 \times 180$
$= 4 \times 135$
$= 5 \times 108$
$= 6 \times 90$
$= 9 \times 60$
$= 10 \times 54$
$= 12 \times 45$
$= 15 \times 36$
$= 18 \times 30$
$= 20 \times 27$

The factors of 540 are-
1, 2, 3, 4, 5, 6, 9, 10, 12, 15, 18, 20, 27, 30, 36,
45, 54, 60, 90, 108, 135, 180, 270, 540

4| What is the GCD and LCM of 240 and 540.

Ans:-

$240 = 2\times120 = 2\times2\times60 = 2^2\times2\times30 = 2^3\times2\times15 = 2^4\times3\times5$

$540 = 2\times270 = 2\times2\times135 = 2^2\times3\times45 = 2^2\times3\times3\times15$

$= 2^2\times3^2\times3\times5$

$= 2^2\times3^3\times5$

$\therefore LCM(240, 540) = 2^4 . 3^3 . 5 = 2160$

and ~~HCF~~ $(240, 540) = 2^2 . 3 . 5 = 60$
GCD

5| Find the H.C.F and L.C.M of 42, 63, and 140

Ans:-

$42 = 2\times21 = 2\times3\times7$

$63 = 3\times21 = 3\times3\times7 = 3^2\times7$

$140 = 2\times70 = 2\times2\times35 = 2^2\times5\times7$

$\therefore Lcm(42, 63, 140) = 2^2\times3^2\times5\times7 = 1260$

$\therefore HCF(42, 63, 140) = 2\times7 = 14$

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6) Find the H.C.F and L.c.m of $\frac{2}{3}, \frac{8}{9}, \frac{16}{81}$ and $\frac{10}{27}$

Ans :-

Calculation for Numerators.

$2 = 2^1$

$8 = 2^3$

$16 = 2^4$

$10 = 2^1 \times 5^1$

Calculation for Denominators

$3 = 3^1$

$9 = 3^2$

$81 = 3^4$

$27 = 3^3$

$Lcm(2,8,16,10) = 2^4 \times 5 = 80$

$HCF(2,8,16,10) = 2$

$Lcm(3,9,81,27) = 3^4 = 81$

$HCF(3,9,81,27) = 3$

$\therefore$ HCF of $\frac{2}{3}, \frac{8}{9}, \frac{16}{81}$ and $\frac{10}{27}$ $= \frac{HCF(2,8,16,10)}{Lcm(3,9,81,27)}$

$= \frac{2}{81}$

$\therefore$ ~~HCF~~ L.c.m of $\frac{2}{3}, \frac{8}{9}, \frac{16}{81}$ and $\frac{10}{27}$

$= \frac{Lcm(2,8,16,10)}{HCF(3,9,81,27)}$

$= \frac{80}{3}$

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7. Find the modulus and Argument of $z = \frac{1+\sqrt{3}i}{1-\sqrt{3}i}$ and also its polar, exponential from.

Ans:-

We have,

$$\frac{1+\sqrt{3}i}{1-\sqrt{3}i}$$

$$= \frac{(1+\sqrt{3}i)(1+\sqrt{3}i)}{(1-\sqrt{3}i)(1+\sqrt{3}i)}$$

$$\cancel{= \frac{1+\sqrt{3}i+\sqrt{3}i+2\sqrt{3}i}{1^2-(\sqrt{3}i)^2}}$$

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

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

$$= \frac{2(-1+\sqrt{3}i)}{4}$$

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

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

Let, $z = -\frac{1}{2}+\frac{\sqrt{3}}{2}i$

$$|z| = \sqrt{\left(-\frac{1}{2}\right)^2+\left(\frac{\sqrt{3}}{2}\right)^2}$$

$$r = \sqrt{\frac{1}{4}+\frac{3}{4}}$$

$$r = \sqrt{\frac{4}{4}} = 1$$

$\therefore$ modulus of z will

$$\theta = \pi - \tan^{-1}\left|\frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}}\right|$$

$$= \pi - \tan^{-1}(\sqrt{3}) = \pi - \frac{\pi}{3}$$

$$= \frac{2\pi}{3}$$

Polar Form $-\frac{1}{2}+\frac{\sqrt{3}}{2}i$

Exponential Form is $z = re^{i\theta}$

$$= 1 \cdot e^{i\frac{2\pi}{3}}$$

$$= e^{\frac{2\pi}{3}i}$$

8] Evaluate $\sqrt{-16} \times \sqrt{-4}$ and $\frac{\sqrt{-16}}{\sqrt{-4}}$

Ans

We have, $\sqrt{-16} \times \sqrt{-4}$

$= \cancel{\sqrt{16i} \times \sqrt{4i}}$

$= \sqrt{16}\, i \times \sqrt{4}\, i$

$= 4i \times 2i$

$= 8i^2$

$= -8$

and, $\frac{\sqrt{-16}}{\sqrt{-4}}$

$= \frac{4i}{2i}$

$= 2$

Ans

$\boxed{9}$ Evaluate modulus and Argument of $8z - z^2$ by replacing $z = 2+i$

Ans :-

We have $z = 2+i$

$\therefore 8z - z^2 = 8(2+i) - (2+i)^2$

$= 16 + 8i - (4 + 4i + i^2)$

$= 16 + 8i - 4 - 4i + 1$

$= 13 + 4i$

modulus $r = \sqrt{(13)^2 + (4)^2}$

$= \sqrt{169 + 16}$

$= \sqrt{185}$

~~Argument~~ $\theta = \tan^{-1} \frac{4}{13}$

$= 17.102$

20) Express $1 + i\sqrt{3}$ in the form of $r(\cos\theta + i\sin\theta)$

Ans:-

Let, $z = 1 + i\sqrt{3}$ $\quad z = x + iy \quad |z| = \sqrt{x^2 + y^2}$

$\theta = \tan^{-1} \left(\frac{y}{x}\right)$

$\therefore$ modulus of $z = \sqrt{(1)^2 + (\sqrt{3})^2}$

$= \sqrt{1 + 3}$

$= 2$

$\therefore r = 2$

Argument of $z = \tan^{-1} \left(\frac{y}{x}\right)$

$= \tan^{-1} \left(\frac{\sqrt{3}}{1}\right)$

$= \tan^{-1} . \tan \frac{\pi}{3}$

$= \frac{\pi}{3}$

Therefore, $r(\cos\theta + i\sin\theta)$ form is

$= 2\left(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}\right)$

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