① Classification of Number system:

- Number
  - Real Number
    - Rational
      - Integer
        - Negtive
        - Zero
        - Positive/Natural Number
          - Prime
          - Neither prime Nor composite
          - Composite
      - Fraction
        - Proper
        - Improper
        - Mixe
    - Irrational
  - Complex Number
    - Purely real
    - Purely Imagin

Ans to the ques. no-2:

⇒ Prime factorization of 540 using tree

- 540
  - 2
  - 270
    - 2
    - 135
      - 3
      - 45
        - 3
        - 15
          - 3
          - 5

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

Ans. to the quen. no-3.

$$\begin{array}{r|l} 2 & 590 \\ \hline 2 & 270 \\ \hline 3 & 135 \\ \hline 3 & 45 \\ \hline 3 & 15 \\ \hline & 5 \end{array}$$

prime factorization of 590 is $= 2^2 \cdot 3^3 \cdot 5$

Total number of factors are $=(2+1)(3+1)(1+1)$

$= 24$

Calculation for all factor

$590 = 1 \times 590$
$= 2 \times 270$
$= 3 \times 180$
$= 4 \times 135$
$= 5 \times 108$
$= 6 \times 90$
$= 9 \times 60$
$= 10 \times 54$
$= 12 \times 45$
$= 15 \times 36$
$= 18 \times 30$
$= 20 \times 27$

The factors of 590 are - 1, 2, 3, 4, 5, 6, 9, 10, 12, 15, 18, 20, 27, 30, 36, 45, 54, 60, 90, 108, 135, 180, 270, 590

Ans. to the quer. no-4:-

$240 = 2\times120 = 2\times2\times60 = 2\times2\times60 = 2\times2\times2\times30 = 2\times2\times2\times2\times15$

$= 2^4\times3\times5$

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

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

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

$GCD(240, 540) = 2.3.5 = 30$

Ans to the quer. no.5:-

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

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

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

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

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

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Ans. to the ques. no-6:

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

Calculation for Numerators

$2 = 2^1$

$8 = 2^3$

$16 = 2^4$

$10 = 2 \times 5$

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

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

Calculation for Denominators

$3 = 3^1$

$9 = 3^2$

$81 = 3^4$

$27 = 3^3$

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

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

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

$$LCM \text{ of } \frac{2}{3}, \frac{8}{9}, \frac{16}{81}, \frac{10}{27} = \frac{LCM(2,8,16,10)}{HCF(3,9,81,27)} = \frac{80}{3}$$

Ans to the ques. no-7

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

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

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

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

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

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

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

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

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

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

$\therefore$ modulus of z is $= 1$

And Argument of z will

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

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

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

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

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

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

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

Ans to the quer. no-8:

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

$\Rightarrow \sqrt{-16} \times \sqrt{-4}$

$= 4i \times 2i$

$= 8i^2$

$= -8$

$\Rightarrow \frac{\sqrt{-16}}{\sqrt{-4}}$

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

$= 2$ Ans

Ans to the ques. no -9

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Evaluate Modulus and Argument of $8z - z^2$ by replacing $z = 2+i$

$\Rightarrow \quad z = 2+i$

$$\therefore 8z - z^2 = 8(2+i) - (2+i)^2$$
$$= 16 + 8i - (4 + 4i + i^2)$$
$$= 16 + 8i - 4 - 4i + 1$$
$$= 13 + 4i$$

$$\text{modulus } r = \sqrt{(13)^2 + (4)^2}$$
$$= \sqrt{169 + 16}$$
$$= \sqrt{185}$$

$$\theta = \tan^{-1} \frac{4}{13}$$
$$= 17.102$$

Ans to the ques. no-10

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

$\Rightarrow$

$z = 1+i\sqrt{3}$

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

$= \sqrt{1+3}$

$= 2$

$\therefore r = 2$

Argument of $z = \tan^{-1}\left|\frac{\sqrt{3}}{1}\right|$

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

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

$\therefore r(\cos\theta + i\sin\theta)$ form is $= 2\left(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}\right)$

Ans