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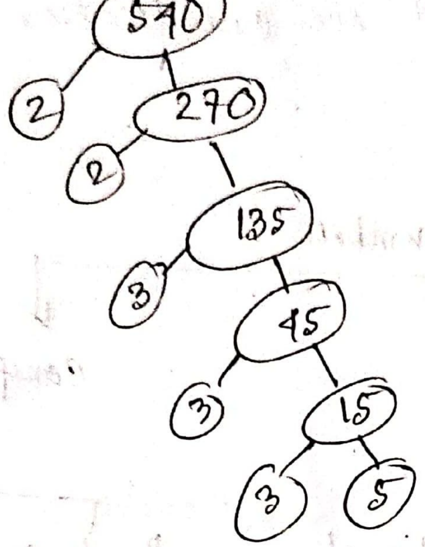
Problem 1: Write down the classification of number system.

Soln:

- Number
  - Real Number
    - Rational
      - Integer
        - Negative
        - Zero
        - Positive natural Number
          - Prime
          - Neither prime nor composite
          - Composite
      - Fractional
        - Proper
        - Improper
        - Mixed
    - Irrational
  - Complex Number
    - Purely Real
    - Purely Imaginary

Problem – 2: Find the prime factorization of 540 using tree.



∴ The prime factorization of 540 ~~using tree~~ is $= 2^2 \cdot 3^3 \cdot 5$

Answer – 3

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

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

So that total number of factor of 540 is $= (2+1)(3+1)(1+1)$

calculation of 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.

Answer-04

$$\begin{array}{r|l} 2 & 240 \\ \hline 2 & 120 \\ \hline 2 & 60 \\ \hline 2 & 30 \\ \hline 3 & 15 \\ \hline & 5 \end{array} \qquad \begin{array}{r|l} 2 & 540 \\ \hline 2 & 270 \\ \hline 3 & 135 \\ \hline 3 & 45 \\ \hline 3 & 15 \\ \hline & 5 \end{array}$$

$\therefore 240 = 2^4 . 3 . 5$

$540 = 2^2 . 3^3 . 5$

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

$\therefore$ G.C.D of $(240, 540) = 2^2 . 3 . 5 = 60$

Answer-05

$$\begin{array}{r|l} 2 & 42 \\ \hline 3 & 21 \\ \hline & 7 \end{array} \qquad \begin{array}{r|l} 3 & 63 \\ \hline 3 & 21 \\ \hline & 7 \end{array} \qquad \begin{array}{r|l} 2 & 140 \\ \hline 2 & 70 \\ \hline 5 & 35 \\ \hline & 7 \end{array}$$

$42 = 2 \times 3 \times 7$ | $63 = 3^2 \times 7$ | $140 = 2 \times 2 \times 5 \times 7$

LCM of $(42, 63, 140) = 2^2 \times 3^2 \times 5 \times 7 = 1260$

H.C.F of $(42, 63, 140) = 7$

Answer-6

Calculation of Numerator

$2 = 2^1$

$8 = 2^3$

$16 = 2^4$

$10 = 2^5$

$\therefore$ L.C.M Of Numerator $= 2^4 \times 5$
$= 80$

$\therefore$ H.C.F Of Numerator $= 2$

Calculation of Denominator:

$3 = 3^1$

$9 = 3^2$

$81 = 3^4$

$27 = 3^3$

$\therefore$ LCM of Denominator $= 3^4$
$= 81$

$\therefore$ HCF of Denominator $= 3$

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

$\therefore$ LCM of $\frac{2}{3}, \frac{8}{9}, \frac{16}{81}$ and $\frac{10}{27} = \frac{80}{3}$

Answer-7

We have,

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

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

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

$= \frac{2\sqrt{3}i-2}{4}$

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

Now,

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

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

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

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

$= 1$

So polar form $= \frac{1}{2} + \frac{\sqrt{3}}{2}i$

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Answer-8

So, the modulas of $z = 1$

And Argument of $z = \theta = \pi - \tan^{-1}\left(\frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}}\right)$

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

Exponential form of $z = r \cdot e^{i\theta}$

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

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

Answer-8

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

$= \sqrt{(4i)^2} \times \sqrt{(2i)^2}$

$= 4i \times 2i$

$= 8i^2$

$= -8$

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

$= \frac{\sqrt{(4i)^2}}{\sqrt{(2i)^2}}$

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

Answer-9

Here given ~~that~~,

$z = 2 + i$

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

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

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

$= 16 + 8i - 4 - 4i + 1 = 13 + 4i$

Modulus, $r = \sqrt{x^2+y^2}$

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

$= \sqrt{169+16} = \sqrt{185}$

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

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

Answer-10

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

Modulus, $r = \sqrt{1^2+(\sqrt{3})^2}$

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

Argument, $\theta = \tan^{-1}\frac{\sqrt{3}}{1}$

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

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

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

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