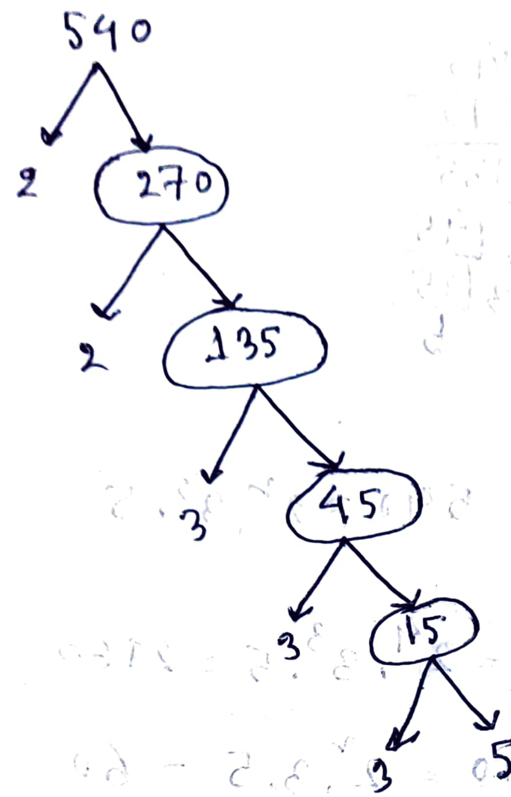
1 Classification of Number system:

- Number
  - Real Number
    - Rational
      - Integer
        - Negative
        - Zero
        - Positive
          - Prime
          - Nither Prime/ Nither Composite
          - Composite
      - Fraction
        - Proper
        - Improper
        - Mixed
    - Irrational
  - Complex Number
    - Purely Real
    - Purely Imagine

2)



So, the prime factoraization of 540 is $2^2 . 3^3 . 5$

3) Prime factarization of 540 $= 2^2 . 3^3 . 5$

$\therefore$ Total Numbers of factors of 540 $= (2+1)(3+1)(1+1) = 24$

$$
\begin{aligned}
540 &= 1 \times 540 \\
&= 2 \times 270 \\
&= 3 \times 180 \\
&= 4 \times 135 \\
&= 5 \times 180 \\
&= 6 \times 90 \\
&= 9 \times 60 \\
&= 10 \times 54 \\
&= 12 \times 45 \\
&= 15 \times 36 \\
&= 18 \times 30 \\
&= 20 \times 27
\end{aligned}
$$

So, the factors of 540 are = 1, 2, 4, 5, 6, 9, 10, 54, 12, 15, 18, 20, 27, 30, 36, 45, 60, 90, 108, 135, 180, 270, 540.

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

$\therefore 240 = 2^4 . 3 . 5$ and $540 = 2^2 . 3^3 . 5$

$\therefore$ LCM of 240 and 540 $= 2^4 . 3^3 . 5 = 2160$

$\therefore$ GCD of 240 and 540 $= 2^2 . 3 . 5 = 60$

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

Now, the prime factorization

$42 = 2 . 3 . 7$

$63 = 3^2 . 7$

$140 = 2^2 . 5 . 7$

L.C.M of 42, 63, 140 $= 2^2 . 3^2 . 5 . 7 = 1260$

HCF of 42, 63, 140 $= 7$

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$\frac{2}{3} \cdot \frac{8}{9}, \frac{16}{81}$ and $\frac{10}{27}$

Colculation of Number | Calculation of Denumerator

$2 = 2$ | $3 = 3$

$8 = 2^3$ | $9 = 3^2$

$16 = 2^4$ | $81 = 3^4$

$10 = 2.5$ | $27 = 3^3$

L.C.M. of Numerator $= 2^4 . 5 = 80$

L.C.M of Denumerator $= 3$

HCF of Numerator $= 2$

HCF of Denumerator $= 3$

$\therefore$ LCM of $\left(\frac{2}{3}, \frac{8}{9}, \frac{16}{18}, \frac{10}{27}\right) = \frac{80}{3}$

$\therefore$ HCF of $\left(\frac{2}{3}, \frac{8}{9}, \frac{16}{18}, \frac{10}{27}\right) = \frac{2}{81}$

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

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

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

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

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

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

Now, $z = -\frac{1}{2} + \left(\frac{\sqrt{3}\,i}{2}\right)$

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

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

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

$$= 1$$

Modulus of $z = 1$

and Argument of z, $\theta = \pi - \tan^{-1}\left|\frac{y}{x}\right|$

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

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

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

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

$$= \frac{(3\pi) - \pi}{3}$$

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

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

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

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

8)

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

$= 4i \times 2i$

$= 8i^2$

$= -8$

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

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

$= 2$

9) $z = 2+i$

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

$= 16 + 8i - (4 - 2.2i + i^2)$

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

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

$= 13 + 4i$

$|z| = \sqrt{x^2 + y^2}$

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

$= \sqrt{169 + 16}$

$= \sqrt{185}$

$=$

Argument, $\theta = \tan^{-1} \frac{y}{x}$

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

≈ 17.10

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

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

$= \sqrt{1+3}$

$= \sqrt{4}$

$= 2$

$\therefore$ Argument, $\theta = \tan^{-1} \frac{y}{x}$

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

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

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