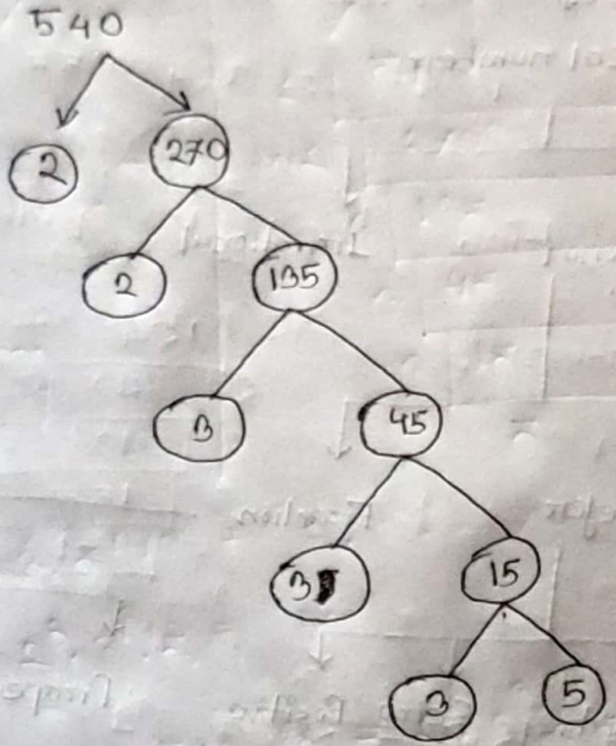
NAME : TAWKIR TAHMID TONMOY

Roll : 221-15-5036

1: Write down the classification of number system

- Number
  - Real number
    - Rational
      - Integer
        - Negative
        - Zero
        - Positive
          - Prime
          - Neither Prime/ Neither composite
          - composite.
      - Fraction
        - Proper
        - Improper
        - Mixed
    - Irrational
  - Complex number
    - Purely Real
    - Purely imagin

#2. Find the Prime factorization of 540 using tree.



∴ The Prime factorization of 540 is $= 2^2 . 3^3 . 5$

#3. Find out the all factors of 540.

Answer :

From Question No. 2 we get the prime factorization of 540 is $= 2^2 \cdot 3^3 \cdot 5$

So, the total numbers of factors of 540 is $= (2+1)(3+1)(1+1) = 3 \cdot 4 \cdot 2 = 24$

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

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

Scanned with CamScanner

#4. What is the GCD and LCM of 240, 540.

Answer :

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

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

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

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

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

#5. Find the HCF and LCM of 42, 63, 140.

Answer.

2 | 42	3 | 63	2 | 140
3 | 21	3 | 21	2 | 70
7	7	5 | 35
		7

Now the Prime factorization of ~~42, 63~~

$42 = 2.3.7$

$63 = 3^2.7$

$140 = 2^2.5.7$

L.C.M of 42, 63, 140 = $2^2.3^2.5.7$ = 1260

HCF of 42, 63, 140 = 7

#6. Find the HCF and LCM of

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

Answer. ~~Calculation of Numerator,~~

Calculation of Numerator

$2 = 2$

$8 = 2^3$

$16 = 2^4$

$10 = 2.5$

Calculation of Denumerator,

$3 = 3^1$

$9 = 3^2$

$81 = 3^4$

$27 = 3^3$

Scanned with CamScanner

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

L.CM of De Numerator $= 3$

HCF of Numerator $= 2$

HCF of Denumerator $= 3$

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

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

#7. Find the modules and argument of $z = \frac{1+\sqrt{3}i}{1-\sqrt{3}i}$ and also its polar, exponential form.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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 $z = re^{i\theta}$

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

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

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

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

$= 4i \times 2i$

$= 8i^2$

$= -8$

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

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

$= 2$

#9 : Evaluate Modulus and argument of $8z - z^2$ by replacing $z = 2+i$.

Answer : $z = 2+i$

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

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

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

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

$= 13+4i$

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

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

$= \sqrt{169+16}$

$= \sqrt{185}$

Scanned with CamScanner

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

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

$= 17.10°$

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

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

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

$= \sqrt{1+3}$

$= \sqrt{4}$

$= 2$

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

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

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

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