Sec - "Y" MAT111

ID- 221-15-5378

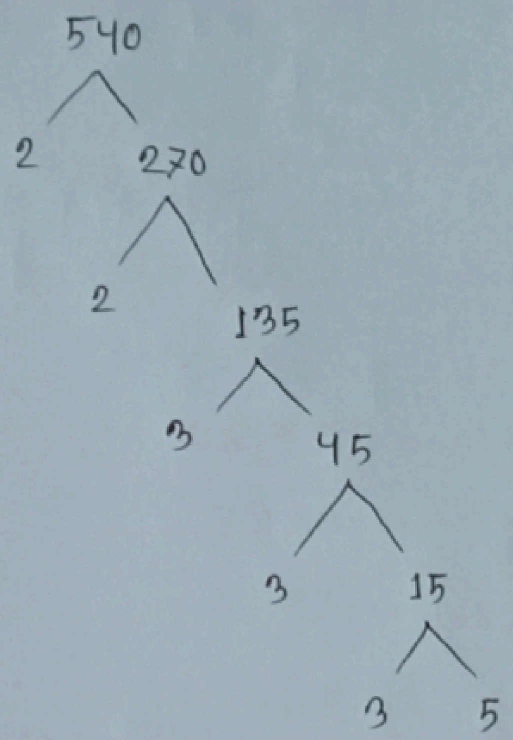
Number system.

01. Classification of number system :

- Number
  - Real Number
    - Rational
      - Integer
        - Negative
        - Zero
        - Possitive/ natural/ Number
          - Prime
          - Neither prime nor composite
          - composite
      - Fraction.
        - proper
        - Improper
        - Mixed.
    - Irrational.
  - complex number
    - Purely real
    - Purely imaginary

— o —

02. prime factorization of 540 :




Therefore, the prime factorization of 540 is

$$= 2^2 \cdot 3^3 \cdot 5 .$$

03.

From no. 02 ,

we have,

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

So, the total number of factors of 540 is

$$= (2+1)(3+1)(1+1)$$

$$= 3 \cdot 4 \cdot 2$$

$$= 24$$

calcutation of all factors,

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

$\therefore$ The factores 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.

04. GCD and LCM of 240 and 540 :

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

$\therefore$ prime factorization of 240

$= 2^4 . 3 . 5 .$

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

$\therefore$ prime factorization of

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

GCD of 240 and 540 are $= 2^2 \times 3 \times 5$

$= 4 \times 3 \times 5$

$= 60$

LCM of 240 and 540 are $= 2^4 \times 3^3 \times 5$

$= 16 \times 27 \times 5$

$= 2160$

— o —

05.

H.C.F and L.C.M of 42, 63 and 140:

$2 \mid 42$
$3 \mid 21$
$\quad 7$
$= 2 \times 3 \times 7$

$3 \mid 63$
$3 \mid 21$
$\quad 7$
$= 3 \times 3 \times 7$

~~2 | 140~~
~~2 | 60~~
~~2 | 30~~
~~3 | 15~~
~~5~~

$2 \mid 140$
$2 \mid 70$
$5 \mid 35$
$\quad 7$
$= 2 \times 2 \times 5 \times 7$

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

$\therefore$ L.C.M of $(42, 63, 140) = 2^2 \times 3^2 \times 7 \times 5$

$= 1260.$

(Ans).

06. calculation for numerators,

$2 = 2^1$

$8 = 2^3$

$16 = 2^4$

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

calculation for Denominators,

$3 = 3^1$

$9 = 3^2$

$81 = 3^4$

$27 = 3^3$

$\therefore$ L.C.M $(2, 8, 16, 10) = 2^4 \times 5 = 80$

$\therefore$ H.C.F $(2, 8, 16, 10) = 2$.

$\therefore$ L.C.M $(3, 9, 81, 27) = 3^4 = 81$

$\therefore$ H.C.F $(3, 9, 81, 27) = 3$.

Here,

H.C.F of $2/3$, $8/9$, $16/81$, $10/27$

$$= \frac{\text{HCF}(2, 8, 16, 10)}{\text{L.CM}(3, 9, 81, 27)}$$

$= 2/81$.

P.T.O.

L.C.M. of $2/3$, $8/9$, $16/81$, $10/27$

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

$$= 80/3 .$$

07. we have,

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

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

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

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

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

$$= -1/2 + \sqrt{3}/2\, i .$$

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

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

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

$$= \sqrt{4/4}$$

$$= 1 .$$

$\therefore$ Modulus of $z = 1$.

$\therefore$ Argument of $z$

$$\theta = \pi - \tan^{-1} \frac{\sqrt{3}/2}{1/2}$$

$$= 2\pi/3 .$$

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

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

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

$= e^{2\pi/3\, i}$.

08. We have,

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

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

$= 4i \times 2i$

$= 8i^2$

$= -8$,

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

$= 4i/2i$

$= 2$.

09. we have,

$$z = 2+i.$$

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

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

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

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

$$= 13 + 4i.$$

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

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

$$= \sqrt{185}.$$

$$\theta = \tan^{-1} 4/13.$$

$$= 17.102.$$

10. $z = 1 + i\sqrt{3}$. $z = x + iy$ $|z| = \sqrt{x^2 + y^2}$

$\theta = \tan^{-1}|y/x|$

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

$= \sqrt{1+3}$

$= 2$.

$\therefore r = 02$.

Argument of $z = \tan^{-1}|y/x|$

$= \tan^{-1}|\sqrt{3}/1|$

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

$= \pi/3$.

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

$2\left(\cos \pi/3 + i\sin \pi/3\right)$.

— o —