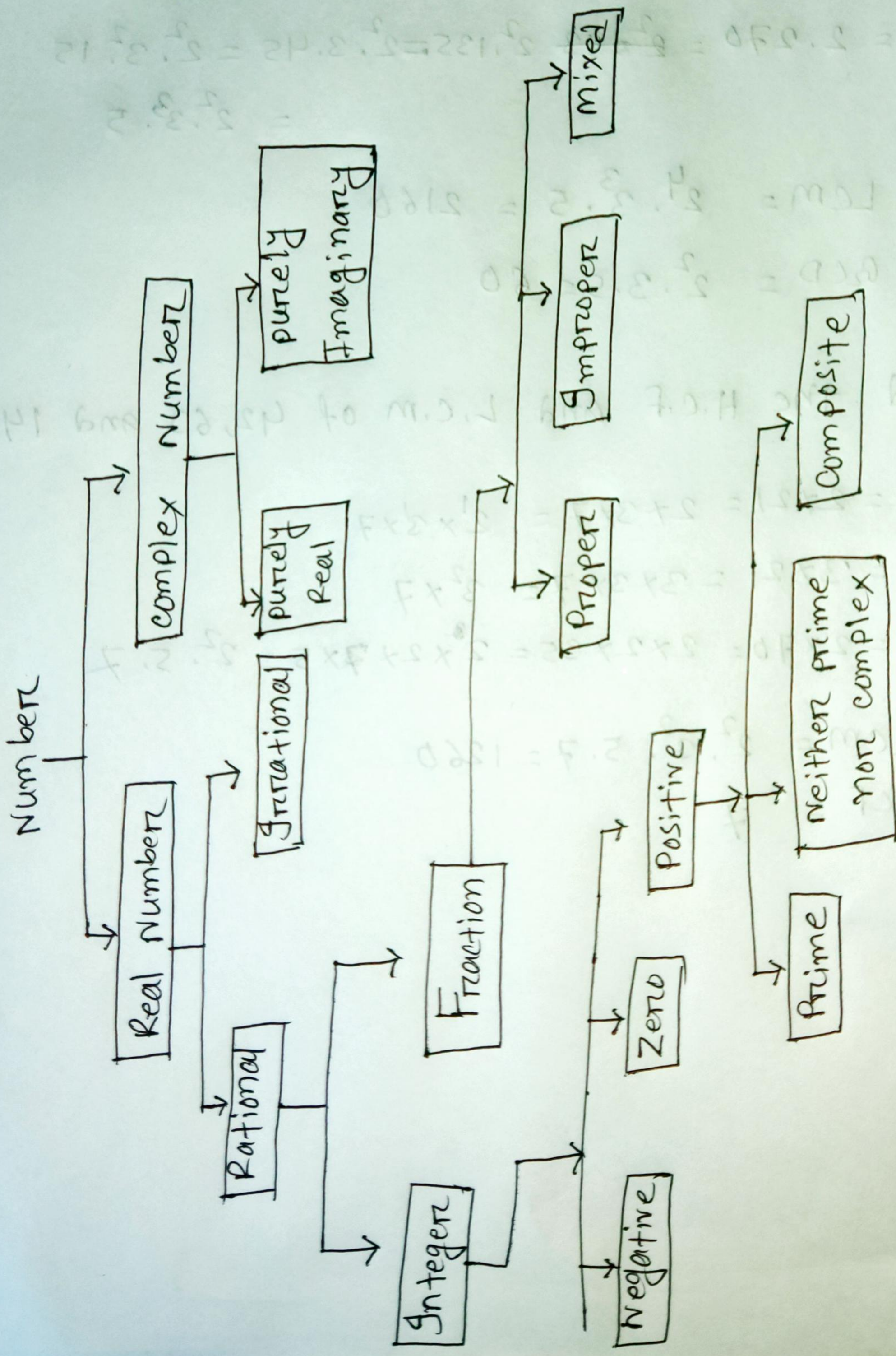
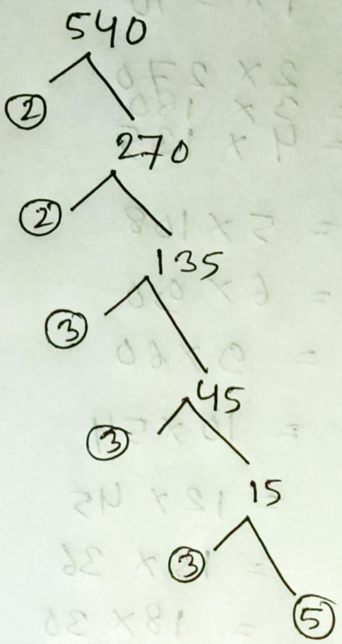
Number system

1. Write down the classification of number system.



2. Find the prime factorization of 540 using tree.



$\therefore 540 = 2 \times 2 \times 3 \times 3 \times 3 \times 5$

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

Ans.

3. Find out the all factors of 540.

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

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.

or,

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

$540 = 2 \times 2 \times 3 \times 3 \times 3 \times 5 = 2^2 \cdot 3^3 \cdot 5$

The Total number of factors ~~o~~of 540 is

$(2+1)(3+1)(1+1) = 3 \cdot 4 \cdot 2 = 24$

④ What is GCD and LCM of 240 and 540.

$240 = 2 . 120 = 2^{2} . 60 = 2^{3} . 30 = 2^{4} . 15 = 2^{4} . 3 . 5$

$540 = 2 . 270 = \cancel{2^{2} . 13}\ 2^{2} . 135 = 2^{2} . 3 . 45 = 2^{2} . 3^{2} . 15$

$= 2^{2} . 3^{3} . 5$

$\therefore$ LCM $= 2^{4} . 3^{3} . 5 = 2160$

GCD $= 2^{2} . 3 . 5 = 60$

⑤ Find the H.C.F and L.C.M of 42, 63 and 140.

$42 = 2 \times 21 = 2 \times 3 \times 7 = 2^{1} \times 3^{1} \times 7^{1}$

$63 = 3 \times 21 = 3 \times 3 \times 7 = 3^{2} \times 7$

$140 = 2 \times 70 = 2 \times 2 \times 35 = 2 \times 2 \times 7 \times 5 = 2^{2} . 5 . 7$

$\therefore$ LCM $= 2^{2} . 3^{2} . 5 . 7 = 1260$

HCF $= 7$

⑥ Find the H.C.F and L.C.M of $\frac{2}{3}$, $\frac{8}{9}$ ~~and~~ $\frac{10}{27}$, $\frac{16}{81}$.

Calculation for Numerators

$2 = 2^1$
$8 = 2^3$
$16 = 2^4$
$10 = 2 \times 5$

Calculation for Denominators

$3 = 3^1$
$9 = 3^2$
81×3^4
$27 = 3^3$

~~∴ L.C.M = $2^4 \times 5 = 80$~~

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

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

And,

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

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

$$\text{HCF of} \left(\frac{2}{3}, \frac{8}{9}, \frac{16}{81}, \frac{10}{27} \right) = \frac{\text{HCF }(2, 8, 16, 10)}{\text{L.C.M}(3, 9, 81, 27)}$$

$$= \frac{2}{81}$$

$$\text{L.C.M of} \left(\frac{2}{3}, \frac{8}{9}, \frac{16}{81}, \frac{10}{27} \right) = \frac{\text{L.C.M }(2, 8, 16, 10)}{\text{H.C.F}(3, 9, 81, 27)}$$

$$= \frac{80}{3}$$

⑦ Finding modulus Argument and polar.

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

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

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

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

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

$[x+iy]$

so, $x = -\frac{1}{2}$ and $y = \frac{\sqrt{3}}{2}$

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

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

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

$$= 1$$

Argument,

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

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

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

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

$$= \pi - 60^\circ$$

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

Polar form,

$$z = r(\cos\theta + i\sin\theta)$$

$$= 1\left(\cos\frac{2\pi}{3} + i\sin\frac{2\pi}{3}\right)$$

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

Ans.

(10) Express :- $r(\cos\theta + \sin\theta)$ from, $1+i\sqrt{3}$

so, $x = 1$ and $y = \sqrt{3}$

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

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

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

$= 60°$

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

so, $z = r(\cos\theta + i\sin\theta)$

$= 1\left(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}\right)$

Therefore, from of $1+i3 = \left(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}\right)$

Ans.