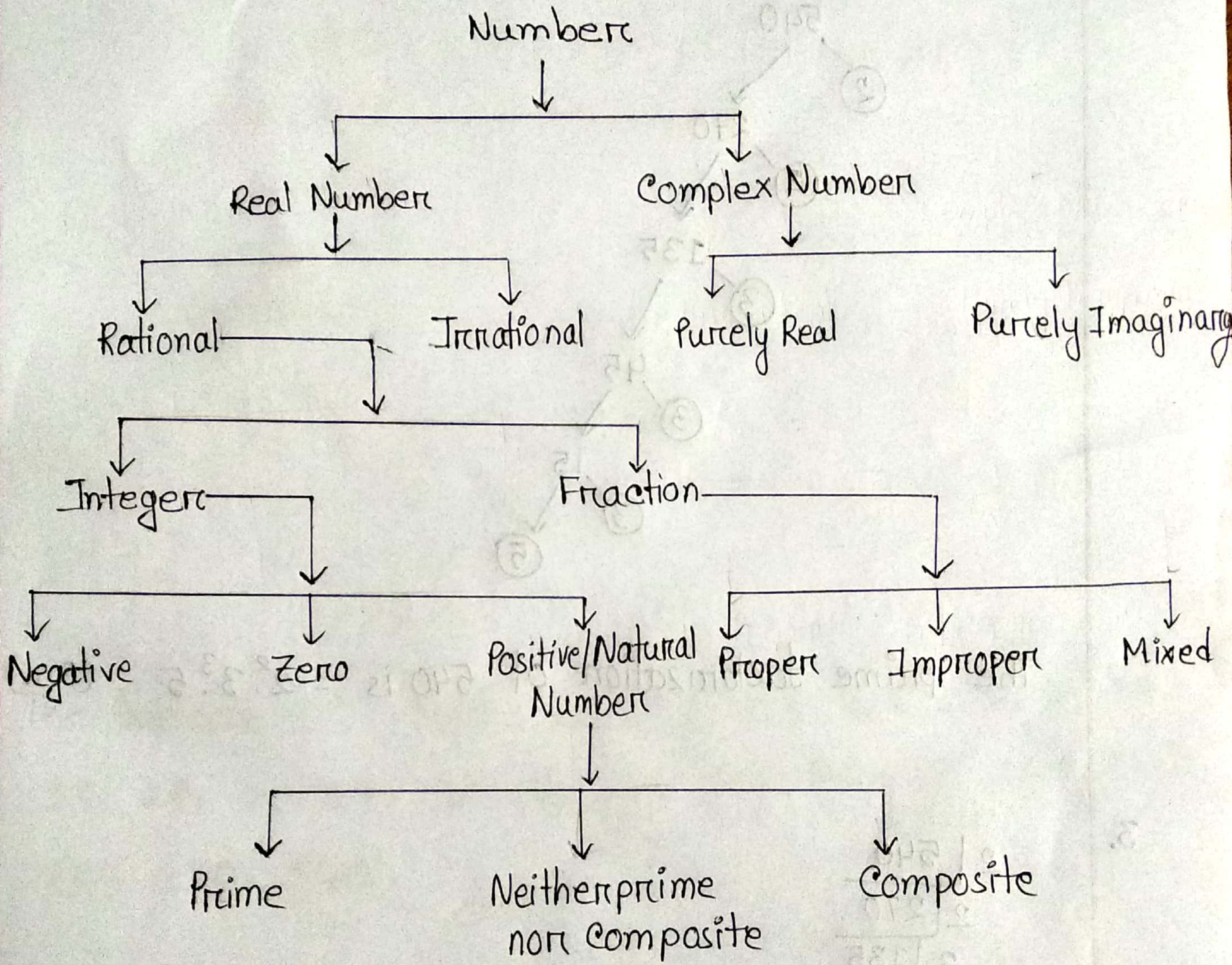
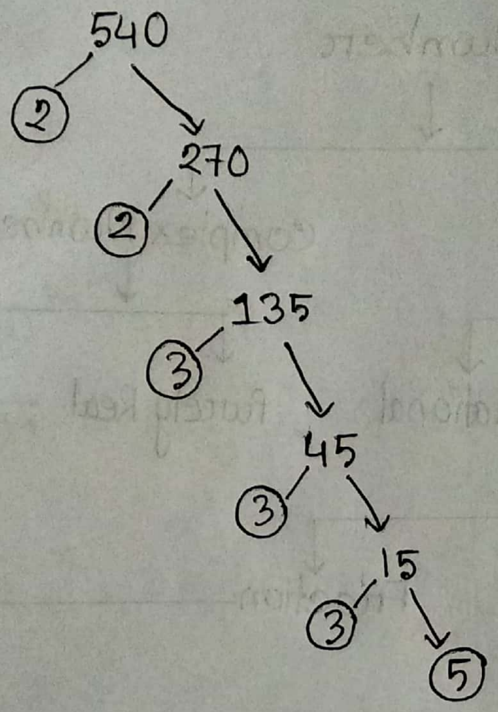
1. classifacation of number system:



2. Prime factorization of 540 using tree diagram:



The prime factorization of 540 is $= 2^2 \cdot 3^3 \cdot 5$ (Ans)

3.

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

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

so, the total ~~mu~~number of factors of 540 is

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

~~$= 2\ 3 + 4 + 2$~~ $= 24$

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

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.

(Ans)

4.

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

prime factorization $= 2^4 . 3 . 5$

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

Prime factorization $= 2^2 . 3^3 . 5$

$\therefore$ LCM (240 & 540) $= 2^4 . 3^3 . 5$

$= 2160$

& GCD or HCF (240 & 540) $= 2^2 . 3 . 5$

$= 60$

(Ans)

5.

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

Prime factorization $= 2.3.7$ Prime factorization $= 3^2.7$ Prime factorization $= 2^2.5.7$

$\therefore$ LCM (42, 63 & 140) $= 2^2 . 3^2 . 5 . 7$

$= 1260$

$\therefore$ HCF (42, 63 & 140) $= 7$

(Ans)

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

$$2 \qquad \begin{array}{r|l} 2 & 8 \\ \hline 2 & 4 \\ \hline & 2 \end{array} \qquad \begin{array}{r|l} 2 & 16 \\ \hline 2 & 8 \\ \hline 2 & 4 \\ \hline & 2 \end{array} \qquad \begin{array}{r|l} 2 & 10 \\ \hline & 5 \end{array}$$

Prime factorization: 2, 2^3, 2^4, $2 \cdot 5$

$\therefore$ LCM $(2, 8, 16 \& 10) = 2^4 \cdot 5 = 80$

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

$$3 \qquad \begin{array}{r|l} 3 & 9 \\ \hline & 3 \end{array} \qquad \begin{array}{r|l} 3 & 81 \\ \hline 3 & 27 \\ \hline 3 & 9 \\ \hline & 3 \end{array} \qquad \begin{array}{r|l} 3 & 27 \\ \hline 3 & 9 \\ \hline & 3 \end{array}$$

Prime factorization: $3, \quad 3^2, \quad 3^4, \quad 3^3$

$\therefore$ LCM $(3, 9, 81 \& 27) = 3^4 = 81$

HCF $(3, 9, 81 \& 27) = 3$

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

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

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

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

(Ans)

7. Given that,

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

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

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

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

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

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

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

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

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

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

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

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

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

Modulus of z is $= 1$

Argument of z is

$$\theta = \pi - \tan^{-1}\left|\frac{y}{x}\right|$$

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

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

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

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

Exponential form is,

$$z = re^{i\theta}$$

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

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

(Ans)

8. $\sqrt{-16} \times \sqrt{-4}$ & $\dfrac{\sqrt{-16}}{\sqrt{-4}}$

$= \sqrt{16i^2} \times \sqrt{4i^2}$ $[\because i^2 = -1]$

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

$= 4i \times 2i$

$= 8i^2$

$= -8$

$= \dfrac{\sqrt{16i^2}}{\sqrt{4i^2}}$ $[\because i^2 = -1]$

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

$= 2$

(Ans)

9. We have $z = 2 + i$

$\therefore 8z - z^2$

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

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

$= 16 + 8i - 4 - 4i + 1$ $[\because i^2 = -1]$

$= 13 + 8i - 4i$

$= 13 + 4i$

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

$= \sqrt{169 + 16}$

$= \sqrt{185}$

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

$= 17 \cdot 10$

(Ans)

10. Let,

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

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

$= \sqrt{1+3}$

$= \sqrt{4} = 2$

$\therefore r = 2$

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

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

$= \tan^{-1}(1{\cdot}7321)$

$= 60°$

$= \pi/3$

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

(Ans)