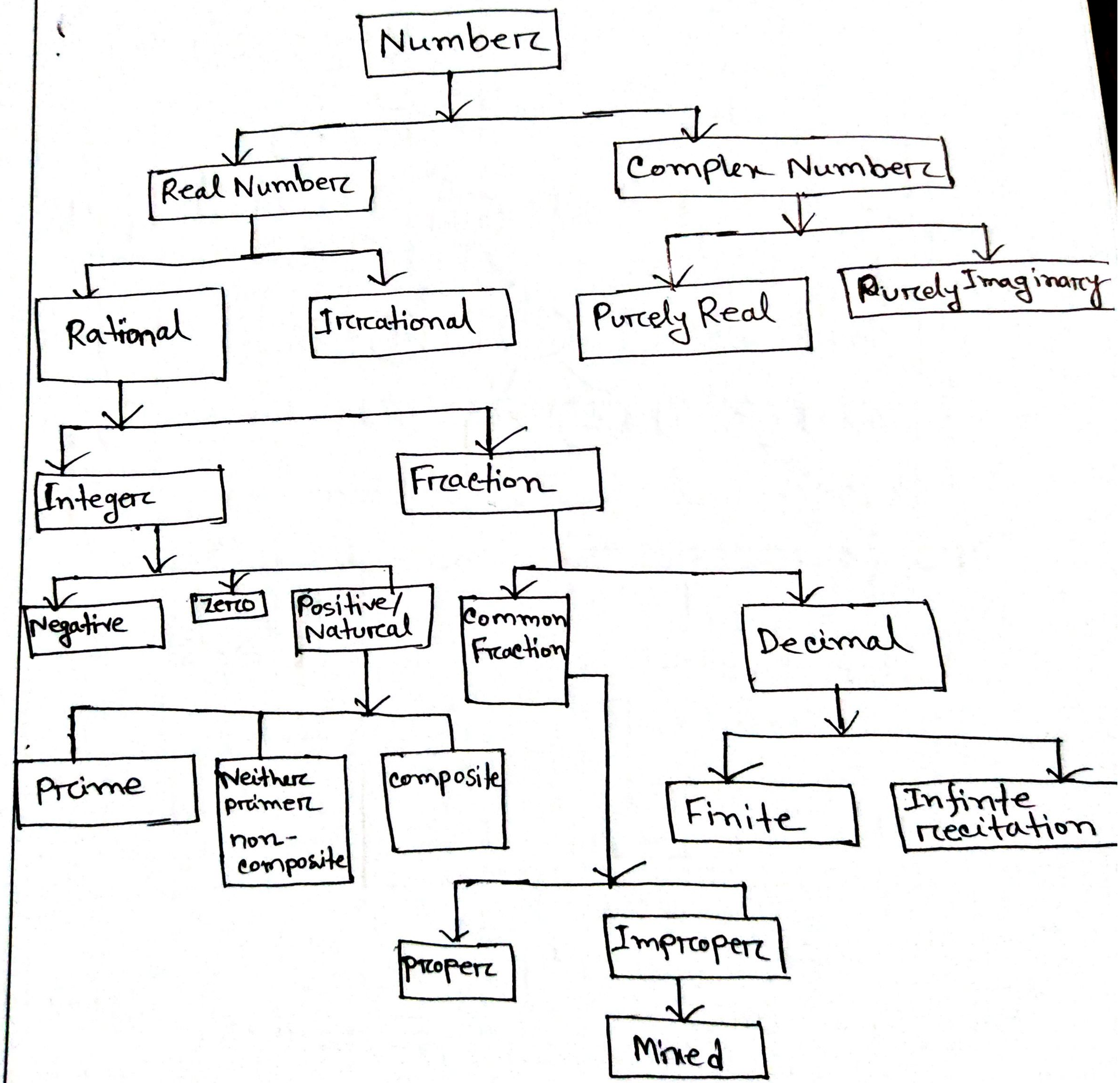
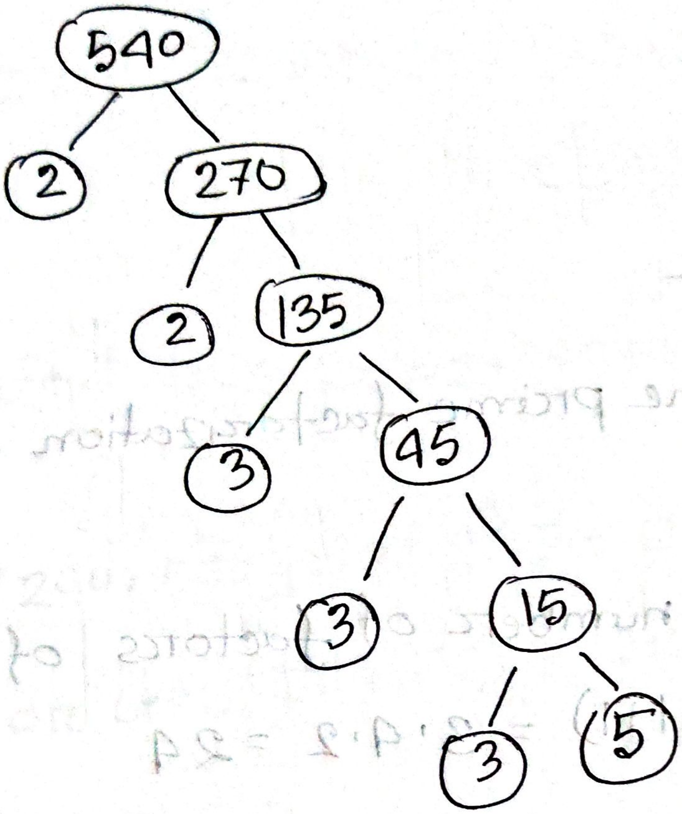
1. Classification of number system:



2



There force, the prime factorization of 540

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

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

So, the total number of factors of 540 is

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

Calculation for all factors –

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

$\therefore$ The all factors of 540 are :– 1, 2, 3, 4, 5, 6, 9, 10, 12, 15, 18, 20, 27, 30, 36, 45, 54, 60, 90, 180, 135, 180, 270 and 540.

(4)

$240 = 2 \times 120 = 2 \times 2 \times 60 = 2 \times 2 \times 2 \times 30 = 2 \times 2 \times 2 \times 2 \times 15$

$= 2^4 \times 3 \times 5$

$540 = 2 \times 270 = 2 \times 2 \times 135 = 2 \times 2 \times 3 \times 45 = 2 \times 2 \times 3 \times 3 \times 15 = 2^2 \times 3^3 \times 5$

$\therefore$ LCM $(240, 540) = 2^4 \cdot 3^3 \cdot 5 = 2160$

& HCF or GCD $(240, 540) = 2 \cdot 3 \cdot 5 = 30$

(5) $42 = 2 \times 21 = 2 \times 3 \times 7$

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

$140 = 2 \times 70 = 2 \times 2 \times 35 = 2^2 \times 5 \times 7$

$\therefore$ LCM $(42, 63, 140) = 2^2 \times 3^2 \times 5 \times 7 = 1260$

& HCF $(42, 63, 140) = 2 \times 7 = 14$

(6)

Calculation for Numberators

$2 = 2^1$

$8 = 2^3$

$16 = 2^4$

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

$LCM(2,8,16,10) = 2^4 \times 5$

$= 80$

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

~~calcut~~ Calculation for Denominatirs

$3 = 3^1$

$9 = 3^2$

$81 = 3^4$

$27 = 3^3$

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

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

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

$$LCM \text{ of } \frac{2}{3}, \frac{8}{9}, \frac{16}{81} \text{ and } \frac{10}{27} = \frac{\cancel{HCF}\ LCM(2,8,16,10)}{HCF(3,9,81,27)} = \frac{80}{3}$$

7

We have, $\frac{1+\sqrt{3}i}{1-\sqrt{3}i}$

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

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

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

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

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

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

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

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

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

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

And Argumest of z will-

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

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

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

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

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

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

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

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

(8)

We have, $\sqrt{-16} \times \sqrt{-4}$

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

$= 4i \times 2i$

$= 8i^2$

$= -8$

and $\frac{\sqrt{-16}}{\sqrt{-4}} = \frac{4i}{2i} = 2$

(9) We have, $z = 2 + i$

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

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

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

$= 13 + 4i$

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

$= \sqrt{169 + 16}$

$= \sqrt{185}$

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

$= 17 \cdot 102^\circ$

(10) Let, $z = 1 + i\sqrt{3}$ $\quad z = x + iy \quad |z| = \sqrt{x^2+y^2}$

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

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

$= \sqrt{1+3}$

$= \sqrt{4}$

$= 2$

$\therefore r = 2$

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

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

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

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

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

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