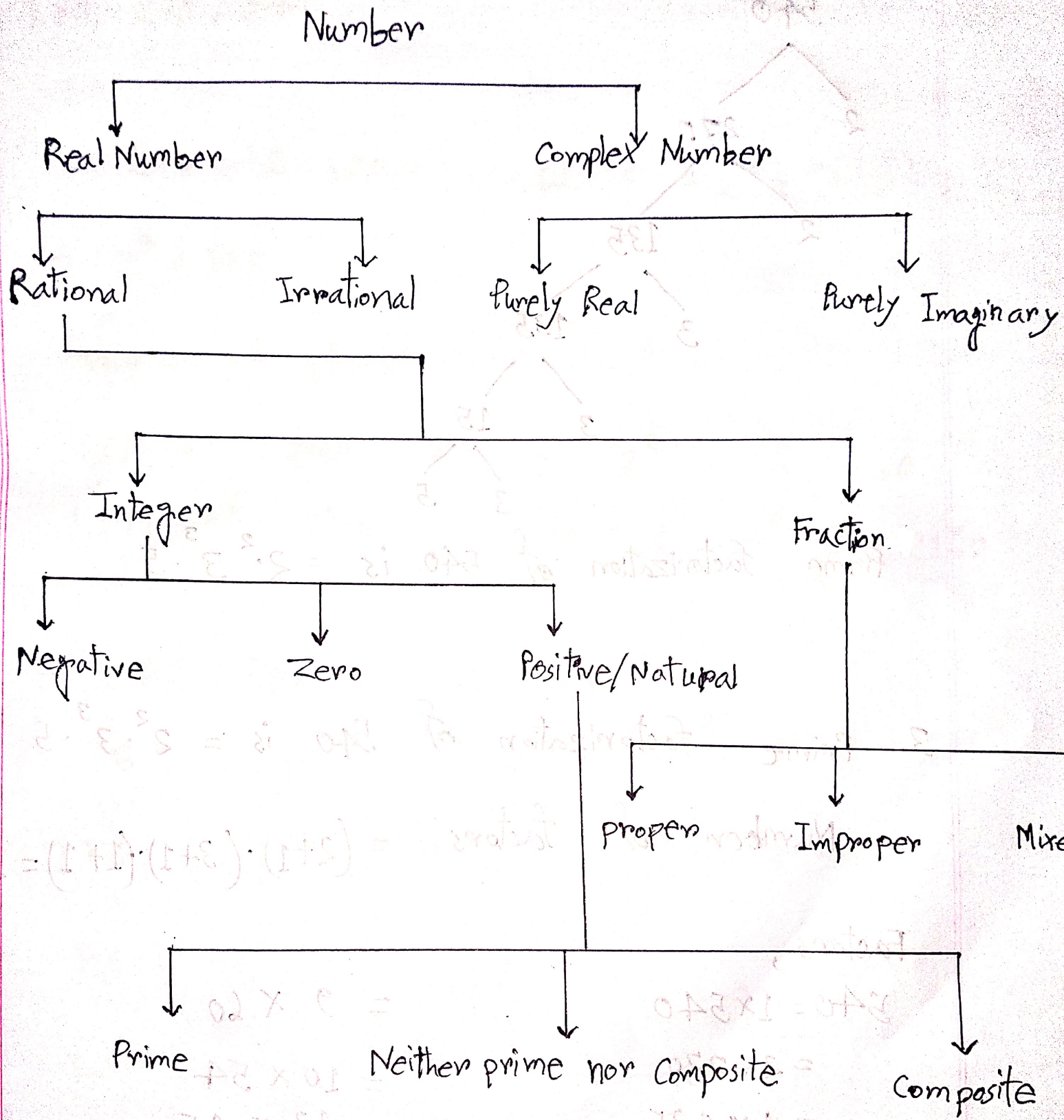
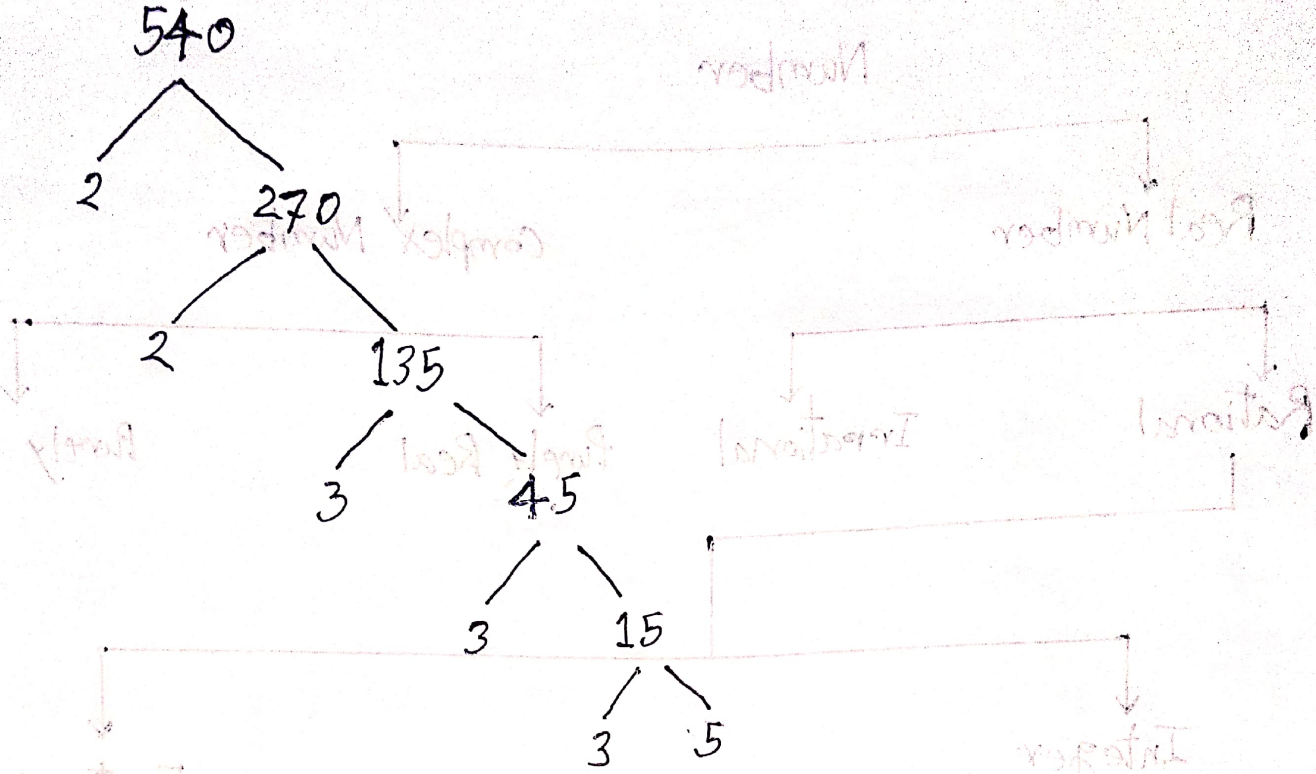
1. Classification of Number System :



2. Prime factorization of 540 using tree :



Prime factorization of 540 is $= 2^2 \cdot 3^3 \cdot 5$

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

Number of factors $= (2+1) \cdot (3+1) \cdot (1+1) = 24$

Factors,

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

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.

4. $240 = 2 \times 120 = 2 \times 2 \times 60 = 2^2 \times 2 \times 30 = 2^3 \times 2 \times 15$

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

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

G.C.D of 240 & 540 is $= 2^2 \times 3 \times 5 = 60$

L.C.M of 240 & 540 is $= 2^4 \times 3^3 \times 5 = 2160$

5. $42 = 2 \times 21 = 2 \times 3 \times 7$

$63 = 7 \times 9 = 3 \times 3 \times 7 = 3^2 \times 7$

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

H.C.F $= 7$

L.C.M $= 2^2 \times 3^2 \times 5 \times 7 = 1260$

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

Numerators

$2 = 2^1$

$8 = 2^3$

$16 = 2^4$

$10 = 2 \times 5$

Denominators

$3 = 3$

$9 = 3^2$

$27 = 3^3$

$81 = 3^4$

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

L.C.M of $(2, 8, 10, 16) = 80$

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

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

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

L.C.M of $\left(\frac{2}{3}, \frac{8}{9}, \frac{10}{27}, \frac{16}{81}\right) = \frac{80}{3}$

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

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

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

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

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

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

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

$= 1$

Argument of z is

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

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

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

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

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

$$= \cos\frac{2\pi}{3} + i\sin\frac{2\pi}{3}$$

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

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

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

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

$= \sqrt{16 \times (-1)} \times \sqrt{4 \times (-1)}$

$= 4i \times 2i$

$= -8$

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

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

$= 2$

9. $z = 2+i$

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

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

$= 13 + 4i$

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

$$= \sqrt{185}$$

Argument, $\theta = \tan^{-1}\left|\frac{4}{13}\right|$

$$= 17.103^\circ$$

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

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

$$= 2$$

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

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

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

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