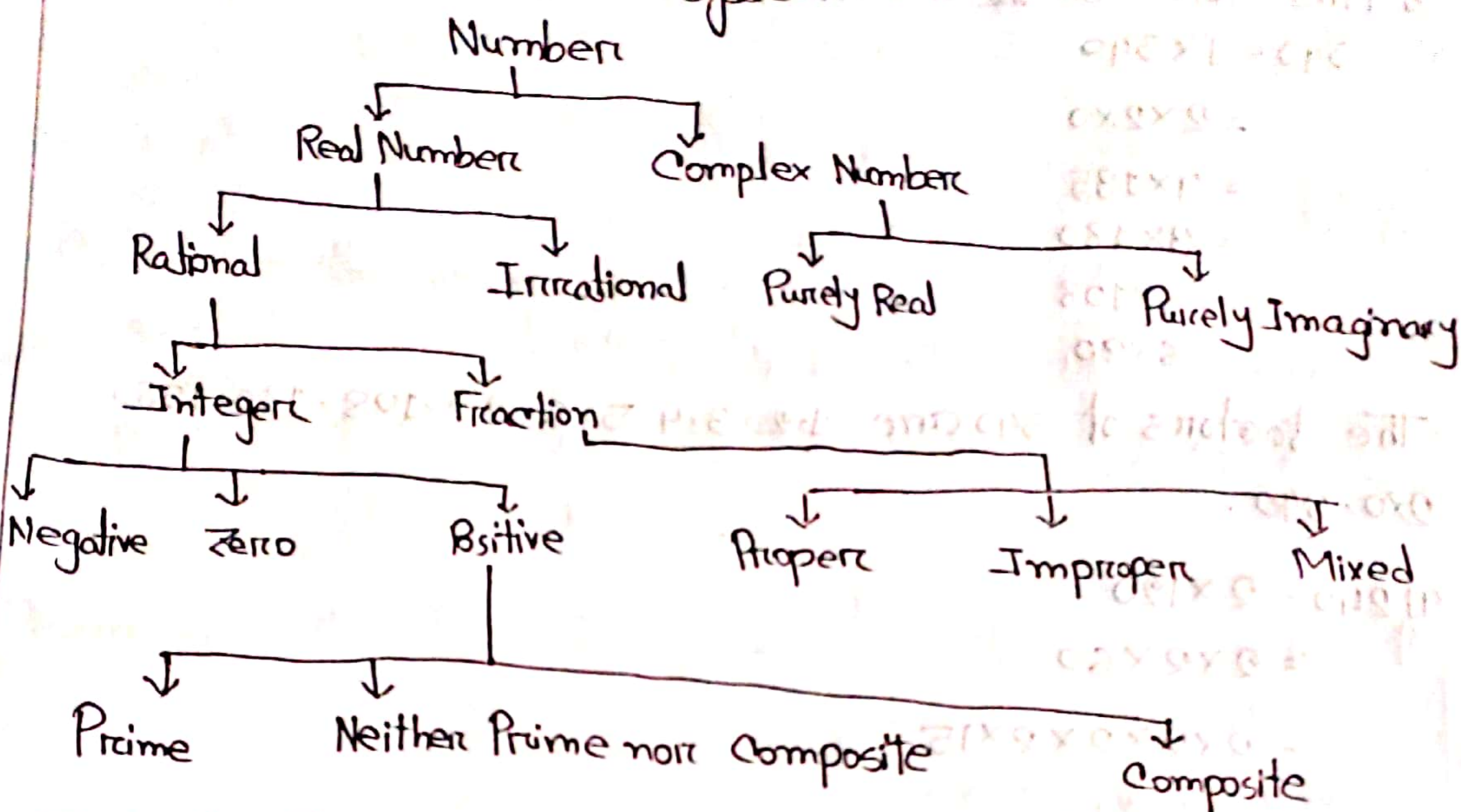
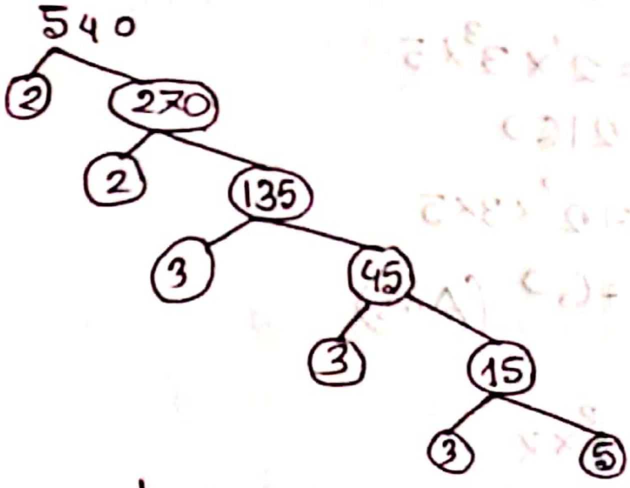
1) Classification of number system:



2) Find the Prime Factorization of 540 with using tree method:



Therefore, the Prime factorization of 540 is = $2^2 \cdot 3^3 \cdot 5^1$

3) Find the all factors of 540

$540 = 1 \times 540$

$= 2 \times 270$

$= 4 \times 135$

$= 3 \times 180$

$= 5 \times 108$

$= 6 \times 90$

The factors of 540 are 1, 2, 3, 4, 5, 6, 90, 108, 180, 13

270, 540.

4) $240 = 2 \times 120$

$= 2 \times 2 \times 60$

$= 2 \times 2 \times 2 \times 2 \times 15$

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

$540 = 2^2 \times 3^3 \times 5^1$

$L.C.M\,(240, 540) = 2^4 \times 3^3 \times 5$

$= 2160$

$G.C.D\,(240, 540) = 2^2 \times 3 \times 5$

$= 60$ (Ans)

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

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

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

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

$= 1260$

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

(Ans)

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6) Calculation for Numerators

$2 = 2^1$ $\qquad$ $L.C.M(2,8,10,16) = 2^4 5 = 80$

$8 = 2^3$ $\qquad$ $H.C.F = 2^1 = 2$

$16 = 2^4$

$10 = 2 \cdot 5$

Calculation for Denominators

$3 = 3^1$ $\qquad$ $L.C.M(3,9,27,81) = 3^4 = 81$

$9 = 3 \cdot 3$ $\qquad$ $H.C.F = 3^1 = 3$

$81 = 3 \cdot 3 \cdot 3 \cdot 3$

$= 3^4$

$27 = 3 \cdot 3 \cdot 3 = 3^3$

Therefore, LCM of $\frac{2}{3}, \frac{8}{9}, \frac{16}{81}$ and $\frac{10}{27} = \frac{80}{3}$

$H.CF = \frac{2}{3}, \frac{8}{9}, \frac{16}{81}$ and $\frac{10}{27} = \frac{2}{81}$ (Ans)

7) Finding modulus Argument and Polar:

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

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

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

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

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

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

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

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

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

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

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

Modulus of z is $= 1$

And Argument of z will

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

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

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

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

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

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

8) Given,

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

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

$= 4i \times 2i$

$= 8i^2$

$= -8$

Again,

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

$= -2$

Ans:

9) Given,

$z = 2+i$

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

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

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

$= 13 + 4i$

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

$= \sqrt{169 + 16}$

$= \sqrt{185}$

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

$= 17.102$

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10) Let,

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

$z = x + iy$

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

We know,

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

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

$= \sqrt{4} = 2$

$\therefore r = 2$

Again,

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

(Ans!)