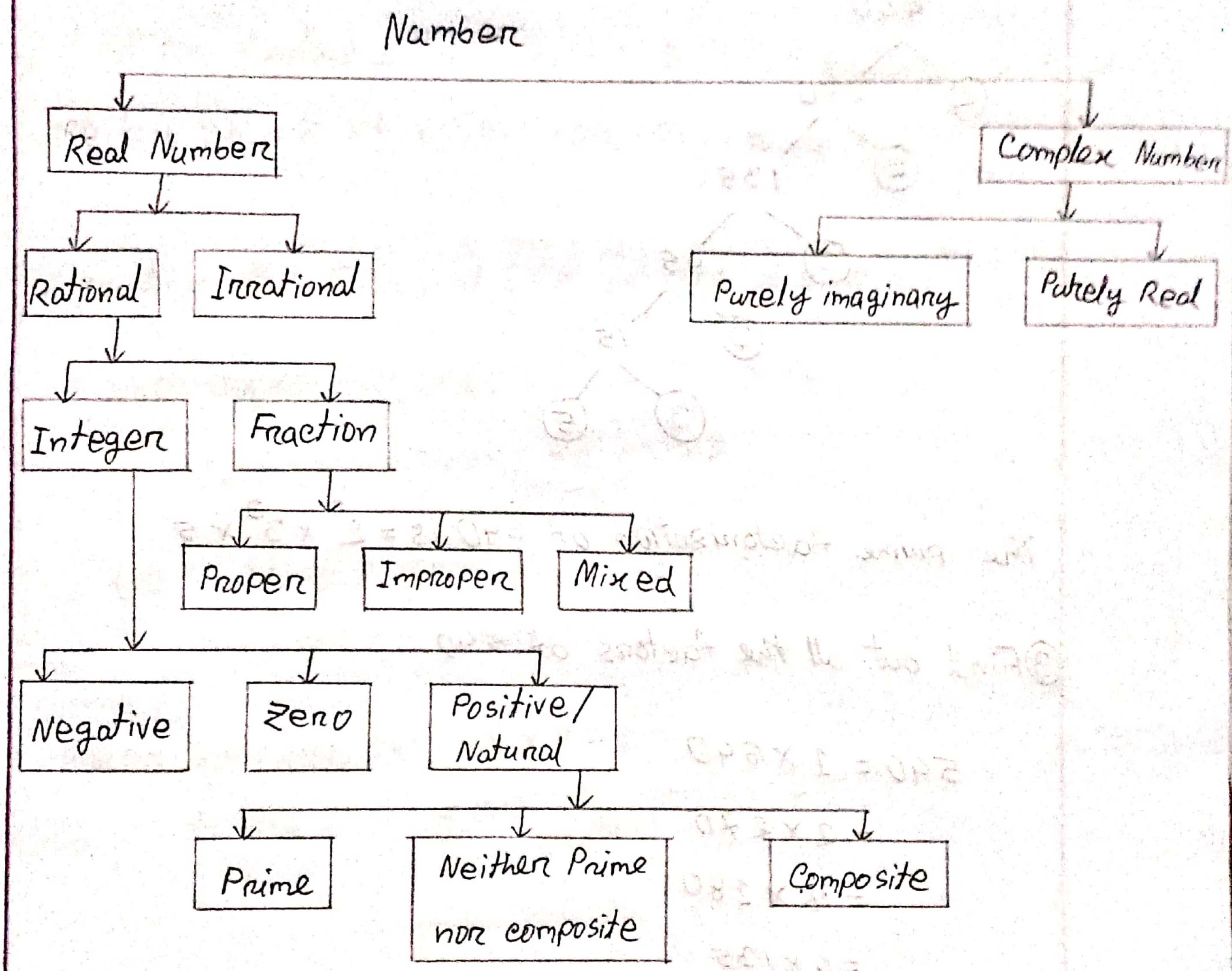
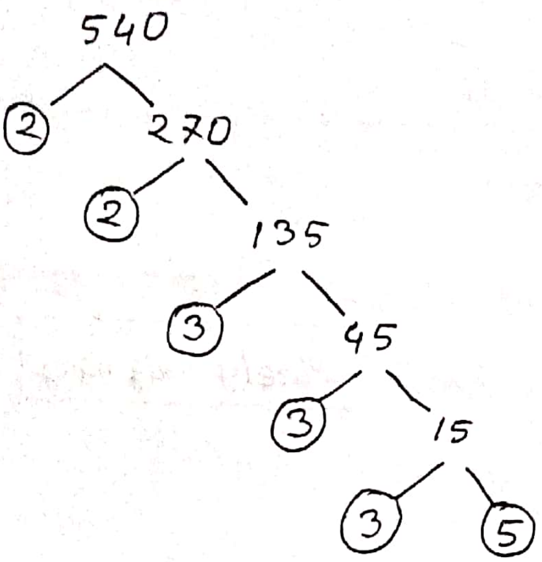
221-15-5592

① Classification of Number system:



② Find the prime factorization of 540 using tree.



The prime factorization of 540 is $= 2^2 \times 3^3 \times 5$

③ Find out all the factors of 540.

$540 = 1 \times 540$

$= 2 \times 270$

$= 3 \times 180$

$= 4 \times 135$

$= 5 \times 108$

$= 6 \times 90$

$= 9 \times 60$

$= 10 \times 54$

$= 12 \times 45$

$= 15 \times 36$

$= 18 \times 30$

$= 20 \times 27$

$\therefore$ All 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. What is the GCD and LCM of 240 & 540

$240 = 2 \times 120 = 2 \times 2 \times 60 = 2^3 \times 30 = 2^4 \times 3 \times 5$

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

$\therefore$ LCM of $(240 \,\&\, 540) = 2^4 \times 3^3 \times 5$

$= 2160$

GCD of $(240, 540) = 2^2 \times 3 \times 5$

$= 60$ (Ans.)

⑤ Find the HCF & LCM of (42, 63, 140)

$42 = 2 \times 3 \times 7$

$63 = 3^2 \times 7$

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

$\therefore$ HCF of $(42, 63, 140) = \cancel{2 \cdot 3 \times 7}\ 7$

$\cancel{= 21}$

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

$= 1260$

(Ans)

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⑥ Find the HCF & LCM of $\frac{2}{3}, \frac{8}{9}, \frac{16}{81}, \frac{10}{27}$

Calculations for Numerator,	Calculations for Denominator,
$2 = 2^1$	$3 = 3^1$
$8 = 2^3$	$9 = 3^2$
$16 = 2^4$	$81 = 3^4$
$10 = 2 \times 5$	$27 = 3^3$

LCM of $(2, 8, 16, 10) = 2^4 \times 5 = 80$

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

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

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

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

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

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

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

(Ans.)

⑦ Find the modulus and Argument of $z = \frac{1+\sqrt{3}i}{1-\sqrt{3}i}$ and also it's polar, exponential form

Given that,

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

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

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

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

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

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

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

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

$$= \pm 1$$

And the argument of z,

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

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

$$= \pi - \left(-\frac{\pi}{3}\right)$$

$$= \frac{4\pi}{3}$$

The polar form of z is,

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

$$= 1\left(\cos\frac{4\pi}{3} + i\sin\frac{4\pi}{3}\right)$$

Exponent form of z is,

$$r = e^{i\theta}$$

$$= e^{i\frac{4\pi}{3}}$$

⑧ Evaluate $\sqrt{-16} \times \sqrt{-4}$ & $\frac{\sqrt{-16}}{\sqrt{-4}}$

ⓐ $\sqrt{-16} \times \sqrt{-4}$

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

$= 4i \times 2i$

$= 8i^2$

$= -8$

ⓑ $\frac{\sqrt{-16}}{\sqrt{-4}}$

$= \frac{\sqrt{16} \times \sqrt{-1}}{\sqrt{4} \times \sqrt{-1}}$

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

$= 2$

(Ans.)

⑨ Evaluate Modulus & Argument of $8z - z^2$ by replacing $z = 2+i$

Given that, $8z - z^2$

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

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

$= 12 + 4i + 1$

$= 13 + 4i$

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

$= \sqrt{185}$

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

(10) Express $1+i\sqrt{3}$ in the form of $r(\cos\theta + i\sin\theta)$

Given that,

$1+i\sqrt{3}$

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

$= 2$

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

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

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

(Ans.)