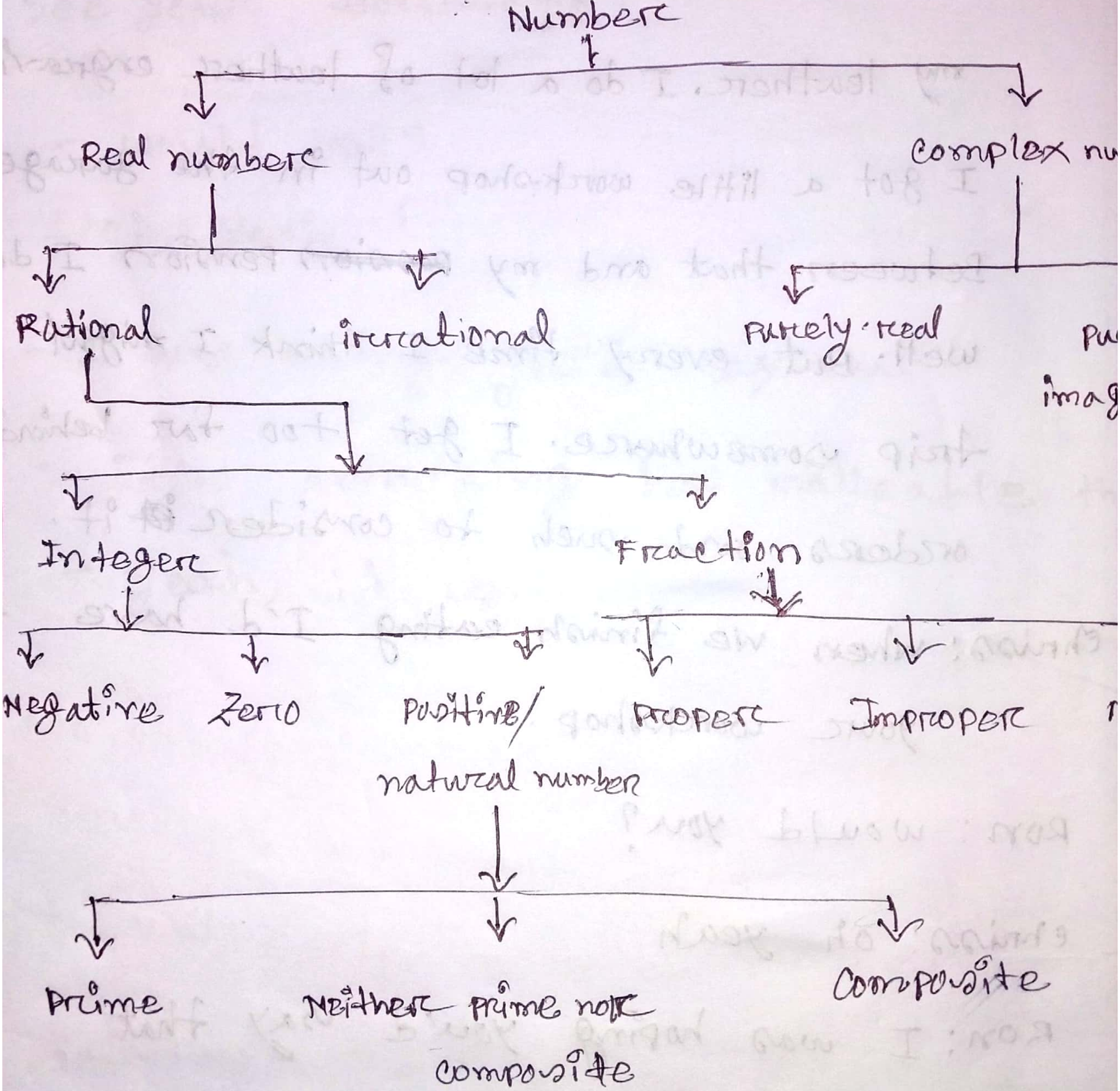
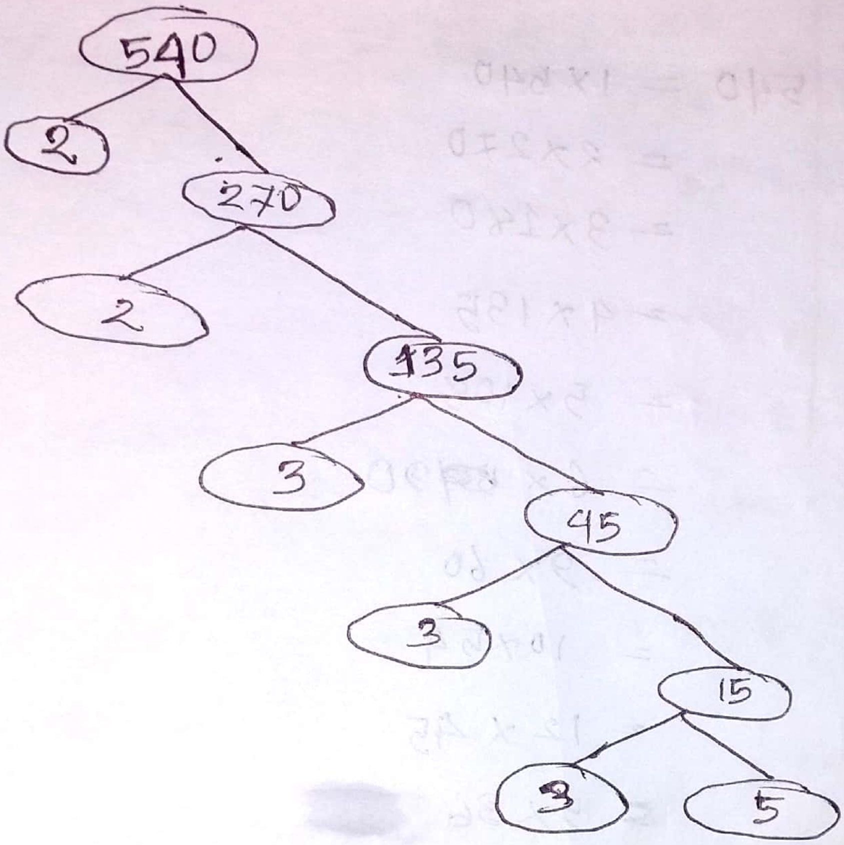
① Write down the clasification of number syst



(2) Find the prime factorization of 540 using tree:



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

(3) Find the all factor of 540:-

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

So, the total number of 540 is

$= (2+1)(3+1)(1+1)$

$= 3 \times 4 \times 2$

$= 24$

calculation for all factors:

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

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 and 540:-

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

$= 2 \times 2 \times 2 \times 2 \times 3 \times 5$

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

$\therefore 540 = 2^2 \cdot 3^3 \cdot 5$ [following previous work]

$\therefore 240 = 2^4 \cdot 3 \cdot 5$

$\therefore LCM = 2^4 \cdot 3^3 \cdot 5 = 2160$

$\therefore GCD = 2^2 \cdot 3 \cdot 5 = 60$

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(5) Find the HCF and LCM of 42, 63 and 140.

$\therefore 42 = 2 \times 21$
$= 2 \times 3 \times 7$

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

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

$\therefore 42 = 2 \cdot 3 \cdot 7$

$\therefore 63 = 3^2 \cdot 7$

$\therefore 140 = 2^2 \cdot 5 \cdot 7$

$\therefore$ LCM $= 2^2 \cdot 3^2 \cdot 5 \cdot 7 = 1260$ (Ans)

$\therefore$ HCF $= 7$ (Ans)

(6) Find the H.C.F and L.C.M of $\frac{2}{3}, \frac{8}{9}, \frac{16}{81}$ and $\frac{10}{27}$

Calculation for Numerators:

~~Lcm~~ $2 = 2^1$

$8 = 2^3$

$16 = 2^4$

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

LCM $= 2^4 \times 5 = 80$

HCF $= 2^1 = 2$

Calculation of Denominators:

$3 = 3^1$

$9 = 3^2$

$81 = 3^4$

$27 = 3^3$

LCM $= 3^4 = 81$

HCF $= 3 = 3$

$\therefore$ LCM of $\left(\frac{2}{3}, \frac{8}{9}, \frac{16}{8}\text{ and } \frac{10}{27}\right) = \frac{80}{3}$ (Ans)

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

(7) Find the modulus and Argument of $z = \frac{1+\sqrt{3}i}{1-\sqrt{3}i}$ also its polar, exponential form:-

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

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

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

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

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

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

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

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

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

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

$$= 1$$

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

And argument of z will-

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

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

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

$\therefore$ polar form, $z = r(\cos\theta + i\sin\theta)$

$$= 1\left(\cos\frac{2\pi}{3} + i\sin\frac{2\pi}{3}\right)$$

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

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

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

(8) Evaluate $\sqrt{-16} \times \sqrt{-4}$ and $\sqrt{\frac{-16}{-4}}$

Answer:

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

$= 4i \times 2i$

$= 8i^2$

$= -8$ (Ans)

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

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

$= 2$ (Ans)

(9) Evalute modulus and Argument of $8z - z^2$

replacing, $z = 2+i$

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

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

$= 13 + 4i$

modulus of $8z - z^2 = \sqrt{(13)^2 + (4)^2} = \sqrt{169 + 16}$

Argument of $8z - z^2 = \tan^{-1}\left(\frac{4}{13}\right)$

$= 17.1^\circ$ (Ans)

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

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

Here, modulus of $|z| = \sqrt{(1)^2+(\sqrt{3})^2}$

$= \sqrt{4} = 2$

$\therefore r = 2$

$\therefore$ Argument, $\theta = \tan^{-1}\frac{y}{x} = \tan^{-1}\left(\frac{\sqrt{3}}{1}\right)$

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

Therefore,

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

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