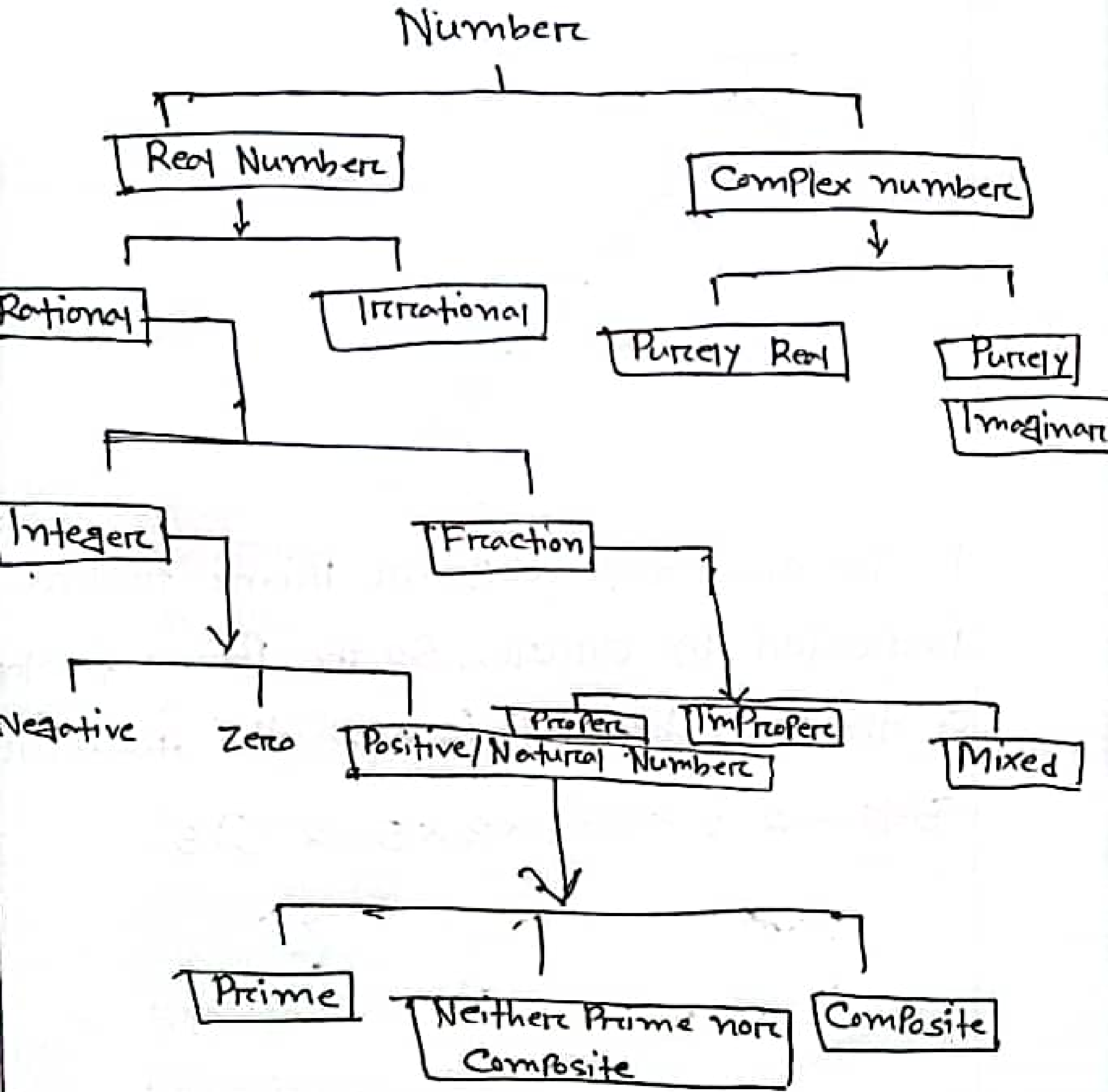
① Write down the classification of number system.

Classification:



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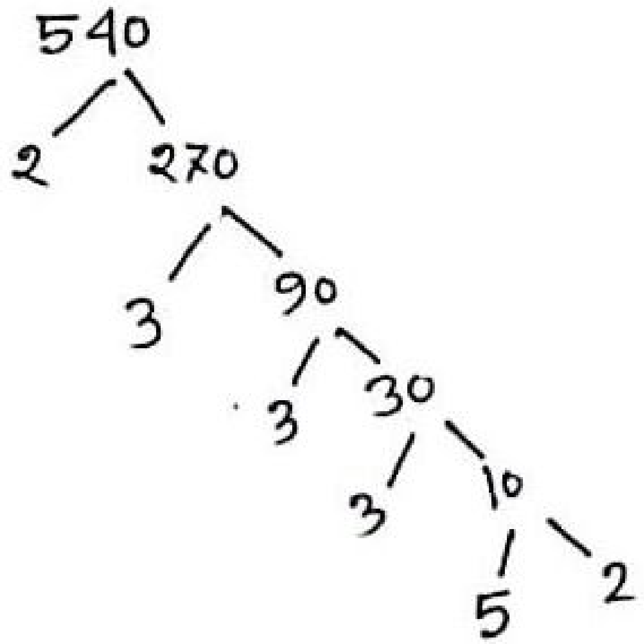
② Find the Prime factorization of 540 using tree.

<u>Solution:</u> The tree diagram for the Prime factors is as follows:



In the above tree diagram Prime factors are indicated by circles, So the Prime factorization of the number 540 is as of the ~~from~~ form,

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

③ Find out the all factors of 540.

Solution:

$$\begin{array}{r|l} 2 & 540 \\ \hline 3 & 270 \\ \hline 3 & 90 \\ \hline 3 & 30 \\ \hline 2 & 10 \\ \hline & 5 \end{array}$$

Prime factorization of 540 is $540 = 2\times2\times3\times3\times3\times5$

$= 2^2 \cdot 3^3 \cdot 5^1$

The total number of factors is $= (2+1)\cdot(3+1)\cdot(1+1)$

$= 3\cdot4\cdot2$

$= 24$

Here,

$540 = 2\times270$

$540 = 3\times180$

$540 = 4\times135$

$540 = 5\times108$

$540 = 6\times90$

$540 = 9\times60$

$540 = 10\times54$

$540 = 12\times45$

$540 = 15\times36$

$540 = 18\times30$

$540 = 20\times27$

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

④ What is the GCD & LCM of 240 & 540.

$$\begin{array}{r|l} 2 & 240 \\ \hline 2 & 120 \\ \hline 2 & 60 \\ \hline 2 & 30 \\ \hline 3 & 15 \\ \hline & 5 \end{array} \qquad \begin{array}{r|l} 2 & 540 \\ \hline 3 & 270 \\ \hline 3 & 90 \\ \hline 3 & 30 \\ \hline 2 & 10 \\ \hline & 5 \end{array}$$

$240 = 2\times2\times2\times2\times3\times5$

$= 2^4 . 3^1 . 5^1$

$540 = 2\times2\times3\times3\times3\times5$

$= 2^2 . 3^3 . 5^1$

Finally, the GCD of 240 & 540 is $= 2^2 \cdot 3^1 . 5^1$

$= 4 . 3 . 5$

$= 60$

the LCM of 240 and 540 $= 2^4 . 3^3 . 5^1$

$= 16 . 27 . 5$

$= 2160$ Ans.

⑤ Find the H.C.F and L.C.M of 42, 63 and 140.

Solution:

Here, $42 = 2\times21 = 2\times3\times7 = 2^1\cdot3^1\cdot7^1$

$63 = 3\times21 = 3\times3\times7 = 3^2\cdot7^1$

$140 = 2\times70 = 2\times2\times35 = 2\times2\times5\times7 = 2^2\cdot5^1\cdot7^1$

Therefore, the HCF of 42, 63 and 140 is -7 Ans:

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

Solution:

Factorization of ~~Numb~~ Numerators

$2 = 2 = 2^1$

$8 = 2\times4 = 2\times2\times2 = 2^3$

$16 = 2\times8 = 2\times2\times4 = 2\times2\times2\times2 = 2^4$

$10 = 2\times5 = 2^1\times5^1$

HCF of Numerators is $= 2^1 = 2$

LCM of Numerators is $= 2^4\times5^1 = 16\times5 = 80$

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

Solution:

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

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

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

$= a+ib$ Where $a = -\frac{1}{2}$ and $b = \frac{\sqrt{3}}{2}$

Now, $r = \sqrt{a^2+b^2}$

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

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

$$= \sqrt{\frac{4}{4}}$$

$$= \sqrt{1}$$

$$= 1$$

and. $\theta = \tan^{-1}\left(\frac{b}{a}\right) = \tan^{-1}\left(\frac{\frac{\sqrt{3}}{2}}{-\frac{1}{2}}\right)$

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

So the Polar form is, $z = r(\cos\theta + i\sin\theta)$.

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

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

and Exponential form, $z = e^{i\cdot\frac{2\pi}{3}}$

Ans:

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

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

$= 4i \times 2i$

$= 8i^2$

$= -8$

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

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

$= 2$

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(9) Evaluate Modulus and Argument of $8z = z^2$ by replacing $z = 2+i$

Solution:

$$8z = z^2$$

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

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

$$= 13 + 4i$$

Modulus $= \sqrt{13^2 + 4^2} = \sqrt{185}$

Argument $= \tan^{-1}\left(\frac{4}{13}\right) = 17.10^\circ$

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

Solution:

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

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

$$= \sqrt{4}$$

$$= 2$$

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

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

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

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