NUMBER SYSTEM ASSIGNMENT

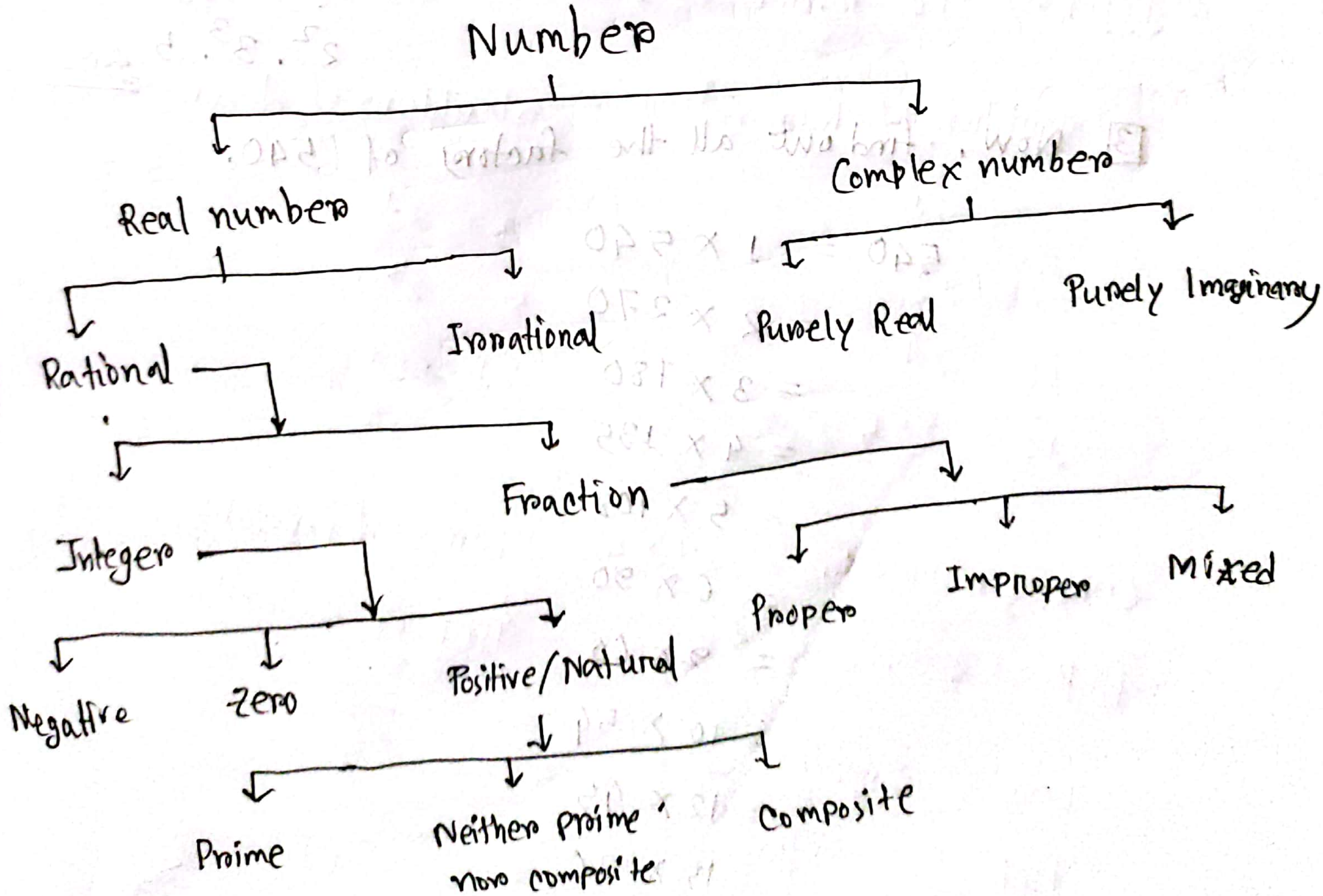
221-15-5405

1. The classifications of numbers are: real number, imaginary numbers, irrational number, integers, whole & natural numbers

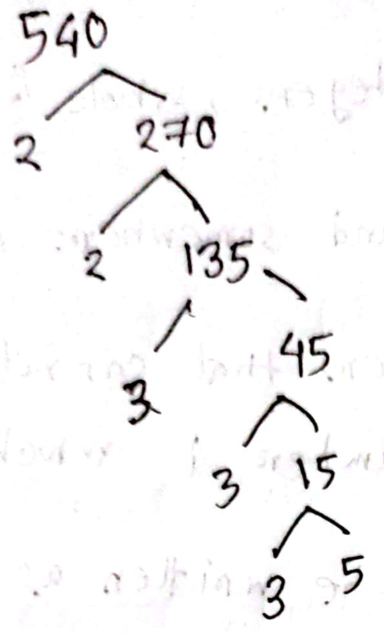
Real numbers are numbers that land somewhere on a number line.

Imaginary numbers are the numbers that can not be written as a fraction. it involve the number i which represents $\sqrt{-1}$

Irrational numbers that cannot be written as a fraction & include never-ending decimal numbers like π.



[2] Let's find the prime factorization of 540 using tre



Therefore, the prime factorization of 540 is; $\cancel{2^3 \times 3^2 \times 5}$

$2^2 . 3^3 . 5$ Ans

[3] Now, find out all the factors of 540.

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

$= 18 \times \cancel{40}\,30$

$= 20 \times 27$

$= 27 \times 20$

The factors of 540 are = 1, 2, 3, 5, 6, 9, 10, 12, 15, 18, 20, 27, 30, 36, 45, 54, 60, 90, 108, 135, 180, 270 & 540

[4] Find the GCD & LCM of 240 & 540

$$\begin{array}{r|l} 2 & 240 \\ \hline 2 & 120 \\ \hline 2 & 60 \\ \hline 2 & 30 \\ \hline 3 & 15 \\ \hline & 5 \end{array} \qquad \begin{array}{r|l} 2 & 540 \\ \hline 2 & 270 \\ \hline 3 & 135 \\ \hline 3 & 45 \\ \hline 3 & 15 \\ \hline & 5 \end{array}$$

Therefore, the prime factorization of 240 : $2^4 . 3 . 5$

of 540 : $2^2 . 3^3 . 5$

& the p.f.

$\therefore$ LCM (240, 540) $= 2^4 . 3^3 . 5 = 16 . 27 . 5 = 2160.$

GCD (240, 540) $= 2^2 . 3 . 5 = 4 . 3 . 5 = 60.$

Ans

5. Find the LCM & HCF of 42, 63, 140

$$\begin{array}{r|l} 2 & 42 \\ \hline 3 & 21 \\ \hline & 7 \end{array} \qquad \begin{array}{r|l} 3 & 63 \\ \hline 3 & 21 \\ \hline & 7 \end{array} \qquad \begin{array}{r|l} 2 & 140 \\ \hline 2 & 70 \\ \hline 5 & 35 \\ \hline & 7 \end{array}$$

P.f. $= 2 \cdot 3 \cdot 7$ P.f. $= 3^2 \cdot 7$ P.f $= 2^2 \cdot 5 \cdot 7$

$\therefore$ LCM $(42, 63, 140) = 2^2 \cdot 3^2 \cdot 5 \cdot 7 = 4 \times 9 \times 5 \times 7 = 1260$

$\therefore$ HCF $(42, 63, 140) = 7$

Ans

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

Calculations of Numerators	Calculations of denominators
$2 = 2^1$	$3 = 3^1$
$8 = 2^3$	$9 = 3^3$
$16 = 2^4$	$81 = 3^4$
$10 = 2 \times 5$	$27 = 3^3$

LCM of Numerators $= 2^4 \times 5$

HCF of numerators $= 2$

LCM of denominators $= 3^4$

HCF of denominators $= 3$

$\therefore$ LCM of fractions $= \frac{2^4 \times 5}{3} = \frac{80}{3}$.

HCF of fractions $= \frac{2}{3^4} = \frac{2}{81}$. Ans

$\boxed{7}$ Here,

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

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

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

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

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

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

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

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

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

$$= \sqrt{1}$$

$$= 1$$

$\text{Arg}(z) = 180^\circ - \tan^{-1} \frac{\sqrt{3}/2}{-1/2}$

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

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

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

$\text{polar}(z) = r(\cos\theta + i\sin\theta)$

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

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

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

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

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

$\boxed{8}$ (a) $\sqrt{-16} \times \sqrt{-4}$

$= 4i \times 2i$

$= 8i^2$

$= -8$ Ans

& , $\frac{\sqrt{-16}}{\sqrt{-4}} = \frac{4i}{2i} = 2$. Ans

$\boxed{9}$ Here, $z = 2+i$

$8z - z^2$

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

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

$= 12 + 4i + 1$

$= 13 + 4i$ Ans

Let, $x = 13 + 4i$

modulus, $|x| = \sqrt{(13)^2 + (4)^2} = \sqrt{169 + 16} = \sqrt{185}$ $\cancel{2}$

$\text{Arg}(x) = \tan^{-1} \frac{4}{13}$ $\cancel{2}$

$\boxed{10}$ Let, $z = 1 + i\sqrt{3}$

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

$= \sqrt{1+4}$

$= \sqrt{5}$

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

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

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

$= \sqrt{5}\left(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}\right)$ $\cancel{3}$

$= \sqrt{5}\left(\frac{1}{2} + \frac{\sqrt{3}i}{2}\right)$

$= \sqrt{5}\left(\frac{1+\sqrt{3}i}{2}\right)$ $\cancel{2}$

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