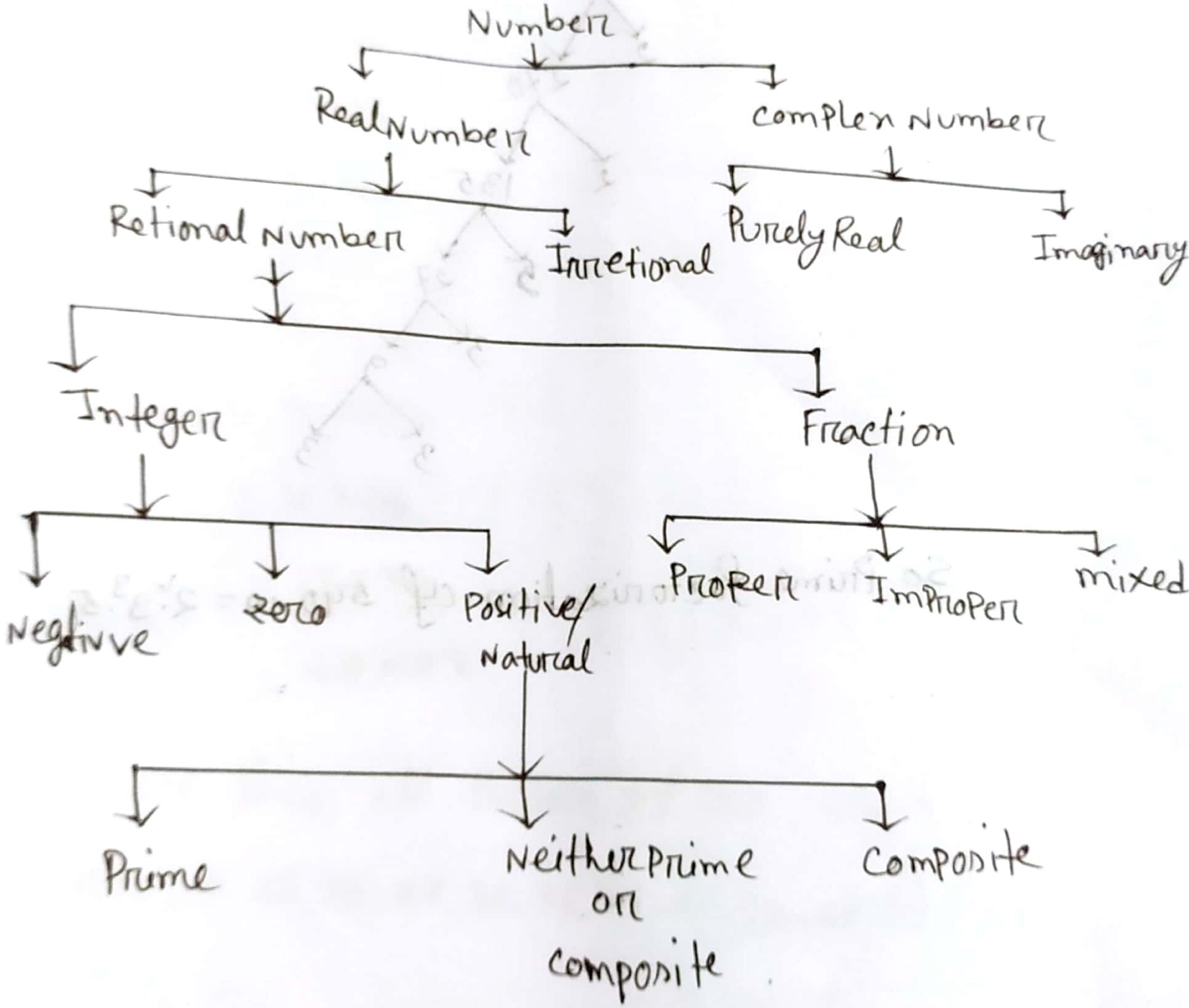
"Complex Number"

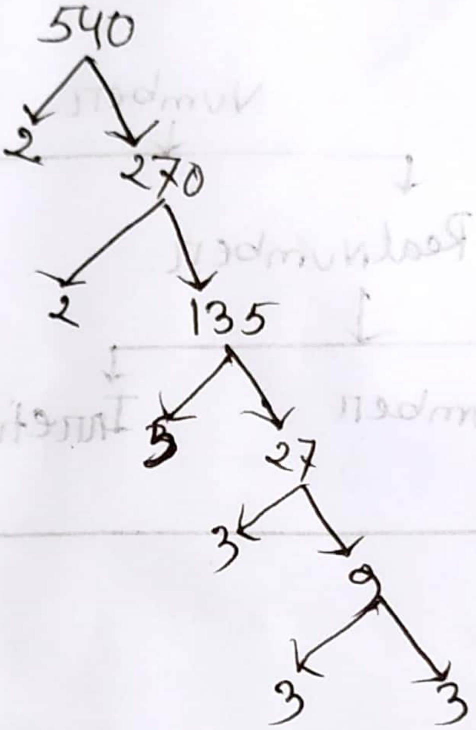
1. Write down the classification of number system.

Ans:- classification of Number system.



2. Find the Prime factorization of 540 using tree

Ans:- The tree diagram for the Prime factors is as follows:-



So Prime factorization of 540 is $= 2^2 \cdot 3^3 \cdot 5$

2: Find the all factor of 540 are—

540 = 1×540

= 2×270

= 3×180

= 4×135

= 5×108

= 6×90

= 9×60

= 10×54

= 12×45

= 15×36

= 18×30

= 20×27

There fore, all factor of 540 are: 1, 2, 3, 4, 5, 6, 9, 10, 12, 15, 18, 20, 27, 30, 36, 45, 60, 90, 108, 135, 180, 270, 540

4. GCD and LCM of 240 and 540:-

2 | 240
2 | 120
2 | 60
2 | 30
3 | 15
  | 5

2 | 540
3 | 270
3 | 90
3 | 30
2 | 10
  | 5

$\therefore$ Prime factorization of $240 = 2^4 \cdot 3^1 \cdot 5^1$

and Prime factorization of $540 = 2^2 \cdot 3^3 \cdot 5^1$

Finally the GCD of 240 and 540 is

$2^2 \cdot 3^1 \cdot 5^1 = 4 \cdot 3 \cdot 5 = 60$ and LCM $= 2^4 \cdot 3^3 \cdot 5^1 = 16 \cdot 27 \cdot 5 = 2160$ Ans

5.

HCF and LCM of 42, 63, 140

2 | 42
3 | 21
  | 7

3 | 63
3 | 21
  | 7

2 | 140
2 | 70
5 | 35
  | 7

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

$63 = 3 \times 3 \times 7$

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

$\therefore$ HCF $= 7$

$\therefore$ LCM $= 2 \times 2 \times 3 \times 3 \times 7 = 252$

6. $\frac{2}{3}, \frac{8}{9}, \frac{16}{81}, \frac{10}{27}$

Factorization of Numerators:-

$2 = 2^1$

$8 = 2^3$

$16 = 2^4$

$10 = 2^1 \times 5$

HCF of Numerators = 2

LCM of numerators = 80

Factorization of Denominators.

$3 = 3^1$.

$9 = 3^2$

$81 = 3^4$

$27 = 3^3$

HCF of denominators = 3

LCM of denominators = 81

$\therefore$ HCF of $\frac{2}{3}, \frac{8}{9}, \frac{16}{81}$ and $\frac{10}{27}$

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

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

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

$$= \frac{16}{3}$$

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

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

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

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

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

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

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

$= x+iy$ [where $x=-\frac{1}{2}$ and $y=\frac{\sqrt{3}}{3}$]

now. $r=\sqrt{x^2+y^2}$

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

$=1$

and.

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

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

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

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

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

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

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

and exponential form is $z = e^{i\frac{2\pi}{3}}$

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

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

$= 4i \times 2i$

$= 8i^2$

$= -8$

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

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

$= 2$

9. Evatule modob and Argument:-

~~$8z-z^2$~~ we have,

$z = 2+i$

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

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

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

$= 13 + 4i$

so, $x = 13$ and $y = 4$

modulus,

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

$= \sqrt{169 + 16}$

$= \sqrt{185}$

Argument

$\theta = \tan^{-1} \left| \frac{4}{3} \right|$

$= \tan^{-1} \frac{4}{3}$

An.

10. Express :- $r(\cos\theta + i\sin\theta)$ from, $1+i\sqrt{3}$

So, $x = 1$ and $y = \sqrt{3}$

We know, $\theta = \tan^{-1}\left(\frac{y}{x}\right)$

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

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

$= 60^{\circ} = \frac{\pi}{3}$

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

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

Therefore, from of $1+i3 = \left(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}\right)$ Ans.