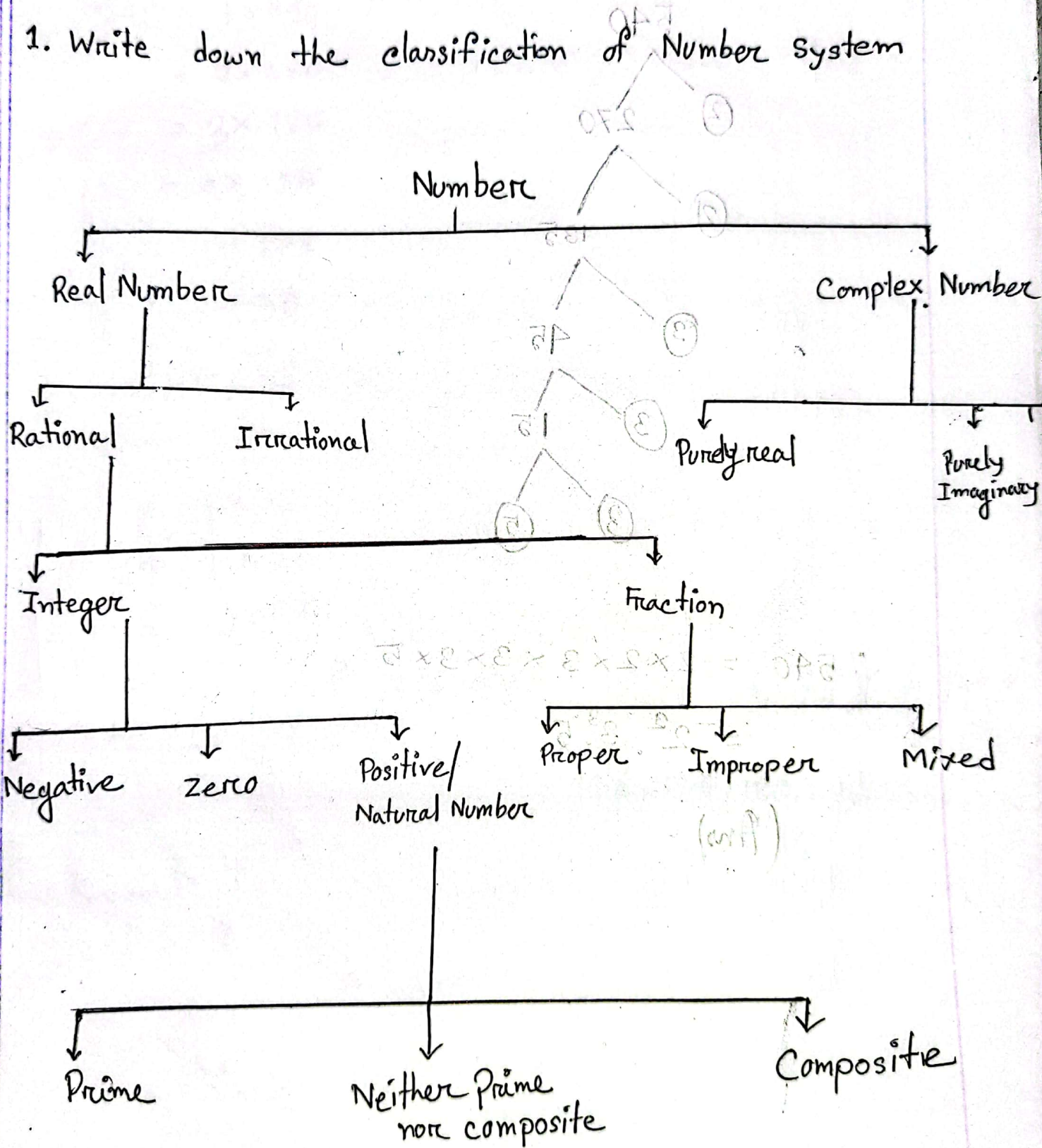
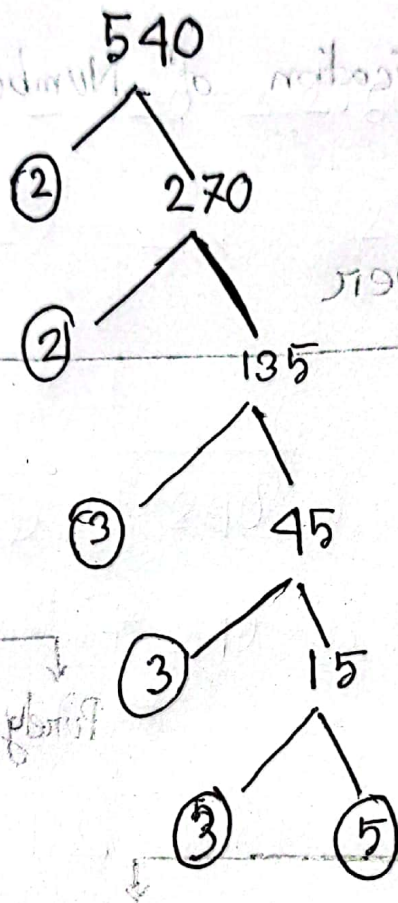


MAT111

1. Write down the classification of Number system



2. Fill the prime factorization of 540 using tree.



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

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

(Ans)

3. Find out the all factors of 540.

$$540 = 1 \times 540$$

$$= 2 \times 270$$

$$= 3 \times 180$$

$$= 4 \times 135$$

$$= 5 \times 108$$

$$= 6 \times 90$$

$$= 9 \times 60$$

$$= 10 \times 54$$

$$= 12 \times 45$$

$$= 15 \times 36$$

$$= 18 \times 30$$

$$= 20 \times 27$$

The factors of 540 are $\rightarrow 1, 2, 3, 4, 5, 6, 9, 10, 12, 15, 18,$
 $= 20, 27, 30, 36, 45, 54, 60, 90,$
 $108, 135, 180, 270, 540$

4. What is the GCD & LCM of 240 & 540.

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

$$540 = 2 \cdot 270 = 2^2 \cdot 135 = 2^2 \cdot 3 \cdot 45 = 2^2 \cdot 3^2 \cdot 15 = 2^2 \cdot 3^3 \cdot 5$$

$$\therefore \text{GCD of } 240 \text{ \& } 540 = 2^2 \cdot 3 \cdot 5 = 60$$

$$\therefore \text{LCM of } 240 \text{ \& } 540 = 2^4 \cdot 3^3 \cdot 5 = 2160$$

(Ans)

5. Find the H.C.F. & LCM of 42, 63 & 140

$$42 = 2 \times 21 = 2 \times 3 \times 7 = 2^1 \times 3^1 \times 7$$

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

$$140 = 2 \times 70 = 2 \times 2 \times 35 = 2^2 \times 5^1 \times 7^1$$

$$\therefore \text{LCM of } (42, 63 \text{ \& } 140) = 2^2 \cdot 3^2 \cdot 5 \cdot 7 = 1260$$

$$\therefore \text{HCF of } (42, 63 \text{ \& } 140) = 7$$

(Ans)

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

Calculation for Numerators

$$2 = 2^1$$

$$8 = 2^3$$

$$16 = 2^4$$

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

$$\text{L.C.M.}(2, 8, 16, 10) = 2^4 \times 5 = 80$$

$$\text{H.C.F.}(2, 8, 16, 10) = 2$$

Calculation for Denominators

$$3 = 3^1$$

$$9 = 3^2$$

$$81 = 3^4$$

$$27 = 3^3$$

$$\text{L.C.M.}(3, 9, 81, 27) = 3^4 = 81$$

$$\text{H.C.F.}(3, 9, 81, 27) = 3$$

$$\text{H.C.F. of } \frac{2}{3}, \frac{8}{9}, \frac{16}{81} \text{ \& } \frac{10}{27} = \frac{\text{H.C.F.}(2, 8, 16, 10)}{\text{L.C.M.}(3, 9, 81, 27)}$$

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

$$\text{L.C.M. of } \frac{2}{3}, \frac{8}{9}, \frac{16}{81} \text{ \& } \frac{10}{27} = \frac{\text{L.C.M.}(2, 8, 16, 10)}{\text{H.C.F.}(3, 9, 81, 27)}$$

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

(Ans)

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

$$\rightarrow \frac{1 + \sqrt{3}i}{1 - \sqrt{3}i}$$

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

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

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

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

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

\therefore Polar form

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

\therefore Exponential form is $= r e^{i\theta}$

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

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

(Ans)

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

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

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

$$= 1$$

\therefore Modulus of Z is $= 1$

and Argument of Z is

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

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

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

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

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

$$= 4i \times 2i$$

$$= 8i^2$$

$$= -8$$

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

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

$$= 2$$

(Ans)

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

Here, $(\frac{\pi}{2} \text{ angle } \frac{\pi}{200}) \cdot z = \sqrt{13} + 4i$

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

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

$$= 13 + 4i$$

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

$$= \sqrt{185}$$

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

(Ans)

10.

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

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

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

$$= \sqrt{4}$$

$$= 2$$

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

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

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

(Ans)