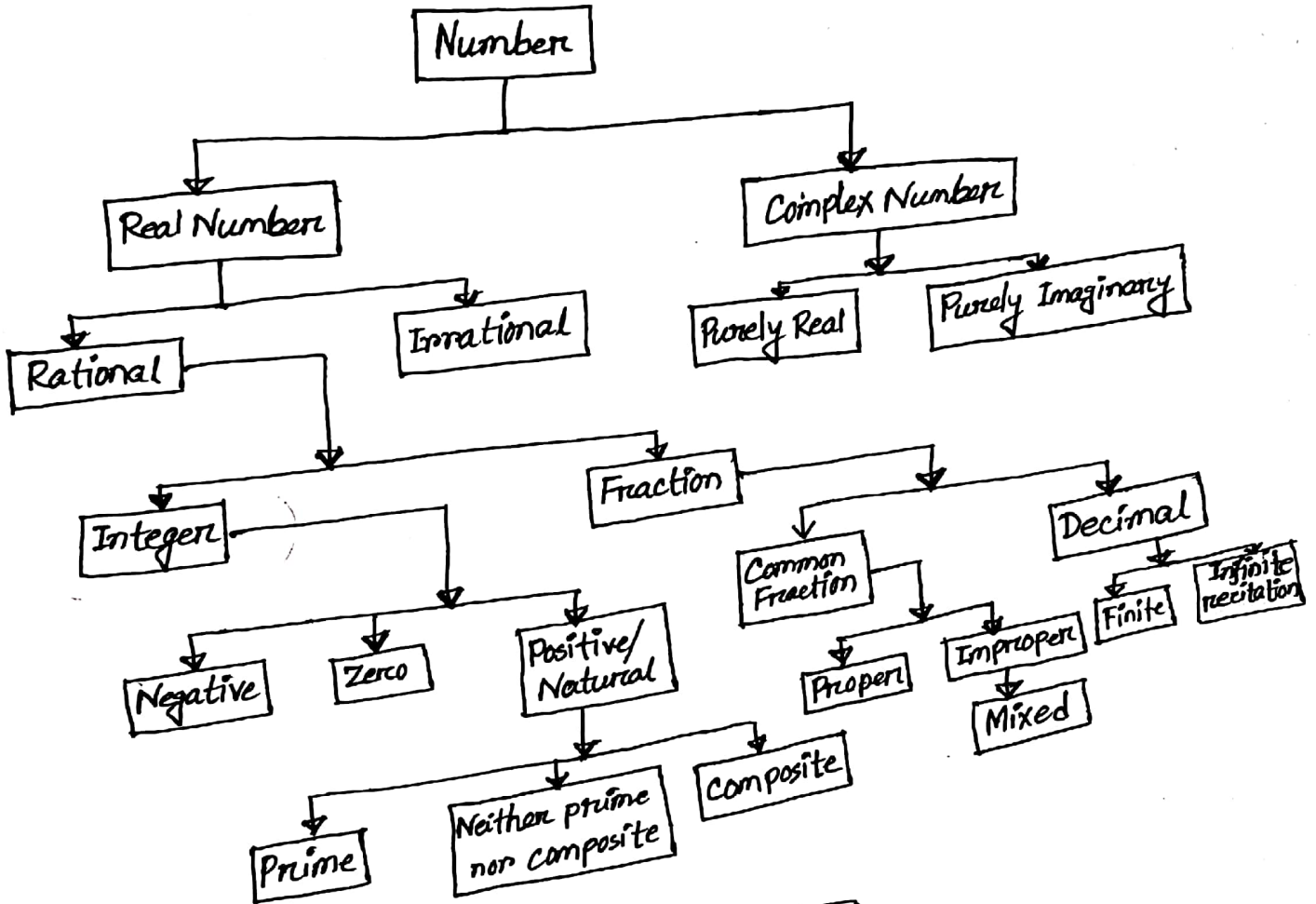
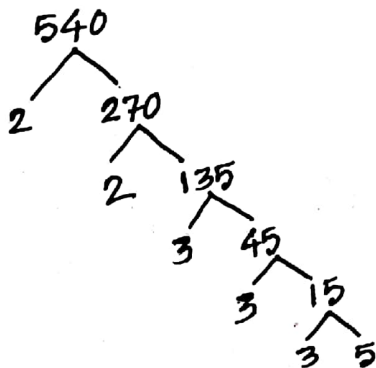


Answer to the exercise no: 1

Classification of number system -



Answer to the exercise no: 2



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

Answer to the exercise question no: 3

2	540
2	270
3	135
3	45
3	15
	5

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

So, the total number of factors of 540 is $= (2+1)(3+1)(1+1)$
 $= 3 \cdot 4 \cdot 2$
 $= 24$

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.

Answer to the exercise question no: 4

$$240 = 2 \times 120 = 2 \times 2 \times 60 = 2 \times 2 \times 2 \times 30 = 2 \times 2 \times 2 \times 2 \times 15 = 2^4 \times 3 \times 5$$

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

$$\therefore \text{LCM}(240, 540) = 2^4 \cdot 3^3 \cdot 5 = 2160$$

$$\& \text{HCF or GCD}(240, 540) = 2^2 \cdot 3 \cdot 5 = 60$$

Answer to the exercise question no: 5

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

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

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

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

$$\& \text{HCF}(42, 63, 140) = 2 \times 7 = 14$$

Answer to the question no: 6

Calculation for Numerators

$$2 = 2^1$$

$$8 = 2^3$$

$$16 = 2^4$$

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

$$\text{LCM}(2, 8, 16, 10) = 2^4 \times 5 = 80$$

$$\text{HCF}(2, 8, 16, 10) = 2$$

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

$$\text{LCM of } \frac{2}{3}, \frac{8}{9}, \frac{16}{81} \text{ and } \frac{10}{27} = \frac{\text{LCM}(2, 8, 16, 10)}{\text{HCF}(3, 9, 81, 27)} = \frac{80}{3}$$

Calculation for Denominators

$$3 = 3^1$$

$$9 = 3^2$$

$$81 = 3^4$$

$$27 = 3^3$$

$$\text{LCM}(3, 9, 81, 27) = 3^4 = 81$$

$$\text{HCF}(3, 9, 81, 27) = 3$$

Answer to the question no: 7

We have,
$$\frac{1+\sqrt{3}i}{1-\sqrt{3}i}$$

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

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

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

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

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

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

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

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

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

∴ Modulus of z is $= 1$

∴ And Argument of z will -

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

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

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

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

Exponential Form is $z = re^{i\theta}$

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

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

Answer to the question no: 8

We have, $\sqrt{-16} \times \sqrt{-4}$

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

$$= 4i \times 2i$$

$$= 8i^2$$

$$= -8$$

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

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

$$= 2$$

Answer to the question no: 9

We have, $z = 2 + i$

$$\begin{aligned}\therefore 8z - z^2 &= 8(2+i) - (2+i)^2 \\ &= 16 + 8i - (4 + 4i + i^2) \\ &= 16 + 8i - 4 - 4i + 1 \\ &= 13 + 4i\end{aligned}$$

$$\begin{aligned}\text{Modulus } r &= \sqrt{(13)^2 + (4)^2} \\ &= \sqrt{169 + 16} \\ &= \sqrt{185}\end{aligned}$$

$$\begin{aligned}\theta &= \tan^{-1} \frac{4}{13} \\ &= 17.102\end{aligned}$$

Answer to the question no: 10

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

$$z = x + iy$$

$$\begin{aligned}|z| &= \sqrt{x^2 + y^2} \\ \theta &= \tan^{-1} \left| \frac{y}{x} \right|\end{aligned}$$

$$\begin{aligned}\therefore \text{Modulus of } z &= \sqrt{(1)^2 + (\sqrt{3})^2} \\ &= \sqrt{1+3} \\ &= 2\end{aligned}$$

$$\therefore r = 2$$

$$\begin{aligned}\text{Argument of } z &= \tan^{-1} \left| \frac{y}{x} \right| \\ &= \tan^{-1} \left| \frac{\sqrt{3}}{1} \right| \\ &= \tan^{-1} \tan \frac{\pi}{3} \\ &= \frac{\pi}{3}\end{aligned}$$

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