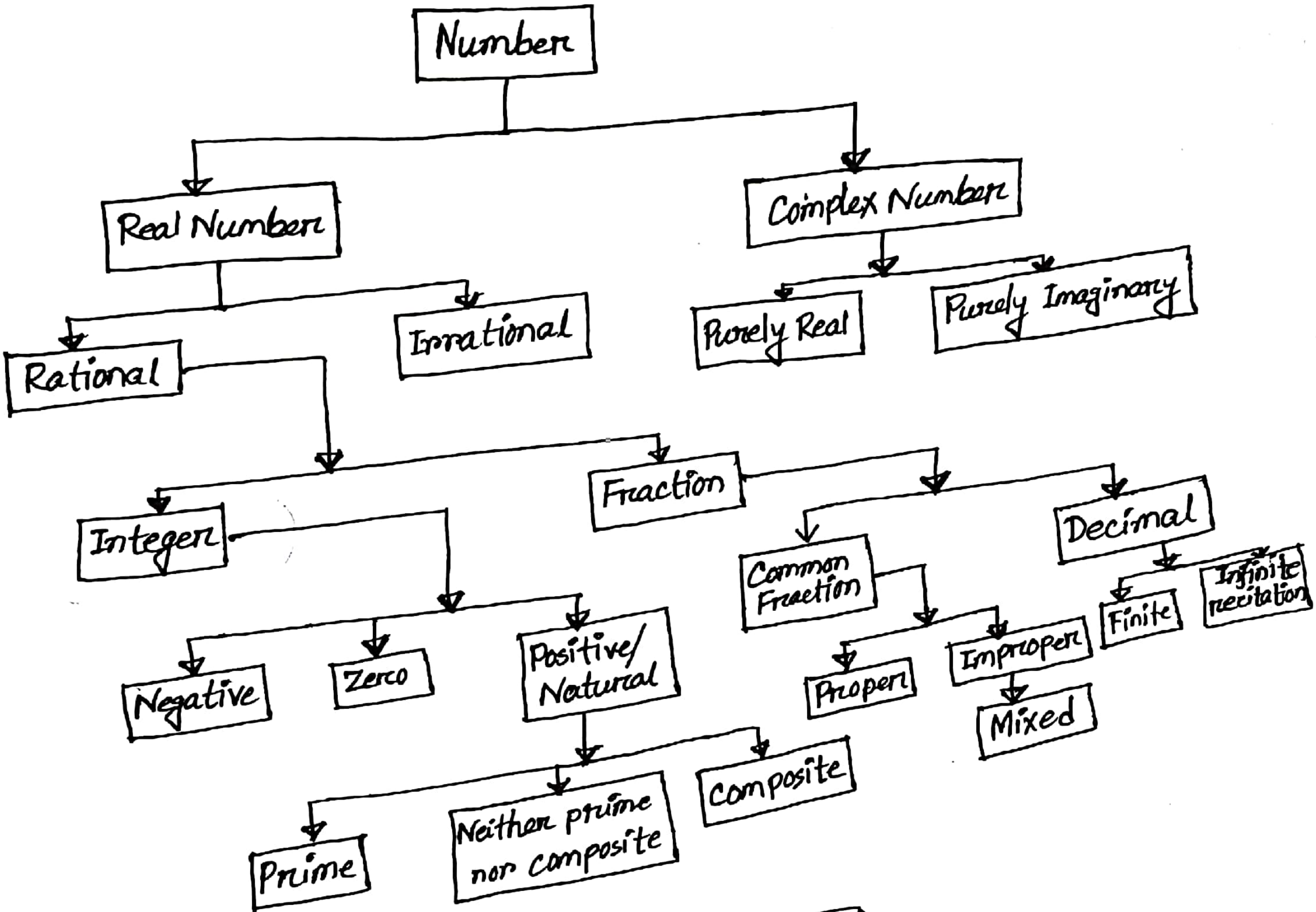
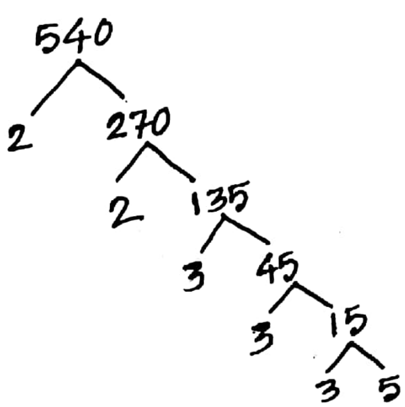
Answer to the exercise no: 1

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 –

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

The factors of 540 are –
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

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

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

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

& HCF or GCD $(240, 540) = 2 \cdot 3 \cdot 5 = 30$

Answer to the exercise question no : 5

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

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

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

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

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

Answer to the question no : 6

Calculation for Numerators

$2 = 2^1$

$8 = 2^3$

$16 = 2^4$

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

Calculation for Denominators

$3 = 3^1$

$9 = 3^2$

$81 = 3^4$

$27 = 3^3$

LCM $(3, 9, 81, 27) = 3^4 = 81$

HCF $(3, 9, 81, 27) = 3$

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

HCF $(2, 8, 16, 10) = 2$

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

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

Answer to the question no: $\boxed{7}$

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

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

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

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

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

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

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

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

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

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

$\therefore$ 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 $z = re^{i\theta}$

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

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

Answer to the question no: $\boxed{8}$

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

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

$$= 4i \times 2i$$

$$= 8i^2$$

$$= -8$$

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

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

$$= 2$$

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Answerr to the question no: 9

We have, $z = 2+i$

$$\therefore \; 8z - z^2 = 8(2+i) - (2+i)^2$$
$$= 16 + 8i - (4 + 4i + i^2)$$
$$= 16 + 8i - 4 - 4i + 1$$
$$= 13 + 4i$$

Modulus $r = \sqrt{(13)^2 + (4)^2}$
$$= \sqrt{169 + 16}$$
$$= \sqrt{185}$$

$$\theta = \tan^{-1} \frac{4}{13}$$
$$= 17.102$$

Answerr to the question no: 10

Let, $z = 1 + i\sqrt{3}$ $\qquad z = x + iy \qquad |z| = \sqrt{x^2 + y^2}$

$\theta = \tan^{-1} \left| \frac{y}{x} \right|$

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

$$\therefore r = 2$$

$$\text{Arrgument of } z = \tan^{-1} \left| \frac{y}{x} \right|$$
$$= \tan^{-1} \left| \frac{\sqrt{3}}{1} \right|$$
$$= \tan^{-1} \tan \frac{\pi}{3}$$
$$= \frac{\pi}{3}$$

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