Daffodil International University

Assignment

Course Title : BASIC MATHEMATICS

Course Code : MAT-111

Assignment: 01

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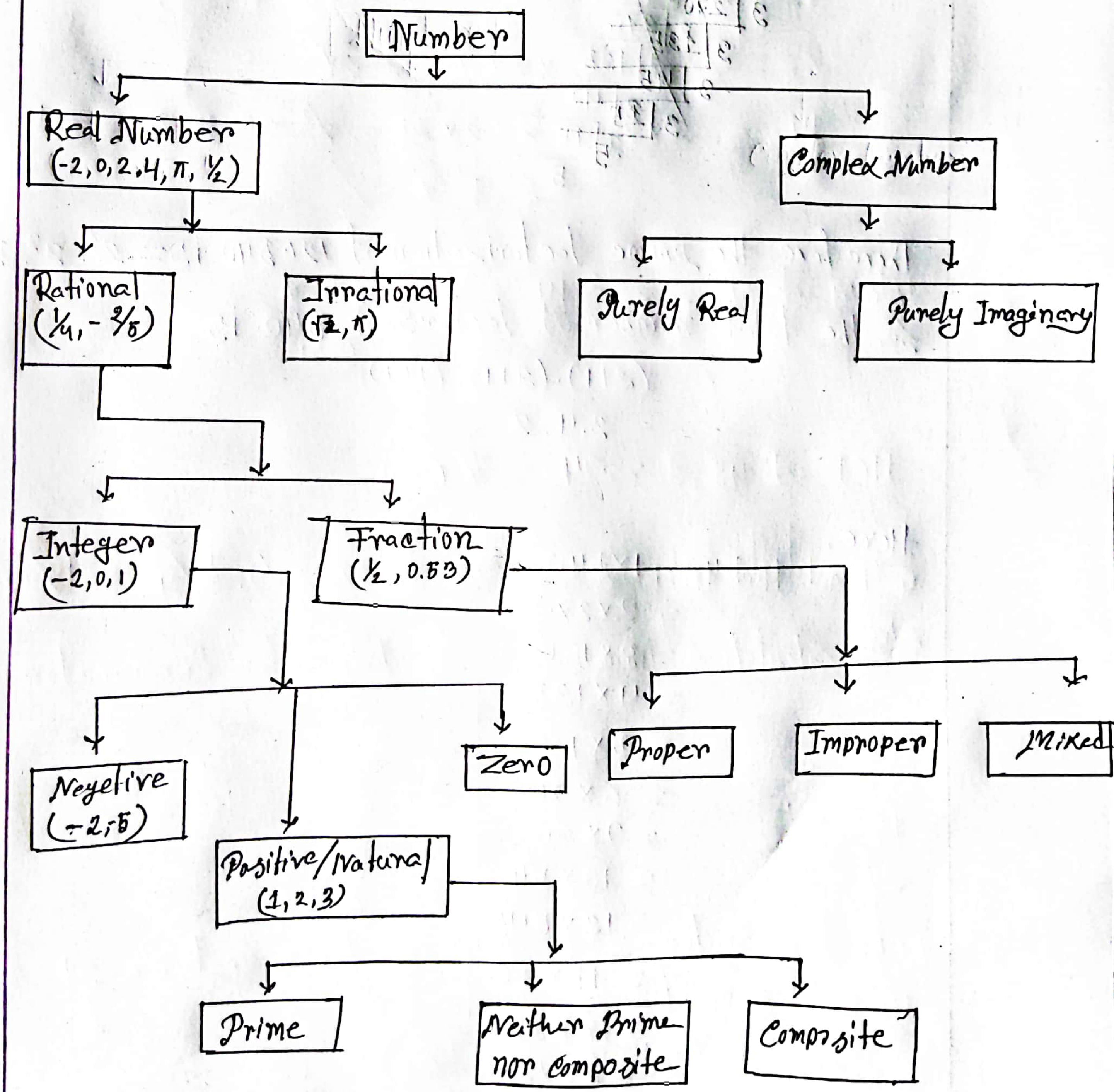
1. Write down the classification of Numbe System?

Ans to the qus no-1



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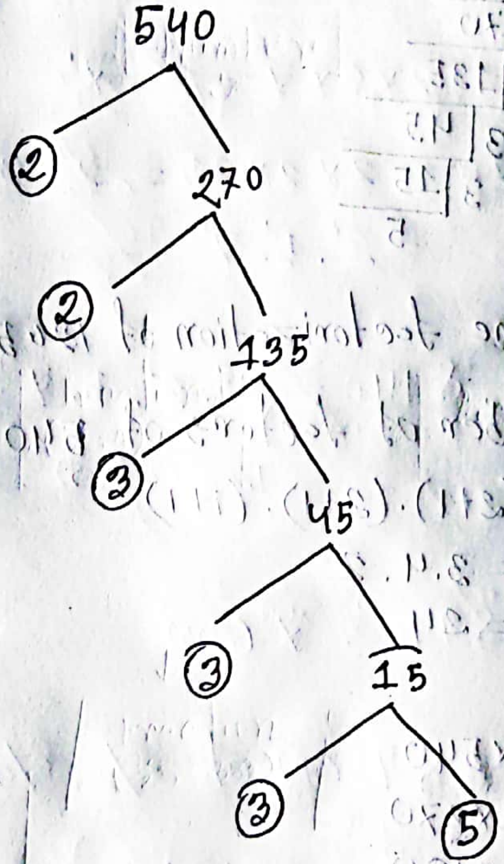
2. Find the prime factorization of 540 using tree:

Solve:



Therefore, the prime factorization of 540

is $= 2 \times 2 \times 3 \times 3 \times 3 \times 5$

$= 2^2 . 3^3 . 5^1$

3. Find out the all factors of 540.

Solve:

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

Therefore, the prime factorization of ~~120~~ 540 is $= 2^2 . 3^3 . 5^1$

So, the total number of factors of 540 is

$(2+1).(3+1).(1+1)$
$= 3.4.2$
$= 24$

Here,

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

The all factor 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 (Ans)

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

Solve: Division Meathod :

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

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

Therefore the prime factorization of 540 is $= 2^2 . 3^3 . 5$

LCM of $(240, 540) = 2^4 . 3^3 . 5$
$= 2160$ (Ans)

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

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

Solve: Here,

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

$63 = 3 \times 21 = 3 \times 3 \times 7 = 3^2 . 7^1$

$140 = 2 \times 70 = 2 \times 2 \times 35$ ~~$\Rightarrow 2^3 . 3^3 . 5 . 7$~~
$= 2^2 . 5^1 . 7^1$

LCM of 42, 63, & 140 $= 2^2 . 3^2 . 5 . 7$
$= 1260$ (Ans)

HCF of 42, 60 & 140 = 7 (Ans)

6. Find the HCF & L.CM of $2/3$, $8/9$, $16/81$ & $10/27$

Solve:

Calculation of Numerator	Calculation for Denominator
$2 = 2^1$	$3 = 3^1$
$8 = 2^3$	$9 = 3^2$
$16 = 2^4$	$81 = 3^4$
~~$27 = 3^3$~~ $10 = 2^1 \times 5^1$	$27 = 3^3$
LCM of Numerator $= 2^4 . 5 = 80$	LCM of Denominator $= 3^4 = 81$
HCF of Numerator $= 2$	HCF of " $= 3$

$\therefore$ LCM of $(2/3, 8/9, 16/81$ & $10/27) = 80/3$

$\therefore$ HCF of $(2/3, 8/9, 16/81,$ & $10/27) = 2/81$

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

Solve: We have,

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

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

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

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

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

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

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

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

where,

$x = -\frac{1}{2}$

and $y = \frac{\sqrt{3}}{2}$

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

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

$$= \sqrt{1}$$

$$= 1$$

$\therefore$ Modulus of z is $= 1$

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And Argument of z is $\theta = \pi - \tan^{-1}\left(\frac{\sqrt{3}/2}{-1/2}\right)$

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

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

$$= \pi - 60^\circ$$

$$= \pi - \pi/3$$

$$= 2\pi/3$$

Polar form,

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

$$= 1(\cos 2\pi/3 + i\sin 2\pi/3)$$

$$= \cos 2\pi/3 + i\sin 2\pi/3$$

Exponential form is $= re^{i\theta}$

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

$$= e^{2\pi/3\, i}$$

(8) Evalute $\sqrt{-16}\times\sqrt{-4}$ & $\sqrt{-16}/\sqrt{-4}$.

Solve:

$$\sqrt{-16}\times\sqrt{-4}$$
$$= i\sqrt{16}\times i\sqrt{4}$$
$$= 4i\times 2i$$
$$= 8i^2$$
$$= -8 \text{ (Ans)}$$

and,

$$\frac{\sqrt{-16}}{\sqrt{-4}}$$
$$= \frac{i\sqrt{16}}{i\sqrt{4}}$$
$$= \frac{4i}{2i}$$
$$= 2 \text{ (Ans)}$$

(9). Evalute Modulus & Argument of $8z-z^2$ by ~~red~~ replacing $z=2+i$

Solve: Here given that

$$z = 2+i$$

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

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

Therefore,

Modulas, $|z| = \sqrt{x^2+y^2}$
$$= \sqrt{13^2+4^2}$$
$$= \sqrt{169+16}$$
$$= \sqrt{185}$$

Argument,
$$\theta = \tan^{-1}(y/x)$$
$$= \tan^{-1} 4/13$$
$$= 17.10^\circ$$

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

Solve:

Here,

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

$$\therefore |z| = \sqrt{1^2+(\sqrt{3})^2}$$

$$= \sqrt{4}$$

$$= 2$$

$$\therefore \text{Argument}, \theta = \tan^{-1}\sqrt{3}/1$$

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

$$= \tan^{-1}\text{(}0$$

$$= \pi/3$$

Therefore, $r(\cos\theta + i\sin\theta)$ from is

$$= 2(\cos \pi/3 + i\sin \pi/3) \text{ (Ans)}$$

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