Ans: (1) Classification of Number System

- Number
  - Real number
    - Rational number
      - Integer
        - negative
        - Zero
        - positive
          - Prime number
          - composite
      - Fraction
        - proper
        - Mixed
        - Improper
    - Irrational
  - Complex number
    - pure real
    - Imaginary

(2) Prime factorization of 540 with tree structure.

- 540
  - 2
  - 270
    - 2
    - 135
      - 5
      - 27
        - 3
        - 9
          - 3
          - 3

So, Prime factorization 590 is $= 2^2 \cdot 3^3 \cdot 5$

③ Find the all factor of 540 are -

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

Therefore all factors are, 1, 2, 3, 4, 5, 6, 9, 1
15, 18, 20, 27, 30, 36, 45, 54, 60, 90, 108, 13
180, 270, 540.

④ GCD and LCM of 240 and 540 !

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

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

$$
\begin{array}{r|l}
2 & 540 \\ \hline
2 & 270 \\ \hline
5 & 135 \\ \hline
3 & 27 \\ \hline
3 & 9 \\ \hline
 & 3
\end{array}
$$

Prime factorization $= 2^2 . 3^3 . 5$

Therefore $GCD = 2^2 . 3.5 = 60$

$LCM = 2^4 . 3 . 5 = 2160$ Ans

(5) HCF and LCM of 42. 63. 140

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

$63 = 7 \times 9 = 7 \times 3 \times 3$

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

Therefore $HCF = 7$

$LCM = 2^2 \times 7 \times 5 \times 3$

$= 1260$

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

Calculations of Numerators	Calculation of Denominat
$2 = 2^1$	$3 = 3^1$
$8 = 2^3$	$9 = 3^2$
$16 = 2^4$	$81 = 3^4$
$10 = 2 \times 5$	$27 = 3^3$
$LCM = 2^4 . 5 = 80$	$LCM = 3^4 = 81$
$HCF = 2$	$HCF = 3$

Therefore, LCM of $\frac{2}{3}, \frac{8}{7}, \frac{16}{81}$ and $\frac{10}{27}$

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

HCF of $\frac{2}{3}, \frac{8}{7}, \frac{16}{81}$ and $\frac{10}{27}$

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

(7) Finding Modulus, Argument and Polar.

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

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

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

$$= \frac{1^2+2\sqrt{3}i+(\sqrt{3}i)^2}{9}$$

$$= \frac{1+2\sqrt{3}i + -3}{9}$$

$$= \frac{-2+2\sqrt{3}i}{9}$$

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

so, $x = -\frac{1}{2}$, $y = \frac{\sqrt{3}}{2}$

$\therefore$ Modulus $|z| = \sqrt{x^2+y^2}$

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

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

$= 1$

Argument

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

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

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

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

$= \pi - 60^\circ$

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

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

Polar form,

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

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

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

8) Evalute :-

$\sqrt{-16} \times \sqrt{-9}$

$= i\sqrt{16} \times i\sqrt{9}$

$= 4i \times 2i$

$= 8i$

$= -8$

and, $\frac{\sqrt{-16}}{\sqrt{-9}}$

$= \frac{i\sqrt{16}}{i\sqrt{9}}$

$= \frac{i9}{i2}$

$= 2$

(9) Evalute Modulus and ~~argu arg~~ Argument :-

$$8z - z^2 \quad [z = 2 + i]$$

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

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

$$= 12 + 4i + 1$$

$$= 13 + 4i$$

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

Modulus $|z| = \sqrt{x^2 + y^2}$

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

$$= \sqrt{185}$$

Argument

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

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

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

so $x = 1$, $y = \sqrt{3}$

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

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

$\therefore$ Therefore,

from $1 + i3 = \left(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}\right)$ A