Motasem Billah Asik
221-15-4976

① Write down the classification of number system?

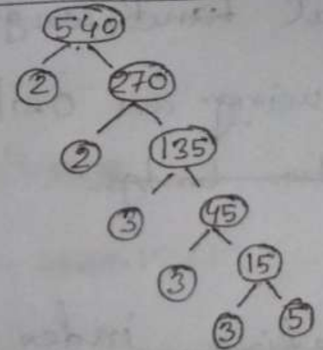
- Number
  - Real number
    - Rational
    - Irrational
  - Complex number
    - Purely Real
    - Purely Imaginary

② Find the prime factorization of 540 using tree.

Division method:

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

Tree diagram:



Multiplication method

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

③ Find out the all factors of 540.

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

The prime factors are:
(1, 2, 3, 4, 5, 6, 9, 10, 12, 15, 18, 20, 30, 36, 45, 54, 60, 90, 108, 135, 180, 270, 540).
Ans.

(4) What is the GCD and LCM of 240 and 540?

$$240 = 2\times120$$
$$= 2\times2\times60$$
$$= 2\times2\times2\times30$$
$$= 2\times2\times2\times2\times15$$
$$= 2^4\times3\times5$$

$$540 = 2\times270$$
$$= 2\times2\times135$$
$$= 2^2\times3\times45$$
$$= 2^2\times3^2\times15$$
$$= 2^2\times3^3\times5$$

L.C.M of $(240, 540) = 2^4\cdot3^3\cdot5 = 2150$

G.C.D of $(240, 540) = 2^2\cdot3\cdot5 = 60$

Ans.

(5) Find the H.C.F and L.C.M of 42, 63, 140.

$$42 = 2\times21$$
$$= 2\times3\times7$$

$$63 = 7\times9$$
$$= 7\times3^2$$

$$140 = 2\times70$$
$$= 2\times2\times35$$
$$= 2^2\times5\times7$$

$\therefore$ H.C.F of $(42, 63, 140) = 7$

L.C.M of $(42, 63, 140) = 2^2\cdot3^2\cdot5\cdot7$

$= 1260$ Ans.

(6) Find the H.C.F and L.C.M of $2/3$, $8/9$, $16/81$ and $10/27$

Calculation of number:

$$2 = 2^1$$
$$8 = 2^3$$
$$16 = 2^4$$
$$10 = 2\times5$$

H.C.F $= 2$

L.C.M $= 2^4\cdot5 = 80$

Calculation of Denominators

$$3 = 3^1$$
$$9 = 3^2$$
$$81 = 3^4$$
$$27 = 3^3$$

$\therefore$ H.C.F $= 3$

L.C.M $= 3^4 = 81$

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

$\therefore$ L.C.M. of $2/3, 8/9, \frac{16}{81}, 10/27 = \dfrac{\text{L.C.M of } (2,8,16,10)}{\text{H.C.F of } (3,9,81,27)} = 80/3$

Ans.

7. Find the modulus and argument of $z = \frac{1+\sqrt{3}i}{1-\sqrt{3}i}$ and also it's polar, exponential form.

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

Notation $= |z|$ $\quad \therefore z_1 = 1+\sqrt{3}i$

Rule $|z| = \sqrt{x^2+y^2}$ $\quad z_2 = 1-\sqrt{3}i$

$|z_1| = \sqrt{1^2+(\sqrt{3})^2} = \sqrt{4} = 2$

$|z_2| = \sqrt{1^2+(-\sqrt{3})^2} = \sqrt{4} = 2$

$\therefore$ modulas of $|z| = 2/2 = 1$

z_1 argument $\theta_1 = \tan^{-1} y/x$

$= \tan^{-1}\sqrt{3} = 60°$

z_2 argument $\theta_2 = 360° - \tan^{-1} y/x = 360° - \tan^{-1}\sqrt{3} = 300°$ Ans.

(8) Evaluate $\sqrt{-16} \times \sqrt{-4}$ and $\frac{\sqrt{-16}}{\sqrt{-4}}$

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

$= \sqrt{(4i)^2} \times \sqrt{(2i)^2}$

$= 4i \times 2i$

$= 8i^2$

$= -8$

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

$= \frac{\sqrt{(4i)^2}}{\sqrt{(2i)^2}}$

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

(9) Evaluate moduluous and Argument of $8z - z^2$ by replacing $z = 2+i$

$8z - z^2$

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

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

$= 16+8i-4-4i+1$

$= 13+4i$

modulus $= \sqrt{(13)^2+4^2} = \sqrt{185}$

Argument $= \tan^{-1}(4/13) = 17°$ Ans.

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

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

$$r = \sqrt{1^2+(\sqrt{3})^2} = \sqrt{4} = 2$$

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

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