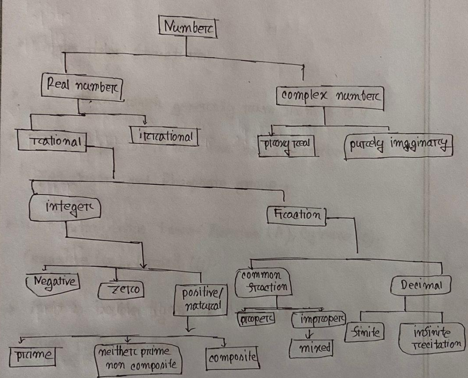
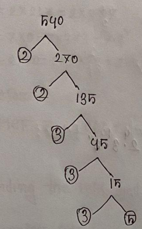
1) Classification of number system



2) Tree diagram,



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

$\therefore$ the prime factors are: 1, 2, 3, 4, 5, 6, 9, 10, 12, 15, 18, 20, 30, 36, 27, 54, 60, 90, 108, 135, 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 $240 = 2^4\cdot 3^1\cdot 5^1$

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

$\therefore$ prime factorization of $540 = 2^2\cdot 3^3\cdot 5^1$

therefore,

$GCD = 2^2\cdot 3^1\cdot 5^1 = 4\times 3\times 5 = 60$

$\therefore LCD = 2^4\cdot 3^3\cdot 5 = 16\times 27\times 5 = 2160$

5) HCF and LCM of 42, 63, 140

$42 = 2\times 21 = 2\times 3\times 7$
$63 = 7\times 9 = 7\times 3\times 3 = 7\cdot 3^2$
$140 = 2\times 70 = 2\times 2\times 35 = 2\times 2\times 5\times 7 = 2^2\cdot 5\cdot 7$

therefore,

$HCF = 7$; $LCM = 2^2\cdot 3^2\cdot 5\cdot 7 = 1260$

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

Numerator side,

$2 = 2^1$
$8 = 2\times 4 = 2\times 2\times 2 = 2^3$
$16 = 2\times 8 = 2\times 2\times 4 = 2\times 2\times 2\times 2 = 2^4$
$10 = 2\times 5 = 2^1\cdot 5^1$

$\therefore LCM = 2^4\cdot 5^1 = 80$
$HCF = 2$

Denominator side,

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

$\therefore HCF = 3$
$L.C.M = 3^4 = 81$

p.t.o

Sub:

Therefore,

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

HCM of $\frac{2}{3}, \frac{8}{9}, \frac{16}{81}$ and $\frac{10}{27} = \frac{2}{81}$

7) Find the Modulus, Arguments and Polarc:

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

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

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

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

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

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

$= -\frac{1}{2} + \frac{\sqrt{3}i}{2}$ $(x+iy)$; so, $x = -\frac{1}{2}$, $y = \frac{\sqrt{3}}{2}$

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

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

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

p.t.o

Sub:

Argument,

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

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

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

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

$= \pi - 60^\circ$

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

Polarc form,

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

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

$= \cos\frac{2\pi}{3} + i\sin\frac{2\pi}{3}$

Ans.

Sub:

8) Evaluate:-

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

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

$= i4 \times 2i$

$= 8i^2$

$= 8(-1)$

$= -8$

9) Evolute modulus and argument,

$8z - z^2$

$= 8(2+i) - (2+i)^2$ $[z = 2+i]$

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

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

$= 12+4i+1$

$= 13+4i$

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

Therefore,

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

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

$= \sqrt{185}$

Argument,

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

$= \tan^{-1}\left(\frac{4}{13}\right)$

Sub:

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

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

We know,

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

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

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

$= \tan^{-1} 60^\circ$

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

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

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

Therefore ~~from~~,

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