Chapter 1 : Rational and Irrational No's

Rational no's : $\frac{p}{q} \longrightarrow$ integer

$q \rightarrow$ integer

$q \neq 0$

* Terminating and repeating (recurring) are rational nos.

$\frac{1}{4} = 0.25$ ↓ Terminating

$\frac{1}{3} = 0.333 = 0.\overline{3}$ ↓ Recurring

To find a Rational Number between any two Rational Numbers

$\frac{a}{1}$ ↓ $\frac{b}{1}$

$a < \frac{a+b}{2} < b$

20 — 25 — 30

↓ 32.5 $\frac{20+25}{2}$

↓ $\frac{25+30}{2} = 27.5$

Method -1

* $\frac{a}{b}$ and $\frac{c}{d} \Rightarrow \frac{a+c}{b+d}$ [$\mathbb{N}^{\sigma}+$] [$\mathbb{D}^{\sigma}+$]

Ex: $\frac{3}{2}$ $\frac{3+5}{2+3}$ $\frac{5}{3}$

$= \boxed{\frac{8}{5}}$

$8+5 = 13$

$5+3 = 8$

$\frac{3}{2} = \quad \frac{8}{5} = \quad \frac{5}{3} =$

$\frac{3+8}{2+5} = \frac{11}{7}$

Merthod -2 [LCM]

$\frac{2}{7}$ $\frac{5}{8}$

LCm = 56

$\frac{2}{7} \times \frac{8}{8} = \frac{16}{56}$ $\frac{5}{8} \times \frac{7}{7} = \frac{35}{56}$

$\frac{16}{56}$ $\frac{35}{56}$

Exercise Questions

2) 9.9 and 10

$$\frac{9.9 + 10}{2} = \frac{19.9}{2} = 9.95$$

$$\frac{99}{10} \qquad \frac{10}{1} \times \frac{10}{10}$$

$$\frac{99}{10} \times \frac{5}{5} \qquad \frac{100}{10} \times \frac{5}{5}$$

$$\frac{495}{50} \qquad \frac{500}{50}$$

3) $\frac{2}{7}$ and $\frac{11}{17}$

=) Adding numerators and denominator of both sides to get three rational numbers using $\frac{a}{b}$ and $\frac{c}{d} = \frac{a+c}{b+d}$

=) $\frac{2}{7} + \frac{11}{17} = \frac{13}{24}$

=) $\frac{2}{7}$ $\frac{13}{24}$ $\frac{11}{17}$

=) $\frac{2+13}{7+24}$ and $\frac{13+11}{24+17}$

=) $\frac{15}{31}$ and $\frac{24}{41}$

Without Actual Division, Method to find terminating decimal

Step 1: Check denominator

Step 2: factor of 2, 5 or both (10)

Converting Repeating Decimals to Rational Numbers

(i) $0.\overline{47}$

$\Rightarrow$ Let $x = 0.\overline{47} = 0.4747474747\ldots$

$100x = 47.474747\ldots$

$x = 0.4747\ldots$

$\ominus \qquad \ominus$

$99x = 41$

$$\boxed{x = \frac{47}{99}}$$

(ii) $2.\overline{357}$

$x = 2.357357$

$1000x = 2357.357357$ [multiply by 1000 on both side]

$x = 2.357357$

$999x = 2355$

$x = \frac{2355}{999} = \frac{785}{333}$

$\therefore x = \frac{785}{333}$

Ex 1A

6) (iv) $x = 0.2\overline{13}$

$10x = 2.\overline{13}$ [multiply by 10 on both sides]

$1000x = 213.\overline{13}$ [multiply by 100 on both sides]

$10x = 2.\overline{13}$

$990x = 211$

$$x = \frac{211}{990}$$

3) $x = 1.4242$

$100x = 142.4242$ [multiply by 100 on both sides]

$\therefore x = 1.4242$

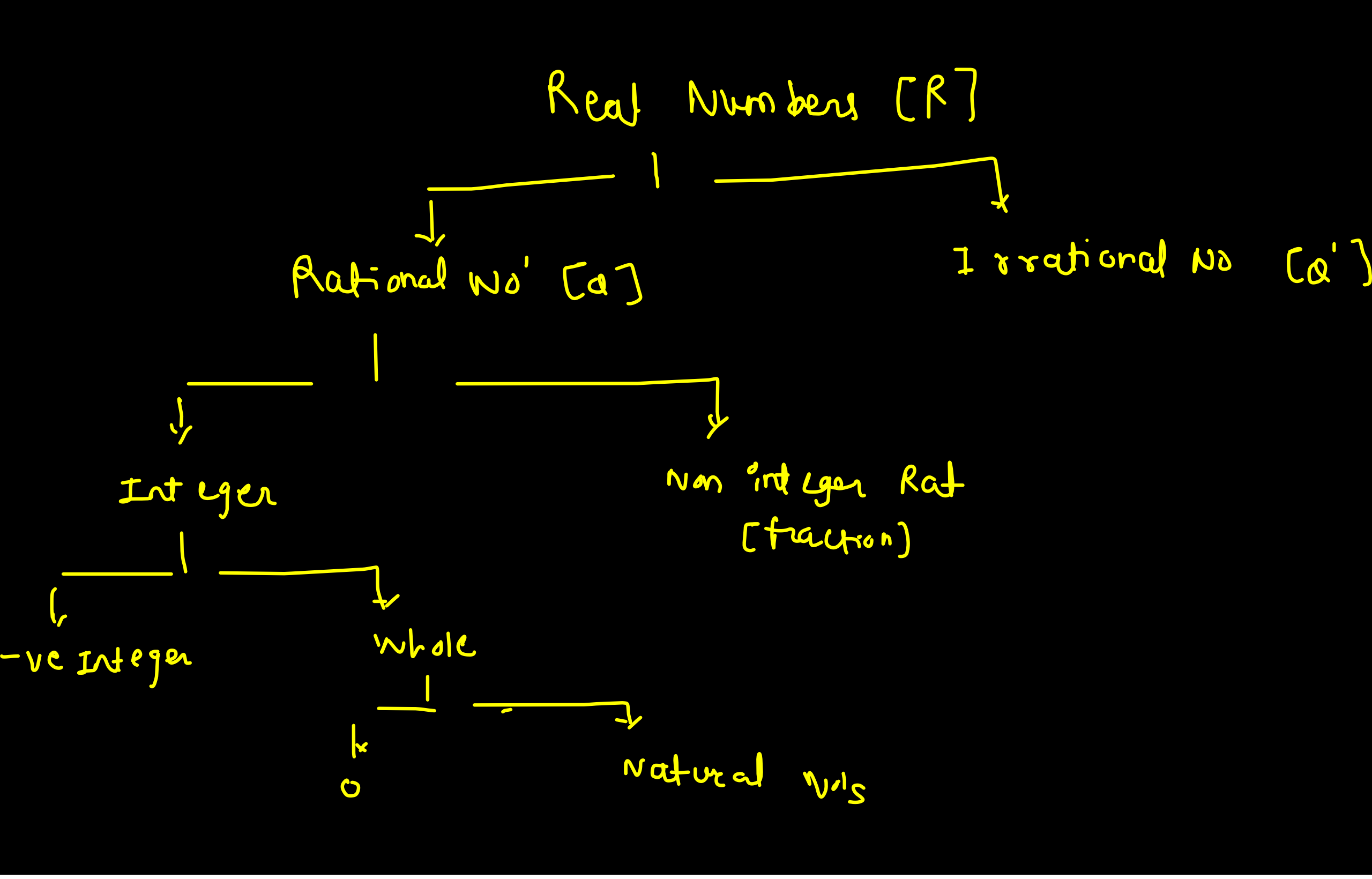
$99x = 141$

$$\boxed{x = \frac{141}{99}}$$

set of Rational No's : $\mathbb{Q}$

set of irrational No's : $\mathbb{Q}'$

$$\mathbb{Q} \cup \mathbb{Q}' = \mathbb{R}$$


Real Numbers [R]
Rational No' [a]
Irrational No [a']
Integer
non integer Rat [fraction]
-ve Integer
Whole
0
Natural No's

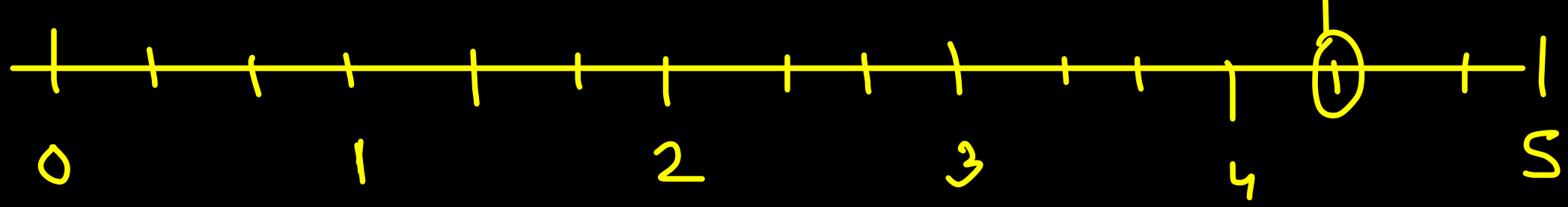
$\frac{13}{3}$

$$\begin{array}{r|l} & 4 \\ \hline 3 & 13 \\ & -12 \\ \hline & 1 \end{array}$$

4 + 5

$\frac{13}{3}$

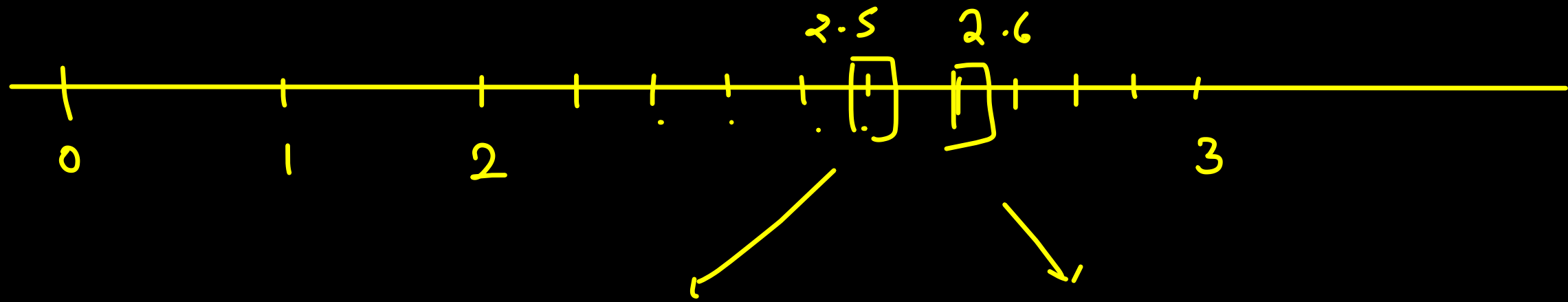
$\frac{13}{3} = 4\frac{1}{3}$

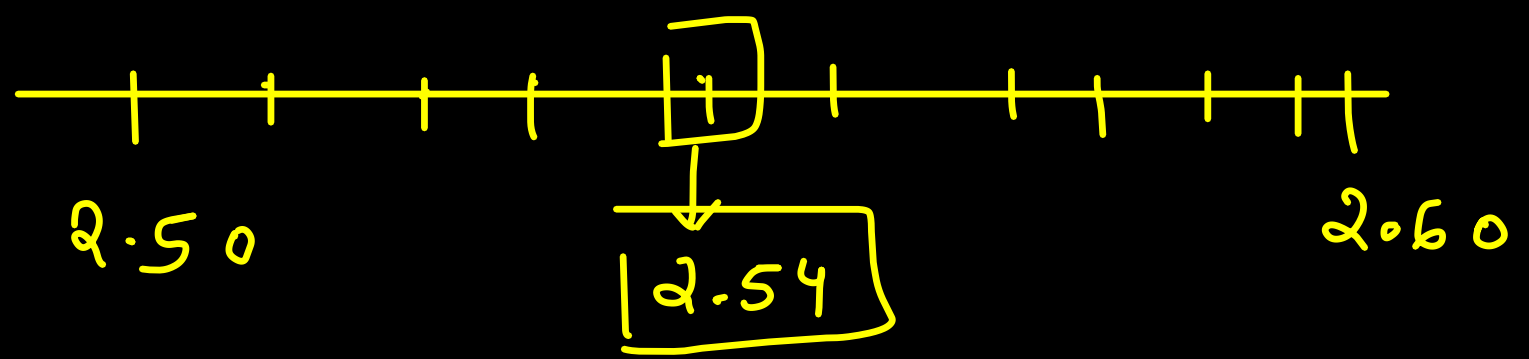


2.54 ----> 2.50 and 2.60

$2.5 = \frac{25}{10}$

$2.6 = \frac{26}{10}$





Ex: $2 \times \sqrt{3} = 2\sqrt{3}$

$2 \times 1.73 \ldots\ldots$

Ex: $\sqrt{3} \times \sqrt{3} \longrightarrow \sqrt{2} \times \sqrt{3}$

$= \sqrt{3 \times 3} = \boxed{3}$ $= \sqrt{6}$ → irrational

↳ Rational No's

Note: Root ma same No's Rehvu Joe Toch operation perform thare (+, −)

Ex: $\sqrt{4} + \sqrt{3} \neq \sqrt{7}$

$= \sqrt{4} + \sqrt{4} \neq \sqrt{8}$

★ Coefficient Ni Add^ thayech

① $\sqrt{4} + ①\sqrt{4} = 2\sqrt{4}$ ✓

↳ Add↙

$$\sqrt{125}$$

$$\sqrt{5\times5\times5}$$

$$5\sqrt{5} - 1\sqrt{5} - 4\sqrt{5}$$

$$5\sqrt{5} - 5\sqrt{5}$$

$$\boxed{0}$$

5	125
5	25
5	5
	1

(ii) $\dfrac{\sqrt{75}}{\sqrt{3}} = \sqrt{\dfrac{75}{3}} = \sqrt{25} = 5$ Rational no

$\dfrac{\sqrt{147}}{\sqrt{3}} = \sqrt{\dfrac{147}{3}} = \sqrt{49} = 7$ Rational no.

(vi) $\left(\frac{3}{4}\sqrt{2}\right)^3 = \dfrac{3\times3\times3}{4\times4\times4} \times \sqrt{2}\times\sqrt{2}\times\sqrt{2}$

$2 \times \sqrt{2}$

$\sqrt{2\times2}$

$\sqrt{4}$

$=2$

= irrational

(vii) $\sqrt{18} \times \sqrt{8} = \sqrt{18 \times 8}$

$= \sqrt{144}$

$= \boxed{12}$

(ix) $(3+\sqrt{2})(3-\sqrt{2})$

$(a+b)(a-b)$

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

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

$= \boxed{7}$

$$(a+b)^2 = a^2 + b^2 + 2ab$$

$$(a-b)^2 = a^2 + b^2 - 2ab$$

$$(a+b)(a-b) = a^2 - b^2$$

$$(a+b)^3 = a^3 + b^3 + 3ab(a+b)$$

$$= 1a^3b^0 + 3a^2b^1 + 3a^1b^2 + 1a^0b^3 \qquad (11)^3$$

$$= a^3 + 3a^2b + 3ab^2 + b^3 \qquad =$$

$$= a^3 + b^3 + \underline{3a^2b + 3ab^2} \qquad \text{'alternate}$$

$$= a^3 + b^3 + 3ab(a+b) \qquad +,-)$$

$$(a-b)^3 = a^3 - 3a^2b^1 + 3a^1b^2 - b^3$$

$$= a^3 - b^3 - 3a^2b + 3ab^2$$

$$= a^3 - b^3 - 3ab(a-b)$$

$$(a+b)^2 = 1a^2b^0 + 2a^1b^1 + 1a^0b^2 \qquad (11)^2 = 121$$

$$= a^2 + 2ab + b^2$$

$$(a-b)^2 = a^2 - 2ab + b^2$$

$$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$$

$$a^3 - b^3 = (a-b)(a^2 + ab + b^2$$

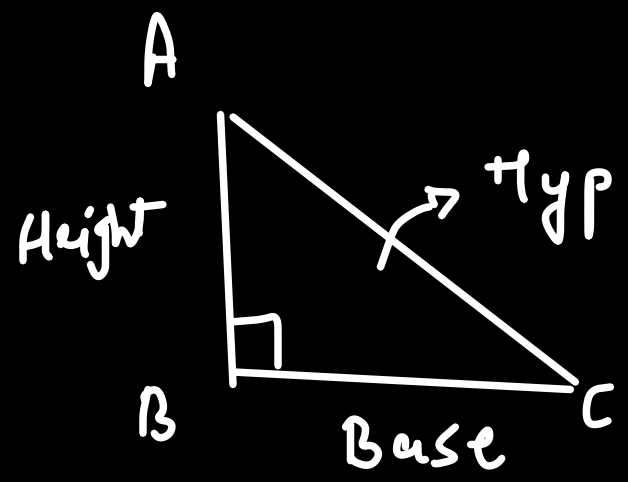
Trick To calculate identities

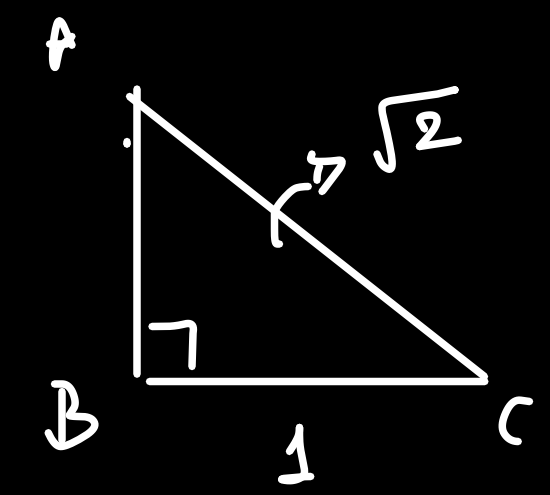
1) Power check -> 11 ni power
2) This gives coefficents
3) A power increase from 0 to highest power
4) B power decrease from 0 to highest power
5) if + che to all +
6) if - che to alternate +, -

* Pythagoras Theorem

$$(\text{Base})^2 + (\text{Height})^2 = (\text{Hypotenuse})^2$$

[Right Δ]



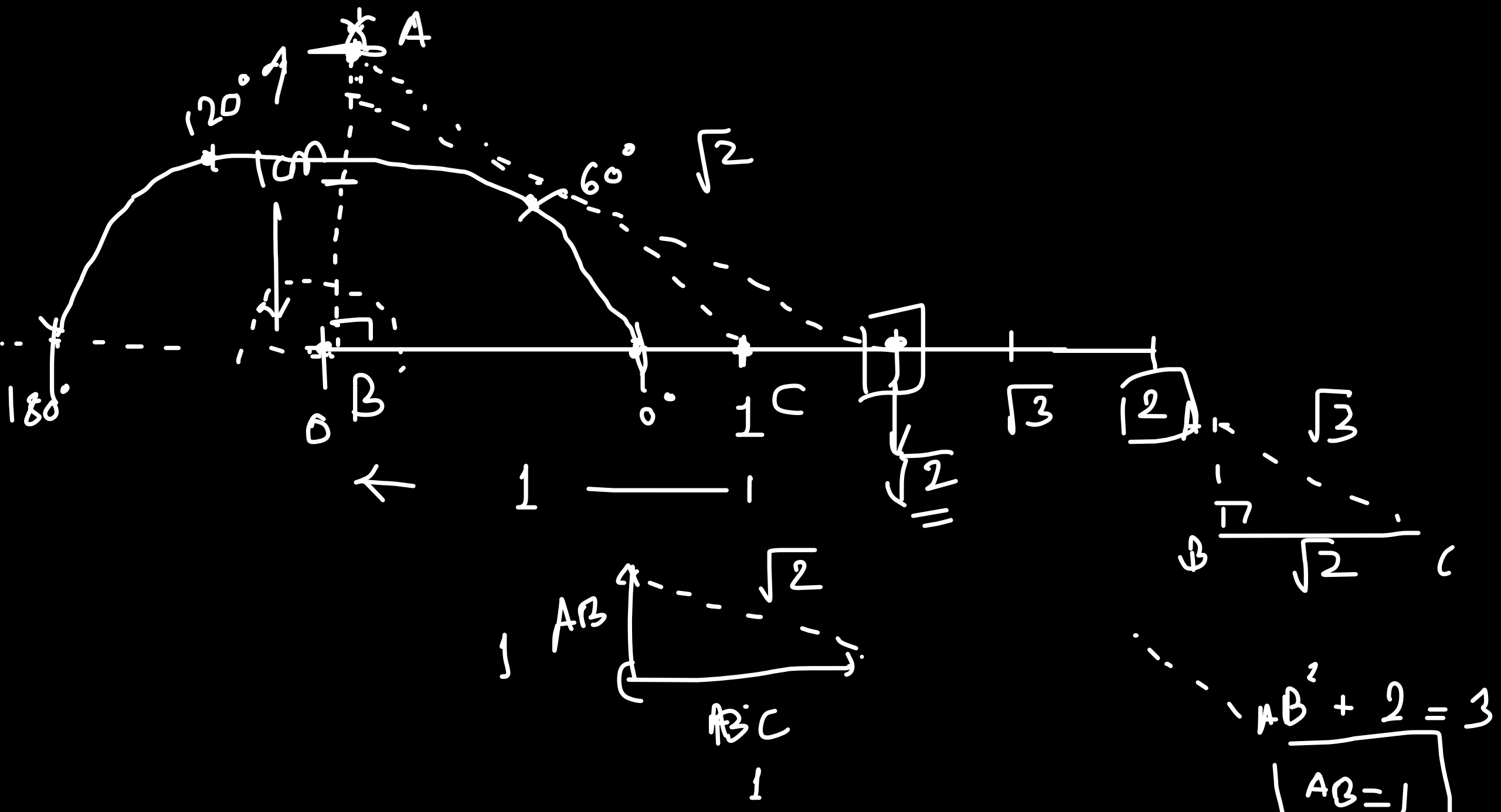


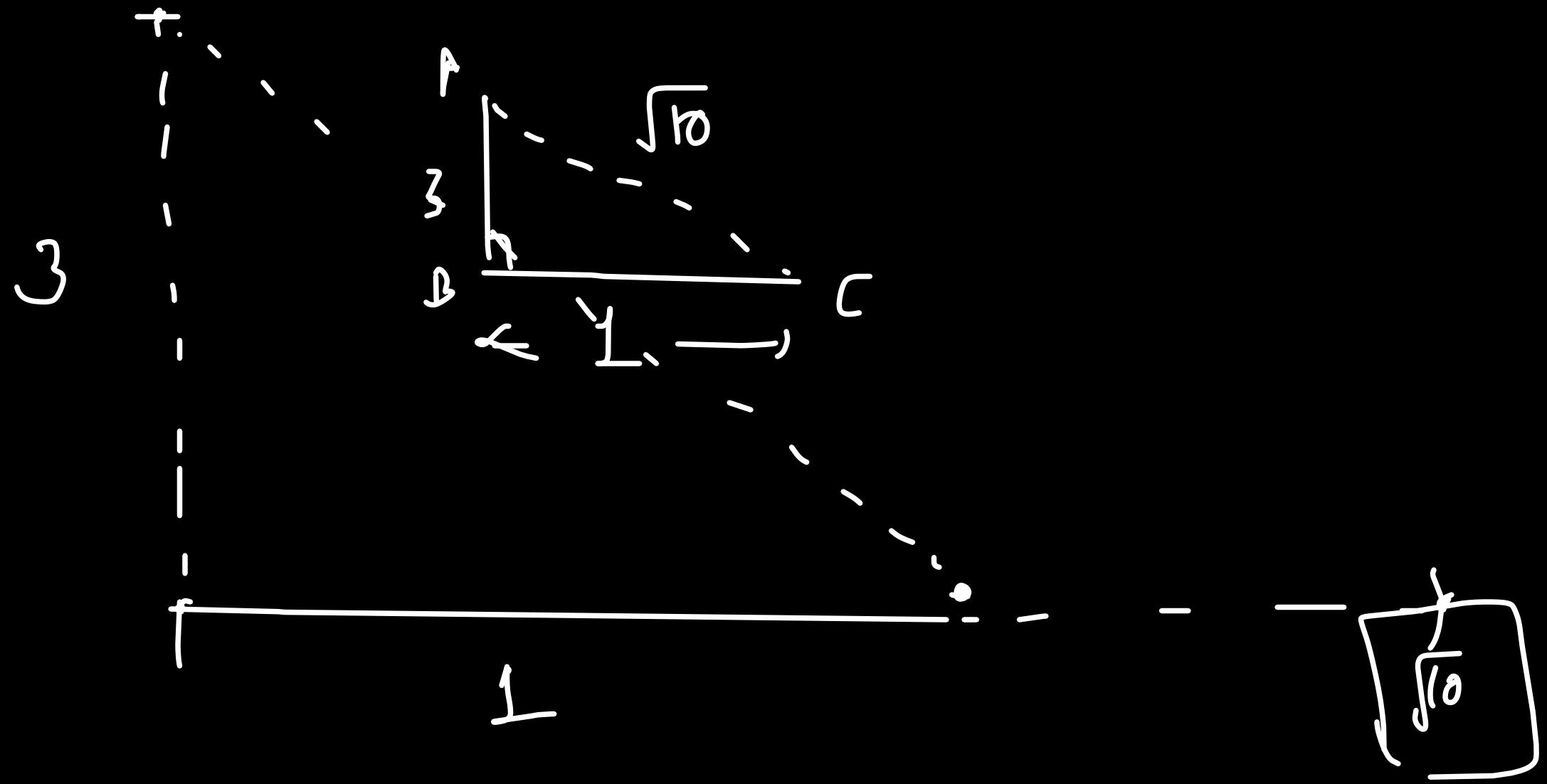
$$(AB)^2 + (BC)^2 = (AC)^2$$

$$(AB)^2 + 1^2 = (\sqrt{2})^2$$

$$(AB)^2 = 2 - 1$$

$$\boxed{AB = 1}$$


A
120°
1
1
60°
√2
180°
B
C
1
1
√3
2
√2
√3
√2
1
AB
√2
ABC
1
AB² + 2 = 3
AB = 1


A
B
C
3
3
$\sqrt{10}$
1
1
$\sqrt{10}$