



# ANNA ADMINISTRATIVE STAFF COLLEGE

*Presents*

## TNPSC GROUP - 4

*Subject*

**APTITUDE & MENTAL ABILITY**

*Topic*

**SIMPLIFICATION - 2**

## CLASS SCHEDULE

CLASS NO	DATE	TOPICS & SUB TOPICS
1	14 – 11 – 2023	Simplification Part 1 – VBODMAS, SQUARE & CUBE ROOT, POWER & INDICES
2	<u>15 – 11 – 2023</u>	<u>Simplification</u> Part 2 – FRACTION, ALGEBRA, WORD PROBLEM
3	20 – 11 – 2023	Percentage Part 1
4	21 – 11 – 2023	Percentage Part 2 - Profit & Loss, Discount, GST
5	27 – 11 – 2023	Least Common Multiple (LCM)
6	28 – 11 – 2023	Highest Common Factor (HCF)
7	04 – 12 – 2023	Ratio & Proportion Part 1
8	05 – 12 – 2023	Ratio & Proportion Part 2 – Ages, Mixture & Allegation
9	11 – 12 – 2023	Simple Interest
10	12 – 12 – 2023	Compound Interest Part 1
11	18 – 12 – 2023	Compound Interest Part 2
12	19 – 12 – 2023	Area Part 1 – Square, Rectangle, Circle
13	25 – 12 – 2023	Area Part 2 – Triangle, Quadrilateral, Trapezium, rhombus
14	26 – 12 – 2023	Volume Part 1 – Cube, Cuboid, Cylinder

## CLASS SCHEDULE

CLASS NO	DATE	TOPICS & SUB TOPICS
15	01 – 01 – 2024	Volume Part 2 – Cone, Sphere, Hemisphere
16	02 – 01 – 2024	Time & Work
17	08 – 01 – 2024	Time & Distance
18	09 – 01 – 2024	Number system (A.P)
19	15 – 01 – 2024	Number system (G.P)
20	16 – 01 – 2024	Logical Reasoning
21	22 – 01 – 2024	Puzzles & Dice
22	23 – 01 – 2024	Alphanumeric Series
23	29 – 01 – 2024	Visual Reasoning
24	30 – 01 – 2024	Probability
25	31 – 01 – 2024	Miscellaneous – Statistics
	17 – 02 – 2024	Maths Revision 1
	18 – 02 – 2024	Maths Revision 2

## SIMPLIFICATION (சுருக்குக)

### TYPE 3: POWER & INDICES (அடுக்குமுறை)

27. Simplify/சுருக்குக  $\frac{2^{-1} \times 3^{-1}}{6^{-2}}$  =  $\frac{1 \times 6^2}{2 \times 3}$  =  $\frac{6}{1}$

~~a) 6.~~

b)  $\frac{1}{6}$

c) 3

d)  $\frac{-1}{3}$

$\frac{-1}{2} = \frac{1}{2}$   
 $\frac{-1}{3} = \frac{1}{3}$   
 $\frac{1}{6} = 6^{-2} = 6^2$

**COMMENT BELOW**

## HOMEWORK SUM DOUBTS- TYPE 1

$$4. \left(1\frac{3}{5}\right) + \left(5\frac{4}{7}\right) = ?$$

a)  $7\frac{8}{35}$    b)  $7\frac{5}{18}$    c)  $6\frac{8}{35}$    d)  $7\frac{1}{7}$

Solution:

$$\left(1\frac{3}{5}\right) + \left(5\frac{4}{7}\right) = \overset{\uparrow}{8} + \frac{39}{7}$$

$$= \frac{56 + 195}{35}$$

$$= \frac{251}{35}$$

$$= 7\frac{6}{35}$$

$$7. \left(\frac{4}{3} - \left(-\frac{3}{2}\right)\right) + \left(-\frac{5}{3} \div \frac{30}{12}\right) + \left(-\frac{12}{9} \times \frac{-27}{16}\right) = ?$$

a)  $\frac{74}{12}$    b) 1   c)  $6\frac{1}{12}$    d)  $6\frac{1}{6}$

Solution

$$\left(\frac{4}{3} + \frac{3}{2}\right) + \left(-\frac{5}{3} \times \frac{12}{30}\right) + \left(-\frac{12}{9} \times \frac{-27}{16}\right)$$

$$= \frac{8 + 9}{6} - \frac{2}{3} + \frac{9}{4} = \frac{17}{6} + \frac{9}{4} - \frac{2}{3}$$

$$= \frac{122}{24} - \frac{2}{3} = \frac{106}{24} = \frac{53}{12} = 4\frac{5}{12}$$

## SIMPLIFICATION (சுருக்குக)

### TYPE 4.1: FRACTION (பின்னம்)

1. The value of  $999 \frac{992}{999} \times 999$

a) 999993

b) 998993...

c) 998999

d) 1000991

Handwritten solution for the problem:

$99 \times \frac{95+1}{99-1} \times 99$

$999 \frac{992+1}{999-1} \times 999$

$\frac{(999 \times 999) + 992}{999} \times 999$

9896

998993

## SIMPLIFICATION (சுருக்குக)

### TYPE 4.1: FRACTION (பின்னம்)

2. The value of  $9999 \frac{9992}{9999-1} \times 9999$

a) 99080092

b) 99989969

~~c) 99980993...~~

d) 99989930

(0993)

99980993

## SIMPLIFICATION (சுருக்குக)

### TYPE 4.1: FRACTION (பின்னம்)

3. The value of  $999 \frac{92}{99} \times 99$

a) ~~98993...~~

b) 98996

c) 100991

d) 99826

$$\begin{array}{r} 999 \frac{92}{99} \times 99 \\ \hline 999 \times 99 + 92 \end{array}$$

$$\begin{array}{r} 99000 \ominus 7 \\ \hline 98993 \end{array}$$

$$9999 \times \frac{95}{99} \times 99$$

$$\begin{array}{r} 990000 - 4 \\ \hline 989996 \end{array}$$



## SIMPLIFICATION (சுருக்குக)

### TYPE 4.1: FRACTION (பின்னம்)

4. The value of  $999 \frac{28}{27} \times 196$

a) 195993

b) 998993

c) 196007...

d) 999982

$$= 1,96,000 \oplus$$

$$\Rightarrow 196007$$

- ① 3 same
- ② 2 same
- ③ 3 diff

99

$$\begin{array}{r} 497 \\ -98 \\ \hline 196 \\ \hline 28 \\ \oplus \\ \oplus \end{array}$$

$$999 \frac{27}{28} \times 196$$

$$196000 \ominus \frac{196}{28}$$

- ⊖ proper/சூடு =  $\frac{2}{3}, \frac{3}{4} \dots$
- ⊕ சூடு =  $\frac{4}{3}, \frac{5}{4}, \frac{3}{2}$

## SIMPLIFICATION (சுருக்குக)

### TYPE 4.2: FRACTION (பின்னம்)

5. Express  $0.\bar{3}$  into fraction

$0.\bar{3}$  என்ற எண்ணை பின்னமாக மாற்றுக

- a)  $\frac{3}{99}$   
b)  $\frac{1}{3} \dots$   
c)  $\frac{3}{10}$   
d)  $\frac{3}{1000}$

$$0.\bar{3} \Rightarrow \frac{03 - 0}{9} = \frac{3}{9} = \frac{1}{3}$$

$$0.\bar{45} = \frac{045 - 0}{99} = \frac{45}{99}$$

## SIMPLIFICATION (சுருக்குக)

### TYPE 4.2: FRACTION (பின்னம்)

6. Express  $0.4\bar{5}$  into fraction

0.45 என்ற எண்ணை பின்னமாக மாற்றுக

a)  $\frac{45}{99}$

b)  $\frac{41}{99}$

~~c)  $\frac{41}{90}$  ...~~

d)  $\frac{45}{90}$

$$0.\overset{\times}{4}\overset{\times}{5} = 0.45555\dots$$

$$= \frac{045 - 04}{90} = \frac{41}{90}$$

## SIMPLIFICATION (சுருக்குக)

### TYPE 4.2: FRACTION (பின்னம்)

7. Express  $2.\overline{124}$  into fraction

2.  $\overline{124}$  என்ற எண்ணை பின்னமாக மாற்றுக

- a)  $\frac{2124}{999}$   
b)  $\frac{2122}{990}$   
c)  $\frac{2124}{900}$   
d)  $\frac{2122}{999} \dots$

$$\begin{aligned} 2.\overline{124} &= 2.124124124\dots \\ &= \frac{2124 - 2}{999} \\ &= \frac{2122}{999} \end{aligned}$$

## SIMPLIFICATION (சுருக்குக)

### TYPE 4.2: FRACTION (பின்னம்)

8.  $0.\overline{23} + 0.\overline{22}$  இன் மதிப்பு என்ன?

(அ)  $0.\overline{43}$

(ஆ)  $0.45$

(இ)  $0.\overline{45}$

(ஈ)  $0.\overline{45}$

The value of  $0.\overline{23} + 0.\overline{22}$  is

(a)  $0.\overline{43}$

(b)  $0.45$

(c)  $0.\overline{45}$

(d)  $0.\overline{45}$

$$\begin{array}{r} 0.232323 \dots \\ + 0.222222 \dots \\ \hline 0.454545 \dots \end{array}$$

## SIMPLIFICATION (சுருக்குக)

### TYPE 4.3: FRACTION (பின்னம்)

9.  ~~$1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{3}}}$~~

- a) 10/7
- ~~b) 11/7...~~
- c) 10/9
- d) 29/9

Handwritten solution for the fraction problem:

$$1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{3}}}$$

Step 1: Simplify the innermost fraction:  $\frac{1}{1 + \frac{1}{3}} = \frac{1}{\frac{4}{3}} = \frac{3}{4}$

Step 2: Substitute back:  $1 + \frac{1}{1 + \frac{3}{4}} = 1 + \frac{1}{\frac{7}{4}} = 1 + \frac{4}{7} = \frac{11}{7}$

Step 3: Final result:  $\frac{11}{7}$

Handwritten solution for the radical problem:

$$\sqrt{608 + \sqrt{21 + \sqrt{9x}}}$$

Step 1: Simplify the innermost radical:  $\sqrt{9x} = 3\sqrt{x}$

Step 2: Simplify the next radical:  $\sqrt{21 + 3\sqrt{x}}$

Step 3: Simplify the outermost radical:  $\sqrt{608 + \sqrt{21 + 3\sqrt{x}}}$

## SIMPLIFICATION (சுருக்குக)

### TYPE 4.3: FRACTION (பின்னம்)

10.  $1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{2}}} = \frac{12}{5}$

- a) 5/8
- ~~b) 8/5...~~
- c) 10/9
- d) 28/9

$$\frac{2}{2} \times \frac{1}{1 + \frac{1}{2}} = \frac{2}{3}$$

$$\Rightarrow 1 + \frac{1}{\left(\frac{2}{2} + \frac{2}{3}\right)} \Rightarrow \frac{1}{\frac{5}{3}} \Rightarrow \frac{3}{5}$$

$$\frac{10}{5} \times \frac{3}{5} = \frac{12}{5}$$

## HOMEWORK – TYPE 4

1. Express  $0.\overline{568}$  into fraction

$0.\overline{568}$  என்ற எண்ணை பின்னமாக மாற்றுக

a)  $563/999$  b)  $568/999$  c)  $563/990$  d)  $568/990$

2. Express  $0.\overline{9}$  into fraction

$0.\overline{9}$  என்ற எண்ணை பின்னமாக மாற்றுக

a)  $1/9$  b) **1** c)  $5/90$  d)  $5/9$

3.  $0.\overline{34} + 0.\overline{34} = ?$

a)  **$0.\overline{687}$**  b)  $0.\overline{68}$  c)  $0.\overline{68}$  d)  $0.\overline{687}$



## SIMPLIFICATION (சுருக்குக)

### TYPE 4.4: FRACTION (பின்னம்)

11. Simplify/சுருக்குக  $\left(1 - \frac{1}{2}\right) \left(1 - \frac{1}{3}\right) \left(1 - \frac{1}{4}\right) \dots \left(1 - \frac{1}{100}\right)$

a)  $\frac{99}{100}$

b)  $\frac{1}{100}$

c)  $\frac{101}{2}$

d)  $\frac{2}{3}$

Handwritten solution for the first part of the problem:

$$\left(1 - \frac{1}{2}\right) \left(1 - \frac{1}{3}\right) \left(1 - \frac{1}{4}\right) \dots \left(1 - \frac{1}{100}\right)$$

Handwritten work shows the product of terms:

$$\frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} \times \dots \times \frac{99}{100}$$

The terms cancel out, leaving  $\frac{1}{100}$ .

Handwritten work for the second part of the problem:

$$\left(\frac{1}{3} - \frac{1}{3}\right) \dots \left(1 - \frac{1}{200}\right)$$

The first term is zero, making the entire product zero.

## SIMPLIFICATION (சுருக்குக)

### TYPE 4.4: FRACTION (பின்னம்)

12. Simplify/சுருக்குக

$$\left(1 + \frac{1}{2}\right) \left(1 + \frac{1}{3}\right) \left(1 + \frac{1}{4}\right) \dots \left(1 + \frac{1}{100}\right)$$

a)  $\frac{2}{101}$

b)  $\frac{3}{100}$

~~c)  $\frac{101}{2}$  ...~~

d)  $\frac{2}{3}$

Handwritten solution showing the simplification process:

The product is written as  $\left(1 + \frac{1}{2}\right) \left(1 + \frac{1}{3}\right) \left(1 + \frac{1}{4}\right) \dots \left(1 + \frac{1}{100}\right)$ . The terms are expanded to  $\frac{3}{2} \times \frac{4}{3} \times \frac{5}{4} \times \dots \times \frac{101}{100}$ . The intermediate terms cancel out, leaving  $\frac{101}{2}$ .

Handwritten notes include:

- $\frac{3}{2} \times \frac{4}{3} \times \frac{5}{4} \times \dots \times \frac{101}{100}$
- $\frac{101}{2}$
- $\frac{101}{2}$

## SIMPLIFICATION (சுருக்குக)

### TYPE 4.4: FRACTION (பின்னம்)

13. Simplify/சுருக்குக  $\left(\frac{1}{4 \times 5}\right) + \left(\frac{1}{5 \times 6}\right) + \left(\frac{1}{6 \times 7}\right) + \dots + \left(\frac{1}{39 \times 40}\right) \Rightarrow \frac{1}{29} - \frac{1}{40}$

a)  $\frac{9}{40}$

b)  $\frac{1}{40}$

c)  $\frac{40}{9}$

d)  $\frac{40}{99}$

$\left(\frac{1}{4 \times 5}\right) + \left(\frac{1}{5 \times 6}\right) + \left(\frac{1}{6 \times 7}\right) + \dots + \left(\frac{1}{39 \times 40}\right) \Rightarrow \frac{1}{29} - \frac{1}{40}$   
 $\Rightarrow \left(1 + \frac{1}{2}\right) \Rightarrow \frac{1}{1} + \frac{1}{2}$   
 $\Rightarrow \left(1 - \frac{1}{2}\right) \Rightarrow \frac{1}{4} - \frac{1}{5}$   
 $\Rightarrow \frac{1}{4 \times 5} \Rightarrow \frac{1}{4} \times \frac{1}{5} = \frac{5-4}{4 \times 5} = \frac{1}{4 \times 5}$   
 $\frac{1}{5 \times 6} = \frac{1}{5} - \frac{1}{6}$   
 $\frac{36}{160} = \frac{9}{40}$

$\frac{1}{4} - \frac{1}{5} + \left(\frac{1}{5} - \frac{1}{6}\right)$   
 $\frac{40-4}{4 \times 40}$

## SIMPLIFICATION (சுருக்குக)

### TYPE 4.4: FRACTION (பின்னம்)

14. Simplify/சுருக்குக  $\left(\frac{1}{2 \times 3}\right) - \left(\frac{1}{3 \times 4}\right) - \left(\frac{1}{4 \times 5}\right) - \dots - \left(\frac{1}{9 \times 10}\right)$

a)  $\frac{1}{2}$

~~b)  $\frac{3}{5}$~~

c)  $\frac{2}{5} \dots$

d)  $\frac{5}{2}$

$$\frac{1}{2} - \frac{1}{10}$$

$$\frac{10 + 2}{2 \times 10}$$

$$= \frac{12}{20} = \frac{3}{5}$$

## SIMPLIFICATION (சுருக்குக)

TYPE 4.4: FRACTION (பின்னம்)

$$\frac{1}{2} - \frac{1}{3} + \frac{1}{3} - \frac{1}{4} + \frac{1}{4} - \frac{1}{5} + \dots + \frac{1}{9^2} - \frac{1}{10^2}$$

15. Simplify/சுருக்குக  $\left(\frac{3}{1^2 \times 2^2}\right) + \left(\frac{5}{2^2 \times 3^2}\right) + \left(\frac{7}{3^2 \times 4^2}\right) + \left(\frac{9}{4^2 \times 5^2}\right) + \dots + \left(\frac{19}{9^2 \times 10^2}\right)$

- a)  $\frac{99}{100} \dots$
- b)  $\frac{100}{99}$
- c)  $\frac{22}{25}$
- d)  $\frac{25}{22}$

Handwritten work for problem 15:

①  $\left(\frac{3}{1^2 \times 2^2}\right) + \left(\frac{5}{2^2 \times 3^2}\right) + \left(\frac{7}{3^2 \times 4^2}\right) + \left(\frac{9}{4^2 \times 5^2}\right) + \dots + \left(\frac{19}{9^2 \times 10^2}\right)$

②  $\left(\frac{1}{2 \times 3}\right) + \left(\frac{1}{4 \times 3}\right) + \dots + \left(\frac{1}{9 \times 10}\right)$

③  $\frac{1}{2} - \frac{1}{10^2} \Rightarrow \frac{99}{100}$

Work for option (a):

$\left(\frac{1 - \frac{1}{2}}{1 + \frac{1}{2}}\right) \dots \left(\frac{1 - \frac{1}{9}}{1 + \frac{1}{9}}\right)$

$\frac{3}{1^2 \times 2^2} = \frac{1}{1^2} - \frac{1}{2^2}$

$\frac{1}{2} - \frac{1}{10^2} \Rightarrow \frac{99}{100}$

## SIMPLIFICATION (சுருக்குக)

### TYPE 4.4: FRACTION (பின்னம்)

16. Simplify/சுருக்குக  $\left(\frac{1}{\sqrt{1+\sqrt{2}}}\right) + \left(\frac{1}{\sqrt{2+\sqrt{3}}}\right) + \left(\frac{1}{\sqrt{3+\sqrt{4}}}\right) + \dots + \left(\frac{1}{\sqrt{99+\sqrt{100}}}\right)$

a) 10

~~b) 9...~~

c) 1

d) 11

$$\begin{aligned} \sqrt{1} &= 1 \\ \frac{1}{\sqrt{5+\sqrt{2}}} &\Rightarrow \sqrt{25+\sqrt{2}} \end{aligned}$$

$\Rightarrow$

$$\begin{aligned} \sqrt{100} \ominus \sqrt{1} &\Rightarrow 10 - 1 \\ &\Rightarrow 9 \end{aligned}$$

## SIMPLIFICATION (சுருக்குக)

### TYPE 5.1: ALGEBRA (இயற்கணிதம்)

17. If  $x + \frac{1}{x} = 3$ , find the value of  $x^2 + \frac{1}{x^2}$

$x + \frac{1}{x} = 3$  எனில்  $x^2 + \frac{1}{x^2}$  இன் மதிப்பு காண்க

SC

a) 6

b) 7...

c) 2

d) 4

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

$x^2 + \frac{1}{x^2} + 2x(\frac{1}{x}) = 9$

$x^2 + \frac{1}{x^2} + 2 = 9$

$x^2 + \frac{1}{x^2} = 9 - 2 = 7$

## SIMPLIFICATION (சுருக்குக)

### TYPE 5.1: ALGEBRA (இயற்கணிதம்)

18. If  $x^2 + \frac{1}{x^2} = 14$ , find the value of  $x + \frac{1}{x}$

$x^2 + \frac{1}{x^2} = 14$  எனில்  $x + \frac{1}{x}$  இன் மதிப்பு காண்க

- a) 6
- b) 2
- c) 5
- d) 4...

$$\left(x + \frac{1}{x}\right)^2 = ?$$

$$x^2 + \frac{1}{x^2} + 2x \cdot \frac{1}{x} = \left(x + \frac{1}{x}\right)^2$$

$$x + \frac{1}{x} = \sqrt{16}$$

$$\frac{14 + 2}{(16)} = \left(x + \frac{1}{x}\right)^2$$

SC

$$x + \frac{1}{x} = n = ?$$
$$x^2 + \frac{1}{x^2} = \frac{n^2 - 2}{2}$$
$$= 14$$
$$n^2 - 2 = 14$$
$$n = 4$$



## SIMPLIFICATION (சுருக்குக)

### TYPE 5.1: ALGEBRA (இயற்கணிதம்)

19. If  $x + \frac{1}{x} = 3$ , find the value of  $x^3 + \frac{1}{x^3}$

$$= n^3 \pm 3n$$

$x + \frac{1}{x} = 3$  எனில்  $x^3 + \frac{1}{x^3}$  இன் மதிப்பு காண்க

- a) 18...
- b) 27
- c) 3
- d) 9

$$10^3 - 3(3) = 27 - 9 = 18$$

$$\left(x + \frac{1}{x}\right)^3 = 3^3$$

$$(a+b)^3 \Rightarrow a^3 + b^3 + 3ab(a+b)$$

$$x^3 + \frac{1}{x^3} + 3x \cdot \frac{1}{x} \left(x + \frac{1}{x}\right) = 27$$

$$x^3 + \frac{1}{x^3} + 9 = 27$$

## SIMPLIFICATION (சுருக்குக)

### TYPE 5.1: ALGEBRA (இயற்கணிதம்)

20. If  $x - \frac{1}{x} = 2$ , find the value of  $x^3 - \frac{1}{x^3}$

$x - \frac{1}{x} = 2$  எனில்  $x^3 - \frac{1}{x^3}$  இன் மதிப்பு காண்க

$$= n^3 + 3n$$
$$= 2^3 + 3(2)$$

- a) 14...
- b) 4
- c) 12
- d) 2

$$(x - \frac{1}{x})^3 = 2^3$$
$$(a-b)^3 = a^3 - b^3 - 3ab(a-b)$$
$$x^3 - \frac{1}{x^3} - 3x \cdot \frac{1}{x} (x - \frac{1}{x}) = 8$$

## SIMPLIFICATION (சுருக்குக)

### TYPE 5.1: ALGEBRA (இயற்கணிதம்)

21. If  $(x + \frac{1}{x})^3 = 8$ , find the value of  $x^3 + \frac{1}{x^3}$

$(x + \frac{1}{x})^3 = 8$  எனில்  $x^3 + \frac{1}{x^3}$  இன் மதிப்பு காண்க  $8 - 6 = 2$

- a) 20
- b) 18
- c) 3
- d) 2..

$$n=2$$

$$n^3 - 3n = 2^3 - 3(2)$$
$$\Rightarrow \cancel{8^3} - \cancel{3(8)}$$

$$(x + \frac{1}{x})^3 = 8$$

$$x^3 + \frac{1}{x^3} + 3 \times \frac{1}{x} (x + \frac{1}{x}) = 8$$

## SIMPLIFICATION (சுருக்குக)

### TYPE 5.1: ALGEBRA (இயற்கணிதம்)

22. If  $x + y + z = 9$  and  $xy + yz + zx = 13$ , then value of  $x^2 + y^2 + z^2$  is

$x + y + z = 9$  and  $xy + yz + zx = 13$  எனில்  $x^2 + y^2 + z^2$  இன் மதிப்பு

~~a) 55...~~

b) 29

c) 39

d) 68

$$(x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$$

~~(a+b+c)~~  $(\underline{a} + \underline{b} + \underline{c})^2 = \underline{a^2 + b^2 + c^2} + 2(ab + bc + ca)$

$$9^2 = ? + 2(13)$$

$$\underline{81 - 26 = ?}$$

## SIMPLIFICATION (சுருக்குக)

### TYPE 5.2: ALGEBRA (இயற்கணிதம்)

23. Simplify/சுருக்குக

$$\frac{728 \times 728 - 272 \times 272}{456}$$

- a) 456
- ~~b) 1000...~~
- c) 728
- d) 272

$$\frac{a^2 - b^2}{a + b} \Rightarrow (a - b)$$

$$\frac{a + b}{a - b} \Rightarrow (a + b)$$

$$\Rightarrow \frac{a^2 - b^2}{a + b} = \frac{(a + b)(a - b)}{a + b} \Rightarrow (a - b)$$

$$\Rightarrow a + b \Rightarrow \underline{728 + 272}$$

$$\begin{array}{r} 728 \\ 272 \\ \hline 456 \end{array}$$

## SIMPLIFICATION (சுருக்குக)

### TYPE 5.2: ALGEBRA (இயற்கணிதம்)

24. Simplify/சுருக்குக  $\frac{728 \times 728 - 272 \times 272}{1000}$

- a) 456...
- b) 1000
- c) 728
- d) 272

$$\frac{a^2 - b^2}{a + b} = a - b$$
$$\Rightarrow 728 - 272$$
$$\Rightarrow 456.$$

## SIMPLIFICATION (சுருக்குக)

### TYPE 5.2: ALGEBRA (இயற்கணிதம்)

25. Simplify/சுருக்குக  $\frac{1.5 \times 1.5 \times 1.5 - 0.5 \times 0.5 \times 0.5}{1.5 \times 1.5 + 1.5 \times 0.5 + 0.5 \times 0.5}$

- a) 1.5
- ~~b) 1...~~
- c) 0.5
- d) 1.4

$$\frac{a-b}{a^2+ab+b^2} \Rightarrow \frac{(a-b)(a^2+ab+b^2)}{(a^2+ab+b^2)}$$

$$\frac{1.5-0.5}{1.5^2+1.5 \times 0.5+0.5^2} \Rightarrow \frac{1}{3+0.75+0.25} = \frac{1}{4} = 0.25$$

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

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

## SIMPLIFICATION (சுருக்குக)

### TYPE 5.2: ALGEBRA (இயற்கணிதம்)

26. Simplify/சுருக்குக  $\frac{1.5 \times 1.5 \times 1.5 + 0.5 \times 0.5 \times 0.5}{1.5 \times 1.5 - 1.5 \times 0.5 + 0.5 \times 0.5}$

- a) 1.5
- b) 1
- c) 0.5
- ~~d) 2...~~

$$a^2 + b^3 = (a+b)$$
$$1.5 + 0.5$$



## SIMPLIFICATION (சுருக்குக)

### TYPE 5.2: ALGEBRA (இயற்கணிதம்)

27. Simplify/சுருக்குக  $\frac{(679+458)^2 - (679-458)^2}{679 \times 458}$

a) 0

b) 1

~~c) 4...~~

d) 2

$$\frac{(a+b)^2 - (a-b)^2}{ab}$$

$$\frac{a^2 + b^2 + 2ab - (a^2 - 2ab + b^2)}{ab}$$
  
$$\frac{2ab + 2ab}{4ab}$$

✓ →

## SIMPLIFICATION (சுருக்குக)

### TYPE 5.2: ALGEBRA (இயற்கணிதம்)

28. Simplify/சுருக்குக  $\frac{(835+378)^2 + (835-378)^2}{(835 \times 835) + (378 \times 378)}$

- a) 0
- b) 1
- c) 4
- ~~d) 2...~~

$$\frac{(a+b)^2 + (a-b)^2}{a^2 + b^2} = 2 \Rightarrow$$

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

$$\ominus \oplus \checkmark$$

$$\ominus \oplus$$

$$\Rightarrow 2$$

## SIMPLIFICATION (சுருக்குக)

### ALGEBRA FORMULAS (இயற்கணிதம்)

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

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

3.  $(a + b)^2 - (a - b)^2 = 4ab$

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

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

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

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

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

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

10.  $(a + b + c)^2 = (a^2 + b^2 + c^2) + 2(ab + bc + ca)$

## ALGEBRA SHORTCUTS (இயற்கணிதம்)

$$1. \frac{a^2 - b^2}{a - b} = a + b$$

$$2. \frac{a^2 - b^2}{a + b} = a - b$$

$$3. \frac{a^3 - b^3}{a^2 + ab + b^2} = a - b$$

$$4. \frac{a^3 + b^3}{a^2 - ab + b^2} = a + b$$

$$5. \frac{a^3 - b^3}{a^2 + ab + b^2} = a - b$$

$$6. \frac{(a+b)^2 - (a-b)^2}{ab} = 4$$

$$7. \frac{(a+b)^2 + (a-b)^2}{a^2 + b^2} = 2$$

$$8. \text{ If } x + \frac{1}{x} = n, \text{ find the value of } x^3 + \frac{1}{x^3} = n^3 - 3n$$

$$9. \text{ If } x - \frac{1}{x} = 2, \text{ find the value of } x^3 - \frac{1}{x^3} = n^3 + 3n$$

$$10. \text{ If } x + \frac{1}{x} = 2, \text{ find the value of } x^2 + \frac{1}{x^2} = n^2 - 2$$

## HOMWORK – TYPE 5

1. Find  $x^3 - y^3$ , if  $x - y = 5$  and  $xy = 14$

$x - y = 5$  &  $xy = 14$  எனில்  $x^3 - y^3$  இன் மதிப்பு காண்க

a) 56 b) 350 c) **335** d) 568

2. If  $a + \frac{1}{a} = 6$ , then find the value of  $a^3 + \frac{1}{a^3}$

$a + \frac{1}{a} = 6$  எனில்  $a^3 + \frac{1}{a^3}$  இன் மதிப்பு காண்க

a) 19 b) **198** c) 90 d) 298

3. If  $(y - \frac{1}{y})^3 = 27$ , then find the value of  $y^3 - \frac{1}{y^3}$

$(y - \frac{1}{y})^3 = 27$  எனில்  $y^3 - \frac{1}{y^3}$  இன் மதிப்பு காண்க

a) **36** b) 68 c) 3 d) 4

4. Find  $27a^3 + 64b^3$ , if  $3a + 4b = 10$  &  $ab = 2$

$3a + 4b = 10$  &  $ab = 2$  எனில்  $27a^3 + 64b^3$  இன் மதிப்பு காண்க

a) 19 b) 198 c) 90 d) **280**

## SIMPLIFICATION (சுருக்குக)

### TYPE 5.3: ALGEBRA (இயற்கணிதம்)

29. Simplify / சுருக்குக  $\frac{m}{m+1} + \frac{1}{m+1} + \frac{1}{m^2-1}$

a)  $m^2$

b)  $\frac{m^2-1}{m^2}$

c)  $\frac{1}{m^2}$

~~d)  $\frac{m^2}{m^2-1}$~~ ...

$$\frac{\cancel{m+1}}{\cancel{m+1}} + \frac{1}{m^2-1}$$

$$\frac{\frac{(m^2-1)}{m-1} \times (1)}{1} + \frac{1}{m^2-1}$$
$$\frac{m^2-1+1}{m^2-1} = \frac{m^2}{m^2-1}$$

## SIMPLIFICATION (சுருக்குக)

### TYPE 5.3: ALGEBRA (இயற்கணிதம்)

30. Simplify / சுருக்குக  $\frac{x^3}{x-2} + \frac{8}{2-x}$

a)  $x^2 - 2x + 4$

~~b)  $x^2 + 2x + 4...$~~

c)  $x^2 - 2x - 4$

d)  $x^2 + 2x - 4$

$(-(x-2))$   
 $-x+2$

$\frac{x^3}{x-2} + \frac{8}{2-x}$   
 $= \frac{x^3}{x-2} + \frac{8}{-(x-2)}$   
 $= \frac{x^3}{x-2} - \frac{8}{x-2}$   
 $= \frac{x^3 - 8}{x-2}$   
 $= \frac{(x-2)(x^2 + 2x + 4)}{x-2}$   
 $= x^2 + 2x + 4$

## SIMPLIFICATION (சுருக்குக)

### TYPE 5.3: ALGEBRA (இயற்கணிதம்)

31. Simplify / சுருக்குக  $\frac{x^3 - 1}{x + 3} \div \frac{x^2 + x + 1}{3x + 9}$

a)  $3x - 1$

b)  $3(x + 1)$

~~c)  $3(x - 1)...$~~

d)  $3x + 2$

$$\Rightarrow \frac{x^3 - 1^3}{x + 3} \times \frac{3(x + 3)}{x^2 + x + 1}$$

$$\Rightarrow \frac{3(x - 1)(x^2 + x + 1)}{x^2 + x + 1}$$



## SIMPLIFICATION (சுருக்குக)

### TYPE 5.3: ALGEBRA (இயற்கணிதம்)

32. Simplify / சுருக்குக  $\frac{x^2 - 2x}{x^2 + 2x} \times \frac{3x + 6}{x - 2}$

- a) 3x
- ~~b) 3...~~
- c) 3x + 2
- d) x - 2

$$\frac{x(x-2)}{x(x+2)} \times \frac{3(x+2)}{x-2}$$

## 2021 GROUP 4

Simply :  $\frac{x^3}{x-y} + \frac{y^3}{y-x}$

(A)  $x^2 + xy + y^2 = (x-y)$

(B)  $x^2 - xy + y^2$

(C)  $x^2 - xy - y^2$

(D)  $x^2 + xy - y^2$

(E) Answer not known

சுருக்குக  $\frac{x^3}{x-y} + \frac{y^3}{y-x}$

~~(A)~~  $x^2 + xy + y^2$

(B)  $x^2 - xy + y^2$

(C)  $x^2 - xy - y^2$

(D)  $x^2 + xy - y^2$

(E) விடை தெரியவில்லை

$$\Rightarrow \frac{x^3}{x-y} - \frac{y^3}{x-y}$$
$$\Rightarrow \frac{x^3 - y^3}{x-y} = \frac{(x-y)(x^2 + xy + y^2)}{x-y}$$

## SIMPLIFICATION (சுருக்குக)

### TYPE 5: SURDS (முறுடுகள்)

$$a=25, b=3 \Rightarrow \frac{a+b}{a-b} \text{ (+) } \frac{2\sqrt{ab}}{a+b}$$

$$\frac{5+\sqrt{3}}{5-\sqrt{3}} \times \frac{5+\sqrt{3}}{5+\sqrt{3}} = \frac{(5+\sqrt{3})^2}{25-3}$$

33. Simplify/சுருக்குக

$$\frac{5+\sqrt{3}}{5-\sqrt{3}}$$

- a)  $\frac{14+5\sqrt{3}}{11}$  ...
- b)  $\frac{14-5\sqrt{3}}{11}$
- c)  $14-5\sqrt{3}$
- d)  $14+5\sqrt{3}$

~~$\frac{2(14+5\sqrt{3})}{22}$~~

$$\frac{(5+\sqrt{3})}{(5-\sqrt{3})} \times \frac{(5+\sqrt{3})}{(5+\sqrt{3})}$$

$a=5, b=\sqrt{3}$

$$\frac{28+10\sqrt{3}}{22} = \frac{2 \cdot 5 + 3 + 2 \cdot 5 \cdot \sqrt{3}}{5^2 - 3} = \frac{14+5\sqrt{3}}{22}$$

~~$\frac{14+5\sqrt{3}}{22}$~~

## SIMPLIFICATION (சுருக்குக)

### TYPE 5: SURDS (முறுடுகள்)

34. Find the value of  $a$  and  $b$  if

$$\frac{\sqrt{7}-2}{\sqrt{7}+2} = a\sqrt{7} + b$$

$\frac{\sqrt{7}-2}{\sqrt{7}+2} = a\sqrt{7} + b$  எனில்,  $a$  மற்றும்  $b$  இன் மதிப்புகளைக் காண்க.

$\sqrt{7}-\sqrt{4} \rightarrow \begin{cases} a=1 \\ b=4 \end{cases}$

a)  $4/3$  and  $0$

b)  $0$  and  $4/3$

c)  $-4/3$  and  $11/3...$

d)  $11/3$  and  $-4/3$

$$\frac{(\sqrt{7}-2)}{(\sqrt{7}+2)} \times \frac{(\sqrt{7}-2)}{(\sqrt{7}-2)}$$

$$\Rightarrow \frac{(\sqrt{7}-2)^2}{(\sqrt{7})^2 - 2^2} = \frac{7+4 - 2 \times \sqrt{7} \times 2}{7-4} = \frac{11-4\sqrt{7}}{3}$$

$$\frac{11}{3} - \frac{4\sqrt{7}}{3} = a\sqrt{7} + b$$

$a = -4/3$

$b = 11/3$

## SIMPLIFICATION (சுருக்குக)

### TYPE 6: WORD PROBLEM

35. The cost of a chocolate is Rs.  $(x + y)$  and Amir bought  $(x + y)$  chocolates. Find the total amount paid by him in terms of  $x$  and  $y$ . If  $x = 10$ ,  $y = 5$  find the amount paid by him.

ஒரு இனிப்பின் விலை  $(x + y)$  ரூபாய். அமீர்  $(x + y)$  இனிப்புகளை வாங்கினார். எனில் அவர் கொடுத்த மொத்தத் தொகையை  $x$  மற்றும்  $y$  களில் காண்க. மேலும்  $x = 10$ ,  $y = 5$  எனில் அமீர் கொடுத்த தொகை எவ்வளவு?

$$\begin{aligned} \text{விலை / rate} &= \frac{10 + 5}{x + y} = \frac{15}{x + y} \\ \text{எண்ணிக்கை} &= (x + y) \Rightarrow 15 \end{aligned}$$

$$\begin{aligned} 15 \times 15 &\Rightarrow (x + y)(x + y) \\ &\Rightarrow (x + y)^2 \checkmark \text{Ans} \end{aligned}$$

## 2021 GROUP 4

If the cost of a dozen soaps is Rs. 396, what will be the cost of 35 such soaps?

- (A) 1515
- (B) 5511
- (C) 1155
- (D) 5115
- (E) Answer not known

ஒரு டசன் சோப்புகளின் விலை ரூ. 396 எனில் 35 சோப்புகளின் விலை என்ன?

- (A) 1515
- (B) 5511
- ~~(C) 1155~~
- (D) 5115
- (E) விலை தெரியவில்லை

$$35 \times 3 = 105$$

$$35 \times 33$$

$$\begin{aligned} \Rightarrow 35 \times 30 &= 1050 \\ 35 \times 3 &= 105 + \\ \hline &1155 \end{aligned}$$

$$1 \text{ டசன்} = 12 \text{ சோப்பு} = 396$$

$$1 \text{ சோப்பு} = \frac{396}{12} = 33$$

$$33$$

## 2021 GROUP 4

The cost of 15 chairs is Rs. 7,500. Find the number of such chairs that can be purchased for Rs. 12,000

- (A) 24
- (B) 26
- (C) 28
- (D) 30
- (E) Answer not known

15 நாற்காலிகளின் விலை ரூ. 7,500 எனில் ரூ. 12,000க்கு எத்தனை நாற்காலிகள் வாங்கலாம்?

- (A) 24
- (B) 26
- (C) 28
- (D) 30
- (E) விடை தெரியவில்லை

$$\begin{aligned} 15 \text{ C} &= 7500 \\ 1 \text{ C} &= \frac{7500}{15} \\ &= 500 \end{aligned}$$

$$\begin{array}{r} 24 \\ \times 500 \\ \hline 12000 \end{array}$$