

APPOLO STUDY CENTRE

TNPSC GROUP I, II & IIA

SIMPLIFICATION WORK SHEET

BOOK SOURCE SPLIT UP

TITLE	STD	NEW OLD	TERM	Exercise
Simplification	6	NEW	1	1.3
	7	OLD	1	1.1 to 1.8
	7	NEW	1	1.1 to 1.6
	8	OLD	1	1.1, 1.2, 1.3
	8	NEW	1	1.1, 1.2
	9	OLD		2.2
	9	NEW	2	3.2
	10	OLD		3.11
	10	NEW		3.4, 3.5, 3.6
R.S.AGGARWAL (2020 Edition)	Page No: 95 - 205			

Important Formula :

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

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

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

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

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

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

- | | |
|--|--|
| 7. $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$ | 17. $a^{-n} = \frac{1}{a^n}$ |
| 8. $a^m \times a^n = a^{m+n}$ | 18. $a^{m/n} = \sqrt[n]{a^m}$ |
| 9. $\frac{a^m}{a^n} = a^{m-n}$ | 19. $(\sqrt[n]{a})^n = (a^{1/n})^n = a$ |
| 10. $(a \times b)^n = a^n \times b^n$ | 20. $\sqrt[n]{ab} = \sqrt[n]{a} \cdot \sqrt[n]{b}$ |
| 11. $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$ | 21. $\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$ |
| 12. $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$ | 22. $(\sqrt[n]{a})^m = \sqrt[n]{a^m}$ |
| 13. $\sqrt{x} = x^{1/2}$ | 23. $\sqrt[m]{\sqrt[n]{a}} = \sqrt[mn]{a} = \sqrt[n]{\sqrt[m]{a}}$ |
| 14. $\sqrt[3]{x} = x^{1/3}$ | 24. $(a - b - c)^2 = a^2 + b^2 + c^2 - 2ab + 2bc - 2ca$ |
| 15. $\sqrt[n]{x} = x^{1/n}$ | 25. $(a + b)^2 + (a - b)^2 = 2(a^2 + b^2)$ |
| 16. $a^0 = 1$ (where $a \neq 0$) | |

BODMAS Rule :

BODMAS

B Bracket

O of

D Division

M Multiplication

A Addition

S Subtraction

Modulus of a Real number :

Modulus of a real number a is defined as

$$|a| = \begin{cases} a & \text{if } a > 0 \\ -a, & \text{if } a < 0 \end{cases}$$

thus $|7| = 7$; and $|-7| = 7$

26. $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$

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

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

$x + \frac{1}{x} = a$; then

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

ii. $x^3 + \frac{1}{x^3} = a^3 - 3a$

iii. $x - \frac{1}{x} = \sqrt{a^2 - 4}$

iv. $x^4 + \frac{1}{x^4} = (a^2 - 2)^2 - 2$

v. $x^5 + \frac{1}{x^5} = (a^2 - 2)(a^3 - 3a) - a$ vi. $x^6 + \frac{1}{x^6} = (a^3 - 3a)^2 - 2$

Virnaculum (or) BAR:

When an expression contains virnaculum, before applying the 'BODMAS' Rule, we simplify the expression under the virnaculum.

Level - I

1. $108 \div 36$ of $\frac{1}{4} + \frac{2}{5} \times 3 \frac{1}{4}$

a. $\frac{3}{4}$ b. $1 \frac{1}{20}$ c. $13 \frac{3}{10}$ d. $12 \frac{13}{10}$

2. $2 - [2 - \{(2 - 2)(2 + 2)\}] = ?$

a. -4 b. 4 c. 6 d. none of these

3. $\frac{180 \times 15 - 12 \times 20}{140 \times 8 + 2 \times 55} = ?$

a. $\frac{1}{7}$ b. $\frac{4}{5}$ c. 2 d. 4

4. $5 \frac{5}{6} - 3 \frac{8}{9} - ? = 1$

a. $\frac{2}{3}$ b. $\frac{3}{2}$ c. $\frac{17}{18}$ d. 3

5. $\frac{3}{5}$ of $\frac{4}{7}$ of $\frac{5}{9}$ of $\frac{21}{24}$ of 504

a. 63 b. 69 c. 96 d. 84

6. By how much is three fifth of 350 greater than $\frac{4}{7}$ of 210
350 இல் ஐந்தில் மூன்று பங்கு ஆனது 210 ல் $\frac{4}{7}$ என்பதை விட எவ்வளவு அதிகம்?
a. 90 b. 110 c. 120 d. 210

7. What is the value of $\frac{(P+Q)}{(P-Q)}$ if $\frac{P}{Q} = 7$

$\frac{P}{Q} = 7$ எனில் $\frac{(P+Q)}{(P-Q)}$ ன் மதிப்பு?

- a. $\frac{1}{3}$ b. $\frac{2}{3}$ c. $\frac{4}{3}$ d. $\frac{7}{8}$

8. $\frac{a}{b} = \frac{4}{3}$, then the value of $\frac{6a+4b}{6a-5b}$

$\frac{a}{b} = \frac{4}{3}$, எனில் $\frac{6a+4b}{6a-5b}$ ன் மதிப்பு

- a. -1 b. 3 c. 4 d. 5

9. $\frac{a}{b} = \frac{4}{5}$ and $\frac{b}{c} = \frac{15}{16}$ then $\frac{c^2-a^2}{c^2+a^2}$ is

$\frac{a}{b} = \frac{4}{5}$; $\frac{b}{c} = \frac{15}{16}$ எனில் $\frac{c^2-a^2}{c^2+a^2}$ ன் மதிப்பு?

- a. $\frac{1}{7}$ b. $\frac{7}{25}$ c. $\frac{3}{4}$ d. none of these

10. $(0.000729)^{-\frac{3}{4}} \times (0.09)^{-\frac{3}{4}}$

- a. $\frac{10^3}{3^3}$ b. $\frac{10^5}{3^5}$ c. $\frac{10^2}{3^2}$ d. $\frac{10^6}{3^6}$

Level - II

11. $\sqrt{27} + \sqrt{12} =$

- a. $\sqrt{39}$ b. $5\sqrt{6}$ c. $5\sqrt{3}$ d. $3\sqrt{5}$

12. simplify: $\frac{(561 \times 561) - (31 \times 31)}{530}$

சுருக்குக: $\frac{(561 \times 561) - (31 \times 31)}{530}$

- a. 530 b. 561 c. 31×31 d. 592

13. simplify: $\frac{\sqrt[3]{729} - \sqrt[3]{27}}{\sqrt[3]{512} + \sqrt[3]{343}}$

சுருக்குக: $\frac{\sqrt[3]{729} - \sqrt[3]{27}}{\sqrt[3]{512} + \sqrt[3]{343}}$

- a. $\frac{2}{5}$ b. $\frac{6}{20}$ c. $\frac{6}{4}$ d. $\frac{5}{2}$

14. If $4x + 5y = 83$; and $\frac{3x}{2y} = \frac{21}{22}$, then $y - x = ?$

$4x + 5y = 83$ மற்றும் $\frac{3x}{2y} = \frac{21}{22}$ எனில் $y - x$ ன் மதிப்பு?

- a. 3 b. 4 c. 7 d. 11

15. $\left(999\frac{1}{7} + 999\frac{2}{7} + 999\frac{3}{7} + 999\frac{4}{7} + 999\frac{5}{7} + 999\frac{6}{7}\right)$ is simplified to

சுருக்குக: $\left(999\frac{1}{7} + 999\frac{2}{7} + 999\frac{3}{7} + 999\frac{4}{7} + 999\frac{5}{7} + 999\frac{6}{7}\right)$

- a. 2997 b. 5979 c. 5994 d. 5997

16. When $(2\sqrt{5} - \sqrt{2})^2$ is simplified, we get

$(2\sqrt{5} - \sqrt{2})^2$ இதன் சுருங்கிய வடிவம்

- a. $4\sqrt{5} + 2\sqrt{2}$ b. $22 - 4\sqrt{10}$ c. $8 - 4\sqrt{10}$ d. $2\sqrt{10} - 2$

17. $0.\overline{34} + 0.\overline{34} =$

- a. $0.\overline{687}$ B. $0.\overline{68}$ C. $0.\overline{68}$ d. $0.\overline{687}$

18. $x = \sqrt{5} + 2$ then find the value of $x^2 + \frac{1}{x^2}$

$x = \sqrt{5} + 2$ எனில் $x^2 + \frac{1}{x^2}$ ன் மதிப்பை காண்க.

- a. 23 b. 21 c. 18 d. 29

19. simplify: $2\sqrt{72} \times 5\sqrt{32} \times 3\sqrt{50}$

சுருக்குக: $2\sqrt{72} \times 5\sqrt{32} \times 3\sqrt{50}$

- a. $30\sqrt{115200}$ b. $7200\sqrt{2}$ c. $14400\sqrt{2}$ d. none of these

20. simplify : $\frac{\sqrt{5}}{\sqrt{6+2}} - \frac{\sqrt{5}}{\sqrt{6-2}}$
 சுருக்குக: $\frac{\sqrt{5}}{\sqrt{6+2}} - \frac{\sqrt{5}}{\sqrt{6-2}}$
 a. $-2\sqrt{5}$ b. $2\sqrt{5}$ c. $-\frac{\sqrt{5}}{8}$ d. $\frac{\sqrt{5}}{34}$
21. $x + \frac{1}{x} = 2$ then $x^3 + \frac{1}{x^3}$
 $x + \frac{1}{x} = 2$ எனில் $x^3 + \frac{1}{x^3}$ ன் மதிப்பு
 a. 8 b. 2 c. 6 d. 4
22. $\sqrt{24} = 4.899$ then the value of $\sqrt{\frac{8}{3}}$ is
 $\sqrt{24} = 4.899$ எனில் $\sqrt{\frac{8}{3}}$ ன் மதிப்பு
 a. 0.544 b. 1.33 c. 1.633 d. 2.666
23. simplify: $(147 + \frac{1}{42})^2 - (147 - \frac{1}{42})^2 =$
 சுருக்குக: $(147 + \frac{1}{42})^2 - (147 - \frac{1}{42})^2 =$
 a. 7 b. 5 c. 147 d. 14

Level - III

24. $\frac{4+\sqrt{5}}{4-\sqrt{5}} - \frac{4-\sqrt{5}}{4+\sqrt{5}} = a + b\sqrt{5}$ find the value of a and b.
 $\frac{4+\sqrt{5}}{4-\sqrt{5}} - \frac{4-\sqrt{5}}{4+\sqrt{5}} = a + b\sqrt{5}$ எனில் a, b ன் மதிப்புகளை காண்க.
 a. $a = 1, b = 0$ b. $a = 0, b = \frac{-16}{11}$
 c. $a = 1, b = \frac{16}{11}$ d. $a = 0, b = \frac{16}{11}$
25. Find the value of $\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$
 $\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$ ன் மதிப்பு
 a. $3 + \sqrt{15}$ b. $4 + \sqrt{15}$ c. $2 + \sqrt{12}$ d. $4 + \sqrt{12}$

26. Simplify: $(7\sqrt{a} - 5\sqrt{b})(7\sqrt{a} + 5\sqrt{b})$

சுருக்குக: $(7\sqrt{a} - 5\sqrt{b})(7\sqrt{a} + 5\sqrt{b})$

a. $7a^2 - 5b^2$

b. $49a - 25b$

c. $49a^2 - 25b^2$

d. $(7\sqrt{a} - 5\sqrt{b})^2$

Solution:

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

$$(7\sqrt{a} - 5\sqrt{b})(7\sqrt{a} + 5\sqrt{b}) = 7^2(\sqrt{a})^2 - 5^2(\sqrt{b})^2$$

$$= 49a - 25b$$

27. $y - \frac{1}{y} = 6$ find the value of $y^3 - \frac{1}{y^3}$

$y - \frac{1}{y} = 6$ எனில் $y^3 - \frac{1}{y^3}$ ன் மதிப்பு

a. 216

b. 222

c. 234

d. 228

Solution:

$$y - \frac{1}{y} = 6$$

$$y^3 - \frac{1}{y^3} = ?$$

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

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

$$(6)^3 = y^3 - 3y + 3\frac{1}{y} - \frac{1}{y^3}$$

$$(6)^3 = y^3 - \frac{1}{y^3} - 3y + \frac{3}{y}$$

$$216 + 3(6) = y^3 - \frac{1}{y^3}$$

$$y^3 - \frac{1}{y^3} = 234$$

28. find the value of a, b if $\frac{\sqrt{7}-2}{\sqrt{7}+2} = a\sqrt{7} + b$

a, b யின் மதிப்பை காண். $\frac{\sqrt{7}-2}{\sqrt{7}+2} = a\sqrt{7} + b$

a. $a = \frac{4}{3}$ $b = \frac{11}{3}$

b. $a = -\frac{11}{3}$; $b = \frac{4}{3}$

c. $a = -\frac{4}{3}$ $b = -\frac{11}{3}$

d. $a = -\frac{4}{3}$; $b = \frac{11}{3}$

Solution:

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

$$\frac{\sqrt{7}-2}{\sqrt{7}+2} \times \frac{\sqrt{7}-2}{\sqrt{7}-2} = \frac{7-2\sqrt{7}-2\sqrt{7}+4}{7-4}$$

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

$$\Rightarrow a = \frac{-4}{3} \text{ and } b = \frac{11}{3}$$

29. If $x = \sqrt{3}+1$, find the value of $\left(x - \frac{2}{x}\right)^2$

$x = \sqrt{3}+1$ எனில் $\left(x - \frac{2}{x}\right)^2$ ன் மதிப்பு?

a. $\sqrt{3}$

b. 3

c. 2

d. 4

Solution:

$$x = \sqrt{3}+1$$

$$\frac{1}{x} = \frac{1}{\sqrt{3}+1} \times \frac{\sqrt{3}-1}{\sqrt{3}-1} = \frac{\sqrt{3}-1}{3-\sqrt{3}+\sqrt{3}-1}$$

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

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

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

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

$$= (2)^2 = 4$$

30. simplify: $\frac{x^3+8}{x^4+4x^2+16}$

சுருக்குக: $\frac{x^3+8}{x^4+4x^2+16}$

a. $\frac{x+2}{x^2+2x+4}$

b. $\frac{x-2}{x^2+2x+4}$

c. $\frac{x+2}{x^2-2x+4}$

d. $\frac{x-2}{x^2-2x+4}$

Solution:

$$x^3+8 = x^3+2^3$$

$$\begin{aligned}
 &= (x+2)(x^2+4-2x) \\
 x^4+4x^2+16 &= x^4+4x^2+16+4x^2-4x^2 \\
 &= x^4+8x^2+16-4x^2 \\
 &= (x^2+4)^2-(2x)^2 && \text{Since, } (a+b)^2 = a^2+2ab+b^2 \\
 &= (x^2+4+2x)(x^2+4-2x) \\
 \therefore \frac{x^3+8}{x^4+4x^2+16} &= \frac{(x+2)(\cancel{x^2+4-2x})}{(x^2+4+2x)(\cancel{x^2+4-2x})} \\
 &= \frac{x+2}{x^2+2x+4}
 \end{aligned}$$

SIMPLIFICATION WORK SHEET - ANSWER

1	2	3	4	5	6	7	8	9	10
C	D	C	C	D	A	C	C	B	D
11	12	13	14	15	16	17	18	19	20
C	D	A	B	D	B	A	C	B	A
21	22	23	24	25	26	27	28	29	30
B	C	D	D	B	B	C	D	D	A