MARUDHAR KESARI JAIN COLLEGE FOR WOMEN
(AUTONOMOUS)

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PG and Department of Mathematics

1st B.Sc. Maths – Semester - I

E-Notes (Study Material)

SEC : MATHEMATICS FOR COMPETITIVE EXAM-I	**Code: 24UMAS13**
Unit: 3 – Simplification (6 Hours)	
Learning Objectives: To understand the BODMAS rule	
Course Outcome: Explain the Simplification problems, BODMAS conditions	

Overview:

BODMAS stands for Bracket, Of, Division, Multiplication, Addition, and Subtraction. The BODMAS is used to explain the order of operation of a mathematical expression. In some regions, the BODMAS is also known as PEDMAS which stands for Parentheses, Exponents, Division, Multiplication, Addition, and Subtraction.

The basics of simplification are to use the 'BODMAS' rule. BODMAS stands for brackets, order of power, division, multiplication, addition, and subtraction. A vinculum is a horizontal line used in a mathematical expression; the line indicates that the following expression is grouped together.

- Brackets of division, multiplication, addition, subtraction rule.
- Simplification problems

UNIT-3.

1) If $x+y=28$, $xy=126$, What is the Value of $x^2+y^2=?$

Soln:

$$x+y=28$$

$$xy=126$$

$$(x+y)^2=(28)^2$$

$$x^2+y^2+2xy=784$$

$$x^2+y^2+2(126)=784$$

$$x^2+y^2=784-252$$

$$x^2+y^2=532.$$

2) If $\frac{a}{b}=\frac{4}{5}$ and $\frac{b}{c}=\frac{15}{16}$ find $\frac{c^2-a^2}{c^2+a^2}=?$

Soln:

$$\frac{a}{b}=\frac{4}{5}, \quad \frac{b}{c}=\frac{15}{16}$$

$$\frac{a}{b}\times\frac{b}{c}=\frac{4}{5}\times\frac{15}{16}\ {}^{3}_{4}=\frac{3}{4}$$

$$\frac{a}{c}=\frac{3}{4} \Rightarrow \frac{c}{a}=\frac{4}{3}$$

$$\frac{c^2+a^2}{c^2+a^2}=\frac{a^2\left(\frac{c^2}{a^2}-1\right)}{a^2\left(\frac{c^2}{a^2}+1\right)}$$

$$=\frac{\left(\frac{16}{9}-1\right)}{\left(\frac{16}{9}+1\right)} = \frac{\frac{16-9}{9}}{\frac{16+9}{9}} = \frac{7}{25}.$$

3. If $4x + 5y = 83$ and $\frac{3x}{2y} = \frac{21}{22}$. Then what is the value of $y - x$?

Soln:

$$\frac{3x}{2y} = \frac{21}{22}$$

$$\frac{x}{y} = \frac{21}{22} \times \frac{2}{3}$$

$$\frac{x}{y} = \frac{7}{11}$$

$$x = \frac{7}{11}y.$$

Sub. x value in (ii), we get

$$4\left[\frac{7}{11}y\right] + 5y = 83$$

$$\frac{28}{11}y + 5y = 83$$

$$\frac{(28 + 55)y}{11} = 183$$

$$\frac{83y}{11} = 83$$

$$\boxed{y = 11}$$

$$x = \frac{7}{11}(11)$$

$$\boxed{x = 7}$$

$$y - x = 11 - 7 = 4$$

4) $\frac{x}{4} - \frac{x-3}{6} = 1$. Find the value of x.

Soln:

$$\frac{x}{4} - \frac{x-3}{6} = 1$$

$$\frac{6x - 4x + 12}{24} = 1$$

$6x - 4x + 12 = 24$

$2x = 12$

$\boxed{x = 6}$

5) The cost of 4 bags and 3 boxes is 555. Find and the cost of 3 bags and 4 boxes is 460. What is the cost of one bag.

Soln:

Let bags be x, and boxes be y.

$4x + 3y = 555$ —— (1)

$3x + 4y = 460$ —— (2)

(1) $\times 4 \Rightarrow 16x + 12y = 2220$

(2) $\times 3 \Rightarrow 9x + 12y = 1380$

$7x = 840$

$\boxed{x = 120}$

∴ The cost of one bag is 120.

6. Simplify.

(i) $5005 - 5000 \div 10$

(ii) $18800 \div 4 \text{ TO } \div 20$

6. Simplify

(i) $5005 \div 5000 \div 10$

6. Simplify

(i) $5005 - 5000 \div 10$

(ii) $18800 \div 470 \div 20$

Soln:

(i) $5005 - \frac{5000}{10}$

$= 5005 - 500$

$= 4505$

(ii) $18800 \div 470 \div 20$

$= 40 \div 20$

$= 2.$

7. Simplify $b - [b - (a+b) - \{b - (b - a - b)\} + 2a]$

Soln:

Given expression $= b - [b - (a+b) - \{b - (b - a + b)\} + 2a]$

$= b - [b - a - b - \{b - 2b + a\} + 2a]$

$= b - [-a - \{b - 2b + a + 2a\}]$

$= b - [-a - \{-b + 3a\}]$

$= b - [-a + b - 3a]$

$= b - [-4a + b]$

$= b + 4a - b$

$= 4a$

8. What value will replace the question mark in the following equation.

$$4\frac{1}{2} + 3\frac{1}{6} + ? + 2\frac{1}{3} = 13\frac{2}{5}$$

Soln:

Let, $\frac{9}{2} + \frac{19}{6} + x + \frac{7}{3} = \frac{67}{5}$

Then, $x = \frac{67}{5} - \left[\frac{9}{2} + \frac{19}{6} + \frac{7}{3}\right]$

$= \frac{67}{5} - \left[\frac{27 + 19 + 14}{6}\right]$

$= \frac{67}{5} - \left[\frac{60}{6}\right]$ (10)

$= \frac{67}{5} - 10 = \frac{67 - 50}{5}$

$= \frac{17}{5}$

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

9. $\frac{4}{15}$ of $\frac{5}{7}$ of a number is greater than $\frac{4}{9}$ of $\frac{2}{5}$ of the same number by 8. What is half of that number?

Soln:

Let the number be x

Then, $\frac{4}{15}$ of $\frac{5}{7}$ of $x - \frac{4}{9}$ of $\frac{2}{5}$ of $x = 8$

$\frac{4}{21}x - \frac{8}{45}x = 8$

$\left[\frac{4}{21} - \frac{8}{45}\right]x = 8$

$$\left(\frac{60-56}{315}\right)x = 8$$

$$\frac{4}{315}x = 8$$

$$8x = \frac{8 \times 315}{4}$$

$$= 630$$

$$\frac{1}{2}x = 315$$

10. Simplify $\left[3\frac{1}{4} \div \left\{1\frac{1}{4} - \frac{1}{2}\left(2\frac{1}{2} - \frac{1}{4} - \frac{1}{6}\right)\right\}\right]$

Soln:

given, expression $= \left[\frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{5}{2} - \frac{30-29}{24}\right)\right\}\right]$

$$= \left[\frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{5}{2} - \frac{1}{12}\right)\right\}\right]$$

$$= \left[\frac{13}{4} \div \left\{\frac{30-29}{24}\right\}\right]$$

$$= \left[\frac{13}{4} \div \frac{1}{24}\right]$$

$$= \frac{13}{4} \times 24$$

$$= 78$$

11. Simpli

Soln:

Given

12. If

then

Soln:

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x

y

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Subt

11. Simplify $108 \div 30$ of $\frac{1}{4} + \frac{2}{5} \times 3\frac{1}{4}$

Soln:

Given exp $= \frac{108}{108} \div 9 + \frac{2}{5} \times \frac{13}{4}$

$= \frac{108}{9} + \frac{13}{10}$

$= 12 + \frac{13}{10}$

$= \frac{133}{10}$

$= 13\frac{3}{10}$

12. If $2x + 3y + z = 55$, $x + z - y = 4$ and $y - x + z = 12$ then what are the values of x, y and z

Soln:

$2x + 3y + z = 55$ — ①

$x + z - y = 4$ — ②

$y - x + z = 12$ — ③

Subtracting ② from ①

$2x + 3y + z = 55$

$x + y + z = 4$ (⊖)

$x + 4y = 51$ — ④

Subtracting ③ from ①

$2x + 3y + z = 55$

$-x + y + z = 12$ (⊖)

$3x + 2y = 43$ — ⑤

13)

Multiply eqn ⑤ by 2

⑤ ⇒ $6x + 4y = 86$

$x + 4y = 51$

$5x = 35$

$x = 7$

⑤ ⇒ $3x + 2y = 43$

$3(7) + 2y = 43$

$21 + 2y = 43$

$2y = 43 - 21$

$2y = 22$

$y = \frac{22}{2}$

$y = 11$

③ ⇒ $y - x + z = 12$

$11 - 7 + x = 12$

$4 + z = 12$

$z = 12 - 4$

$z = 8$

13) Find the Value of $(1-\frac{1}{3})(1-\frac{1}{4})(1-\frac{1}{5})\cdots(1-\frac{1}{100})$

Soln:

Given Expression.

$$(1-\tfrac{1}{3})(1-\tfrac{1}{4})(1-\tfrac{1}{5})\cdots(1-\tfrac{1}{100})$$

$$= (\tfrac{2}{3})(\tfrac{3}{4})(\tfrac{4}{5})\cdots(\tfrac{99}{100})$$

$$= \frac{2}{100_{50}} = \frac{1}{50}$$

14. Find the Value of $\frac{1}{2\times3} + \frac{1}{3\times4} + \frac{1}{4\times5} + \frac{1}{5\times6} + \cdots + \frac{1}{9\times10}$

Soln:

Given Exp:

$$= \left(\frac{1}{2}-\frac{1}{3}\right) + \left(\frac{1}{3}-\frac{1}{4}\right) + \left(\frac{1}{4}-\frac{1}{5}\right) + \left(\frac{1}{5}-\frac{1}{6}\right) + \cdots \left(\frac{1}{9}-\frac{1}{10}\right)$$

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

$$= \frac{10-2}{20}$$

$$= \frac{8^{\not 2}}{20_{10}5} = \frac{2}{5}$$

15) Simplify : $99\frac{48}{49} \times 245$

Soln:

Given exp $= \left[100 - \frac{1}{49}\right] \times 245$

$= \left[100 - \frac{1}{49}\right] \times 245$

$= \frac{4899}{49} \times 245$

$= 4899 \times 5 = 24495$

16) A board 7 ft. 9 inches long is divided into 3 equal parts that is the length of each part?

Soln:

Length of the board = 7 ft.

9 inches = $(7 \times 12 + 9)$ inches = 93 inches

∴ Length of each part = $\left(\frac{93}{3}\right)$ inches

= 31 inches

= 2 ft. 7 inches.

17) A man divides Rs. 8600 among 5 sons, 4 daughter and 2 nephews. If each daughter receives four times as much as each nephew, and each son receives five times as much as each nephew, how much does each daughter receive?

Soln:

Let

Then, Sh

Share

So, 5

Sha

18. Simpl

soln:

Soln.

Let the share of each nephew be Rs. x

Then, share of each daughter = Rs. (4x)

Share of each son = Rs (5x).

So, $5 \times 5x + 4 \times 4x + 2 \times x = 8600$

$25x + 16x + 2x = 8600$

$43x = 8600$

$x = 200$

Share of each daughter = Rs (4 × 200)

= Rs. 800.

18. Simplify $\dfrac{\frac{7}{2} \div \frac{5}{2} \times \frac{3}{2}}{\frac{7}{2} \div \frac{5}{2} \text{ of } \frac{3}{2}} \div 5.25$

Soln.

$\dfrac{\frac{7}{2}}{\frac{5}{2}} \times \frac{3}{2} \div 5.25$

$\dfrac{\frac{7}{2}}{\frac{15}{4}} \div 5.25$

$\dfrac{\frac{7}{2} \times \frac{2}{5} \times \frac{3}{2}}{\frac{7}{2}} \div 5.25$

$\dfrac{\frac{7}{5} \times \frac{3}{2}}{\frac{7}{2} \times \frac{4}{15}} \div 5.25$

$$\frac{\frac{21}{10}}{\frac{14}{15}} \div 5.25$$

$$\frac{\cancel{21}^{3}}{\cancel{10}_{2}} \times \frac{\cancel{15}^{3}}{\cancel{14}_{2}} \div 5.25$$

$$\frac{9}{4} \div 5.25$$

$$\frac{\frac{9}{4}}{5.25} = \frac{\cancel{9}^{3}}{\cancel{21}_{7}} = \frac{3}{7}.$$

19) Simplify : $12.05 \times 5.4 \div 0.6$

soln:

$$12.05 \times \frac{5.4}{0.6}$$

$$12.05 \times 9 = 108.45$$

20) Simplify : $0.6 \times 0.6 + 0.6 \div 6$

soln:

$$= 0.6 \times 0.6 + \frac{0.6}{6}$$

$$= 0.6 \times 0.6 + 0.1$$

$$= 0.36 + 0.1$$

$$= 0.46$$

21. Find the Value of x, $\frac{17.28 \div x}{3.6 \times 0.6} = 2$

soln:

$$\frac{17.28}{x} = 2 \times 3.6 \times 0.6$$

$$\frac{17.28}{x} = 1.44 \Rightarrow \frac{17.28}{1.44} = x$$

$$\boxed{x = 12}$$

22) &

Soln

23) 8.

Sol

22) Find the value of x, $3648.24 + 364.824 \div x - 36.4824 = 3794.1696$.

Soln:

$$\frac{364.824}{x} = 3794.1696 + 36.4824 - 3648.24$$

$$\frac{364.824}{x} = 182.412$$

$$\frac{364.824}{182.412} = x$$

$$\boxed{x = 2}$$

23) $8.5 - \left\{5\frac{1}{2} - \left(7\frac{1}{2} + 2.8 \div x\right)\right\} \times 4.25 \div (0.2)^2 = 306$

Soln:

$$= 8.5 - \left\{\frac{11}{2} - \left(\frac{15}{2} + \frac{2.8}{x}\right)\right\} \times \frac{4.25}{0.04} = 306$$

$$= 8.5 - \left\{5.5 - \left(7.5 + \frac{2.8}{x}\right)\right\} \times 106.25 = 306$$

$$= 8.5 - \left\{5.5 - \frac{7.5x + 2.8}{x}\right\} \times 106.25 = 306$$

$$= 8.5 - \left\{\frac{5.5x - 7.5x + 2.8}{x}\right\} \times 106.25 = 306$$

$$8.5 - \left\{\frac{-2x - 2.8}{x}\right\} \times 106.25 = 306$$

$$8.5 - \left\{\frac{-212.5x - 297.5}{x}\right\} = 306$$

$$8.5 + \frac{212.5x + 297.5}{x} = 306$$

$$8.5x + 212.5x + 297.5 = 306x$$

$$221x - 306x = -297.5$$

$$-85x = -297.5$$

$$x = \frac{297.5}{85}$$

$$\boxed{x = 3.5}$$

24. Find the Value of $4 - \cfrac{5}{1 + \cfrac{1}{3 + \cfrac{1}{2 + \frac{1}{4}}}}$

Soln:

$$\Rightarrow 4 - \cfrac{5}{1 + \cfrac{1}{3 + \cfrac{1}{2 + \frac{1}{4}}}}$$

$$= 4 - \cfrac{5}{1 + \cfrac{1}{3 + \cfrac{1}{\frac{9}{4}}}}$$

$$= 4 - \cfrac{5}{1 + \cfrac{1}{3 + \frac{4}{9}}}$$

$$= 4 - \cfrac{5}{1 + \cfrac{1}{\frac{31}{9}}}$$

$$= 4 - \cfrac{5}{1 + \frac{9}{31}} = 4 - \cfrac{5}{\frac{40}{9}}$$

$$= 4 - \frac{45}{40}$$

$$= \frac{160 - 45}{40} = \frac{115}{40}$$

$$= \frac{23}{8}$$

25) If

Soln

26.

25) If $\dfrac{2x}{1+\dfrac{1}{1+\dfrac{x}{1-x}}} = 1$ Find the Value of x

Soln:

$$\Rightarrow \frac{2x}{1+\dfrac{1}{\dfrac{1-x+x}{1-x}}} = 1$$

$$\frac{2x}{1+\dfrac{1}{\dfrac{1}{1-x}}} = 1$$

$$\frac{2x}{1+1-x} = 1$$

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

$$2x = 2-x$$

$$2x+x = 2$$

$$3x = 2$$

$$\boxed{x = 2/3}$$

26. If $\frac{a}{b} = \frac{3}{4}$ & $8a+5b = 22$ then find the value of a.

Soln:

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

$$\boxed{b = \frac{4a}{3}}$$

$8a + 5b = 22$

$8a + 5\left(\frac{4a}{3}\right) = 22$

$8a + \frac{20a}{3} = 22$

$\frac{24a + 20a}{3} = 22$

$44a = 66$

$a = \frac{66}{44}$ $3/2$

$\boxed{a = 3/2}$

27. If $\frac{x}{4} - \frac{x-3}{6} = 1$

Sol^n:

$\frac{x}{4} - \frac{x-3}{6} = 1$

$\frac{6x - 4x + 12}{24} = 1$

$\frac{2x + 12}{24} = 1$

$2x + 12 = 24$

$2x = 24 - 12$

$2x = 12$

$x = \frac{12}{2}$ 6

$\boxed{x = 6}$

27.

28. If $2x+3y=34$ & $\frac{x+y}{y}=\frac{13}{8}$ then Find the Value of $5y+7x$.

soln:

$$2x+3y=34 \quad \text{---} (1)$$

$$\frac{x+y}{y}=\frac{13}{8}$$

$$8x+8y=13y$$

$$8x+8y-13y=0$$

$$8x-5y=0 \quad \text{---} (2)$$

$(1)\times 4 \Rightarrow \quad 8x+12y=136$

$(2) \Rightarrow \quad 8x-5y=0$

$\ominus \quad \oplus$

$0 \quad 17y=136$

$$\boxed{y=8}$$

$$8x-5(8)=0$$

$$8x-40=0$$

$$8x=40$$

$$\boxed{x=5}$$

$$5y+7x$$

$$=5(8)+7(5)$$

$$=40+35$$

$$=75$$

29) A Man spends $\frac{2}{5}$ salary for his rent, $\frac{3}{10}$ of his salary on food, and $\frac{1}{8}$ of his salary on conveyance. If he has Rs. 1400 left with him. Find his expenditure on food and conveyance.

Let the total be 1.

expenditure $= 1 - \left[\frac{2}{5} + \frac{3}{10} + \frac{1}{8}\right]$

$= 1 - \left[\frac{16 + 12 + 5}{40}\right]$

$= 1 - \frac{33}{40}$

$= \frac{40 - 33}{40}$

$= \frac{7}{40}$

$\frac{7}{40} x = 1400$

$x = \frac{1400 \times 40}{7}$

$x = 8000.$

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Additional Resources:

https://www.youtube.com/watch?v=rf3jJBwd9A8&list=PLNLFUrpFioatQ9txDDWVsgjvHJX3Q-tgn

Practice Questions:

Section – A

- Define BODMAS rule
- Define modulus of a real number
- Simplify: 5005 – 5000 ÷ 10
- Simplify: 12.05 × 5.4 +0.6
- Simplify: (3080 + 6160) ÷ 28=?
- Find the value of 25 – 5 [2 + 3 {2 -2 (5-3) + 5} – 10] ÷ 4 is
- If 45 – [28 – {37 – (15 - *)}] = 58, then * is equal to:
- Find the value of (i) (6+6+6+6) ÷ 6, (ii) (4+4+4+4) ÷ 4 *is equal to*:
- Find 100 + 50 × 2 =?
- Find 5004 ÷ 139 – 6 =?
- Simplify: 7500 + (1250 ÷ 50) =?
- Find the value of 1001 ÷ 11 of 13 is:
- Simplify: (-5) (4) (2) (-3÷ 4)
- Simplify: 5.8 × 2.5 + 0.6 × 6.75 + 139.25 =?
- Find x if x/5 – x/6 = 4
- If a + b = 5 and 3a + 2b = 20, then (3a + b) will be:
- How many pieces of 85 cm length can be cut from a rod 42.5 meters long?
- What fraction of an hour is a second
- If a – b = 3 and $a^2 + b^2 = 29$, find the value of ab
- If a + b + c = 13, $a^2 + b^2 + c^2 = 69$ then find ab + bc + ca

Section – B

- Find the value of x in each of the following equation a) $17.28 \div x\ 3.6 \times 0.2 = 2$, b) $3648.24 + 364.824 \div x - 36.4824 = 3794.169$
- If x/y = 6/5, find the value of $X^2 + y^2/X^2 - y^2$
- 4/5 of 5/7 of a number is greater than 4/9 of 2/5 of the same number by 8. What is half of the number?
- Simplify: 108 ÷ 36 of 1/4 + 2/5 × 3(1/4)
- Simplify: 1) 12.05 × 5.4 ÷ 0.6 2) 0.6 × 0.6 + 0.6 ÷ 0.6
- Find the value of x in $8.5 - \{5(1/2) - (7(1/2) + 2.8 \div x)\} \times 4.25 \div (0.2)^2 = 306$
- If a/b = 3/4 and 8a + 5b = 22, then find the value of a
- Find the value of (1-1/3) (1-1/4) (1-1/5) …… (1-1/100).
- Simplify: 99(48/49) × 245.
- A board 7 ft. 9 inches is divided into equal parts. What is the length of each part?
- A tin of oil was 4/5 full. When 6 bottles of oil were taken out and four bottles of oil were poured into it, it was ¾ full. How many bottles of oil can the tin contain?
- Find the value of $75983 \times 75983 - 45983 \times 45983 = 30000$
- Find the value of (i) $343 \times 343 \times 343 - 113 \times 113 \times 113$
- (ii) $343 \times 343 + 343 \times 113 + 113 \times 113$
- Two pens and three pencils cost Rs.86. Four pens and a pencil cost Rs.112. Find the cost of a pen and that of a pencil what mathematical operation should come at the place of *? In the equation 2 ? 6 – 12 ÷ 4+2 = 11

Section – C

- Simplify: b- [b – (a+ b) – {b – (b-a-b)} + 2a
- what value will replace the question mark in the following equation?
- 4(1/2) + 3(1/6) +? + 2(1/3) = 13(2/5)
- If 2x + 2y = 34 and x+ y /y = 13/8, then find the value of 5y + 7x
- If 2x + 3y + z = 55, x +z – y = 4 and y- x + z = 12, then what are the value of x, y and z

- A third of Arun's marks in mathematics exceeds a half of his marks in English by 30.If he got 240 marks in the two subjects together, how many marks did he get in english?
- A man divides Rs. 8600 among 5 sons, 4 daughters and 2 nephews. If each daughter receives four times as much as each nephew, and each son receives five times as muchas each nephew, how much does each daughter receive?
- A train starts full of passengers. At the first station, it drops one –third of the passengers and takes 280 more. At the second station, it drops one – half of the new total and takes 12 more. On arriving at the third station, it is found to have 248passengers. Find the number of passengers in the beginning.
- Arun and sajal are friends. Each has some money. If Arun gives Rs. 30 to sajal, then sajal will have twice the money left with arun. but, if sajal gives Rs.10 to Arun, then Arun will have thrice as much as is left with sajal. How much money does each have?
- Income of a company doubles after every one year. If the initial income was Rs. 4lakhs, what would be the income after 5 years1/4 of a tank holds 135 litres of water. What part of the tank is full if it contains 180 litres of water?

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References:

R.S. Agarwal, Quantitative Aptitude for Competitive Examination, S. Chand and Company, New Delhi