

MPM1DI Exponents, Algebra and Equations

1. Simplify and then evaluate:

$$\begin{aligned} \text{a) } & \frac{8^{-5} \times 8^{22}}{(8^{-3})^{-5}} \\ & = \frac{8^{17}}{8^{15}} \\ & = 8^2 \\ & = 64 \end{aligned}$$

$$\begin{aligned} \text{b) } & \frac{(-3x^3y^3)^4}{-9x^7y^{10}}, \quad x = -1, y = -2 \\ & = \frac{(-3)^4(x^3)^4(y^3)^4}{-9x^7y^{10}} \\ & = \frac{81x^{12}y^{12}}{-9x^7y^{10}} \\ & = \frac{81}{-9} \cdot \frac{x^{12}}{x^7} \cdot \frac{y^{12}}{y^{10}} \\ & = -9x^5y^2 \end{aligned}$$

$$\begin{aligned} \text{if } x = -1, y = -2 & \\ & = -9(-1)^5(-2)^2 \\ & = -9(-1)(4) \\ & = 36 \end{aligned}$$

2. Simplify:

$$\begin{aligned} \text{a) } & \frac{(3x^{-7}y)(-4xy^5)}{6x^{-6}y^2} \\ & = \frac{-12x^{-6}y^6}{6x^{-6}y^2} \\ & = -2x^0y^4 \text{ or } -2y^4 \\ & = -2y^4 \end{aligned}$$

$$\begin{aligned} \text{b) } & 5y^2(4y^2 - 6y) - 3y(2y^3 - 7y) \\ & = 20y^4 - 30y^3 - 6y^4 + 21y^2 \\ & = 14y^4 - 30y^3 + 21y^2 \end{aligned}$$

$$\begin{aligned} \text{c) } & \left(\frac{15x^3y^2 - 25x^2y^3}{5x^2y^2} \right) - \left(\frac{16x - 4y}{4} \right) \\ & = \left(\frac{15x^3y^2}{5x^2y^2} - \frac{25x^2y^3}{5x^2y^2} \right) - \left(\frac{16x}{4} - \frac{4y}{4} \right) \\ & = (3x^1y^0 - 5x^0y^1) - (4x - y) \\ & = 3x - 5y - 4x + y \\ & = -x - 4y \end{aligned}$$

3. Solve the following equations:

$$\begin{aligned} \text{a) } & 3(x-1) - 2(5x+2) = 0 \\ & 3x - 3 - 10x - 4 = 0 \\ & -7x - 7 = 0 \\ & \frac{-7x}{-7} = \frac{7}{-7} \\ & x = -1 \end{aligned}$$

$$\begin{aligned} \text{b) } & 0.4(0.3x - 2) = 0.4 - 0.08x \\ & 0.12x - 0.8 = 0.4 - 0.08x \\ & 0.12x + 0.08x = 0.4 + 0.8 \\ & \frac{0.2x}{0.2} = \frac{1.2 \times 10}{0.2 \times 10} \\ & x = \frac{12}{2} \\ & x = 6 \end{aligned}$$

$$\begin{aligned} \text{c) } & x^1 \cdot x^1 + x(3x) + 5(2) = 74, \quad x > 0 \\ & x^2 + 3x^2 + 10 = 74 \\ & 4x^2 + 10 = 74 \\ & \frac{4x^2}{4} = \frac{64}{4} \\ & \sqrt{x^2} = \sqrt{16} \\ & x = 4 \end{aligned}$$

4. Solve the following equation and check your answer.

$$\frac{4x-2}{5} + \frac{1}{10} = \frac{3x+7}{2} - 1$$

$$\frac{10}{10} \left(\frac{4x-2}{5} \right) + \frac{10}{10} \left(\frac{1}{10} \right) = \frac{5}{10} \left(\frac{3x+7}{2} \right) - \frac{10}{10} (1)$$

$$2(4x-2) + 1(1) = 5(3x+7) - 10(1)$$

$$8x - 4 + 1 = 15x + 35 - 10$$

$$8x - 3 = 15x + 25$$

$$8x - 15x = 25 + 3$$

$$\frac{-7x}{-7} = \frac{28}{-7}$$

$$x = -4$$

check:

$$LS = \frac{4x-2}{5} + \frac{1}{10}$$

$$= \frac{4(-4)-2}{5} + \frac{1}{10}$$

$$= \frac{-16-2}{5} + \frac{1}{10}$$

$$= \frac{-18}{5} + \frac{1}{10}$$

$$= \frac{-36}{10} + \frac{1}{10}$$

$$= -\frac{35}{10}$$

$$= -\frac{7}{2}$$

$$RS = \frac{3x+7}{2} - 1$$

$$= \frac{3(-4)+7}{2} - 1$$

$$= \frac{-12+7}{2} - \frac{2}{2}$$

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

$$= -\frac{7}{2}$$

$\therefore LS = RS$

$\therefore x = -4$ is the solution