

SHARP

Algebraic Expressions Investigation Memo

Grade 9 Maths

Let's explore like and unlike terms.

1. Based on the above, answer the following questions:

a) What do you notice about the first sum ($5X$) and the second sum ($5X^2$)?

The sums give different answers.

b) Using the same technique, say whether the following are the same or different:

i) $4X$ and $4X^3$ - different

$$4X = 16 \text{ and } 4X^3 = 256$$

ii) $-2X^2$ and $-2X^3$ - different




$$-2X^2 = -32 \text{ and } -2X^3 = -128$$

iii) $6X$ and $6X$ - same

$$6X = 24 \text{ and } 6X = 24$$

iv) $7X$ and $7(X)$ - same

$$7X = 28 \text{ and } 7(X) = 28$$

c) Store the value of 3 into Y (so press   ). Now, say whether the following are the same or different:

i) $4XY$ and $4YX$ - same

$$4XY = 48 \text{ and } 4YX = 48$$

ii) $4X^2$ and $4Y^2$ - different

$$4X^2 = 64 \text{ and } 4Y^2 = 36$$

iii) $5XY$ and $XY \times 5$ - same

$$5XY = 60 \text{ and } XY \times 5 = 60$$

iv) $4X^2Y^2$ and $(2XY)^2$ - same

$$4X^2Y^2 = 576 \text{ and } (2XY)^2 = 576$$

d) From your results in questions b) and c), answer the following questions:

i) Which examples gave the same results?

For question b) questions iii) and iv).

For question c) questions i) iii) and iv).

ii) Why do you think that they gave the same results?

Because although they were written in slightly different ways, they meant the same thing. The two examples were alike in terms of coefficients and variables and exponents.

iii) Which examples gave different results?

From question b) questions i) and ii)

From question c) question ii).

iv) Why do you think that the results were different?

The variables or exponents on the variable were not the same, and that changed the answer.

v) Do you think the results would have changed if we had substituted different numbers or values into X and Y?

No, because the variable and exponents would still have been different.

vi) From the above, how do we then define “like” terms?

Like terms are terms that have the same variables with the same exponents on them.

vii) From the above, how do we define “unlike” terms?

Unlike terms are terms that either do not have the same variables, or have the same variables but have different exponents.

2. Use the values saved into A, B and C to answer the following questions:

a) What process did the calculator follow to reach the value of 137?

The calculator substituted (or exchanged) the value saved in each letter into the place of the letter and then did the calculation following the BODMAS rules.

b) For each of the following find the answer using your calculator to substitute.

i) $4A + 7B - 3C$

= -25

ii) $(5B - 3C)^2 - 10A$

= 921

iii) $10C^2 + 9B^2 - 8A^2$

= 137

iv) $AB + BC + AC$

= -22

c) Now we are given that $x = -2$, $y = 6$ and $z = 0$, use your knowledge of substitution (and show all the steps) to find the answers to following expressions.

$$\begin{aligned} \text{i)} \quad & 3x + 7y - 2z \\ & = 3(-2) + 7(6) - 2(0) \\ & = -6 + 42 - 0 \\ & = 36 \end{aligned}$$

$$\begin{aligned} \text{ii)} \quad & 4xyz \\ & = 4(-2)(6)(0) \\ & = 0 \end{aligned}$$

$$\begin{aligned} \text{iii)} \quad & x^2 + y^2 + z^2 \\ & = (-2)^2 + (6)^2 + (0)^2 \\ & = 4 + 36 + 0 \\ & = 40 \end{aligned}$$

$$\begin{aligned} \text{iv)} \quad & xy + 7xz - 10yz \\ & = (-2)(6) + 7(-2)(0) - 10(6)(0) \\ & = -12 + 0 - 0 \\ & = -12 \end{aligned}$$

3. For each of the following, multiply the terms together.

$$\begin{aligned} \text{a)} \quad & 3x(4x + 5y) \\ & = 3x \times 4x + 3x \times 5y \\ & = 12x^2 + 15xy \end{aligned}$$

$$\begin{aligned} \text{b)} \quad & 5x(6x^2 - 8xy^2) \\ & = 5x \times 6x^2 - 5x \times 8xy^2 \\ & = 30x^3 - 40x^2y^2 \end{aligned}$$

$$\begin{aligned} \text{c)} \quad & (7x + 6y)(9xy - 6xy^2) \\ & = 7x \times 9xy + 7x \times (-6xy^2) + 6y \times 9xy + 6y \times (-6xy^2) \\ & = 63x^2y - 42x^2y^2 + 54xy^2 - 36xy^3 \end{aligned}$$

$$\begin{aligned} \text{d)} \quad & (2abc - 3ab^2c^2)(4abc - 5ab^3c) \\ & = 2abc \times 4abc + 2abc \times (-5ab^3c) - 3ab^2c^2 \times 4abc - 3ab^2c^2 \times (-5ab^3c) \\ & = 8a^2b^2c^2 - 10a^2b^4c^2 - 12a^2b^3c^3 + 15a^2b^5c^3 \end{aligned}$$

e) $4x(5x - 6y + 7z) + 6x(7x + 8y - 9z)$

$$= 4x \times 5x + 4x \times (-6y) + 4x \times 7z + 6x \times 7x + 6x \times 8y + 6x \times (-9z)$$

$$= 20x^2 - 24xy + 28xz + 42x^2 + 48xy - 54xz$$

$$= 62x^2 + 24xy - 26xz$$

4. For each of the following, simplify:

a) $(16x^2 - 4x) \div 4x$

$$= 16x^2 \div 4x - 4x \div 4x$$

$$= 4x - 1$$

c) $(81x^2 + 72y^2) \div 9$

$$= 81x^2 \div 9 + 72y^2 \div 9$$

$$= 9x^2 + 8y^2$$

b) $(49a^2bc + 56ab^2c - 28abc^2) \div 7abc$

$$= 49a^2bc \div 7abc + 56ab^2c \div 7abc - 28abc^2 \div 7abc$$

$$= 7a + 8b - 4c$$

d) $(36a^3b^2c - 48a^2bc + 24abc) \div 6abc$

$$= 36a^3b^2c \div 6abc - 48a^2bc \div 6abc + 24abc \div 6abc$$

$$= 6a^2b - 8a + 4$$

e) $(125c^3d^2 - 100c^2d^2 + 50cd^2 - 25d^2) \div 5d^2$

$$= 125c^3d^2 \div 5d^2 - 100c^2d^2 \div 5d^2 + 50cd^2 \div 5d^2 - 25d^2 \div 5d^2$$

$$= 25c^3 - 20c^2 + 10c - 5$$