GRADE 8

ALGEBRA EXPRESSIONS: EXAMPLES AND EXERCISES

ALGEBRA AS A LANGUAGE



Class Activity 1

Write an expression for each of the following:

- Add 3 to 5 ……
- 10 more than 8 ……
- The sum of 3 and 4 ……
- Deduct 8 from 12 ……
- From 8 subtract 15 ……
- 3 less than 7 ……
- The difference between 10 and 12 ……

Class Activity 2

Write an expression for each of the following:

- Add m to 5 ……
- 10 more than p ……
- The sum of a and b ……

Class Activity 3

Write an expression for each of the following:

- Deduct 8 from x ……
- From 8 subtract x ……
- 3 less than p ……

Class Activity 4

Write an expression for each of the following:

- multiply a and b ……
- 9 times p ……
- The product of f and g ……

Class Activity 5

Write an expression for each of the following:

- divide r by 5 ……
- The quotient if 8 is divided by y ……

WRITING ALGEBRAIC EXPRESSIONS

EXAMPLE 1

Multiply a number by 2, and add 1 to the answer

1.1) Represent this information in a flow diagram.

1.2) Represent this information as an algebraic expression.

EXAMPLE 2



Multiply a number by 6, and subtract 10 from the answer

2.1) Represent this information in a flow diagram.

2.2) Represent this information as an algebraic expression.

EXAMPLE 3



Divide a number by 4, and add 8 to the answer

3.1) Represent this information in a flow diagram.

3.2) Represent this information as an algebraic expression.

EXAMPLE 4



Subtract 4 from a number and then multiply the answer by 8

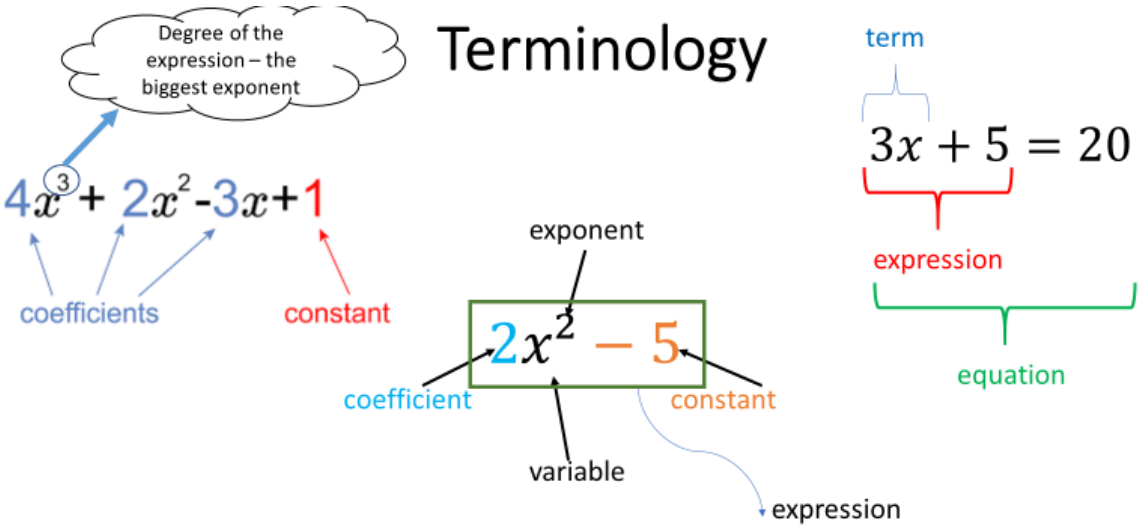
4.1) Represent this information in a flow diagram.

4.2) Represent this information as an algebraic expression.

EXERCISE 1

Copy and complete the following table:

Words	Flow diagram	Algebraic Expression
Multiply a number by two and add six to the answer	→ $\times 2$ → $+6$ →	
Add three to a number and then multiply the answer by two		
	→ $\times 5$ → -1 →	
		$7 + 4 \times x$
		$10 - 5x$



TERMS OF AN EXPRESSION

Class Activity 6

How many terms in the expression?

- $5x$ ……
- $5x + 10$ ……
- $5x + 2y - 10$ ……
- $5 \times x + 10$ ……
- $\frac{5+x}{10}$ ……

Names of expressions:

1 term = **mo**nomial

2 terms = **bi**nomial

3 terms = **tri**nomial

Class Activity 7

How many terms in the expressions below?

	Amount of terms	Name of expression
❑ $2x + 3y - 5$	……..	……
❑ $8b \times 5c$	……..	……
❑ $\frac{3+c}{d}$	……..	……
❑ $8k + (5 + m)$	……..	……

EXERCISE 2

Determine the number of terms:

1. $2x + 3y$
2. $4a \times 3b$
3. $10 \times 3a + 5c$
4. $5x - 3y + 6 \times 2$
5. $\frac{3k+2}{6}$
6. $\frac{3k+2}{6} + 8$
7. $3(x + 3y - 4)$
8. $2(x + 1) - 4$
9. $2(x + 1) \div 4$
10. $\frac{7}{m} - 4(m + 2) - m^3$
11. $5 - 4y + 3(y + 4)$
12. $5 \times 2 - 4y + 3(y + 4)$
13. $(x + 3)(x - 3)$

WRITING EXPRESSION IN DESCENDING/ ASCENDING POWERS

Class Activity 8

Descending power of x

$2x + 4 + 8x^2$

Ascending power of x

$2x + 4 + 8x^2$

Example 5	**Example 6**
$7y^2 - y + 6$	$y^2 + (y^4 + k) - 3$
7.1 How many terms in this algebraic expression?	6.1 How many terms in this algebraic expression?
7.2 Give the constant term in this algebraic expression.	6.2 Give the constant term in this algebraic expression.
7.3 What is the coefficient of y in the second term?	6.3 What is the coefficient of y in the first term?
7.4 What is the exponent of y in the first term?	6.4 What is the exponent of y in the second term?
7.5 What is the degree of the expression?	6.5 What is the degree of the expression?

Example 7 $-5m^2 - \frac{m}{2}$ 7.1 How many terms in this algebraic expression? 7.2 Give the constant term in this algebraic expression. 7.3 What is the coefficient of m in the second term? 7.4 What is the exponent of m in the second term? 7.5 What is the degree of the expression?	**Example 8** $-6x^5 - 4x^7 + 3x^2 - x + 8x^6 + 10$ 8.1 Rewrite the expression in order of descending powers of x? 8.2 How many terms are in there in the above expression? 8.3 What is the coefficient of the x term? 8.4 What is the degree of the polynomial? 8.5 What is the difference between the constant term and 2?
Example 9 $2x^2y - 5$ 9.1 Identify the variables in the above expression. 9.2 Give the constant term in the above expression. 9.3 What is the coefficient of y? 9.4 What is the coefficient of x^2?	

EXERCISE 3

(i) Write in descending order of x .
(ii) Determine the degree of the expression.
(iii) Determine the coefficient of x.

1. $2x+x^3 - 1$
2. $\frac{x}{2} + x^3$
3. $x + 3 - 6x^2$
4. $5x - 3 + x^5$
5. $x + 3$

ALGEBRA:
ADDITION AND SUBTRACTION

SIMPLIFICATION OF ALGEBRAIC EXPRESSIONS

We may only add like terms.

Class Activity 9

Simplify the following expressions:

1) $3 + 3 + 3 + 3$	4) $a + a + a + a + b + b + b$
2) $a + a + a + a$	5) $3 + 3 + 3 + 3^2 + 3^2$
3) $3 + 3 + 3 + 3 + 5 + 5$	6) $a + a + a^2 + a^2 + a^2$

ADDING & SUBTRACTING LIKE TERMS

Example 1

1.1) $2a - 7a + 1a$	1.3) $2ab + 4ab - ab$
1.2) $3p^2 - 6p^2 + p^2$	1.4) $2x^2y + 5yx^2 - x^2y$

Example 2



2.1) $2a + 5a + 2$	2.7) $12xy - 5yx + xy$
2.2) $5b - b$	2.8) $5b - (-b)$
2.3) $x + x + x$	2.9) $3p^2 - (+4p^2) + p^2$
2.4) $a^2 + a + 3a^2 + 4a$	2.10) $ba^2 + 3ab + 3a^2b - 4ab$
2.5) $3a + 6b - 5a + 2b$	2.11) $2x^2 + 3x - x - 5x^2$
2.6) $5p + 4 - 3m - p - 1 - 2m$	

EXERCISE 4

Simplify:

1) $2c + 3c$
2) $-4m + 5m$
3) $x + x + 3x$
4) $4y + 3y - y$
5) $6k - 2k - k$
6) $4a - 3a - a$
7) $3ab + 2ab$
8) $3ab + 2ba$
9) $2a - b + (-4a) + 5b$
10) $-6x - (-y) - 4x - 10y$
11) $-2k - 3 + 4 + 2k$
12) $2a + 8 - 4 - 5a - 4b$
13) $-3k - 2k - (-4p) - 10pk$
14) $7a - 5b + 2c - 4a - 32b - 3c$

EXERCISE 5

Simplify:

1) $2a^3 - a^3$
2) $-4m^2 + (-6m^2)$
3) $-7b + 5a^2 - 2a^2 + 3b$
4) $5x^2 - 2x - 7x^2 + 2x$
5) $-2x^2 + 3x - x - x^2$
6) $-2p^2 - p - 1 - 1 + 2 + 4p + 2p^2$
7) $-4a^2 - 3a - 1 - 7a - 4 + 7a$
8) $3x^3 - 5x^3 + 9x$
9) $7m^7 + 7m^7$
10) $3ab - 2bc - 4ba + 5bc$
11) $-2ab - 3bc - 4bc + 7ba$

EXERCISE 6

Simplify:

1) $2a + 8 - 4 - 2a - 4$
2) $2a + 8a - 4a^2 - 2a - 4a^2$
3) $c^2 - 1 - c + 3c^2 - 4 - 2c - 7c^2 - 3$
4) $-3x^3 - x^3 + 4x^3$
5) $-3a - 2a + 4b - 10b$
6) $-2t^2 - t - 2 + 2 + t + 2t^2$
7) $-6x + y - 4x - 10y$
8) $4m + 5m - 9m$
9) $3ab - 2a + 8ba - 5a + 2b - 4a - 3$
10) $7r - 7$
11) $-4a^2b - 3ab^2 - 1 - 7ba^2 - 4 + 7ab^2$
12) $-3k - 2k + 5k^2$
13) $2x^2y + xy + 3xy - x^2y$
14) $-6x + y - 4x + 10xy - y$

EXERCISE 7

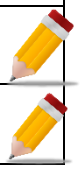
Simplify:

1) $-4m + 5m - 9m + 2m$
2) $2a + 8 - 4 - 5a - 4b$
3) $2a - b - 4a + 5b$
4) $-6x + y - 4x - 10y$
5) $7a - 5b + 2c - 4a - 32b - 3c$
6) $-3k - 2k + 4p - 10pk$
7) $-2x^2 + 3x - x - x^2$
8) $-2p^2 - p - 1 - 1 + 2 + 4p + 2p^2$
9) $3ab - 2bc - 4ba + 5bc$
10) $-3x^3 - 6x^3 - 2x$
11) $5x^2 - 2x - 7x^2 + 2x$
12) $-3k - 2k + 5k^2$
13) $-4a^2 - 3a - 1 - 7a - 4 + 7a$
14) $-6x + y - 4x + 10xy - y$
15) $-2ab - 3bc - 4bc + 7ba$

Example 3

Simplify

3.1.1) $2x^2 + 6x + 8 + (-3x^2) - 4x + 10$
3.1.2) If $x = 2$ determine the numerical value of the expression above
3.2) Add $5x^2 - 8x + 2$ to $3x^2 + 4x - 10$
3.3) Subtract $5x^2 - 8x + 2$ from $3x^2 + 4x - 10$



EXERCISE 8

Add:

1) $2x^2 - 5x$; $x^2 + 4$; $-7x + 8$

2) $^2 - 3p + 1$; $-2p^2 + 7$; $-5p - 2$

3) $2b^2 - 4b + 1$; $-b^2 - b$; $2b^2 + 2b - 8$

EXERCISE 9

1) Subtract $2x^2 - 5x \ from \ x^2 + 4$

2) Subtract $-2p + 7 \ from \ -5p - 2$

3) From $2b^2 - 4b + 1 \ \ subtract \ \ -b^2 - b$