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Algebraic Expressions 7th Grade Worksheets

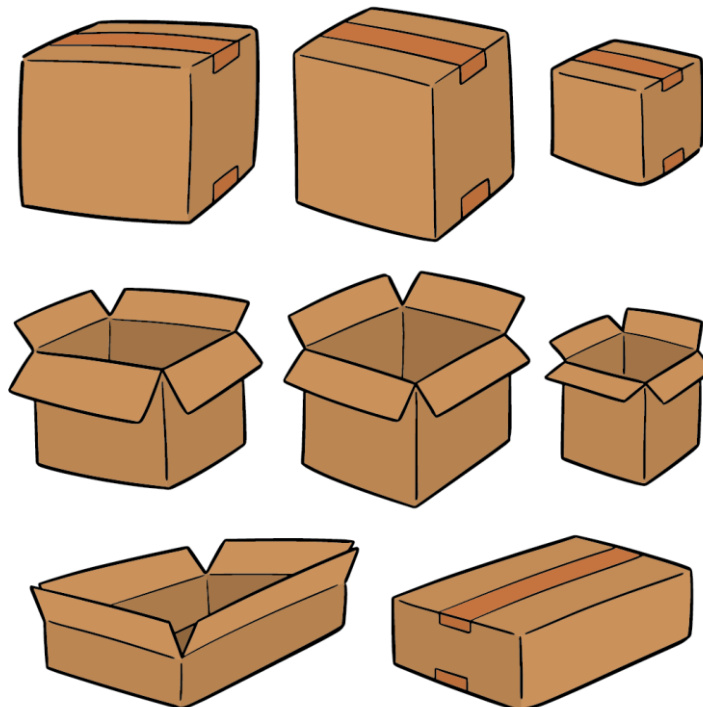
1) Identify the algebraic expressions among the following:

- a) $2x + y$
- b) 3
- c) $x = 2$
- d) $2x - 5$

2) Convert the following phrases into expressions:

- a) One-fourth of the sum of x and 2 times y
- b) The number m multiplied by itself.
- c) Product of the numbers x and y is subtracted from 10.

3) Benjamin had some boxes of apples, each with 8 apples. If he gave away 10 apples to his friend then write an algebraic expression for the number of apples he currently have with him. Assume the number of boxes to be x .



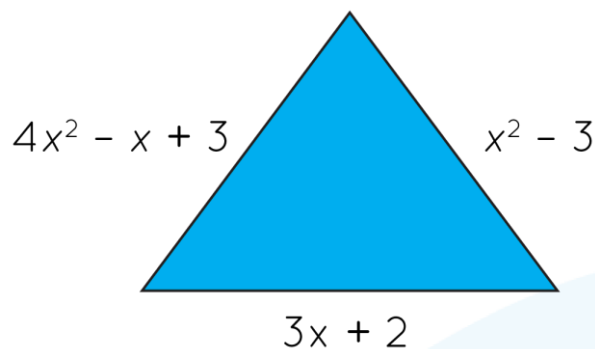
4) Classify the following as monomials, binomials, and trinomials.

- a) $x + 3y - z$
- b) $x^2y + 3x - 2$

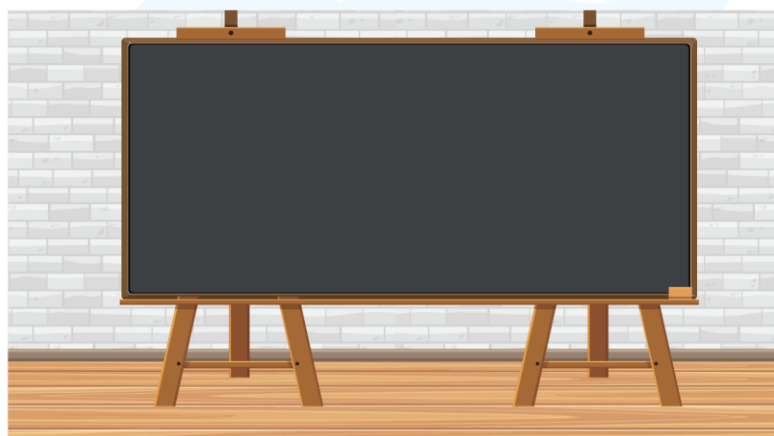
c) $\frac{x}{2} - 6$

5) Simplified form of $2(x+4) + 3(x-5) - 2y =$ _____.

6) Find the perimeter of the following triangle as an algebraic expression:



7) The area of a rectangle is represented by an algebraic expression $3x^3 - 5x + 7$ square units. Calculate its area when $x = 3$.



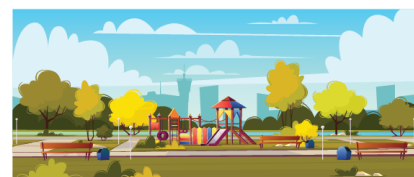
8) The distance from Emma's house to her school is $(3x^3 + 2x^2y + 2)$ units and the distance from her school to park is $(-2x^3 + 5xy - 7)$. Then find the distance from her house to the park.



$3x^3 + 2x^2y + 2$



$-2x^3 + 5xy - 7$



9) Add the following algebraic expressions:

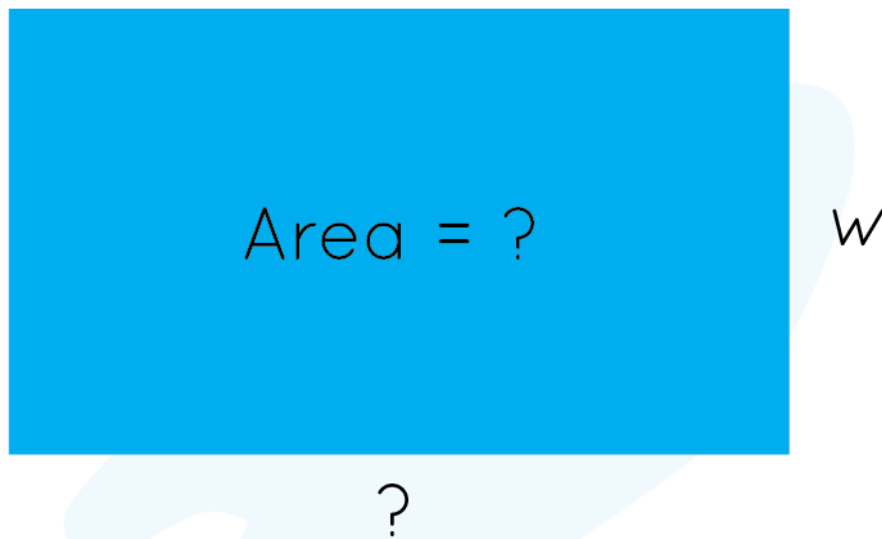
$12x - 10y + 5xy + 23$, $17 + 5x - 10y - 8xy$, and $-8xy$

10) The length of a rectangle is 5 units more than half of its width. Then

a) What is its length as an algebraic expression?

b) Find an expression for its area.

Assume its width to be w .



11) Find the difference $9p^2 - [-3q^2 - \{-7p^2 + 8pq - 9q\}] = \underline{\hspace{2cm}}$

12) Amelia earns \$ x annually. If she spends \$ y per month. Then find an algebraic expression that represents her savings in 2 years.



13) Factor the following using GCF.

a) $5h - 25$

b) $1.4x - 7$

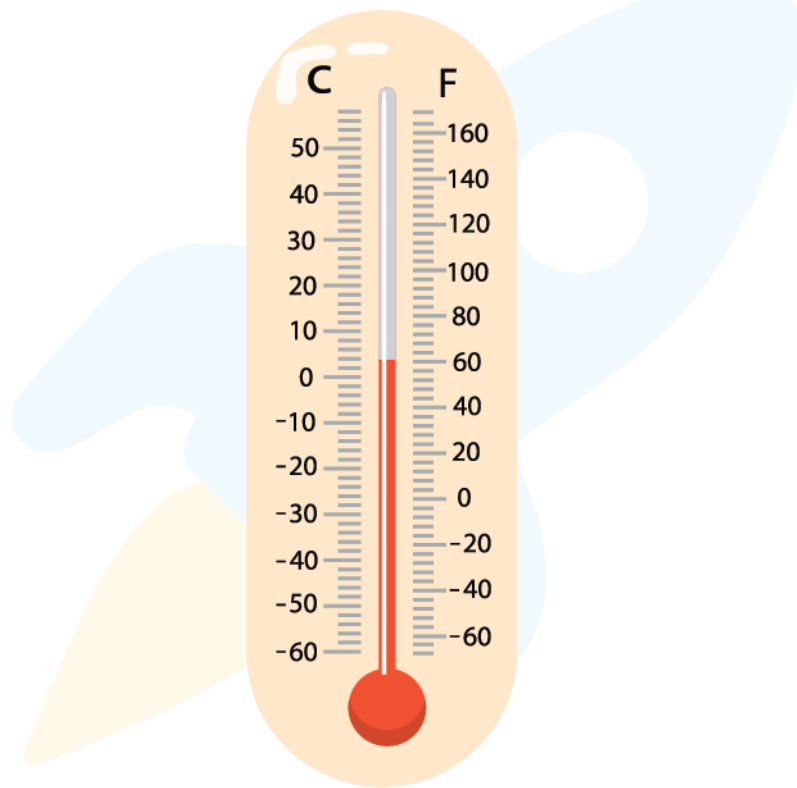
14) Factor the coefficient of the variable.

a) $-\frac{1}{2}x + 8$

b) $-\frac{1}{8}x - \frac{3}{2}y$

15) The expression used to convert Fahrenheit to Celsius is

$C = (F - 32) \times \frac{5}{9}$, where F and C represents the temperatures in Fahrenheit and Celsius respectively. Then find the temperature that corresponds to $15^\circ F$ in terms of Celsius.



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ANSWERS

1) a) Options a), b) and d)	2) a) $\frac{1(x+2y)}{4}$ b) m^2 c) $10-xy$	3) $8x - 10$
4) a) Trinomial b) Trinomial c) Binomial	5) $5x-2y-7$	6) $5x^2 + 2x + 2$
7) 73 square units	8) $x^3 + 2x^2y + 5xy - 5$	9) $17x - 20y - 11xy + 40$
10) $0.5w^2+5w$	11) $2p^2 + 3q^2 + 8pq - 9q$	12) $2x-24y$ dollars
13) a) $5(h-5)$ b) $1.4(x-5)$	14) a) $-\frac{(x-16)}{2}$ b) $-\frac{(x+12)}{8}$	15) -9.4 celsius

SOLUTIONS

Complete solution/explanation



1) Identify the algebraic expressions among the following:

- a) $2x + y$
- b) 3
- c) $x = 2$
- d) $2x - 5$

Solution:

Among the given options, the ones with “=” symbol are equations. The rest are expressions.

So the algebraic expressions are a), b) and d).

2) Convert the following phrases into expressions:

- a) One-fourth of the sum of x and 2 times y
- b) The number m multiplied by itself.
- c) Product of the numbers x and y is subtracted from 10.

Solution:

a) $\frac{1}{4}(x + 2y)$

b) $m \times m = m^2$

c) $10 - xy$

3) Benjamin had some boxes of apples, each with 8 apples. If he gave away 10 apples to his friend then write an algebraic expression for the number of apples he currently have with him.

Assume the number of boxes to be x .

Solution:

The number of boxes = x .

So the total number of apples = $8x$.

Since he gave away 10 apples, the current number of apples = $8x - 10$.

4) Classify the following as monomials, binomials, and trinomials.

a) $x + 3y - z$

b) $x^2y + 3x - 2$

c) $\frac{x}{2} - 6$

Solution:

The algebraic expressions are called monomials if they have one term, binomials if they have two terms, and trinomials if they have three terms. Hence:

a) $x + 3y - z$ is a trinomial.

b) $x^2y + 3x - 2$ is a trinomial.

c) $\frac{x}{2} - 6$ is a binomial.

5) Simplified form of $2(x + 4) + 3(x - 5) - 2y = \text{-----}$.

Solution:

We distribute 2 and 3 and combine the like terms.

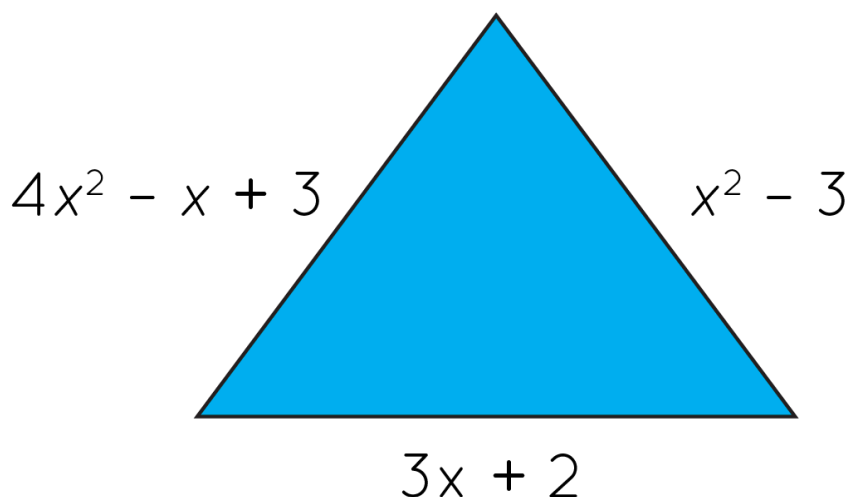
$$2(x + 4) + 3(x - 5) - 2y$$

$$= 2x + 8 + 3x - 15 - 2y$$

$$= (2x + 3x) - 2y + (8 - 15)$$

$$= 5x - 2y - 7$$

6) Find the perimeter of the following triangle as an algebraic expression:



Solution:

We will add all the sides and simplify it by combining like terms.

$$\begin{aligned} \text{Perimeter} &= (4x^2 - x + 3) + (x^2 - 3) + (3x + 2) \\ &= (4x^2 + x^2) + (-x + 3x) + (3 - 3 + 2) \\ &= 5x^2 + 2x + 2 \end{aligned}$$

So the perimeter of the triangle = $5x^2 + 2x + 2$ units.

7) The area of a rectangle is represented by an algebraic expression $3x^3 - 5x + 7$ square units. Calculate its area when $x = 3$.

Solution:

We will just substitute $x = 3$ in the given algebraic expression to find the required area

$$\begin{aligned} &3x^3 - 5x + 7 \\ &= 3(3)^3 - 5(3) + 7 \\ &= 3(27) - 15 + 7 \\ &= 81 - 15 + 7 \\ &= 73 \end{aligned}$$

So the required area = 73 square units.

8) The distance from Emma's house to her school is $(3x^3 + 2x^2y + 2)$ units and the distance from her school to park is $(-2x^3 + 5xy - 7)$. Then find the distance from her house to the park.



Solution:

We will add the given two distances to get the total distance.

$$\begin{aligned} &(3x^3 + 2x^2y + 2) + (-2x^3 + 5xy - 1) \\ &= (3x^3 - 2x^3) + 2x^2y + 5xy + (2 - 1) \\ &= x^3 + 2x^2y + 5xy - 5 \end{aligned}$$

So the total distance from Emma's home to the park =

$$x^3 + 2x^2y + 5xy - 5 \text{ units.}$$

9) Add the following algebraic expressions:

$12x - 10y + 5xy + 23$, $17 + 5x - 10y - 8xy$, and $-8xy$

Solution:

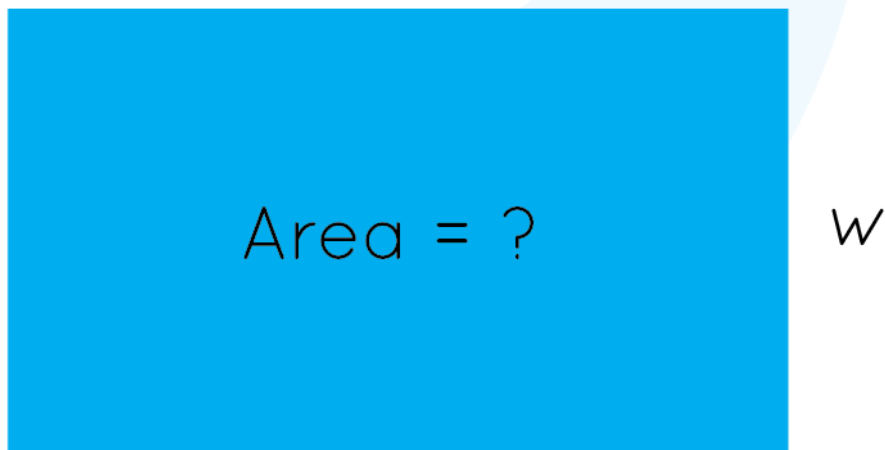
$$\begin{aligned} & (12x - 10y + 5xy + 23) + (17 + 5x - 10y - 8xy) + (-8xy) \\ &= (12x + 5x) + (-10y - 10y) + (5xy - 8xy - 8xy) + (23 + 17) \\ &= 17x - 20y - 11xy + 40 \end{aligned} \quad 10)$$

10) The length of a rectangle is 5 units more than half of its width. Then

a) What is its length as an algebraic expression?

b) Find an expression for its area.

Assume its width to be w .



Solution:

a) The length of the rectangle is, $l = \frac{1}{2}w + 5$ units.

b) The area of the rectangle is,

$$\text{Area} = \text{Length} \times \text{Width}$$

$$= \left(\frac{1}{2}w + 5 \right) w$$

$$= \frac{1}{2}w^2 + 5w$$

So the area = $\frac{1}{2}w^2 + 5w$ square units.

11) Find the difference $9p^2 - \left[-3q^2 - \{ -7p^2 + 8pq - 9q \} \right] = \underline{\hspace{2cm}}$

Solution:

$$\begin{aligned}
 & 9p^2 - \left[-3q^2 - \{-7p^2 + 8pq - 9q\} \right] \\
 & = 9p^2 - \left[-3q^2 + 7p^2 - 8pq + 9q \right] \\
 & = 9p^2 + 3q^2 - 7p^2 + 8pq - 9q \\
 & = 2p^2 + 3q^2 + 8pq - 9q
 \end{aligned}$$

12) Amelia earns \$ x annually. If she spends \$ y per month. Then find an algebraic expression that represents her savings in 2 years.

Solution:

Amelia's annual salary = \$ x

The amount that she spends monthly = \$ y

So the amount that she spends annually = \$ $12y$

Her savings in one year = \$ $(x - 12y)$

Her savings in 2 years = $2(x - 12y) = (2x - 24y)$ dollars.

13) Factor the following using GCF.

a) $5h - 25$

b) $1.4x - 7$

Solution:

a) $5h - 25 = 5(h - 5)$

b) $1.4x - 7 = 1.4(x - 5)$

14) Factor the coefficient of the variable.

a) $-\frac{1}{2}x + 8$

b) $-\frac{1}{8}x - \frac{3}{2}y$

Solution:

a) $-\frac{1}{2}x + 8 = -\frac{1}{2}(x - 16)$

b) $-\frac{1}{8}x - \frac{3}{2}y = -\frac{1}{8}(x + 12)$

15) The expression used to convert Fahrenheit to Celsius is

$$C = (F - 32) \times \frac{5}{9}, \text{ where } F \text{ and } C \text{ represents the temperatures in}$$

Fahrenheit and Celsius respectively. Then find the temperature that corresponds to $15^{\circ}F$ in terms of Celsius.

Solution:

We just substitute $F=15$ in the given equation to find the temperature in terms of Celsius.

$$C = (15 - 32) \times \frac{5}{9}$$

$$C = -17 \times \frac{5}{9}$$

$$C \approx -9.4$$

So the required temperature is $-9.4^{\circ}C$.

