

2.2 Add and Subtract Polynomials

1. Vocabulary

a) Term: an expression formed by the **product** of a number and/or variable.

ex: $5x$, $7x^2y^3z$, 8 , x

constant ↙

$5x$

↙ ↘

coefficient

variable

A term with
no variable
is called a
constant.

b) Polynomial: an algebraic expression consisting of one or more terms. Terms are separated by additions or subtractions.

ex: $5x^2$	1 term: monomial
$2x - 1$	2 terms: binomial
$\underline{4x^2} + \underline{7x} + \underline{8}$	3 terms: trinomial

Anything larger can just be called a polynomial

Quiz yourself!

Q1 The result of $(3x + 4x)$ is $7x^2$.

T/F FALSE (= $7x$) 

Q2 Using tiles, you can remove two zero pairs to simplify $3x + (-2x)$.

T/F TRUE 

Q3 Like terms have the same variable and the same exponent.

T/F TRUE 

Q4 $4x - 5 + (-2x) - 3$ simplifies to $2x - 2$.

T/F $4x - 5 - 2x - 3$ FALSE
 $= 2x - 8$

Q5 A polynomial with one term is a monomial.

A polynomial with two terms is a binomial.

A polynomial with three terms is a trinomial.

Recall: Like terms have the same variable(s) with the same exponent.

To simplify polynomials, combine like terms by adding or subtracting their coefficients. The variable and its exponent stays the same.

Ex.1: Simplify

a) $2x + 6y - 8 + x - 6y - 3$

$$= 2x + x + 6y - 6y - 8 - 3$$

$$= 3x - 11$$

b) $6x^3 + (-2) - (-3x) - 3x^2 + x + 4x^3 + 6$ *Simplify signs!*

$$= 6x^3 - 2 + 3x - 3x^2 + x + 4x^3 + 6$$

$$= 6x^3 + 4x^3 - 3x^2 + 3x + x - 2 + 6$$

$$= 10x^3 - 3x^2 + 4x + 4$$

c) $-a^2 + ab - b^2 - 2b^2 + ab^2 - 4a^2 + 5ab$

$$= -a^2 - 4a^2 - b^2 - 2b^2 + ab + 5ab + ab^2$$

$$= -5a^2 - 3b^2 + 6ab + ab^2$$

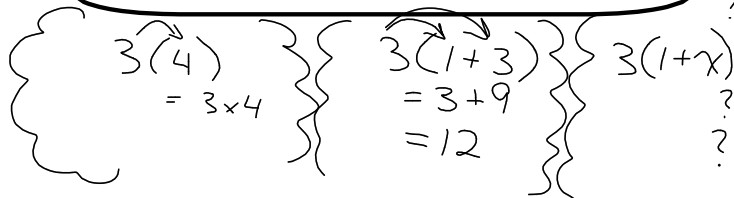
Ex. 2 Simplify.

a) $|(5x - 3) + (4x + 6)|$

$$= 5x - 3 + 4x + 6$$

$$= 9x + 3$$

Adding a bracket means that you are adding each term inside the bracket.



b) $|(3m^2 - 8m + 2) + (5m - 1 + 2m^2)|$

$$= 3m^2 - 8m + 2 + 5m - 1 + 2m^2$$

$$= 5m^2 - 3m + 1$$

c) $|(5x^2 + 3xy - 2y^2) + (3x^2 - 7xy - y^2)|$

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

$$= 8x^2 - 4xy - 3y^2$$

To subtract an expression in brackets, remove the brackets and subtract **each** term.

Ex. 3 Simplify.

a) $(3x - 7) - (7x + 2)$

$$= 3x - 7 - 7x - 2$$

$$= -4x - 9$$

b) $(5x^2 + 8x - 2) - (4x^2 - 3)$

$$= 5x^2 + 8x - 2 - 4x^2 + 3$$

$$= 1x^2 + 8x + 1$$



$$= x^2 + 8x + 1$$

c) $(4x^2 - x + 7) - (2x^2 - 8x + 5)$

$$= 4x^2 - x + 7 - 2x^2 + 8x - 5$$

$$= 2x^2 + 7x + 2$$

Ex. 7 Simplify, THEN evaluate when $m = -2$

$(m - 3) + (6 - 5m + m^2) - (2m^2 + 4m + 1) - (6m^2 - 1)$

$$= m - 3 + 6 - 5m + m^2 - 2m^2 - 4m - 1 - 6m^2 + 1$$

$$= m^2 - 2m^2 - 6m^2 + m - 5m - 4m - 3 + 6 - 1 + 1$$

$$= -7m^2 - 8m + 3$$

Sub $m = -2$

$$= -7(-2)^2 - 8(-2) + 3$$

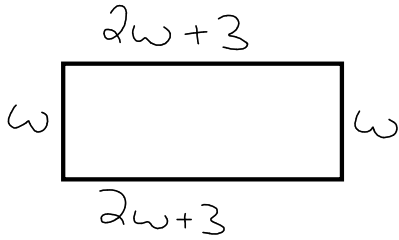
$$= -7(4) + 16 + 3$$

$$= -28 + 19$$

$$= -9$$

Example 4: John is building a dock at his cottage. The length of the dock is twice the width, plus 3 meters.

a) Find a simplified algebraic expression for the perimeter of the dock.



Perimeter = side 1 + side 2 + ...

$$P = \underline{2w+3} + \underline{w} + \underline{2w+3} + \underline{w}$$

$$= 6w + 6$$

b) If the width of the dock is 4 m, find the perimeter of the dock.

$$w = 4$$

$$P = 6w + 6$$

Sub $w = 4$

$$P = 6(4) + 6$$

$$= 30$$

Ex. 5 Colin added a monomial, a binomial and a trinomial. The result was a binomial. What could the three polynomials he added together be?

$$(x) + (2x + 1) + (2x - 1 - 3b)$$

$$= 5x - 3b$$

Needs to cancel

Guiding Questions:

- If a monomial and binomial have like terms, how many terms will be in their sum?
- If a monomial and binomial do not have any like terms, how many terms will be in their sum?
- How can the sum of a binomial and a trinomial produce a binomial?

Ex. 6 Determine the missing numbers to make the following true:

$$(3x^2 + \underline{5}x - 7) + (4x^2 + (-3)x) + (\underline{-2}) = \underline{7}x^2 + 2x - 9$$