3.4 Communicate With Algebra
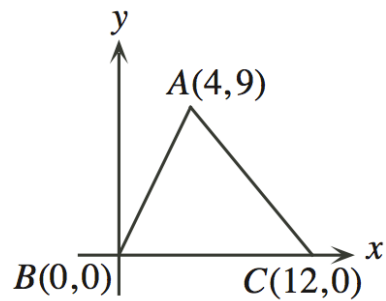
Brain Teaser:

In the diagram, what is the area of the triangle?

$A_{triangle} = \dfrac{(base)(height)}{2}$

$= \dfrac{(12)(9)}{2}$

$= 54 \text{ units}^2$

Part 1: DO IT NOW

A hockey team gets 2 points for a win, 1 point for a tie, and 0 points for a loss.

a) Write an equation for determining the amount of points a team has:

$$\text{Points} = 2(\text{wins}) + 1(\text{ties}) + 0(\text{losses})$$

b) If the Penguins win 54 games, tie 8, and lose 20; how many points will they get?

$$\text{Points} = 2(54) + 1(8) + 0(20)$$

$$\text{Points} = 108 + 8 + 0$$

$$\text{Points} = 116$$

Part 2: Terms

Term: an expression formed by the **product** of numbers and or variables.

Example of a term:

$$4x^2$$

The number in front of the variable is called the coefficient.

Identify the coefficient and the variable for the expression $4x^2$:

Coefficient: __4__

Variable: __x^2__

Practice with Terms

Identify the coefficient and the variable of each term:

a) Jim earns $7 per hour at his part-time job. If he works for x hours, his earnings, in dollars, are $7x$.

b) The depth, in meters, of a falling stone in a well after t seconds is $-4.9t^2$

c) The area of a triangle with base b and height h is $\frac{1}{2}bh$

d) The area of a square with side length k is k^2

Expression	Coefficient	Variable	Comments
$7x$	7	x	
$-4.9t^2$	-4.9	t^2	The negative sign is included with the coefficient
$\frac{1}{2}bh$	$\frac{1}{2}$	bh	The variable can consist of more than one letter or symbol
k^2	1	k^2	When the coefficient is not shown, it is 1.

Part 3: Polynomials

Polynomial: an algebraic expression consisting of one or more terms connected by addition or subtraction operators

Example of a polynomial:

$$3x^2 + 2x$$

A polynomial can be classified by the number of terms it has:

A _MONOMIAL_ is a polynomial with only   one term .

A _BINOMIAL_ is a polynomial with   two terms .

A _TRINOMIAL_ is a polynomial with   three terms .

A _4-TERM POLYNOMIAL_ is a polynomial with   four terms .

Classify each polynomial by the number of terms it has:

Polynomial	Number of Terms	Type of Polynomial
$3x^2 + 2x$	2	BINOMIAL
$-2m$	1	MONOMIAL
$4x^2 - 3xy + y^2$	3	TRINOMIAL
$a - 2b + c - 3$	4	4-TERM POLYNOMIAL

Hint: You can find the number of terms by looking for the addition and subtraction operators that separate the terms

Part 4: Degree of a Term

Degree of a term: the sum of the <u>exponents</u> on the variables in a term

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Example of determining the degree of a term:

Term: $5x\,y^2\ ^3$

Sum of Exponents on Variables: $2 + 3 = 5$

Degree of Term: 5

Find the degree of each term by adding the exponents of the variables:

Term	Sum of Exponents	Degree of Term
x^2	2	2
$3y^4$	4	4
$0.7uv$	$1+1=2$	2
$-2a^2b$	$2+1=3$	3
-5	0	0

Note:
- a variable that appears to have no exponent actually has an exponent of __1__
- a constant has a degree of __0__

Part 5: Degree of a Polynomial

The ***degree of a polynomial*** is equal to the degree of the highest-degree term in the polynomial

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Example:

Polynomial: $\overset{6}{3x^2y^4} + \overset{4}{11x^2y^2} + \overset{5}{y^5}$

Highest-Degree Term: $3x^2y^4$

Degree of highest-degree term: $2+4=6$

Degree of polynomial: 6

Find the degree of each polynomial:

Polynomial	Term with Highest Degree	Degree of Term with Highest Degree	Degree of Polynomial
$x + 3$	x	1	1
$5x^2 - 2x$	$5x^2$	2	2
$3y^3 + 0.2y - 1$	$3y^3$	3	3
$7x^2y^4 + x^6y$	x^6y	$6+1 = 7$	7

Part 6: Apply Our Knowledge!

Mr. Jensen works part time as a golf instructor. He earns $125 for the season, plus $20 for each children`s lesson and $30 for each adult lesson that he gives.

a) Write an expression that describes Mr. Jensen's total earnings for the season. Identify the variables and what they stand for.

$$Earnings = 20 \, (child \; lessons) + 30 (adult \; lessons) + 125$$

b) If Mr. Jensen gave **8 children's** lessons and **6 adult lessons**, what were his total earnings?

$$Earnings = 20(8) + 30(6) + 125$$

$$Earnings = 160 + 180 + 125$$

$$Earnings = \$465$$

Review of Terms

__TERM_____ : an expression formed by the product of numbers and/or variables

__POLYNOMIAL_____ : an algebraic expression consisting of one or more terms connected by addition or subtraction signs.

__DEGREE OF TERM_____ : the sum of the exponents on the variables in a term

__DEGREE OF POLYNOMIAL__ : equal to the degree of the highest-degree term in a polynomial