

MATH 1010 ~ Intermediate Algebra

Chapter 1 Fundamentals of Algebra

## Section 1.4, 1.5 : Algebraic Expressions

Objectives:

- \* Identify the terms and coefficients of algebraic expressions.
- \* Simplify algebraic expressions.
- \* Evaluate algebraic expressions by substituting values for variables.
- \* Translate verbal phrases into algebraic expressions, and visa versa.

$$12b - [9 - 7(5b - 6)] = ?? \quad \text{if } b = -3$$

coeff of  $xy^2$   
is 3  
4 terms

## ALGEBRAIC EXPRESSIONS

$$\underline{3}xy^2 - \underline{7}x + \underline{8}y - \underline{5}$$

coeff of  $y$ : 8

const: -5  
Variables:  $x$  &  $y$   
Coeff of  $x$ : -7

Vocabulary:

variable: an unknown quantity; most common name is  $x$ .

constant: a fixed number.

ex  $2x + 7$   
var. is  $x$   
const. is 7  
coeff. is 2

expression: like a fragment of a sentence (missing verb);

collection of algebraic terms ex  
algebraic expression →

$$2x^2 - 4x + 1$$

there are variables involved

coefficient: the number multiplied by variable

terms separated by addition/subtraction

ex  $(2x^2) + (4x) + (1)$

ex  $4 - 5w$

3 terms

① EXAMPLE: Simplify these.

expressions

① simplify

② evaluate

expressions

$$\text{a) } \underbrace{-5x + 4} + \underbrace{-7x + 9} = -12x + 13$$

13 const.  
-12 coeff. of x

$$\text{b) } \underbrace{3xy^2} - x^2 + y - \underbrace{5xy^2} + 2 \\ = -2xy^2 - x^2 + y + 2$$

$$\text{c) } \underbrace{3a(a^2 - 5)} + \underbrace{a^2(a - 1)} = 3a^3 - 15a + a^3 - a^2 \\ = 4a^3 - a^2 - 15a$$

$$\text{d) } 4[3(2y-1) + 5(2y^2 - y + 1)] = 4[6y - 3 + 10y^2 - 5y + 5] \\ = 4[10y^2 + y + 2] \\ = 40y^2 + 4y + 8$$

② EXAMPLE: Evaluate these expressions when  $x = 6$  and  $y = -3$ .

$$\text{a) } \frac{3}{2}x - 2 = \frac{3}{2}(\cancel{6}) - 2 = 9 - 2 = 7$$

$$\text{b) } \frac{2x + y}{x} = \frac{2(6) + -3}{6} = \frac{12 - 3}{6} = \frac{\cancel{12}^3}{\cancel{6}_2} = \frac{3}{2}$$

$$\text{c) } y^2 - x = (-3)^2 - 6 = 9 - 6 = 3$$

## CONSTRUCTING EXPRESSIONS

See box on page 41 of text for suggestions

③ EXAMPLE: Write an expression for each of these.  
(Even problems from text)

a) (#6) Fifteen decreased by 3 times a number,  $n$ .

$$15 - 3n$$

b) (#8) The product of a number,  $y$  and 10 is decreased by 35.

$$10y - 35$$

c) (#22) The absolute value of the quotient of a number,  $n$  and 4.

↑ numerator    ↑ den.     $\left| \frac{n}{4} \right|$

d) (#46) The amount of money (in cents) represented by  $m$  dimes and  $q$  quarters.

dime is 10¢  
qtr is 25¢

$$10m + 25q$$

④ MORE EXAMPLES: Write an expression for these.

a) (#52) The amount of water in  $q$  quarts of a food product that is 65% water.

$0.65q$  qts of water      65% of  $q$

b) (#62) The sum of two consecutive even integers, the first of which is  $2n$ .

~~ex~~ 2, 4, 6, 8, ...

$$2n + (2n + 2) = 4n + 2$$

c) (#68) Express the area of this triangle.

$$\begin{aligned} A &= \frac{1}{2} h \left( \frac{4}{5} h + 12 \right) \\ &= \frac{1}{2} \left( \frac{4}{5} \right) h^2 + 6h \\ &= \frac{2}{5} h^2 + 6h \end{aligned}$$

