[ ] → like ( )

→ simplify everything in numerator, everything in denom, then put it together

EXAMPLE 3 Using Brackets and Fraction Bars as Grouping Symbols

Simplify each expression.

a) $2[8+3(6+5)]$

$2[8+3\cdot 11]$ Inside ( ) or [ ] follow PEMDAS

$2[8+33]$

$2[41] = 2\cdot 41 = \boxed{82}$

$33 + 8 = 41$

Now you try!

b) $\frac{4(5+3)+3}{2(3)-1} = \frac{4(8)+3}{6-1} = \frac{32+3}{5} = \frac{35}{5} = \boxed{7}$

c) $7[(3^2-1)+4]$

$7[(9-1)+4]$

$7[8+4]$

$7[12] = 7\cdot 12 = \boxed{84}$

d) $\frac{9(14-4)-2}{4+3\cdot 6} = \frac{9(10)-2}{4+18} = \frac{90-2}{22} = \frac{88}{22} = \boxed{4}$

$22\overline{)88}$ 4, -88, 0

1.3 Variables, Expressions, and Equations

Objectives:

- Evaluate algebraic expressions, given values for the variables
- Translate word phrases to algebraic expressions
- Identify solutions of equations
- Identify solutions of equations from a set of numbers
- Distinguish between expressions and equations

Variable : a symbol for a value we don't know yet (often a letter)

Algebraic expression : numbers joined with variables by +, −, ×, ÷, etc

Ex. $2n+3$ Ex. $4x^2-5y$

EXAMPLE 1 Evaluating Expressions : Substitute a value for the variable, then simplify

Find the value of each algebraic expression for $x = 5$.

a) $8x$

$= 8\cdot x$

$= 8\cdot 5$

$= \boxed{40}$

b) $3x^2 - 4$

$= 3\cdot 5^2 - 4$

$= 3\cdot 25 - 4$

$= 75 - 4$

$= \boxed{71}$

PEMDAS

EXAMPLE 2 Evaluating Expressions

Find the value of each expression for $x = 5$ and $y = 3$.

a) $2x + 7y$

$= 2 \cdot 5 + 7 \cdot 3$

$= 10 + 21$

$= \boxed{31}$

P
E
MD
AS

b) $\frac{9x-8y}{2x-y} = \frac{9 \cdot 5 - 8 \cdot 3}{2 \cdot 5 - 3}$

$= \frac{45-24}{10-3}$

$= \frac{21}{7} = \boxed{3}$

c) $x^2 - 2y^2$

$= 5^2 - 2 \cdot 3^2$

$= 25 - 2 \cdot 9$

$= 25 - 18 = \boxed{7}$

P
E
MD
AS

EXAMPLE 4 Deciding Whether a Number Is a Solution of an Equation

Decide whether the given number is a solution of the equation.

Solution: value of a variable to make an equation true

(a) $5p + 1 = 36$; 7 — Test $p = 7$

$5 \cdot 7 + 1 = 36$

$35 + 1 = 36$ True! $p = 7$ is the solution

$36 = 36$

(b) $9m - 6 = 32$; 4 — Test $m = 4$

$9 \cdot 4 - 6 = 32$

$36 - 6 = 32$

$30 \neq 32 \Rightarrow$ False; $m = 4$ is NOT the solution

c) $4x - 3 = 8$; $\frac{11}{4}$ Test $x = \frac{11}{4}$

$\frac{4}{1} \cdot \frac{11}{4} - 3 = 8$

$11 - 3 = 8$

$8 = 8$ True: $x = \frac{11}{4}$ is the solution

EXAMPLE 5 Finding a Solution from a Given Set

Write each word statement as an equation. Use x as the variable. Then find all solutions of the equation from the set

$\{0, 2, 4, 6, 8, 10\}$.

sum: result of adding

(a) The sum of a number and four is six.

use n = $\square$

$n + 4 = 6$

$0+4 \neq 6$
$2+4 = 6$ ✓ $\Rightarrow$ $\boxed{n = 2}$
$4+4 \neq 6$

(b) Nine more than five times a number is 49.

$5n + 9 = 49$

$5 \cdot 0 + 9 \neq 49$
$5 \cdot 2 + 9 \neq 49$
$5 \cdot 4 + 9 \neq 49$
$5 \cdot 6 + 9 \neq 49$
$\boxed{5 \cdot 8 + 9 = 49}$ $\boxed{n = 8}$

(c) The sum of a number and 12 is equal to four times the number.

$n + 12 = 4n$

$0 + 12 \neq 4 \cdot 0$
$2 + 12 \neq 4 \cdot 2$
$\boxed{4 + 12 = 4 \cdot 4}$
$\boxed{n = 4}$

↻ equals ↻ more like a phrase

EXAMPLE 6 Distinguishing between Equations and Expressions

Decide whether each of the following is an *equation* or an *expression*.

a) $2x - 5y$ expression

b) $2x = 5y$ equation

c) $2x + 5 = 6$ equation

d) $2x + 5 - 6$ expression