

(1-1) Words and Expressions

Numerical Expressions contain a combination of numbers and operations

Equation – number sentence with an equal sign

Expression – does not have an equal sign

Most expressions translate in the same order they are written:

Three plus eight --- $3 + 8$

Four divided by 7 --- $\frac{4}{7}$

Add	Subtract	Multiply	Divide
Sum Total In all combined	Minus Difference How much more?	Product Times Same cost for each	Quotient Divided by Equally shared

◆ use fraction line to say “divided by”

twenty-three divided by eight ----- $\frac{23}{8}$

◆ use “•” or () to show multiplication

five times 21----- $5 \cdot 21$ or $5(21)$

“Flip phrases” – the order is switched

Two LESS THAN 5 --- **5-2**

8 SUBTRACTED FROM 78 --- **78-8**

5 DIVIDED INTO 35 --- $\frac{35}{5}$

12 GREATER THAN 23 --- **23+12**

5 times the sum (use parenthesis) **of 8 and 3**

$$5(8+3)$$

4 more than (flip) **the product of 3 and 9**

$$(3 \times 9) + 4$$

(1-1) Order of Operations pt. 2

- SHOW ALL STEPS
- ONE CHANGE PER STEP

Graciously **E**xcuse **M**y **D**ear **A**unt **S**ally

Grouping Symbols **E**xponents **M**ultiply **D**ivide **A**dd **S**ubtract

- 1) Do what is in the grouping symbols first-working inside out
- 2) Exponents next
- 3) Multiplication and/or division – work from left to right
- 4) Addition and/or subtraction – work from left to right

- Underline the part you are doing
- Write the answer underneath
- Bring down everything else

$$\begin{array}{r} (15 \div 3) + 9 \\ \hline 5 \quad + 9 \\ \hline 14 \end{array}$$

$$\begin{array}{r} 6 \div 3 \times 8 \\ \hline 2 \times 8 \\ \hline 16 \end{array}$$

$$\begin{array}{r}
 5(\underline{5-3}) \times 2 \\
 \underline{5 \times 2} \quad \times 2 \\
 \underline{10 \quad \times 2} \\
 20
 \end{array}$$

6(4) ---- means “6 times 4”

6•4 ---- means “6 times 4”

Evaluate – means to find the value or solve

When you have a fraction, and there is/are operations in the numerator and/or denominator, you have to treat the numerator and denominator as separate parts (follow order of operations for each). Then divide.

$$\frac{13 + 5}{3^2}$$

$$\frac{18}{9}$$

$$2$$

- Try these:**
1. $12 - 3(4)$
 2. $3[(20 - 7) + 1]$
 3. $\frac{34 + 18}{27 - 14}$
 4. $(4^2 + 4) \div 4$
 5. $6[1 + (5 - 2)^2]$
 6. $5^2 - 4[3 + 1]$

1-2 Variable and Expressions

Variables – letters that represent numbers

- must be lower case

Expressions – phrases that contain at least one operation

mathematical/numerical expression

$$6+23(4+8)$$

algebraic expression

$$3ab - c$$

Evaluate – find the value of

Coefficient – the number you are multiplying by a variable (6x-“6” is the numerical coefficient

$\frac{x}{2}$ $\frac{1}{2}$ is the numerical coefficient ; with x the coefficients is 1)

Substitution – replacing a variable with a number

Open Sentence – number sentence with a variable

Equation – number sentence with an equal sign

Solution – value that makes a number sentence true

$$3a = 21 \quad \text{the solution is } a = 7$$

Consecutive – right in a row, in order. 1,2,3 are consecutive numbers. 2,4,6 are consecutive EVEN #.

“is” means “=”

Comma vs no comma – comma separates different parts of an expression. No comma, no pause

The sum of a number n and a number b, times 15

$$15(n + b)$$

The sum of a number n **and** a number b times 15

$$n + 15b$$

*****NUMBER ALWAYS GOES BEFORE
VARIABLE FOR MULTIPLICATION WITH
NO SYMBOLS BETWEEN*****

Examples:

1. A number t increased by 9 $t + 9$
2. sixteen less than a number x $x - 16$
3. the quotient of a number x decreased by twelve,
and forty $\frac{x-12}{40}$
4. the product of sixteen **and** the sum of five and a
number r $16(5 + r)$
5. sixteen less than a number s $s - 16$

Try These:

1. The product of eight and a number b
2. A number q divided by sixteen
3. A number k less twenty-seven
4. the quotient when a number d is divided by eleven
5. the difference when a number a is subtracted from b
6. A number r divided by the difference of 83 and 10
7. the sum of a number y and 10, divided by the difference of x and 5
8. the value of cents in y nickels (cents = no decimal)
9. The greatest of three consecutive even numbers following the even number x
($x+2$, $x+4$, $x+6$)
10. the **product** of 18 less than a number b **and** the sum of 22 and 45

1. $8b$

2. $\frac{q}{16}$

3. $k - 27$

4. $\frac{d}{11}$

5. $b - a$

6. $\frac{r}{83-10}$

7. $\frac{y+10}{x-5}$

8. $5y$

9. $x + 6$

10. $(b-18)(22+45)$

1-2 Variables and Expressions with Substitution

STEP 1 – REPLACE variables with numbers (no solving yet!!) **REWRITE THE PROBLEM!!!**

STEP 2, 3... solve using order of operations

EXAMPLES: $m = 4, n = 3, p = 2$

	$7m - 3p$	$2p + p^2$	$(m - p)n$	$(m - p)^3$
Step 1 →	$7(4) - 3(2)$	$2(2) + 2^2$	$(4 - 2)3$	$(4 - 2)^3$
	$28 - 6$	$4 + 4$	$(2)3$	2^3
	22	8	6	8

When showing multiplication, the coefficient is **ALWAYS** written before the variable with no symbols in between: $6a, 12x, 8b$

NOT → $a6 \quad 6 \square a \quad b8 \quad x12$

Try These:

Evaluate each expression if $a = 7 \quad b = 6 \quad c = 4 \quad d = 3$

7. $3a + 4b - 2d$

8. $abc \div 21$

9. $(3b + 2c)d$

10. $3b + (2cd)$

11. cd^2

12. $(cd)^2$

(1-2) More...Evaluating and Writing Expressions

Inequality – a number sentence containing

$>$ (*greater than*)

\geq (*greater than or equal to*)

$<$ (*less than*)

\leq (*less than or equal to*)

Write an equation or inequality for the verbal phrase:

Twice a number x is less than or equal to 14

$$2x \leq 14$$

Thirty-five is sixteen more than a number t

$$35 = t + 16$$

“is” means “=”

The product of 5 and the difference of r and 10 is

greater than 40

$$5(r - 10) > 40$$

The sum of a number and 3 times the number is

greater than or equal to 26

$$x + 3 \geq 26$$

Try these:

- 1) The sum of a number m and six is greater than 15
- 2) A number decreased on one is less than 5
- 3) Twice a number, divided by 3, is fifteen
- 4) The product of a and the difference of 6 minus 1 is equal to a
- 5) The sum of z and 17 is less than the difference of 21 minus z
- 6) Two increased by 8 times a number is equal to the number divided by 5
- 7) The product of y and ten, decreased by 6
- 8) The difference when the product of a number and 3 is subtracted from 30 is greater than or equal to the number increased by 10

$$1. \quad m + 6 > 15$$

$$2. \quad x - 1 < 5$$

$$3. \quad \frac{2x}{3} = 15$$

$$4. \quad a(6 - 1) = a$$

$$5. \quad z + 17 < 21 - z$$

$$6. \quad 2 + 8x = \frac{x}{5}$$

$$7. \quad 10y - 6$$

$$8. \quad 30 - 3x \geq x + 10$$

(1-3) Properties

Commutative Property (+) and (x) – the order in which numbers are added or multiplied does not change the sum or product. **Numbers move**

$$a + b = b + a$$
$$7 + 4 = 4 + 7$$

$$ab = ba$$
$$7(2) = 2(7)$$

Associative Property (+) and (x) – the way in which numbers are grouped does not change the sum or product. **Parenthesis move, numbers don't move**

$$(a + b) + c = a + (b + c)$$
$$(3 + 1) + 6 = 3 + (1 + 6)$$

$$(ab)c = a(bc)$$
$$(4 \cdot 2)6 = 4(2 \cdot 6)$$

Additive Identity – when **0 is added** to any number, the sum is the number.

$$a + 0 = a$$

$$8 + 0 = 8$$

$$0 + 8 = 8$$

Multiplicative Identity – when any number is **multiplied by 1**, the product is the number.

$$a \cdot 1 = a$$

$$4 \cdot 1 = 4$$

$$1 \cdot 4 = 4$$

Multiplicative Property of Zero When any number is **multiplied by 0**, the product is 0.

$$a \cdot 0 = 0$$

$$6 \cdot 0 = 0$$

$$0 \cdot 6 = 0$$

Distributive Property – to multiply a sum or difference by a number, multiply each term inside the parentheses by the number outside the parentheses.

$$a(b + c) = ab + ac$$

$$a(b - c) = ab - ac$$

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

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

Name the Property

1. $7.6 + 0 = 0 + 7.6$

2. $(19 \cdot 3) 6.2 = 19 (3 \cdot 6.2)$

3. $5 (9 + 8) = (5 \cdot 9) + (5 \cdot 8)$

4. $6 + (1.2 + 0.8) = (1.2 + 0.8) + 6$

True or False

A) $3.84 + (6.73 + 3.77) + 2.1 = 3.84 + 10.5 + 2.1$

B) $(3 + 12) 6 = (3 \cdot 6) + (12 \cdot 6)$

C) $9 (15.1 - 6.3) = (9 \cdot 15.1) + (9 \cdot 6.3)$

Complete. Name the property.

A) $6 \cdot \square = 7 \cdot 6$

B) $5 (4 + 2) = (5 \cdot 4) + (\square \cdot 2)$

C) $(3 \cdot \square) 9 = 3 (8 \cdot 9)$

(1-3) Properties – part II

Coefficient – the number by which you are multiplying a variable. $6x$ (6 is the coefficient)

$$\frac{3x}{4} \quad \frac{3}{4} \text{ is the coefficient}$$

To simplify expressions:

When multiplying two terms with coefficients and variables, multiply the numbers, keep the variable the same.

$$\begin{array}{ccc} 3x(4) & 4(4)(t) & 21n(0) \\ 12x & 16t & 0 \end{array}$$

Addition with numbers and variables:

$$3 + x + 9 \quad x + 9 + 6 \quad 2x + 6 + 5x + 8$$

You can **add the numbers**, you can **add the coefficients of the variables**, but you can't combine the two.

$$\begin{array}{ccc} 3 + x + 9 & x + 9 + 6 & 2x + 6 + 5x + 8 \\ x + 12 & x + 15 & 7x + 14 \end{array}$$

Math Manners: when you have terms with variables and terms without, your final answer should have the variable + number (in that order)

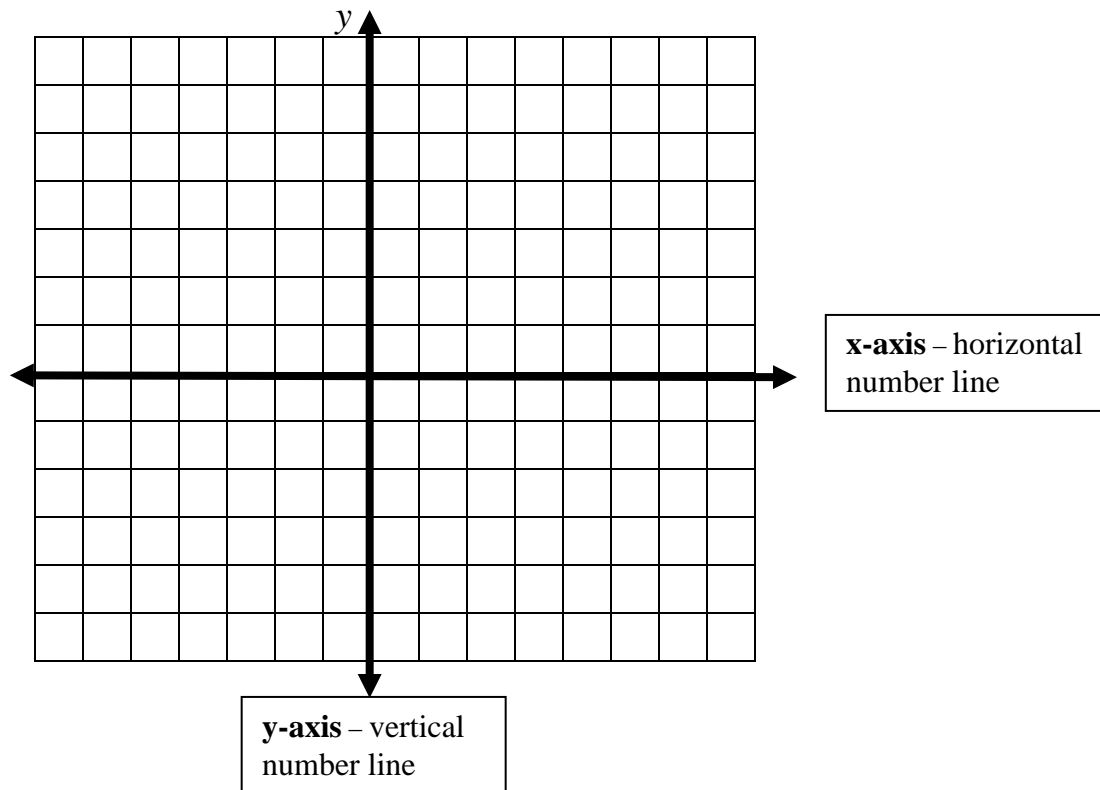
$$\begin{array}{cc} 3 + x + 9 & x + 9 + 6 \\ x + 12 \text{ (not } 12 + x) & x + 15 \text{ (not } 15 + x) \end{array}$$

(1-4) Coordinate Plane

◆ Personal tutor introduction

A coordinate plane is a mathematical system used to identify locations.

- ▶ On a **coordinate plane**, two number lines are drawn perpendicular to each other.
- ▶ The **horizontal** number line is the **x-axis**.
- ▶ The **vertical** number line is the **y-axis**.



- ▶ An **ordered pair** is a set of two numbers (x,y) where the x is the x -coordinate and the y is the y -coordinate.

Origin - point at which the x and y axis intersect. The ordered pair for the origin is $(0,0)$

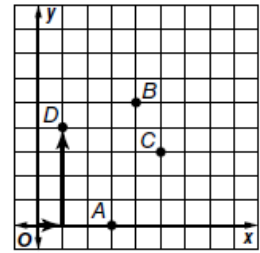
Write the ordered pair that names point D .

Step 1 Start at the origin.

Step 2 Move right on the x -axis to find the x -coordinate.

Step 3 Move up the y -axis to find the y -coordinate.

The ordered pair for point D is $(1, 4)$.

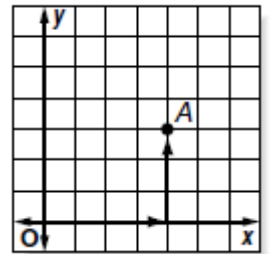


Graph an ordered pair.

Step 1 Start at the origin.

Step 2 Since the x -coordinate is 4, move 4 units to the right.

Step 3 Since the y -coordinate is 3, move 3 units up. Draw a dot.



Ordered pairs must have parenthesis and a comma between the points.

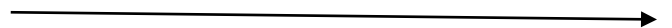
A relation is a set of ordered pairs.

You must use $\{ \}$ to show the **set**

A relation can also be shown in a table or graph.

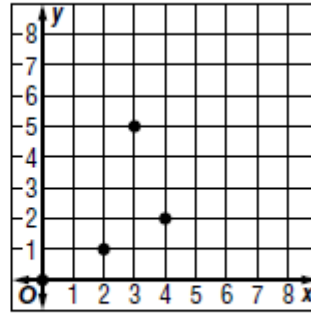
The set of x -coordinates is the domain.

The set of y -coordinates is the range.



Express the relation $\{(0,0), (2,1), (4,2), (3,5)\}$ as a table and as a graph. Then determine the domain and range.

x	y
0	0
2	1
4	2
3	5



The domain is $\{0, 2, 4, 3\}$, and the range is $\{0, 1, 2, 5\}$.

(1-5) Words, Equations, Tables, and Graphs

- ◆ Function – relationship where one thing depends on another
- ◆ Function Rule – gives the operation performed on the input
- ◆ Function Table – a way to organize the input numbers, output numbers, and the function rule
- ◆ Domain – the set of input values (shown inside “set” symbols)
- ◆ Range – the set of output values (shown inside “set” symbols)
- ◆ Equation – a mathematical sentence stating that two quantities are equal.

Functions are often written as equations with two variables—one to represent the input and one to represent the output.

Complete the following function table; then state the domain and range.

The team scores 6 points for each touchdown.

Input (x)	Rule: $6x$	(Output) y
1	$6(1)$	6
2	$6(2)$	12
3	$6(3)$	18
4	$6(4)$	24

Domain: $\{1,2,3,4\}$

Range: $\{6,12,18,24\}$

Suppose a student movie ticket costs \$4. Using two variables, write an equation to show the relationship between the number of tickets and the total cost.

Equation: ???

Make a function table that shows the total cost for 1,2,3 and 4 tickets. Then identify the domain and range.

x	Rule:	y

Domain: _____

Range: _____

Page 35 #1-7