# FOR STUDENTS WHO HAVE COMPLETED 6th GRADE MIF
# (Students entering Pre-Algebra or Math 7))

Name: _____

Date: _____ Period: _____

Dear Parent/Guardian & Pre-Algebra/Math 7 Student,

Next school year, your child will be taking Pre-Algebra or Math 7 and will need core prerequisite skills from 6th grade math upon the start of school. You will find a review packet of skills which each child is expected to know upon the start of the year. Students will be given a test (no calculators) on this information during the second week of the school year. Teachers will go over the answers from the packet during the first week of school and minimal direct instruction will occur on these concepts, as they are a review from Pre-Algebra. Students may seek additional help during recap to ask questions.

**Topics from 6th Grade Math to be tested during the second week of school.**

**1.1** Problem Solving

**1.2** Word and Expressions

**1.3** Variables and Expressions

**1.4** Properties of Numbers

**1.5** Ordered Pairs and Relations

**1.6** Equations & Graphs

You may also access the following websites to assist your child.

www.purplemath.com
www.math.com
www.khanacademy.com

It is recommended that Pre-Algebra students who score between 60 and 100 continue with the current course. Pre-Algebra students who score below a 60 may consider taking Math 7, as it is imperative for future successes in math to have essential, baseline skills.

## PLEASE SHOW ALL WORK. STUDENTS SHOULD NOT USE A CALCULATOR FOR THIS PACKET.

Have a great summer.

The PAMS Math Department

# 1.1 Problem Solving

## Four-Step Plan:

The following four steps can be used to solve any math problem.

1. **Understand:** Get a general understanding of the problem
2. **Plan:** Make a plan to solve the problem and estimate the solution

   Select and apply the appropriate strategy is significant in solving problems.

   **a.** Look for a Pattern
   **b.** Make a Table
   **c.** Guess, Check, and Revise
   **d.** Work Backwards
3. **Solve**: Use your plan to solve the problem
4. **Check**: Check the reasonableness of your solution

**Example:** According to a recent study, 1 out of every 10 people is left-handed. If there are 172 people in the eighth grade, predict the number of students who are left–handed.

**Understand:** You know that 1 out of 10 people is left-handed. You also know that there are 172 people in the eighth grade. You need to predict how many of the students are left-handed.

**Plan:** Make a table to organize the information and look for a pattern.

| **Number of People** | 10 | 20 | 30 | 40 | 50 |
|---|---|---|---|---|---|
| **Number who are left–handed** | 1 | 2 | 3 | 4 | 5 |

**Solve:** By extending the pattern, you can predict that **17 students will be left-handed.**

**Check:** For every 10 students in the class, 1 is left-handed. There are 17 groups of 10 in a class of 172 and $17 \times 1 = 17$. The answer is correct.

# 1.1 Excercises

**1.** Bob's Video has a membership fee of $6 and DVD rentals are $0.50 each. Video Heaven has no membership fee and DVD rentals are $3 each. How many DVDs must be rented in order for Bob's Video Venue to be more economical?

| | |
|---|---|
| **2.** James needs to buy one can of orange soda for every three cans of cola. If James buys 24 cans of cola, how many cans of orange soda should he buy? | **3.** Find the next term in the pattern<br>2, 6, 18, 54, 162, . . . |
| **4.** A cookie shop offers 6 varieties of cookies and bakes 5 dozen of each kind every day, from Monday through Friday. How many cookies are baked in four weeks? | **5.** Jeremy needs to type a 500-word report for science class. He knows he can type about 20 words per minute. About how long will it take Jeremy to type his report? |
| **6.** An aquarium contains 50 gallons of water. When the plug is pulled, water drains from the aquarium at a rate of 2 gallons per minute. How many gallons of water still remain in the aquarium after 8 minutes? | **7.** After a shopping trip to the mall, Ashley saw $6.10 in her purse. She spent $25.80 on a pair of shoes, $9.25 on a necklace, and $18.85 on a belt. How much money did Ashley bring to the mall? |

# 1.2 Words and Expressions

## Writing Numerical Expression

A **Numerical Expression** contains a combination of **numbers and operations** such as addition, subtraction, multiplication, and division. Verbal phrases can be translated into numerical expressions by replacing words with operations and numbers.

| + | − | × | ÷ |
|---|---|---|---|
| plus | minus | times | divide |
| Sum | difference | product | quotient |
| increased | Decreased | of | divided among |
| more than | less than | | |

**Example: Write a numerical expression for the verbal phrase.**

**a. Verbal Phrase:** The product of seventeen and three → **Expression: 17 × 3**

**b. Verbal Phrase**: Eight less than twenty → **Expression: 20 – 8**

## Evaluating Numerical Expressions

### Order of Operations.

**Step 1:** Evaluate the expressions inside **Grouping Symbols ( ), [ ], { } − (P)**

**Step 2: Multiply and/or Divide** from ***Left to Right*** **– (M/D)**

**Step 3: Add and/or Subtract** from ***Left to Right*** **− (A/S)**

**Example: Evaluate the expression.**

**a.** $4(3 + 6) + 2 \cdot 11$ **Parentheses**

$= 4(9) + 2 \cdot 11$ **Multiply – L to R**

$= 36 + 22$ **Add**

$= 58$

**b.** $12 \div 2^2 \times 3 - 7$ **Exponent**

$= 12 \div 4 \times 3 - 7$ **Divide – L to R**

$= 3 \times 3 - 7$ **Multiply – L to R**

$= 9 - 7$

$= 2$

# 1.2 Exercises

**Write a numerical expression for each verbal phrase.**

**1.** eleven less than twenty

**2.** the product of seven and twelve

**3.** the quotient of forty and eight

**4.** sixteen less than fifty-four

**5.** the sum of thirteen and eighteen

**6.** three times seventeen

**Evaluate each expression.**

**7.** $3[(2 + 7) \div 9] - 3$

**8.** $(8 \cdot 7) \div 14 - 1$

**9.** $2[(13 - 4) + 2(2)]$

**10.** $\frac{4(18 + 2)}{2(9 - 4)}$

# 1.3 Variables and Expressions

## A. Writing Variable (Algebraic) Expressions

An **Algebraic Expression** is a combination of variables, numbers, and at least one operation.

A **Variable** is a letter or symbol used to represent an unknown value.

To translate verbal phrases with an unknown quantity into algebraic expressions, first define the variable.

**Example:**

| Verbal Sentence | Algebraic Expression |
|---|---|
| Eight less than twice a number | $2c - 8$ |
| The quotient of a number and four | $x \div 4$ OR $\frac{x}{4}$ |
| The product of four and a number increased by ten | $4n + 10$ |

## B. Evaluating Variable (Algebraic) Expressions

To evaluate an algebraic expression, replace the variable(s) with known values and follow the order of operations.

### Substitution Property of Equality

If two quantities are equal, then one quantity can be replaced by the other.

### Example: Evaluate the expression if $r = 6$ and $s = 2$.

**a.** $8s - 2r$ **Replace *r* with 6 and *s* with 2.**

$= \underline{8(2)} - \underline{2(6)}$ **Multiply Left to Right.**

$= 16 - 12$ **Subtract.**

**$= 4$**

**b.** $4s^3 - 5r + 4$ **Replace *s* and *r***

$= 4 \cdot \underline{\mathbf{2^3}} - 5(6) + 4$ **Powers**

$= \underline{\mathbf{4 \cdot 8}} - \underline{\mathbf{5(6)}} + 4$ **Multiply Left to Right**

$= \underline{32 - 30} + 4$ **Add/Subtract Left to Right**

$= 2 + 4$ **Add/Subtract Left to Right**

**$= 6$**

# 1.3 Exercises

**Translate each phrase into an algebraic expression.**

**1.** Twelve less than four times a number

**2.** The sum of nine times a number and eighteen

**3.** The amount in dollars of $n$ five dollar bills

**4.** The number of chairs divided into groups of six

**5.** twenty dollars divided among a number of friends, minus three

**Evaluate each expression if $r = 2$, $s = 3$, and $t = 12$.**

**6.** $2t - rs$

**7.** $\frac{t}{rs}$

**8.** $t(4 + r)$

**9.** $\frac{5t}{(r + 3)}$

**10.** $(t - 2s)7$

**11.** $(t + r) - (r + s)$

# 1.4 Properties of Numbers

| Property | Example |
|---|---|
| Commutative Property of Addition | $a + b = b + a$ |
| Commutative Property of Multiplication | $a \cdot b = b \cdot a$ |
| Associative Property of Addition | $(a + b) + c = a + (b + c)$ |
| Associative Property of Multiplication | $(a \cdot b) \cdot c = a \cdot (b \cdot c)$ |
| Additive Identity | $a + 0 = a$ **and** $0 + a = a$ |
| Multiplicative Identity | $a \cdot 1 = 1 \cdot a = a$ |
| Multiplicative Property of Zero | $a \cdot 0 = 0 \cdot a = 0$ |

**Example 1: Identify the property being demonstrated**

| |
|---|
| $(2 \cdot 5) \cdot 8 = 2 \cdot (5 \cdot 8)$ |
| $10 + 0 = 10$ |
| $15 \cdot 0 = 0 \cdot 15 = 0$ |
| $6 + 3 = 3 + 6$ |
| $5 \cdot 1 = 1 \cdot 5 = 5$ |

## Simplifying Expressions

**Example: Simplify the expression.**

$(9 + r) + 7$

$= r + (9 + 7)$

$= r + 16$

$5 \cdot (3x)$

$= (5 \cdot 3)x$

$= 15x$

# 1.4 Exercises

**Name the property shown by each statement.**

**1.** $8 \cdot 6 = 6 \cdot 8$ _____

**2.** $2 \cdot (3 \cdot 4) = (2 \cdot 3) \cdot 4$ _____

**3.** $20 + 0 = 20$ _____

**4.** $p \cdot 0 = 0$ _____

**5.** $75 + 25 = 25 + 75$ _____

**6.** $2 \cdot (3 \cdot 4) = (2 \cdot 3) \cdot 4$ _____

**7.** $14 \cdot 1 = 14$ _____

**Simplify each expression.**

**8.** $24 + (x + 6)$

**9.** $3 \cdot (4a)$

**10.** $(3 + f) + 17$

**11.** $(n + 7) + 12$

**12.** $(7 \cdot x) \cdot 8$

**13.** $21 \cdot (s \cdot 0)$

# 1.5 Ordered Pairs and Relations

In mathematics, a **coordinate system** or **coordinate plane** is used to locate points.

The ***horizontal number line*** is called the ***x*-axis**

The ***vertical number line*** is called the ***y*-axis**.

The point where the two axes intersect is the **origin (0, 0).**

An **ordered pair** of numbers is used to locate points in the coordinate plane.

The point **(4, 3)** has an ***x*-coordinate of 4** and a ***y*-coordinate of 3**.

A **relation** is a set of ordered pairs, such as {(0, 3), (1, 2), (3, 6), (7, 4)}.

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

The **set of *x*-coordinates** is the **domain** of the relation.

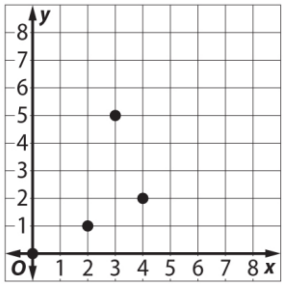
The **set of *y*-coordinates** is the **range** of the relation.

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

**Table**

| *x* | *y* |
|---|---|
| 0 | 0 |
| 2 | 1 |
| 4 | 2 |
| 3 | 5 |

**Graph**




**Domain is {0, 2, 4, 3},**

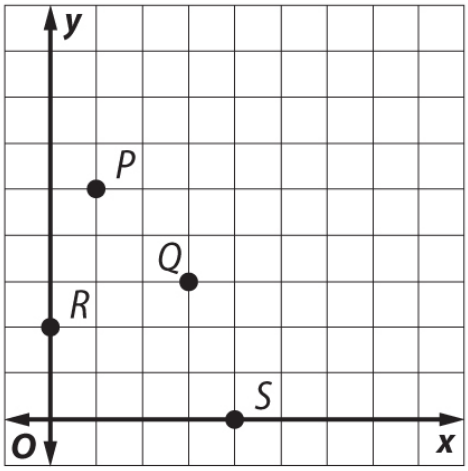
**Range is {0, 1, 2, 5}.**

# 1.5 Exercises

**1 to 8: Refer to the coordinate plane shown at the right.**

**1 to 4: Write the ordered pair that names each point.**

| | |
|---|---|
| **1.** *P* | **2.** *Q* |
| **3.** *R* | **4.** *S* |




**5 to 8: Plot and label the points on the graph to the right.**

| | |
|---|---|
| **5.** A(7, 3) | **6.** B(5, 6) |
| **7.** C(2, 0) | **8.** D(0, 8) |

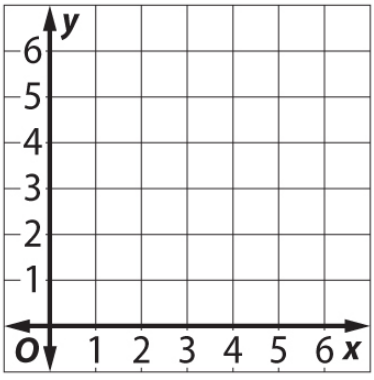
**9-10: Express the relation as a table and as a graph. Determine the domain and range.**

**9.** {(4, 6), (0, 3), (1, 4)}

**Domain:** _____

**Range:** _____

| *x* | *y* |
|---|---|
| | |
| | |
| | |

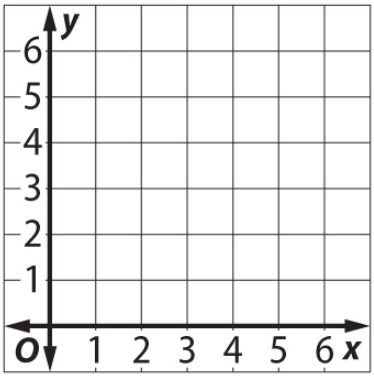



**10.** {(5, 2), (2, 0), (2, 6)}

**Domain:** _____

**Range:** _____

| *x* | *y* |
|---|---|
| | |
| | |
| | |



# 1.6 Words, Equations, Tables, and Graphs

Relations can be described as ***Words***, ***Equations***, ***Tables***, and ***Graphs.***

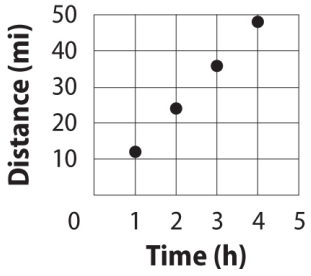
**Words** The distance biked is equal to ***12 miles per hour times the number of hours***.

**Equation** $d = 12t$

**Table**

| Time (hr) | Distance (mi) |
|---|---|
| 1 | 12 |
| 2 | 24 |
| 3 | 36 |
| 4 | 48 |

**Graph**




**Example 1: Write an equation then use the equation to complete the table and graph. Find the domain and range.**

**Words** Tori's computer backs up the file she is working on every 5 minutes. Make a table to find the time for **3, 6, 9, and 12** backups. Then graph the ordered pairs.

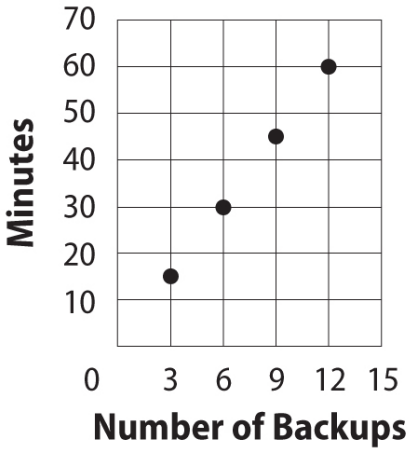
Let ***m*** represent the number of minutes and ***b*** represent the number of backups.

**Equation**: $m = 5b$.

**Table**

| Input (*b*) | 5*b* | Output (*m*) |
|---|---|---|
| 3 | **5(3)** | **15** |
| 6 | **5(6)** | **30** |
| 9 | **5(9)** | **45** |
| 12 | **5(12)** | **60** |

**Graph**




**Domain: 3, 6, 9, and 12** **Range: 15, 30, 45, 60**

# 1.6 Exercises

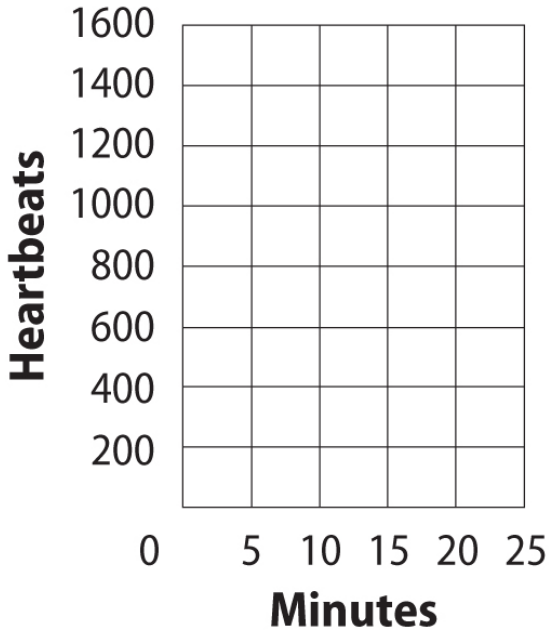
**1. Viktor's heart beats 80 times a minute.**

**a.** Write an equation to find the number of times Viktor's heart beats for any number of minutes.

**b.** Make a table to find the number of times Viktor's heart beats in 5, 10, 15, and 20 minutes.

| Minutes | Heartbeats |
|---|---|
| 5 | |
| 10 | |
| 15 | |
| 20 | |

**c.** Graph the ordered pairs for the relation.




**Complete each table. Then state the domain and range.**

**2**. Each ticket cost $7.

| Number of Tickets | Total Cost ($) |
|---|---|
| 4 | |
| 8 | |
| 15 | |
| 20 | |

**Domain:** _____

**Range:** _____

**3.** Natalie has twice as many CDs as Kilan.

| Kilan's CDs | Natalie's CDs |
|---|---|
| 5 | |
| 8 | |
| 13 | |
| 21 | |

**Domain:** _____

**Range:** _____

# Answers

## 1.1 Exercises

**1.** 6 DVD's **2.** 6 cans **3.** 486 **4.** 7,200 cookies **5.** 25 minutes **6.** 34 gallons **7.** $60

## 1.2 Exercises

**1.** 20 – 11 **2.** 7 × 12 **or** 7 · 12 **3.** 40 ÷ 8 **or** $\frac{40}{8}$ **4.** 54 – 16 **5.** 13 + 18 **6.** 3 × 17 **or** 3 · 17

**7.** 0 **8.** 3 **9.** 26 **10.** 8

## 1.3 Exercises

**1.** $4n - 12$ **2.** $9x + 18$ **3.** $5n$ **4.** $c \div 6$ **or** $\frac{c}{6}$ **5.** $20 \div n - 3$ **or** $\frac{20}{n} - 3$

**6.** 18 **7.** 2 **8.** 72 **9.** 12 **10.** 42 **11.** 9

## 1.4 Exercises

**1.** Commutative Property of Multiplication **2.** Associative Property of Addition

**3.** Identity Property of Addition **4.** Multiplication Property of Zero

**5.** Commutative Property of Addition **6.** Associative Property of Multiplication

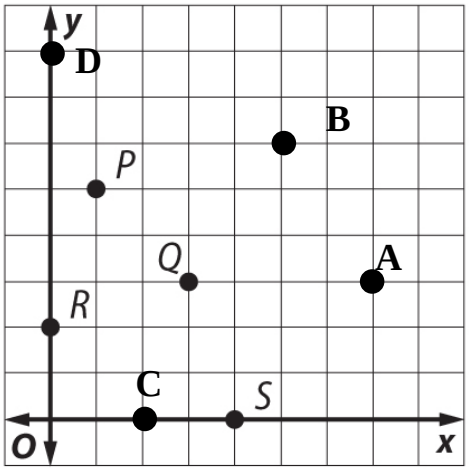
**7.** Identity Property of Multiplication

**8.** $x + 30$ **9.** $12a$ **10.** $f + 20$ **11.** $n + 19$ **12.** $56x$ **13.** 0

## 1.5 Exercises

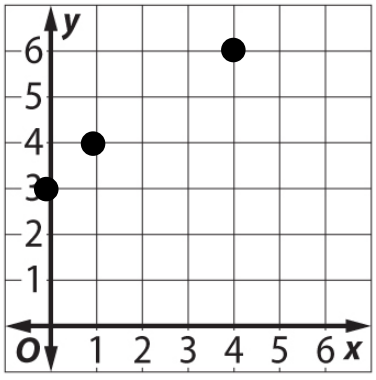
**1.** (1, 5) **2.** (3, 3) **3.** (0, 2) **4.** (4, 0)

**5 to 8**




**9.**

| x | y |
|---|---|
| 4 | 6 |
| 0 | 3 |
| 1 | 4 |

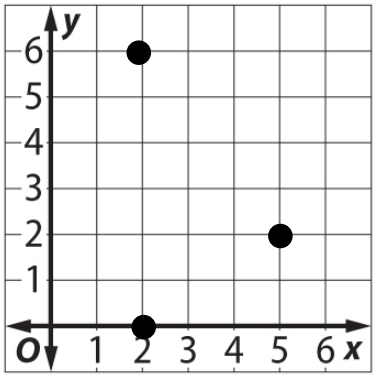



**Domain:** 4, 0, 1

**Range:** 6, 3, 4

**10.**

| x | y |
|---|---|
| 5 | 2 |
| 2 | 0 |
| 2 | 6 |




**Domain:** 5, 2

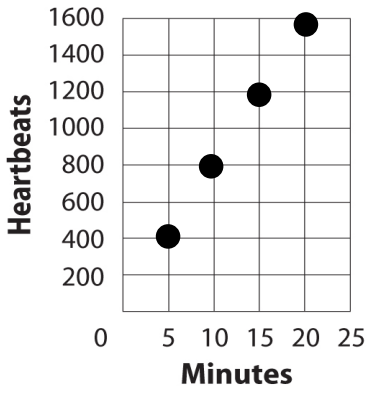
**Range:** 2, 0, 6

# 1.6 Exercises

**1a.** $h = 80m$

**1b.** 400, 800, 1200, 1600

**1c.**




**Complete each table. Then state the domain and range.**

**2.**

| Number of Tickets | Total Cost ($) |
|---|---|
| 4 | 28 |
| 8 | 32 |
| 15 | 60 |
| 20 | 80 |

**Domain:** 4, 8, 15, 29

**Range:** 28, 32, 60, 80

**3.**

| Kilan's CDs | Natalie's CDs |
|---|---|
| 5 | 10 |
| 8 | 16 |
| 13 | 26 |
| 21 | 42 |

**Domain:** 5, 8, 13, 21

**Range:** 10, 16, 26, 42