

Name: _____

Date: _____

MORE WORK WITH DOMAIN AND RANGE
N-GEN MATH[®] ALGEBRA I



*The domain and range of a function are important ideas. In purely mathematical settings, the domain and range can often involve sets that include **all real numbers** (any type of number used for measurement). Sometimes in real-world settings, the domains and ranges are limited to particular types of numbers. First, some review.*

Exercise #1: The domains and ranges are sets (collections of numbers or possibly even non-numbers). Fill in each of the following:

(a) The **domain** of a function is the **set** of all _____ to the function.

(b) The **range** of a function is the **set** of all _____ of the function.

Let's also review some basic sets of numbers, which can often be used to describe domains and ranges.

Exercise #2: For each of the following sets, list some examples of numbers that lie in the set.

(a) The **set of integers** (positive and negative whole numbers as well as zero): _____

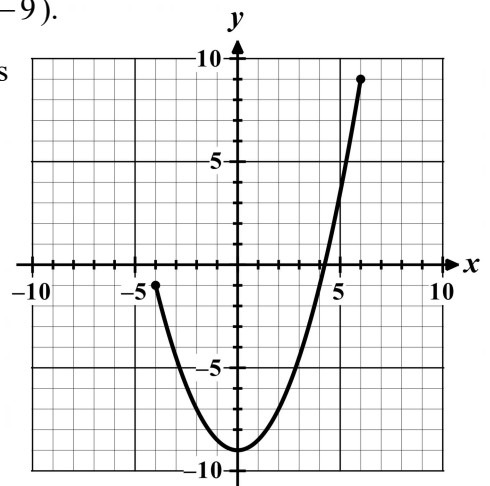
(b) The **set of rational numbers** (ratios of integers, including whole numbers): _____

(c) The **set of real numbers** (rational numbers plus irrational numbers – all numbers you know so far): _____

Exercise #3: A function is shown graphed below (its equation is $y = \frac{1}{2}x^2 - 9$).

(a) Why would it be incorrect to describe the **domain** of this function as all integers from $x = -4$ to $x = 6$?

(b) Describe the set of numbers that makes up the **range** of this function.



(c) Using the graph, estimate the output of the function when the input is $x = \pi$. Verify using the equation.



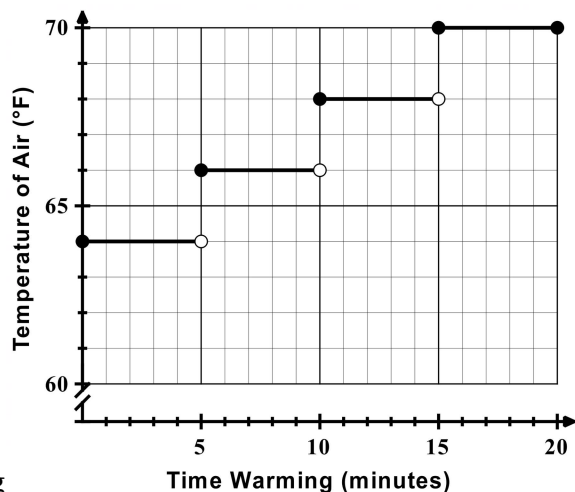
For some functions, the domain and range are not **all real numbers** or some **continuous interval** of real numbers. Often, these occur in scenarios that arise in the real-world.

Exercise #4: A fundraiser is selling raffle tickets for \$1.50 each. The amount of money they raise, m , is a function of the number of raffle tickets they sell, n . They can sell at most 50 raffle tickets.

- (a) What is the value of $m(14)$? What does it tell you?
- (b) Write a formula below for the amount of money raised, m , in terms of the number of tickets, n .
- (c) Give a description of the domain of this function. Write it in roster form.
- (d) Is the value \$10 part of the range of this function? Justify.

Exercise #5: A smart thermostat warms up a house in the morning over the span of 20 minutes by raising the temperature of the air the furnace releases. The relationship is shown in the graph below.

- (a) What is the temperature of the air coming from the furnace after 12 minutes? Illustrate on your graph.
- (b) Describe the set that represents the domain of this function. Write it using set-builder notation.



- (c) Is there any time from 0 to 20 minutes when the air coming from the furnace is 65 °F? Explain your yes/no answer.

- (d) Describe the set that represents the range of this function. Write the set using any proper notation.



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FLUENCY

1. A function is given by the set of ordered pairs $\{(-2, 1), (-1, 6), (0, 11), (1, 16), (2, 21)\}$. Which of the following best describes the domain of this function?

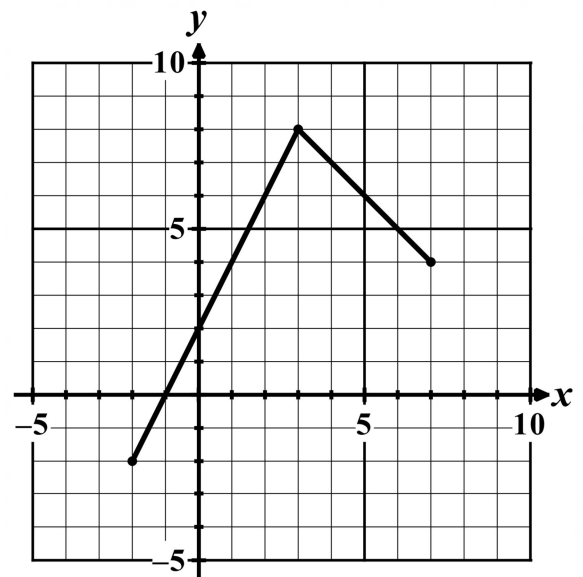
- (1) All real numbers from -2 to 2
 (2) All integers from -2 to 2
 (3) All real numbers from 1 to 21
 (4) All integers from 1 to 21 _____

2. A function is defined by the formula $f(x) = -2x + 7$ with a domain of $\{x \text{ is any real number} \mid x \geq 2\}$. Which of the following correctly describes the range of this function? Experiment with your calculator if needed.

- (1) All real numbers less than or equal to 7
 (2) All real numbers greater than or equal to 7
 (3) All real numbers less than or equal to 3
 (4) All real numbers greater than or equal to 3 _____

3. A function is given by the graph shown below. Answer the following questions based on the graph.

- (a) State a value that is in the domain of this function.
 (b) State a value that is *not* in the domain of this function.
 (c) State a value that is in the range of this function.
 (d) State a value that is *not* in the range of this function.



- (e) When describing the domain and range of this function, would it be better to use the phrase “all integers” or “all real numbers”? Explain.



APPLICATIONS

4. A bus tour company will give a tour with a minimum of 5 people and a maximum of 20 people. For each person, they charge a fee of \$15.
- (a) How much money will the tour company bring in if 9 people go on the tour? Show your calculation.
- (b) Write an equation for the amount of money, m , the tour company makes in terms of the number of people, n , that go on the tour.
- (c) Write the domain of this function using any proper notation.
- (d) What are the minimum and maximum values of the range of this function?
- (e) Give an example of a number that is between the minimum and maximum range values that is still not in the range. Explain why it is not in the range.
5. At a particular gas station, the total cost in dollars, c , for the gasoline put in a vehicle that holds up to 14 gallons can be modeled using the function $c = 7.68t$, where t is the amount of time the tank has been filling, measured in minutes. The time it takes to fill the full 14 gallons is five minutes.
- (a) How much will the cost be if the tank is filling for 2.5 minutes?
- (b) How much will the cost be if the tank is filling for π minutes? Round appropriately.
- (c) What is the maximum cost for filling this car's tank? Justify.
- (d) What is the domain of this function? Explain.
- (e) Explain why the range of this function is *not* all real numbers from 0 to the maximum you found in (c)?

