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Evaluating Functions and their Domain and Range - 8th/9th grade Algebra

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Unit 1: Functions

Stage 1 Desired Results

ESTABLISHED GOALS

A.2 Linear functions, equations, and inequalities. The student applies the mathematical process standards when using properties of linear functions to write and represent in multiple ways, with and without technology, linear equations, inequalities, and systems of equations. The student is expected to:

A.2(A) determine the domain and range of a linear function in mathematical problems; determine reasonable domain and range values for real - world situations, both continuous and discrete; and represent domain and range using inequalities.

A.12 Number and algebraic methods. The student applies the mathematical process standards and algebraic methods to write, solve, analyze, and evaluate equations, relations, and functions. The student is expected to:

A.12(A) decide whether relations represented verbally, tabularly, graphically, and symbolically define a function.

A.12(B) evaluate functions, expressed in function notation, given one or more elements in their domains.

Transfer

Students will be able to independently use their learning to…

Create a function machine that illustrates a situation and after determining and expressing the domain and range numerically and verbally. Students will analyze the function, evaluating at important values, and expressing in various representations.

Meaning

UNDERSTANDINGS

Students will understand that…

Functions can be represented in a variety of ways. Different representations can give different information at a glance, serving a different purpose.

Being able to interpret various representations and analyze the relationships can assist in understanding the independent or dependent values within the relationship and whether there is cause and effect.

Numbers have meaning. It is important to attach the meaning to values given in the equation and the resulting ordered pairs.

Many real world functional relationships can be represented by equations. Equations can be used to find the solution of given real-world problems.

ESSENTIAL QUESTIONS

Why is it helpful to have several different representations of the same function?

Why is it considered functional to have outputs with different inputs but not vice-versa?

How can functions describe real-world situations, model predictions and solve problems?

How does identifying the restriction on the domain and range of a function further our understanding of the function?

Why does is matter to be able to link inputs with outputs? What real world purposes could this serve?

Acquisition

Students will know…

- Definition of a function (for every input, there is exactly one output)
- Other Vocabulary: Domain, Range, Discrete, Continuous
- Domain and range are the inputs and outputs, the x and y, the independent and dependent variables of an equation.
- All functions are relations, not all relations are functions
- Real world data can often be modeled with a function.
- Functions can be written in various forms, including graphs, tables and equations, and representations can be translated from one to another.
- Functions are a mathematical way to describe relationships between two quantities that vary.

Students will be skilled at…

- Identifying functions using various methods.
  - Vertical Line Test (Graph)
  - X cannot repeat with different Ys (Table, Mapping)
- Evaluating functions given the input.
- Stating domain and range of a relation using inequalities or lists.
- Attributing meaning to values in an equation given a situation.
- Identifying Independent and Dependent Variables
- Represent and describe functions

Stage 2 - Evidence		
CODE (M or T)	**Evaluative Criteria**	**Assessment Evidence**
T M	Create a function. Explain key features of their function. Evaluate function values. Determine what would break the function.	PERFORMANCE TASK(S): Students will create a function machine for a real-world example of a function. From that situation, the students will determine whether the situation is continuous or discrete, explaining how they know. The students will determine a reasonable domain and range and express appropriately according to the situation, either as a list or inequalities. They will then use the domain and range to express the relation of the situation in two or more representations, and evaluate the function at the extrema. The students will need to describe WHY the situation is a function and give an anecdote that would then eliminate this possibility. --- OTHER EVIDENCE: Pretest Exit Tickets Pop Quiz Warm-Ups Homework Quiz Test

Stage 3 – Learning Plan		
CODE (A, M, T)	Pre-Assessment 10 question grade level pre-test (TEKS A.2A, A.12A, A.12B). Students given answers after to monitor their own progress. Use MAP data (or something similar) to check prior grade level understanding. For unit 1 prior knowledge TEKS could include, but are not limited to TEKS 8.5G, 6.7A, 6.6A.	
A M	**Learning Activities** **Vocabulary from Unit**: Domain, Range, Function, Relation, Evaluate, Continuous, Discrete, Representation, Mapping, Ordered Pairs, Graph, Equation, Function Notation, Independent Variable, Dependent Variable, Linear, Nonlinear Function, Vertical Line Test Students take the pretest and grade themselves so they can track their own progress. They may also make a Quizlet, flash cards, or look over vocabulary words to review before beginning the unit. Students can work with the vocabulary in whichever way you have built into your classroom, but some ideas may be Frayer Model or a Categorical Diagram to cluster like words together. You may also develop a quizlet for students study use. **Day 1 –** Function or Not **Warm – Up –** Discuss with your partner or tablemates, How does a vending machine work? What makes a vending machine "functional" and when would a vending machine be dysfunctional? **Discussion –** Vending machines work because if you press B2, you hopefully know what you're going to get. Say B2 is a Snickers bar, and C4 is a Butterfingers – each input has exactly one output. If Snickers are popular, you can press either B2 OR B3, so the same output can have	Progress Monitoring (e.g., formative data) Vocabulary could also be included in pre-test too gauge students' language knowledge.

multiple inputs. If you press B2, it shouldn't drop more than just a Snickers. The candy that drops *depends* on the buttons you input.

EQ Focus – Why is considered functional to have outputs with different inputs but not vice-versa?

New Vocabulary – Function, Relation, Mapping, Ordered Pairs, Graph, Independent and Dependent Variable, Vertical Line Test

A

Lesson – Using the example of the vending machine, the students will go through mathematical examples and non-examples and determine if they are functions. Then they will decide on the rule or notes to write to help them remember. Then they will create one example of a function within the four representations (Ordered Pairs, Table, Map, and Graph),

Exit Ticket – allow students to use their notes, straight forward function or not with a few different representations. Could make electronic.

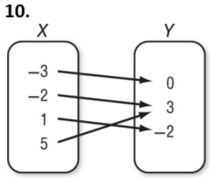
M

Activity – Discuss with your group and think of two other examples of functions in the real world, like a vending machine. Share out.

A

Independent Practice – Homework, practice identifying functions from various representations. How would you describe a function to a younger middle school student? How would you describe a function to your parent?

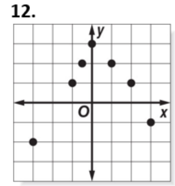
10.



11.

x	y
1	5
–4	–3
7	6
1	–2

12.



Or

McGraw Hill Textbook Page 51, #1 – 8, 20 – 25, 27 – 32, 46, 47, 49, 50, 55, 59

Pre-Read for Day 2 Option:

https://www.mathsisfun.com/sets/function.html

A

Day 2 – Evaluate Functions

Warm – Up – Simplify Expressions using the order of operations.

Discussion – Evaluating Functions is like simplifying expressions, but you are linking an input with an output, or an x- value with a y-value. The important thing to realize, is you are *substituting* a value in where x is. Fun "Nuggetizer" video of a function machine:

https://www.youtube.com/watch?v=VUTXsPFx-qQ

Potential Rough Spot – Evaluating when your input is an expression. Make sure Students understand distributive property and combining like terms.

EQ Focus – Why does is matter to be able to link inputs with outputs? What real world purposes could this serve?

New Vocabulary – Domain, Range, Evaluate, Function Notation, Independent and Dependent Variable

A

Lesson – To evaluate functions, you plug your input value in for x (or your domain element) to find your output value for y (or the corresponding element of the range). Function Notation is a way to identify relationships within an equation.

Having answers available on practice allows student to check their own understanding as the go.

Activity – Evaluate Function Practice Owl. Review problems where the input is an expression.

Independent Practice – McGraw Hill Textbook Page 51, #11-19 odds, 33-43 odds, 51, 57

M	**Day 3 –** Evaluate Functions Many Ways **Warm – Up –** Evaluating Functions - If evaluating functions is pairing an input to its corresponding outputs, you can do so with an equation, table of values, or graph. **Discussion –** Where do we see our new vocabulary used in our warm-up? When it tells me to find the range, given the domain, what does that mean? **EQ Focus –** How can functions describe real-world situations, model predictions and solve problems? **New Vocabulary –** Domain, Range, Evaluate, Function Notation, Independent and Dependent Variable **Lesson –** Sometimes you are expected to find the input when given the output. How do you do this in a graph or equation?	Common Misconceptions – If given the output, some students settle for only one input. Double check this understanding on graphs.
A M	**Activity –** Evaluating Functions in Many Ways (Odds) in partners or tables. **Independent Practice –** Homework: Evaluating Functions in Many Ways (Evens), Pre-Read https://www.mathsisfun.com/sets/domain-range-codomain.html and https://www.mathsisfun.com/sets/intervals.html	This homework could be good to collect to check students' understanding.
A	**Day 4 –** Domain and Range **Warm – Up –** Go over Pre-Reading links, or have students do in pairs at beginning of class. Also, available notes in McGraw-Hill Algebra 1 Textbook page 40 and 48.	
A	**Discussion –** What representations work best for discrete functions? Which work best for continuous? Are there some representations that work for both? **EQ Focus –** How does identifying the restriction on the domain and range of a function further our understanding of the function? **New Vocabulary –** Domain, Range, Discrete, Continuous **Lesson –** Depending on whether is it discrete or continuous determines what method we use to express the domain and range.	Potential Rough Spot – Students may need review of inequality symbols and what they mean. Use the You Try! sections as an opportunity for informal feedback.
A	**Activity –** Students read the inequality statements or lists with a partner and write in words what it means. Then they find and write the corresponding graph that matches that domain and range. **Independent Practice –** Domain and Range HW and watch video in preparation for tomorrow: https://www.youtube.com/watch?v=p4nJCpO_8zs	
M	**Day 5 –** Domain and Range in Context **Warm – Up –** Review words that mean Domain (x-value, independent variable, input) and Range (y-value, dependent variable, output) **Discussion –** What are your take-aways from the YouTube video? **EQ Focus –** How does identifying the restriction on the domain and range of a function further our understanding of the function? **Lesson –** Review the real number system from prior TEKS. Can you say all real numbers if we're talking about number of tickets being sold at the dance? Would you include less than zero if the range is about your grade on a test?	Students are uncomfortable when it comes to the gray area that happens with domain and range in context.
T	**Activity –** Domain and Range Situation to Graph Match from Supporting STAAR Achievement: Algebra I from Region 4 (Not included in UbD) **Independent Practice –** Imagine the Possibilities from Supporting STAAR Achievement: Algebra I from Region 4 (Not included in UbD)	Exit Ticket.. Domain and Range Evaluation from Supporting STAAR Achievement: Algebra I from Region 4

M T M/T T T M T	**Day 6 –** Domain and Range in Context **Warm – Up –** When is a situation a function and when is it not? **Discussion –** How can we determine the domain and range without a visual aid? **EQ Focus –** How does identifying the restriction on the domain and range of a function further our understanding of the function? **Activity –** Students practice finding domain and range given situations. This will be a stretch for some as they may have to think of the relationship with an equation or make a table to describe what is happening. **Independent Practice –** Finish Be Reasonable. Review Notes. Lesson Review in McGraw-Hill Textbook page 65, #59 – 74, page 70, #3, 6, 8, 15 **Day 7 – Quiz/Intro to Performance Task** **EQ Focus –** How can functions describe real-world situations, model predictions and solve problems? **Independent Practice – Think of a real world function that you can use for your performance task tomorrow.** **Day 8 –** Performance Task/Review **Warm – Up –** Go over quiz. Focus on common misconceptions. **Discussion –** Use a situation or two from "Be Reasonable" to explain purpose and procedure of Performance Task. **EQ Focus –** How can functions describe real-world situations, model predictions and solve problems? **Activity – Performance Task** **Day 9 –** Performance Task/Review Give students time to work on Performance Task. **Independent Practice –** Optional Reviews: Complete any unfinished practice from the week. Evaluate Functions Coloring Activity Walk-Around Poem Review: https://docs.google.com/presentation/d/1Av3sj-rm6zVq_z7CyxU-tVJokvtctw0Hd3Z05WbFaKw/edit?usp=sharing Quizlet Options for Domain and Range Desmos Function Card Sort **Day 10 –** Unit 1 Test Functions	Leave room for multiple representations of contextual domain and range. Provide Feedback in small groups to review quiz and discuss situations fro Performance Task.

This course is Pre-AP so though the Readiness standard A.2A specifies for linear functions, domain and range for various functions and non-functions are used.

As of 2019, Spring Branch ISD is using Algebra 1 Textbook by McGraw-Hill Education.

Works Cited

Bolen-Abbot, Shelley, et al. Engaging Mathematics: Algebra 1. Vol. 2, Region 4 Education Service Center, 2017.

Carter, John A., et al. *Texas Algebra 1*. McGraw-Hill Education, 2015.

Create Custom Pre-Algebra, Algebra 1, Geometry, Algebra 2, Precalculus, and Calculus Worksheets, www.kutasoftware.com/.

Desmos Classroom Activities, teacher.desmos.com/.

"STAAR Released Test Questions." 20 June 2019, tea.texas.gov/student.assessment/STAAR_Released_Test_Questions/.

Name: _____ Algebra PreAP: _____

Unit 1 Performance Assessment: Functions

Come up with a real-world example of a function. You may either research to find one, or you may create your own. Then, complete the following tasks.

Part A: **Design** a function machine (like the Nuggetizer Video), that identifies how the output is related to the input according to the situation you choose from the list provided.

Situation:

_____

_____

_____

Your function machine should be designed on a sheet of 8 x 11 white computer paper. It should include an input, the function (expression or equation, algebraically or verbally), and the output. **Determine** the domain and range and include on your mini-poster design.

Part B: Is your function discrete or continuous? **Justify** your response:

_____

_____

_____

Part C:

Choose two or more **representations** (Map, Ordered Pairs, Graph, Equation, or is there another way?) to show your function numerically:

Representation 1:	Representation 2:

Justify your choices for these representations:

_____

_____

Part D: **Explain** verbally *why* this situation is a function within the context of the situation:

_____

Create an example of a hypothetical situation in this context that would cause this situation to be a non-function, then explain whether your hypothetical would be possible in the real world. Why or why not?

_____

_____

_____

Part E: **Evaluate** the function at 5 different points. Identify the independent and dependent variables.

x:_____	Process/Relationship	y:_____

Part F: How can functions describe real-world situations, model predictions and solve problems?

_____

_____

_____

_____

_____

_____

_____

Rubric for Unit 1 Functions Performance Assessment. (Max point value for section given in parenthesis)

	Developing	Proficient	Advanced	Notes/Comments
Part A 50% Function Machine Domain and Range	Function Machine is not included. Domain and range not included or incorrect. The function is expressed verbally or numerically incorrectly. Input and output are given and output is calculated incorrectly. (25)	Function Machine is included and situation is a function. Domain and range are included and correct based on the developed function. The function is expressed verbally or numerically correctly. Input and output are given and output is calculated correctly. (40)	Function Machine is included and function is unique. Domain and range are included and correct based on the developed function. The function is expressed verbally and numerically correctly. Input and output are given and output is calculated correctly. (50)	
Part B 10% Discrete or Continuous	Either does not correctly determine whether the function is discrete or continuous OR does not give sound justification. (5)	Correctly determine continuous or discrete, and gives sound justification. (8)	Correctly determine continuous or discrete, and gives sound detailed justification. (10)	
Part C 10% Multiple Representations	One or more of the representations are left out or expressed incorrectly. Justification is not given for why these representations were chosen. (5)	Two representations are chosen with justification. Both representations are expressed correctly. (8)	Two representations are chosen with detailed justification. Both representations are expressed correctly. (10)	
Part D 10% Explain Function	Explanation is incoherent or does not show that student understands definition of a function. (5)	Explanation is given correctly and directly. Awareness of what makes a function is apparent. (8)	Hypothetical goes above and beyond. Explanation shows deep understanding of definition of a function. (10)	
Part E 10% Evaluate	Function is incorrectly evaluated two or more times. (5)	Function is correctly evaluated at no less than four different points. (8)	Function is correctly evaluated at five different points. Choice of inputs are restricted to reasonable values given the context. (10)	
Part F 10% Write it!	The Essential Question is not answered. (5)	The Essential Question is answered. Correct grammar is used. (8)	The Essential Question is answered with detail and in depth. Correct grammar is used. (10)	
			Total: _____	

Name_____ Algebra Pd_____

Unit 1 Functions Pre-test

THIS IS A PRE-TEST: <u>YOU ARE NOT EXPECTED</u> TO KNOW EVERYTHING ON THIS TEST.

A.2A

1. What are the domain and range of $f(x) = -37$?

   D: _____

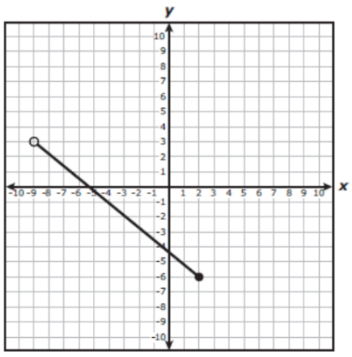
   R: _____

2. Determine the domain and range for the relation $\{(2,5),(-1,3),(0,-1),(3,3),(-4,-2)\}$.

   D: _____

   R: _____

3. Determine the domain and range of the function:



   D: _____

   R: _____

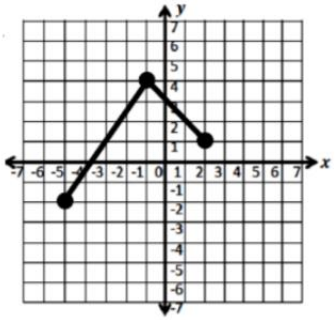
4. The daily cost of hiring a plumber, y, to work x hours on a repair project can be modeled using a linear function. The plumber charges a fixed cost of $80 plus an additional cost of $45 per hour. The plumber works a maximum of 8 hours per day.

   For one day of work, what is the range for this situation?

A.12A

5. Determine whether the relation $\{(2,3),(-1,3),(0,4),(3,2),(-2,3)\}$ is a function.

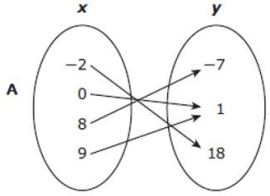
6. Determine whether the relation is a function.



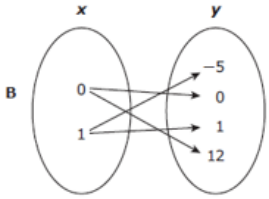
Explain how you know.

7. Which representation shows y as a function of x?

A



B



C

x	y
−1	0
−1	5
−1	10
−1	15

D

x	y
−4	−8
0	3
1	2
−4	10

A.12B

8. If $f(x) = 5 - 2x$, find $f(-15)$.

9. Consider the function $g(x) = -3x - 4$. If the domain value is selected from the set $\{-8, -2, 0, 3\}$, which of the following is a corresponding range value?

A. 18 B. -10 C. -13 D. -5

10. If $f(x) = (x-2)^2 - 4$ and $g(x) = 3x - 1$, which statement is true?

A. $f(0) = g(3)$ B. $f(-1) = g(2)$ C. $f(2) = g(1)$ D. $f(6) = g(0)$

How did you do?

A.2A				*A.12A*			*A.12B*		
1	2	3	4	5	6	7	8	9	10
_____/4 = _____x 100				_____/3 = _____x 100			_____/3 = _____x 100		

Record your results on your data Algebra tracker under Pre-Assessment.
Complete the Pre-Assessment Reflection Questions.

Answers:

1. D: $\mathbb{R}$ R: $y = -37$

2. D: $\{-4, -1, 0, 2, 3\}$

   R: $\{-2, -1, 3, 5\}$

3. D: $-9 < x \leq 2$

   R: $-6 \leq y < 3$

4. $80 \leq y \leq 440$

5. It is a function

6. It is a function, it passes the vertical line test.

7. A

8. 35

9. C

10. B

Name _____ Algebra Pre-AP/GT Period _____ Date _____

Unit 1 Functions Data Tracker Developing < 70% 70% ≤ Proficient < 90% Advanced ≥ 90%

	Pre-Assessment		Formative		Post-Assessment		
TEKS	Percent	D, P, A	Percent	D, P, A	Percent	D, P, A	√
A.2(A) determine the domain and range of a linear function in mathematical problems; determine reasonable domain and range values for real-world situations, both continuous and discrete; and represent domain and range using inequalities							
A.12(A) decide whether relations represented verbally, tabularly, graphically, and symbolically **define a function**							
A.12(B) **evaluate functions**, expressed in function notation, given one or more elements in t heir domains							

Pre-Assessment Reflection:

1. What are your current areas of strength?

2. What are your current areas of growth/ where do you need to focus? Why?

Developing	**69% or less**	**Red**
Proficient	**70% – 89%**	**Yellow**
Advanced	**90% - 100%**	**Green**

3. How can you use the proficiency scale to determine your next steps? Are you ready for the advanced content or proficient content? What specifically are you focusing on?

Post-Assessment Reflection:

1. What are your **new** areas of strength?

2. What did you do to develop your areas of growth? *(Self-directed learning time, working with teachers/ peers, etc.)*

3. Where are you now on the proficiency scale?

Readiness Standard: (A.2A) **Determine the domain and range of a linear function in mathematical problems; determine reasonable domain and range values for real-world situations, both continuous and discrete; and represent domain and range using inequalities**

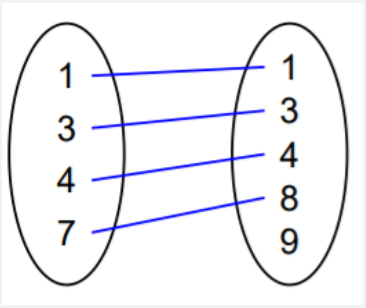
I KNOW & UNDERSTAND HOW TO…

<table>
<tr><td>Advanced</td><td>… extend my learning or apply it in creative ways.
€ Mapping diagram
€ Graphs
€ Verbal situations</td><td colspan="3">€ Discrete data

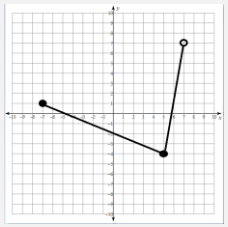
The total cost in dollars to buy shoes for players on a soccer team can be found using the function c= 49.95s+10.25, where s is the number of shoes bought. There are at least 11 players but no more than 18 players on the soccer team. Create a graph that shows the domain and range for the function of this situation.</td><td colspan="2">€ Continuous Data

The total cost of renting a car is a function of the number of miles the car is driven. The owner of the car rental charges a down payment of $21 and $0.05 for each mile driven. Charlie rents a car for 2 days and drives 55.6 miles. Construct a graph that shows the domain and range for this situation.</td></tr>
<tr><td>Proficient</td><td>… solve problems involving the domain and range of a linear function

€ Mapping diagram
€ graphs
€ Verbal situations</td><td>…find domain and range of a linear function using a Mapping diagram

X f(x)
 

What is the domain of f?</td><td>…find domain and range of a linear function using a graph

 
What is the range of the function graphed on the grid?</td><td>…find domain and range of a linear function from a verbal description

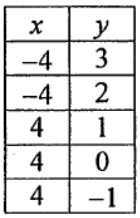
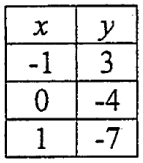
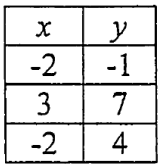
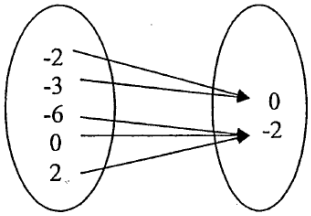
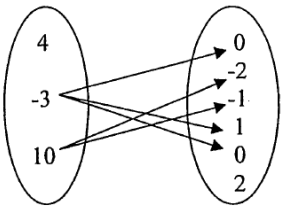
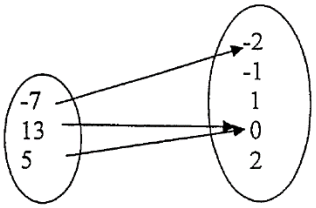
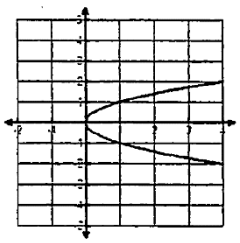
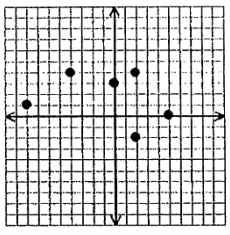
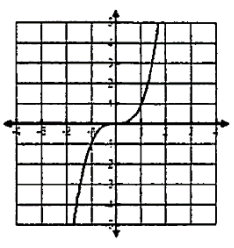
A flower delivery van can carry a maximum weight of 180 lbs. Each vase of flowers weighs 2.2 lbs. The total flower weight is a function of the number of vases on the van. What is the greatest value in the domain for this situation?</td></tr>
</table>

Name_____ Algebra Period_____

FUNCTION NOTES

A function is a relation where each _____ has exactly one _____. (**x can not repeat**)

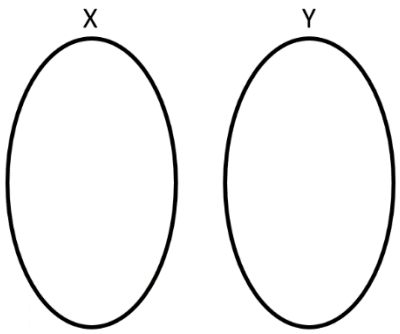
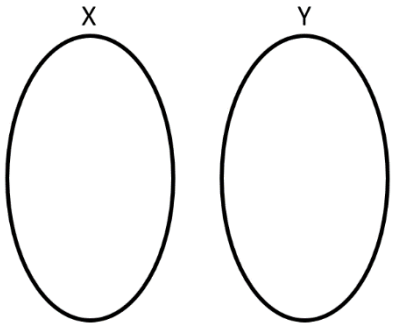
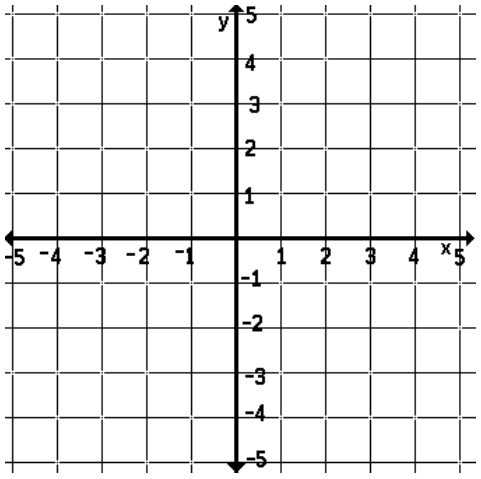
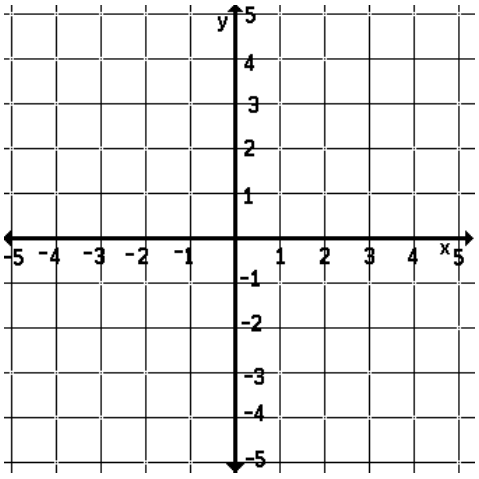
Use the definition above to decide if the following are or are not functions and explain why.

Ordered pairs Function Rule:	{(-1, 3), (0, -4), (1, -7)} _____ a function because _____	{(-2, -1), (3, 7), (-2, 4)} _____ a function because _____	{(6, 3), (5, 2), (2, −3), (12, −12)} _____ a function because _____
Tables Function Rule:	 _____ a function because _____	 _____ a function because _____	 _____ a function because _____
Mappings Function Rule:	 _____ a function because _____	 _____ a function because _____	 _____ a function because _____
Graphs Function Rule:	 _____ a function because _____	 _____ a function because _____	 _____ a function because _____

Create a Function (or NOT)

A _____ is a relation where every _____ (X) has exactly one _____ (Y).

Below, create your own functions in each representation. Then create non-functions in each representation. Check with a buddy when you're finished.

	Functions	**Not** Functions
Ordered Pairs		
Tables	<table><tr><th>X</th><th>Y</th></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>	<table><tr><th>X</th><th>Y</th></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>
Mapping Diagrams		
Graphs		

Name_____ Algebra PreAP _____

Evaluating Functions

Warm up - Simplify the following expressions

1) $5 + (16 + 2) \div 3$	2) $(2)^3 + 5(2)^2$	3) $2(-4)^2 + \frac{1}{3}(-3)^3$

Nuggetizer video: https://www.youtube.com/watch?v=VUTXsPFx-qQ

Vocabulary

Domain – set of all _____ values **Range** – set of all _____ values

$y = 2x$

Input	Output

$y = x$

Input	Output

$y = 6$

Input	Output

$y = x - 8$

Input	Output

$y =$ _____

Input	Output

Function Notation

Equation: y = 2x + 8 Function notation: f(x) = 2x + 8 ⬅ How do we say this?

To evaluate a function means to find the _____ for a specific _____.

Example: $f(x) = x^2$ and $g(x) = 6x + 7$ find:

1) $f(5)$

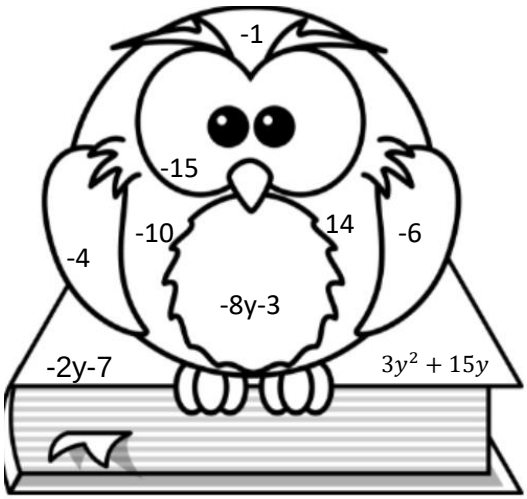
2) $2g(-4)$

3) $f(-5) + 6$

4) $f(-2) + g(q + 1)$

Evaluating Function Practice

Using function *f* and function *g*, evaluate at the given points. Find your answer in the picture and color it the designated color.



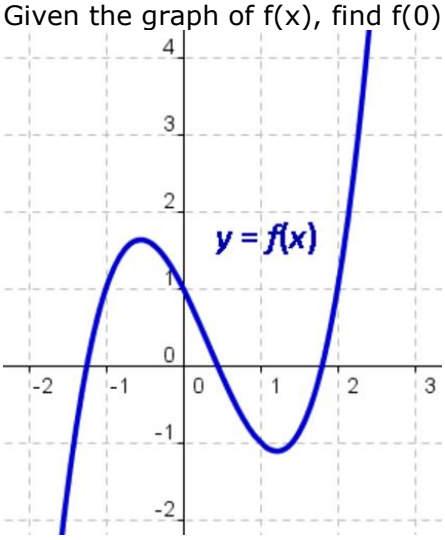
$f(x) = -2x - 3$ and $g(x) = x^2 + 5x$ find:

1) RED $f(-1)$	2) BLUE $f(6)$	3) YELLOW $g(2)$
4) BLUE $g(-3)$	5) YELLOW $g(-2) + 2$	6) GREEN $f(0) - 7$
7) RED $f(4y)$	8) GREEN $3g(y)$	9) PURPLE $f(y + 2)$

Name_____ Algebra Period_____

Evaluating Functions Warm Up

Given the graph of f(x), find f(0)



$f(0) =$ _____

Given $g(x) = -\frac{1}{3}x + 3$, create a table of values that represent the inputs and outputs.

x	$g(x)$

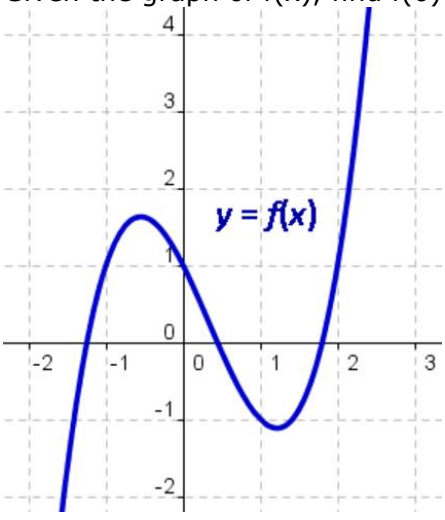
Given $h(x) = \frac{1}{2}x^2 - 2x$ and the domain of {-2, 0, 4, 6} find the range.

Range: {_____}

Name_____ Algebra Period_____

Evaluating Functions Warm Up

Given the graph of f(x), find f(0)



$f(0) =$ _____

Given $g(x) = -\frac{1}{3}x + 3$, create a table of values that represent the inputs and outputs.

x	$g(x)$

Given $h(x) = \frac{1}{2}x^2 - 2x$ and the domain of {-2, 0, 4, 6} find the range.

Range: {_____}

Name: _____ Algebra PreAP/GT_____

Evaluating Functions in Many Ways

1) Let $g(x) = \frac{1}{5}x + 2$. Evaluate each of the following:
   a) $g(-5)$ = _____
   b) $g(-1)$ = _____
   c) $g(10)$ = _____
   d) $g(14)$ = _____

2) Let $f(x) = \frac{2}{3}x - 4$. Evaluate each of the following:
   a) $f(-3)$ = _____
   b) $f(6)$ = _____
   c) $f(-1)$ = _____
   d) $f(4)$ = _____

3) Let $g(x) = \frac{1}{2}x^2 + 4x - 1$. Given the domain {-2, 0, 1, 4, 8}, find the range.

   _____

4) Let $f(x) = \frac{3}{2}x^2 - 5x$. Given the domain {-4, -2, 0, 1, 8}, find the range.

   _____

5) Suppose $h(x) = 4x - 2$. Given the range {-2, 0, 18}, find the domain.

   _____

6) Suppose $f(x) = 7x + 4$. Given the range {-3, 4, 25}, find the domain.

   _____

7) Let $g(x) = -\frac{1}{6}x - 2$. Create a table of values.

x	$g(x)$

8) Let $f(x) = \frac{2}{3}x + 8$. Create a table of values.

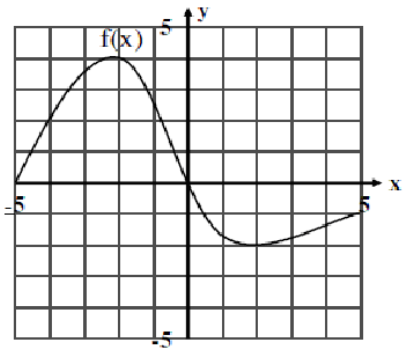
x	$f(x)$

9) Evaluate the following expressions given the functions below.

$g(x) = -3x + 1$ $f(x) = x^2 + 7$ $h(x) = \frac{12}{x}$ $j(x) = \frac{1}{2}x + 9$

   a) $g(10)$ = _____ b) $f(3)$ = _____
   c) $h(-2)$ = _____ d) $j(8)$ = _____
   e) Find x if $g(x) = 16$ _____
   f) Find x if $h(x) = 24$ _____
   g) Find x if $f(x) = 23$ _____
   h) Find x if $j(x) = 17$ _____

10) Given this graph of the function f(x), find:



a) $f(-4) =$ _____

b) $f(0) =$ _____

c) $f(2) =$ _____

d) $f(5) =$ _____

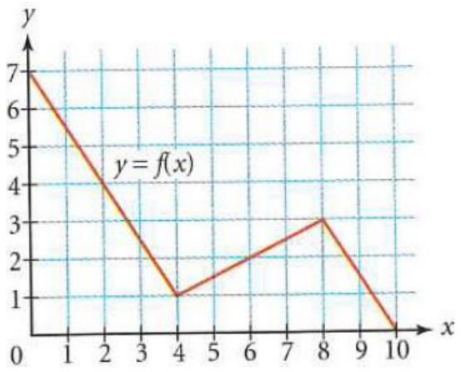
e) $x\ when\ f(x) = 2$

_____

f) $x\ when\ f(x) = 0$

_____

11) Given this graph of the function f(x), find:



a) $f(6) =$ _____ b) $f(2) =$ _____

c) $f(0) =$ _____ d) $f(5) =$ _____

e) $x\ when\ f(x) = 1$ _____

12) Denise decides to study abroad in France. She has to exchange her dollars for Euros. The following function describes the exchange rate between dollar and Euros.

$$f(d) = 0.75d$$

Find f(200). _____

What does this mean in words?

13) The profit from selling *s* number of t-shirts is described by the following function:

$$p(s) = 8s - 500$$

Find p(70). _____

What does this mean in words?

14) The value of a car is given by the following function:

$$v(t) = 20000(.90)t$$

Find v(1)= _____

What does this mean in words?

15) Daniel's income for the fall semester is described by the following function:

$$f(h) = 1000 + 9h$$

Find f(320) _____

What does this mean in words?

16) If you are given the function $f(x) = \frac{1}{3}x^2 - \frac{2}{3}x + 10$, what kind of values should you choose to create a table?

Fill in the table with corresponding values of your choice.

x				
f(x)				

Name:_____ Algebra PreAP:_____

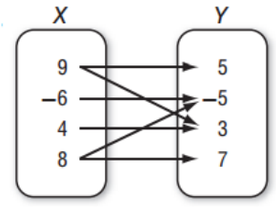
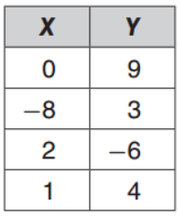
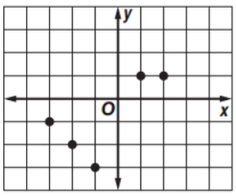
Domain and Range Notes

DOMAIN = VALUES OF INDEPENDENT VARIABLE RANGE = VALUES OF DEPENDENT VARIABLE

Definitions: **Domain** The set of all _____ values of a relation

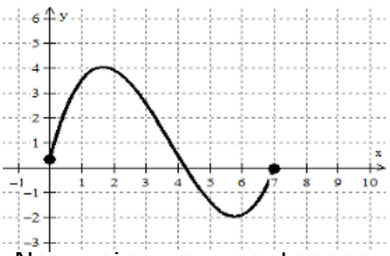
Range The set of all _____ values of a relation

What do domain and range look like for different representations? TRY IT.

Ordered pairs	Mapping Diagram
$\{(-1,1)(-2,2)(4,-4)(7,-7)\}$ Domain:_____ Range:_____	 Domain:_____ Range:_____
Table	**Discrete Graph**
 Domain:_____ Range:_____	 Domain:_____ Range:_____

What we've seen so far is DISCRETE. **Discrete** domain and range are given as LISTS.

However, if the relation is connected, the relation is CONTINUOUS. In this case, domain and range are given as INEQUALITIES. Look at the least and greatest values for each axis then write **sentences** that explain the domain and range of the following.



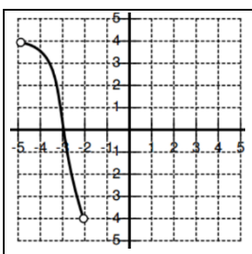
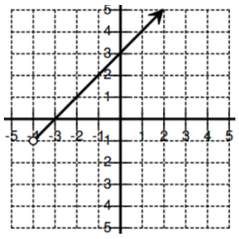
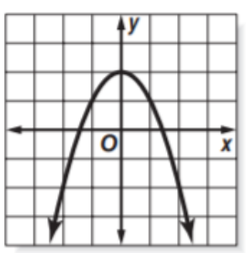
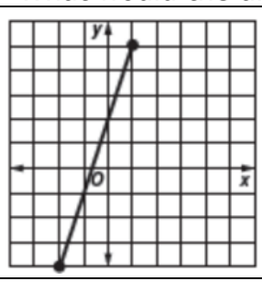
I think the domain is…

I think the range is…

Now using your sentences, write the inequality statements.

Domain inequality statement:	**Range** inequality statement:

TRY IT! Find the Domain and Range for the following CONTINUOUS functions!

 D: R: *What do the open circles indicate?	 D: R: *What would the arrow indicate?
 D: R:	 D: R:

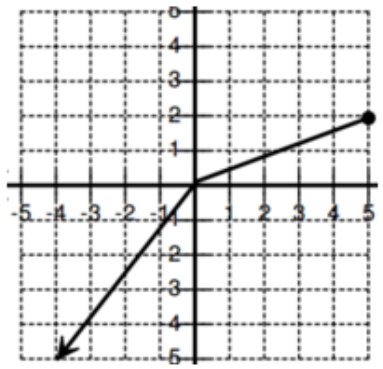
Name:_____ Algebra PreAP/GT:_____

Domain and Range Practice

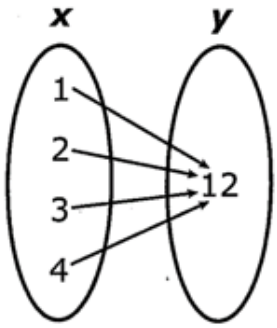
Read the domain and range statements with your partner and write in words what it means. Then find and write the letter of the corresponding representation. Determine if it is discrete or continuous.

Domain: $-4 < x \leq 3$ In words: **Range:** $-5 < y \leq 2$ In words: Matching Letter _____ discrete or continuous _____	**Domain:** $\{-1, 0, 1, 2\}$ **Range:** $\{-1, 0, 1\}$ Matching Letter _____ discrete or continuous _____	**Domain:** $\{-3, -1.5, 0, 2.7, 5, 8\}$ **Range:** $\{8\}$ Matching Letter _____ discrete or continuous _____
Domain: $\{0, 1, 2, 3, 4\}$ **Range:** $\{0, 1, 2, 4\}$ Matching Letter _____ discrete or continuous _____	**Domain:** $\mathbb{R}$ In words: **Range:** $y \geq -4$ In words: Matching Letter _____ discrete or continuous _____	**Domain:** $\{1, 2, 3, 4\}$ **Range:** $\{12\}$ Matching Letter _____ discrete or continuous _____
Domain: $\mathbb{R}$ In words: **Range:** $\mathbb{R}$ In words: Matching Letter _____ discrete or continuous _____	**Domain:** $x \leq 5$ In words: **Range:** $y \leq 2$ In words: Matching Letter _____ discrete or continuous _____	Give the domain and range for the remaining map. D: R: Matching Letter _____ discrete or continuous _____
Give the domain and range for the remaining table. D: R: Matching Letter _____ discrete or continuous _____	Give the domain and range for the two remaining graphs. D: R: Matching Letter _____ discrete or continuous _____	Give the domain and range for the two remaining graphs. D: R: Matching Letter _____ discrete or continuous _____

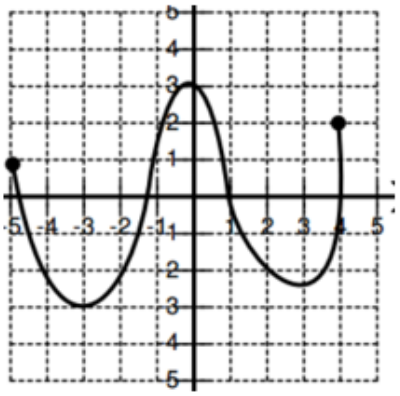
A



B



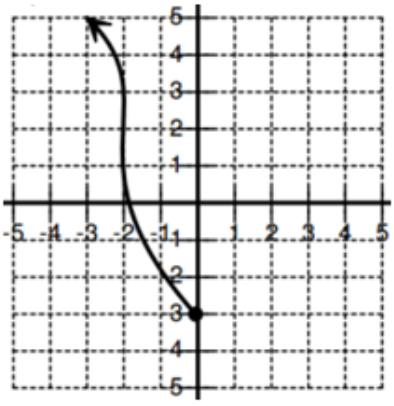
C



D

{(-3, 8), (-1.5, 8),
(0, 8), (2.7, 8),
(5, 8), (8, 8)}

E



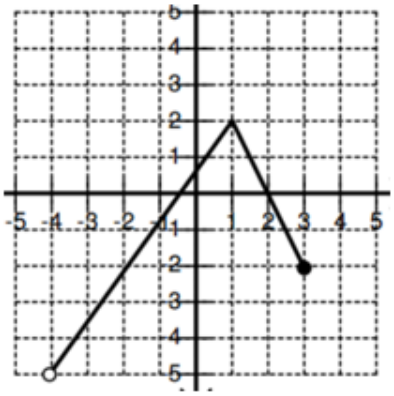
F

x	y
-1	-1
0	1
1	0
1	-1
2	-1

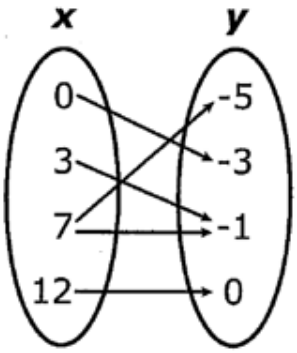
H

{(0, 0), (1, 2),
(1, 4), (2, 1),
(3, 4), (4, 1)}

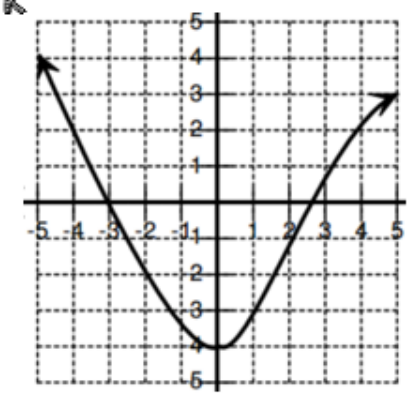
I



J



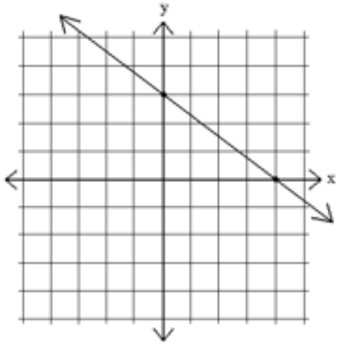
K



L

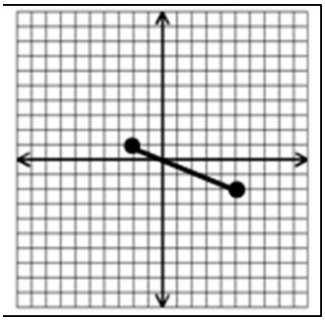
x	y
1	0
2	0
3	1
4	1
5	1

M

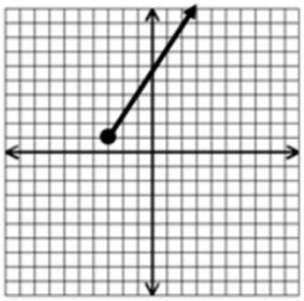


Name:_____ Algebra PreAP:_____

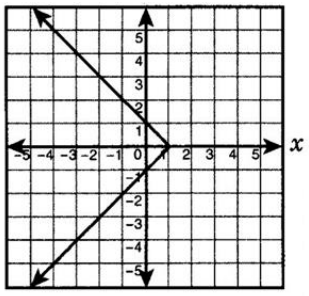
Domain and Range Homework



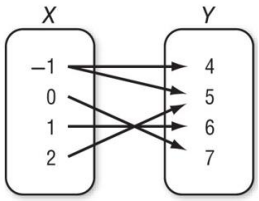
Function? Yes or No
Continuous or Discrete?
Domain:
Range:



Function? Yes or No
Continuous or Discrete?
Domain:
Range:



Function? Yes or No
Continuous or Discrete?
Domain:
Range:



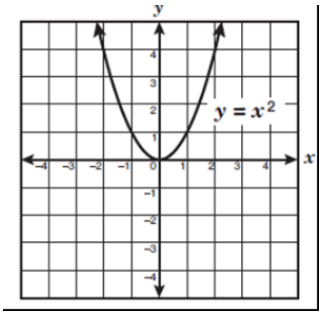
Function? Yes or No
Continuous or Discrete?
Domain:
Range:

{(4, 2), (2, 3), (6, 1)}

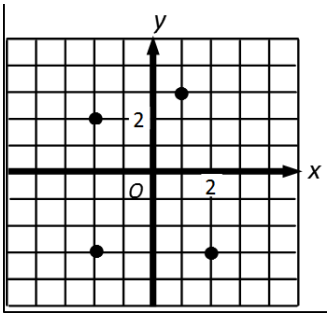
Function? Yes or No
Continuous or Discrete?
Domain:
Range:

x	y
1	5
–4	–3
7	6
1	–2

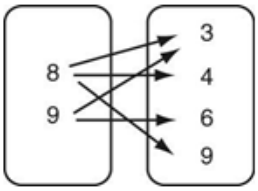
Function? Yes or No
Continuous or Discrete?
Domain:
Range:



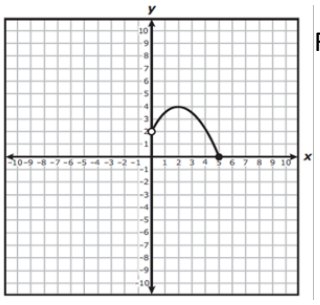
Function? Yes or No
Continuous or Discrete?
Domain:
Range:



Function? Yes or No
Continuous or Discrete?
Domain:
Range:



Function? Yes or No
Continuous or Discrete?
Domain:
Range:

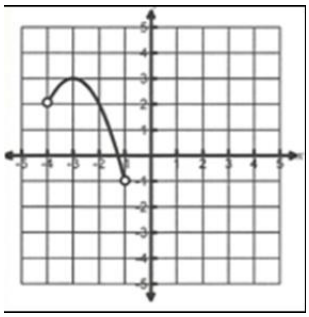


Function?

C/D?

D:

R:

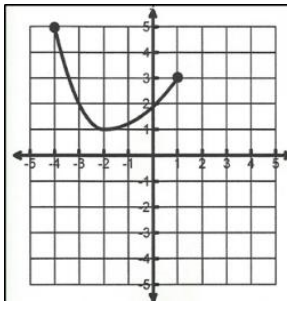


Function?

C/D?

D:

R:



Function?

C/D?

D:

R:

Name: _____ Algebra PreAP/GT _____

Be Reasonable!!

In the following situations, come up with a reasonable domain and range**. Explain why your domain and range are reasonable.**

Ask yourself: Can these values be negative? Can these values be fractions?
Are these values **continuous** or **discrete**? How can I tell?
Can I use an inequality? List of numbers? Will words describe the domain or range best?

1. Jesse is parking in a garage for a concert. It costs $6 for the first 2 hours, and an additional $3 for each additional hour or fraction of an hour. The maximum charge for the day is $24. Determine a reasonable domain and range for this situation if the cost is a function of time.

Domain: _____

Range: _____

2. There are a total of 128 teams at the start of a citywide basketball tournament. Half of the teams are eliminated after each round. Determine a reasonable domain and range for this situation if the number of teams is a function of the number of rounds.

Domain: _____

Range: _____

3. In 1952, the United States had 58,000 reported cases of Polio – the worst outbreak in the nation's history. The vaccine was created soon after and in 1994, the Americas were declared Polio-free. Determine a reasonable domain and range for this situation if the number of reported polio cases is a function of the year.

Domain: _____

Range: _____

4. Each question on Geraldine's last test was worth 5 points. She knows she answered at least 11 correctly. Her teacher gives no partial credit. She is trying to figure out her possible score. Determine a reasonable domain and range for this situation if the score on the test is a function of the number of questions she answered correctly.

Domain: _____

Range: _____

5. A candle started out 16 inches tall. Each hour it burns, it is ¼ inch shorter. Determine a reasonable domain and range for this situation if the height of the candle is a function of the time it spends burning.

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Domain: _____

Range: _____

6. When sending a package, Harry pays $3.50 for up to 1 pound and then pays an additional $0.10 each additional ounce. Harry has several packages, the heaviest weighing 3 pounds. Determine a reasonable domain and range for this situation if the cost of the package is a function of its weight.

Domain: _____

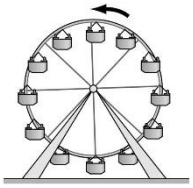
Range: _____

7. A kettle of boiling water cools in a warm kitchen. Water boils at 212°F and the kitchen is about 78°F. Determine a reasonable domain and range for this situation if the temperature is a function

Domain: _____

Range: _____

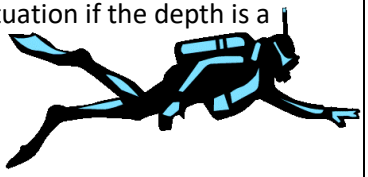
8. Hannah went to the carnival and rode the Ferris wheel 7 times in a row. Each ride is about a minute long. The Ferris wheel went up 100 meters. Determine a reasonable domain and range for this situation if Hannah's height from the ground is a function of time elapsed.



Domain: _____

Range: _____

9. Laurie is getting her SCUBA diving instructor certification. She knows that recreational diving is usually restricted to 30 or 40 meters below the surface. She can take people under water to explore coral reefs as long as they have oxygen in their tank. Determine a reasonable domain and range for this situation if the depth is a function of time.



Domain: _____

Range: _____

10. Tanya saves $25 each week until she has enough to buy a coat she's been eyeing at the department store. The coat costs $245 and she is hoping she can purchase it before the winter holidays. Determine a reasonable domain and range for this situation if amount she needs to buy the coat is a function of the amount she has saved.

Domain: _____

Range: _____

These situations will be helpful and guide you through your **performance task** over the next few days. If you have any questions, make a note of them here:

Quiz Tomorrow!

Name_____ Algebra PreAP/GT Period_____

Unit 1 Functions Quiz

1. What are the domain and range of the relation in the table?

x	y
4	9
6	13
0	0
-5	-9

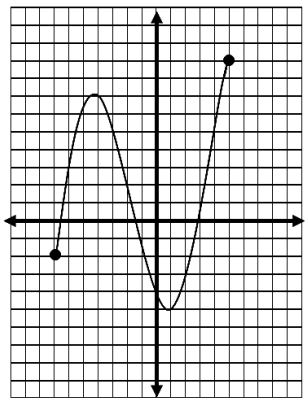
A. D:$\{-9,0,9,13\}$ R:$\{-5,0,4,6\}$

C. D: $\{-5 \le x \le 6\}$ R: $\{-9 \le y \le 13\}$

B. D: $\{-5,0,4,6\}$ R: $\{-9,0,9,13\}$

D. D: $\{-9 \le x \le 13\}$ R: $\{-5 \le y \le 6\}$

2. What are the domain and range of the relation in the graph?



A. D:$\{-7 \le x \le 5\}$ R:$\{-5 \le y \le 9\}$

C. D: $\{-2 \le x \le 5\}$ R: $\{-2 \le y \le 7\}$

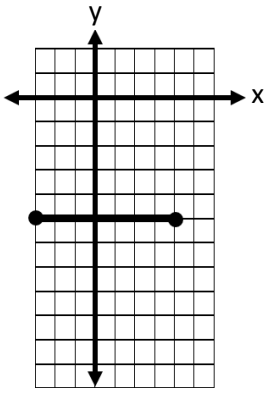
B. D: $\{1 \le x \le 5\}$ R: $\{-5 \le y \le 9\}$

D. D: $\{-5 \le x \le 9\}$ R: $\{-7 \le y \le 5\}$

3. Using the graph from **number 2** evaluate the function at f(5).

f(5) = _____

4. What are the domain and range of the relation in the graph?



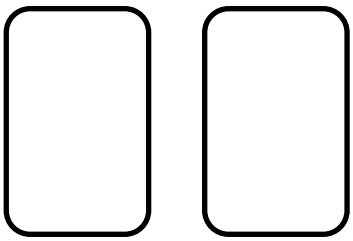
A. D:$\{-3 \le x \le 6\}$ R:$\{0 \le y \le -5\}$

C. D: $\{-3 \le x \le 4\}$ R: $\{y = -5\}$

B. D: $\{-4 \le x \le 5\}$ R: $\{-6 \le y \le 0\}$

D. D: $\{x = -5\}$ R: $\{-3 \le y \le 4\}$

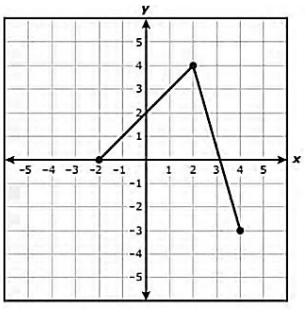
5. Express the ordered pairs relation below as a mapping diagram. Label the ovals as Domain and Range. Don't forget your arrows!



$\{(1,2)\ (2,3)\ (3,5)\ (4,10)\ (5,5)\}$

Is this relation a function?

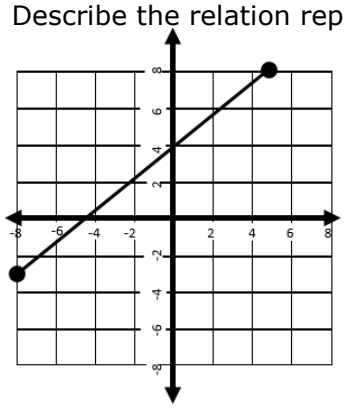
6. What are the domain and range of the function graphed on the grid?



Domain: _____

Range: _____

7. Describe the relation represented by the graph.



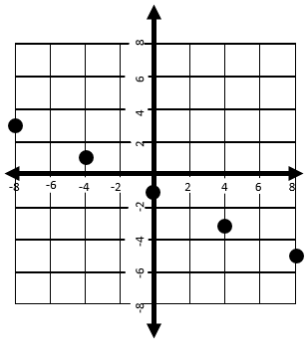
Is it a function? _____

Is it discrete or continuous? _____

What is the domain? _____

What is the range? _____

8. Describe the relation represented by the graph.



Is it a function? _____

Is it discrete or continuous? _____

What is the domain? _____

What is the range? _____

9. If -2 is an element in the domain of $f(x) = \frac{2x+8}{4}$, what is the corresponding element in the range?

Answer: _____

10. Which of the following relations is not a function?

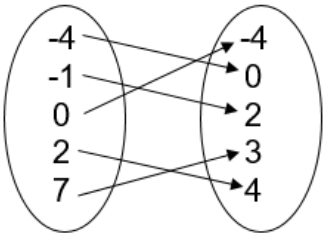
A. {(−1, 4), (1, 6), (4, 10)} B. {(−1, 2), (1, 3), (−1, 4)}

C. {(−1, 6), (4, 7), (5, 6)} D. {(−1, 2), (1, 2), (3, 3)}

11. The mapping on the right represents all of the points on the graph of function f.

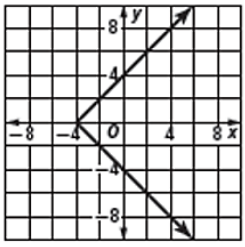
What is the range of f?

A. $\{-4, -1, 0, 2, 7\}$
B. $\{-4, -1, 0, 1, 2, 3, 4, 7\}$
C. $\{-4, 0, 2, 3, 4\}$
D. $\{0\}$



12. Which representation shows *y* as a function of *x*?

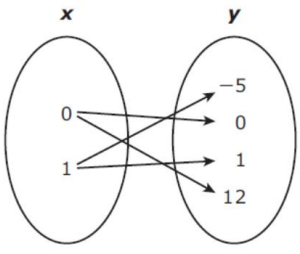
A.



B.

x	y
6	−6
−6	6
8	−8
−8	8

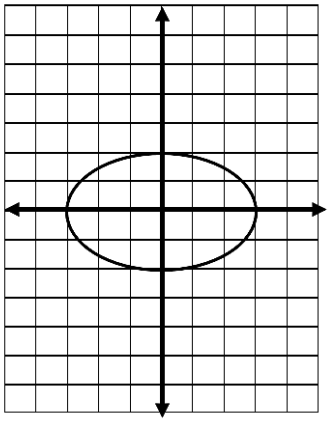
C.



D.

x	y
2	−1
2	−2
2	−3
2	−4

Give the domain and the range of the relation. Then, tell whether the relation is a function.



13. D: _____

R: _____

Function? _____

14. What are the domain and range of $f(x) = -4$?

D: _____ R: _____

15. Determine if the table on the right represents a function. Explain how you know.

_____

_____

x	y
-2	-5
-1	-1
1	-1
2	-5

16. Part of Peter's budget is money for transportation. He needs gas in his truck to drive to and from college next week. His truck holds up to 28 gallons. Gas costs $2.79 per gallon. Analyze the domain and range for a function that determines his total cost.

	Part of the Situation It Represents	**Type of Numbers**	**Any Restrictions**
Domain			
Range			

17. The number of ferryboat trips $f(c)$, needed to transport *c* cars in 1 day can be found using the function $\boldsymbol{f(c) = \frac{c}{20}}$**.** To transport the maximum 5000 cars, the ferry makes 250 daily trips. What is the **range** of the function?

A. The set of all integers greater than or equal to 5,000
B. The set of all integers from 0 to 5,000
C. The set of all integers greater than or equal to 250
D. The set of all integers from 0 to 250

18. Find the value of f(200) in the function $\boldsymbol{f(c) = \frac{c}{20}}$.

f(200) = _____

How did you do?

A.2A										
1	**2**	**3**	**4**	**7**	**8**	**11**	**13**	**14**	**16**	**17**
_____/11 = _____x 100 = _____										

A.12A							*A.12B*		
5	7	8	10	12	13	15	3	9	18
_____/7 = _____x 100 = _____							_____/3 = _____x 100 = _____		

Record your results on your data Algebra tracker under Quiz. Are you improving? What do you need to focus on for your upcoming test?