Warmup 9/

(Area of a square with a side length of 3) For 1 & 2, select the correct graph <u>and explain why you chose it.</u>



3) Draw a graph with an x-axis of "time" and a y-axis of "distance traveled" that would be impossible – that is, where Tom would be in 2 places at once.

Go over Graphing Stories WS

Table of Contents

- p. 1 Converting Fractions and Decimals (1.1)
- p. 2 Roots (1.8 & 1.9)
- p. 3 Solving x² and x³ Equations (1.8)
- p. 4 Rational vs. Irrational (1.1)
- p. 5 What is a function?

YOU DO NOT NEED TO LABEL A NEW NOTES PAGE. THIS WILL BE A HANDOUT!!!

What is a Function?

Objectives:

-Introduce yourself to the VERY important math concept of a "function"

-Decide if a table, graph, or situation is or is not a function

5

Game: Guess My Rule

<u>Input</u> <u>Output</u> -4 -18

Input	<u>Output</u>
10	45
7	19.5
3	-0.5
6	13
10	45
-6	19

Input	<u>Output</u>		
5	13		
2	13		
97	13		
-3.2	13		
0	13		



•(It has to be "fair"!!!)

Rest of today:

- We will simply be asking the question "Is this a function???"
- We will do more practice later with trying to figure out what the rule is. But for now, all we care about is if the rule is FAIR or not.



No; the input "5" has more than one output.

X	У
-8	16
10	-20
1	-2
4	-8
1	-2

Yes; there is a repeated input, but the output is the same.

X	У
1	5
1	6
2	7
2	8
3	9

No; the inputs "1" and "2" have more than one output.

X	У
1	24
2	9
3	-6
4	-21
5	-36

Yes; each input has only one output.

X	У
1	-2
2	-2
3	-2
4	-2
5	-2

Yes; each input has only one output. (You can have the same output for multiple inputs!)

(2, 8); (-5, 9); (7, 9); (2, -4), (7, 4)

No; the input "2" has more than one output.

(1, 5); (8, 19); (4, 11); (-8, -13), (1, 5)

Yes, each input has only 1 output.

Mapping Diagram:

Express the relation (2,0), (5, 9), (-1, 9), (-2, 16) as a mapping diagram.





Yes, each input has only 1 output.



No; the input "6" has more than one output.



Yes, each input has only 1 output.

IS IT A FUNCTION?

One input \rightarrow Multiple outputs = **BAD** Multiple inputs \rightarrow one output = **OK**

(There are several types of mathematical rules that can give you repeated outputs. For example, multiplying by zero then adding anything. Squaring a number. Taking the absolute value. And many, many more!)

Let's look at some graphs

now...

8 This graph is just plain wrong. How can Tom be in two places at once?



Time

1 Tom ran from his home to the bus stop and waited. He realized that he had missed the bus so he walked home.

Distance from home

G

Input = time, Output = distance from home

2 different times → same location: does make sense!

Time

Created by Ms. Niemec

Warmup $9/(\frac{4!}{4}+2\sqrt{4})$

Try to figure out the rules. Write each rule in the form "Output = Input + 3" or something similar.

1)	Input	Output	2)	Input	Output	3)	Input	Output
	9	-9		2	13		5	15
	70	52		5	25		7	39
	32	14		6	29		-7	39
	-6	-24		7	33		10	90
	99	81		100	405		3	-1
	Output = Input – 18			Output = Input•4 + 5		5	Output = Input ² – 10	

4) The exclamation point in Ms. Niemec's problem above is actually a mathematical symbol. Based on the fact that today is the 10th, can you figure out what 4! should be equal to? (And is there anyone who actually knows what the ! sign does?)

Bonus knowledge!

- ! = "factorial"
- "5!" is "5 factorial"
- It means to multiply $5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$.
- What is the value of 5 factorial?
- Factorials get huge very quickly:
- 10! = $10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$
- 10! = 3,628,800

What is the input and output of this point?



Input = 8 Output = -3

If the input is 6, what's the output?



Output = 8

On a graph...

• "x" is the input, and "y" is the output.







Yes







Yes; every xvalue has only one yvalue

Rules for graphs of functions

• ON A GRAPH:

- The x-value (horizontal) is the INPUT and the y-value (vertical) is the OUTPUT.
- To be a function, each x-value can only have one y-value.





Yes



Yes





Would this be a function?

- Input = student in this class
- Output = desk label of the student's assigned seat

Yes, each student only has one assigned seat

Would this be a function?

- Input = letter of the alphabet
- Output = word that begins with that letter

No; a letter could have multiple words that begin with it

WITH YOUR GROUP:

- Decide whether each of the relationships are functions. EACH PERSON should be able to explain each one, so discuss well!!!
- 1. Input = Instagram account, Output = password
- 2. Input = password, Output = Instagram account
- 3. Input = student, Output = the student's current hair color
- 4. Input = student in our class, Output = planet he/she lives on
- 5. Input = state, Output = # of letters in the state's name
- 6. Input = state, Output = a letter in the state's name
- 7. Input = month, Output = # of days in the month
- 8. Input = # of days in the month, Output = month
- 9. Input = date, Output = temperature outside
- **10**. Input = any integer, Output = double that integer

1, 4, 5, 10 are functions

Please complete #4 – 9 on the homework

• We will check it in just a couple minutes!

Warmup 9/(The month of Mrs. England's birthday + the number of daughters she has)

- TODAY'S WARMUP WILL BE ON A NOTECARD. ON YOUR WARMUP PAGE, JUST WRITE "NOTECARD."
- For each question, say if it <u>is</u> or <u>is not</u> a function and explain why.



-10

Table of Contents

- p. 1 Converting Fractions and Decimals (1.1)
- p. 2 Roots (1.8 & 1.9)
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- p. 4 Rational vs. Irrational (1.1)
- p. 5 What is a function?
- p. 6 Function Notation: f(x)

Function Notation

6

Objectives:

-Use function notation to evaluate functions

-Write a rule using function notation

Function Names

- In math, we give each function rule a name. This name is simply a letter of the alphabet.
- Let's name these three functions:
 - 1. Input = state, Output = letters in the state's name
 - 2. Input = month, Output = # of days in the month
 - 3. Input = any integer, Output = double that integer

What is the output of _____ for the input ____?

Function notation

- Let's say the function "L" tells you how many letters are in a state's name.
- It's a mouthful to ask "What is the output of L if the input is "lowa"?
- So instead, we use **function notation**. The function name goes first, then the input you want goes in parentheses after the letter.
- L(lowa) = ?

- Suppose the function **H** takes any number and divides it in half.
- What is H(10)?
- What is H(44)?
- What is H(302)?
- What is H(-8.4)?
- Here's how we would write the function:

$$H(x) = \frac{x}{2}$$

Function Notation

This is the name of the function

This is the variable (the input)

How do you say it? <u>"f of x"</u>

Letters

 Before now, letters have always been used as variables. But now, letters can also be used to name a function.

 You have to be smart as a math student and understand if you are looking at a variable or the name of a function.

Evaluating Functions

• Use the following functions:

 $c(x) = x^2 + 1$ b(x) = -9 + xa(x) = 4x - 2a(3) = 4(3) - 21) What is a(3)? a(3) = 12 - 2a(3) = 10 $c(-3) = (-3)^2 + 1$ 2) What is c(-3)? c(-3) = 9 + 1c(-3) = 103) What is b(100)? b(100) = -9 + 100b(100) = 91

IMPORTANT

• f(x) DOES NOT MEAN "f times x"

 f(5) means "What do you get when you plug "5" into the function "f"?"

b(100) = 91

MEANS:

"If you plug '100' into the function 'b', the output is 91"

The "91" is your answer. The "b(100)" is just labeling your answer. Like "x = 5"

Evaluate using the given functions:

- r(x) = -2x + 8 $s(x) = 3x^2$ t(x) = |x 2|
 - **1.** s(5) =75
 - 2. t(5) =3
 - 3. r(-6) =20
- 4. t(-4) =6

VOLUNTEERS TO PUT THESE ON THE BOARD??? (and label them correctly???)

5. s(-3) =27

WRITING FUNCTION RULES FROM REAL-WORLD SITUATIONS

Each <u>pair</u> should get a whiteboard, marker, eraser!

Write a rule in Function Notation:

x	a(x)
1	12
2	22
3	32
4	42
5	52
6	62

Output = Input•10 + 2 a(x) = x•10 + 2 a(x) = 10x + 2

- Write a rule in function notation to model the situation.
 Describe what the input and output represent.
- Herb is buying pizzas. Each pizza costs \$12.

Function Rule: c(p) = 12p

Input (p): # of pizzas Output (c(p)): Total cost

Homework: Function Notation Worksheet

There is a typo on #13...it should be obvious.