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Focused Mathematics Intervention— Level 8

This sample includes the following:

To Create a World in which Children Love to Learn!

Level 8

Focused Mathematics Intervention

Teacher's Guide

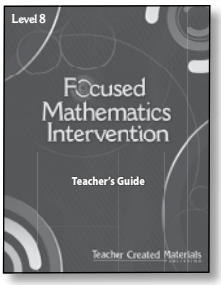
Teacher Created Materials
PUBLISHING

Table of Contents

Kit Components

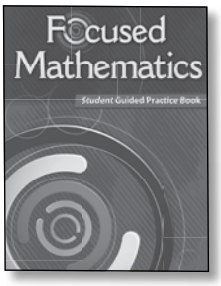
Teacher's Guide

30 easy-to-use, standards-based lesson plans



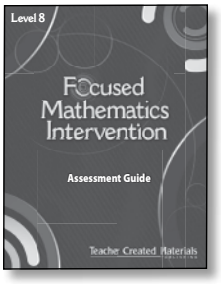
Student Guided Practice Book

Full-color student activities



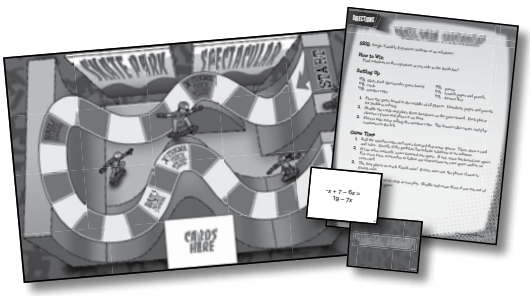
Assessment Guide

Includes a pretest, posttest, performance tasks with assessments, and the answer key for the *Student Guided Practice Book*



3 Math Fluency Game Sets

Include a game board, directions, an answer key, and game pieces



3 Digital Math Fluency Games

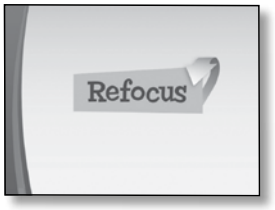
Focus on mathematical skills and strategies, and are on the Digital Resources USB Device

Digital Resources

- PDFs of all student materials, game sets, activity sheets, assessments, etc.
- PDFs of teacher resources
- Digital Math Fluency Games
- Electronic versions of the Pretest, Posttest, Performance Tasks, and reporting tools

Refocus Mini Lesson PPT

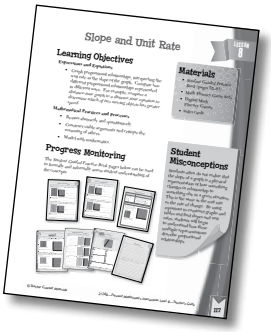
Provided as PowerPoint® and PDF files



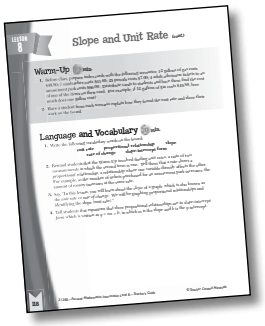
Teaching a Lesson

Teacher's Guide

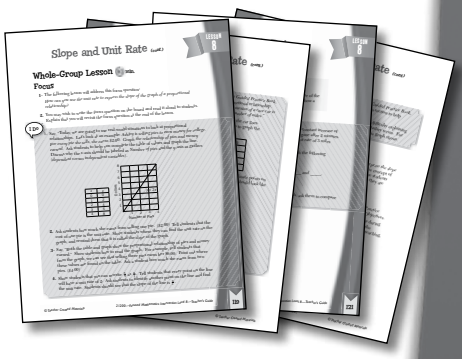
Each 8-page lesson is organized in a consistent format for ease of use. Teachers may choose to complete some or all of the lesson activities to best meet the needs of their students. Lesson materials can be utilized flexibly in a variety of settings. For example, modeling with a small group, using printed materials with a document camera, or using PDF materials on a digital platform, such as an interactive whiteboard. Each lesson includes:



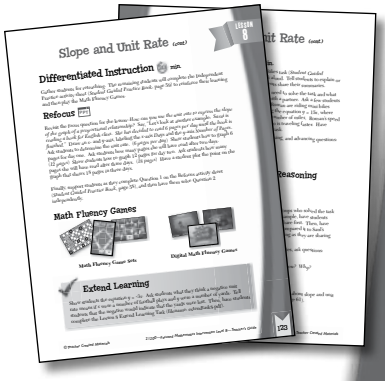
- an overview page with key information for planning
- key mathematics content standards covered
- key mathematical practices and processes addressed
- an overview providing teacher background or student misconceptions



- a Warm-Up activity to build students' recall of important mathematical concepts
- a whole-class Language and Vocabulary activity
- time markers to indicate the approximate time for instruction



- a whole-class section focusing on the key concept/skill being taught
- use of the gradual release of responsibility model in the Whole-Group lesson section



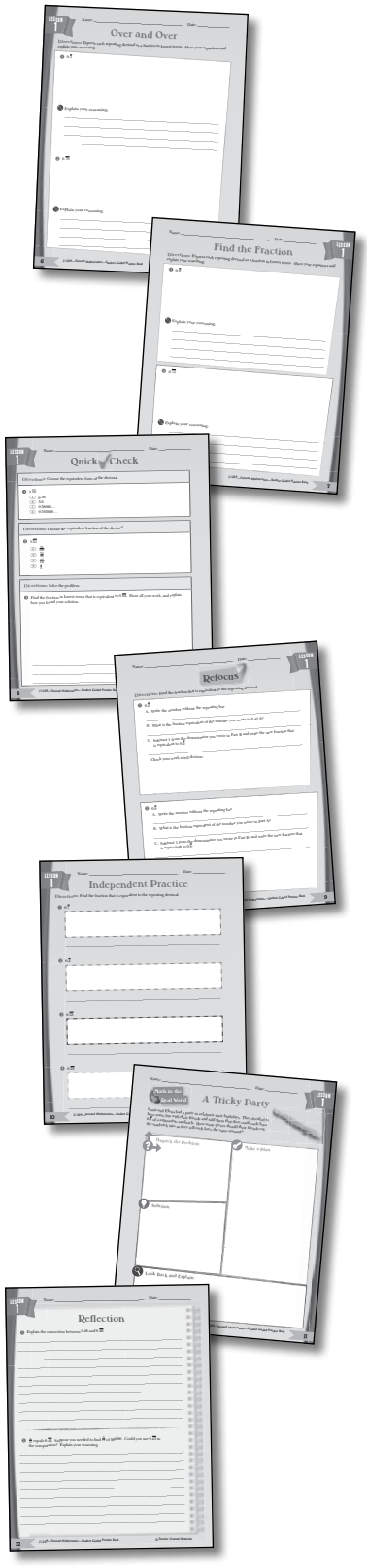
- differentiation strategies to support and extend learning with the Refocus lesson and Extend Learning activity
- math fluency games that motivate students to develop and reinforce mastery of basic skills
- a Math in the Real World concept task activity

Teaching a Lesson *(cont.)*

Student Guided Practice Book

Each lesson in the *Teacher's Guide* has seven corresponding student pages in the *Student Guided Practice Book:*

- a We Do activity to support the gradual release of responsibility model
- a You Do activity to facilitate independent practice
- a Quick Check to easily monitor students' progress
- a Refocus activity for students who need more instruction
- an Independent Practice page to reinforce mathematical content taught in the lesson
- a Math in the Real World concept task for students to apply the math concept in a real-life scenario
- a Reflection page for students to share their mathematical understanding



LESSON 13

Definition of Function

Learning Objectives

Functions

- Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.

Mathematical Practices and Processes

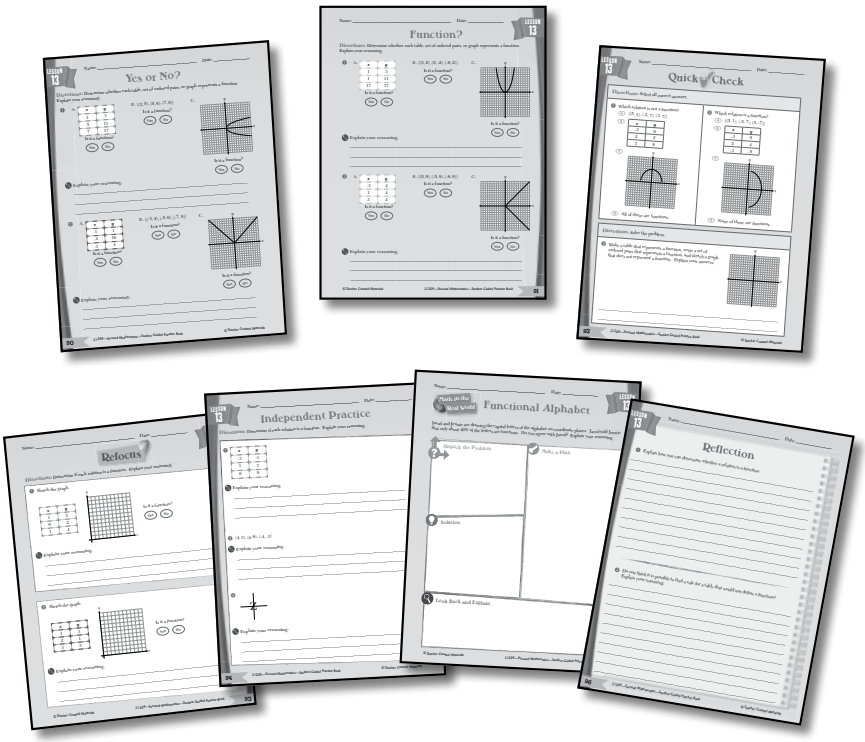
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Attend to precision.
- Look for and make use of structure.

Materials

- *Student Guided Practice Book* (pages 90–96)
- Math Fluency Game Sets
- Digital Math Fluency Games
- sticky notes
- chart paper
- markers
- grid paper

Progress Monitoring

The *Student Guided Practice Book* pages below can be used to formally and informally assess student understanding of the concepts.



Student Misconceptions

Students often believe that any equation in two variables is a function. Sometimes students generalize the vertical line test to a "horizontal line" test, mistakenly believing that the graph of a function cannot be crossed more than once by a horizontal line. It is crucial that students understand that a relation that has no repeated x-coordinates is a function. Then, by investigating graphs of equations that are functions and equations that are not functions, students can see that having a relation that has no repeated x-coordinates will pass the vertical line test.

Definition of Function *(cont.)*

Warm-Up 10 min.

1. Before class, prepare six posters: three with the charts below and three with the graphs of the ordered pairs on the chart. Label the tables *A*, *B*, *C* and the graphs *D*, *E*, *F*. Do not label charts and graphs in the same order.

x	*y*
-2	3
0	1
1	-1

x	*y*
2	4
0	0
1	2

x	*y*
4	-2
1	1
4	2

2. Put students in groups of three or four. Give each group three sticky notes. Ask each group to match the table with its graph and write the letters on a sticky note.
3. When students have finished, ask a student to explain the group's answer. Continue with two more students. If students disagree on choices, ask a student with a different answer to explain. Have the class discuss the correct answer.

Language and Vocabulary 10 min.

1. Write the following vocabulary words on the board:

_x_-coordinate **_y_-coordinate** **input** **output**
function **vertical line test**

2. Tell students that the *input* is the *x-coordinate* and the *output* is the *y-coordinate*. Ask students to identify the *inputs* and *outputs* from the Warm-Up tables.
3. Ask students to write the ordered pairs for one of the tables. Tell them that today they are going to look at special relations called *functions*. A function has no repeated *x*-coordinates. Ask students to identify the tables from the Warm-Up that are functions. Ask why the third table does not represent a function.
4. Have students compare the graphs and see what the repeated *x*-coordinate does to the graph. They should see that two of the points lie on a vertical line. Explain that a function will never contain points that lie on a vertical line—this is called the *vertical line test*. Have students explain why the first two tables pass the vertical line test.

Definition of Function *(cont.)*

Whole-Group Lesson 40 min.

Focus

1. The following lesson will address this focus question:
   How can you determine if a relation is a function by looking at its graph, a set of ordered pairs, or a table of its values?
2. You may wish to write the focus question on the board and read it aloud to students. Explain that you will revisit the focus question at the end of the lesson.

I Do

1. Say, "Today, we are going to use tables and graphs to investigate functions. Let's look at an example." Write a table on the board with input 2, 7, 9, and output 4, 9, 11. Label the input column x and the output column y. Ask students if the ordered pairs on the table represent a function. They should see that there are no repeated input (x) values, so the relation is a function. Have a student graph the relation on a grid on the board. Ask the class to explain how the graph demonstrates that the relation is a function.
2. Show students the ordered pairs (1, 1) (9, -3), (9, 3). Ask students if the ordered pairs represent a function. They should see that there are repeated input (x) values, so the relation is not a function. Ask the class to predict how the graph will demonstrate that the relation is not a function. (*There will be two points on the same vertical line.*) Ask a student to graph the points.
3. Show students a table with input 2, 3, 4, 5 and output 4, 1, 1, 3. Ask students if the ordered pairs represent a function. Students may disagree, so ask a student to graph the points. When the points are graphed, ask if the graph passes the vertical line test. (*Yes.*) Point out that the repeated y-coordinates cause two points to lie on a horizontal line. The horizontal line does not indicate whether or not the relation is a function.
4. Show students a circle on a grid. Ask them to explain why it is or is not a function. Ask them to describe the repetitions they would find in the input column of the table. Draw a sideways S on a grid. Ask them to explain why it is or is not a function. Ask them to describe the repetitions they would find in the input column of the table.

Definition of Function *(cont.)*

Whole-Group Lesson *(cont.)*

We Do

1. Refer students to the Yes or No? activity sheet (*Student Guided Practice Book*, page 90). Say, "Let's look at more examples of relations. Look at the table in the first problem. What should you look at to determine if the relation shown in the table is a function?" Students should say that they need to look at the first column, the *x*-coordinates. Ask students how the input determines whether or not the relation is a function. Students should notice that there are no repeated numbers in the *x* column, so the relation is a function. Ask students to change one number on the table so it is not a function. Students should suggest that a number in the *x* column should be changed so that it is the same as one of the other numbers in the column. Ask students if the table would still represent a function if you changed the *11* in the *y* column to a *3*. Students should recognize that repeated numbers in the *y* column do not determine whether or not a relation is a function.
2. Now, look at the set of ordered pairs. Say, "What do you look at to determine if the relation is a function?" Students should respond that you look at the *x*-coordinates. Ask if the relation is a function. (*Yes.*) They should recognize that there are no repeated *x*-coordinates.
3. Ask students to look at the graph. Ask how they can determine if it is a function. If necessary remind students of the vertical line test. Ask if they can draw a vertical line that crosses the graph more than once. (*No.*) Have students discuss why this is the same as having repeated *x*-coordinates. Students should recognize that all points on a vertical line have the same *x*-coordinate.

Definition of Function *(cont.)*

Whole-Group Lesson *(cont.)*

Language Support

As you make tables and graphs, emphasize that all of them represent relations, but only some of them represent a function. Make sure students understand that functions are a special kind of relation.

We Do (cont.)

4. To help students explain their reasoning, provide them with the following sentence frames:

- *A table does not represent a function if there are _____.*
- *A set of ordered pairs does not represent a function if there are _____.*
- *A graph does not represent a function if it fails the _____ test.*
- *A table, set of ordered pairs, or graph represents a function if _____.*

5. Ask students to complete the activity sheet and discuss their answer and explanations with other students after they finish.

Definition of Function *(cont.)*

Whole-Group Lesson *(cont.)*

You Do

1. Refer students to the Function? activity sheet (*Student Guided Practice Book*, page 91). Provide the sentence frames from Step 4 of the We Do section to help students explain their reasoning.
2. Have students share their answers and reasoning. If students have difficulty explaining their reasoning, remind them to use the sentence frames and vocabulary words. For example, have students explain why a relation is not a function.

Closing the Whole-Group Lesson

Revisit the focus question for the lesson: *How can you determine if a relation is a function by looking at its graph, a set of ordered pairs, or a table of its values?* Ask students to discuss how using the vertical line test on a graph and looking for repeated x-coordinates in a set of ordered pairs or in the first column of a table are all checking the same thing. Students should recognize that repeated numbers in the first column of a table or the first coordinate in an ordered pair would be graphed as points on a vertical line.

Progress Monitoring 5 min.

1. Have students complete the Quick Check activity sheet (*Student Guided Practice Book*, page 92) to gauge student progress toward mastery of the Learning Objectives.
2. Based on the results of the Quick Check activity sheet and your observations during the lesson, identify students who may benefit from additional instruction in the Learning Objectives. These students will be placed into a small group for reteaching. See instructions on the following page.

Definition of Function *(cont.)*

Differentiated Instruction 20 min.

Gather students for reteaching. The remaining students will complete the Independent Practice activity sheet (*Student Guided Practice Book*, page 94) to reinforce their learning and then play the Math Fluency Games.

Refocus PPT

Revisit the focus question for the lesson: *How can you determine if a relation is a function by looking at its graph, a set of ordered pairs, or a table of its values?* To help students understand the graph of a function, sketch a graph that is a function, such as a parabola, and another that is not, such as a sideways *P*. Ask a student to try to draw a vertical line that touches more than one point. Explain that the parabola passes the vertical line test because it is not crossed more than once, so it is a function. The sideways *P* fails the test, so it is not a function. Show students the table of values.

x	*y*
-2	3
0	1
-1	-1

Ask students to graph the ordered pairs. Ask if the graph passes the vertical line test. Because it is not possible to draw a vertical line passing through more than one point, the table represents a function. Have students complete Questions 1 and 2 on the Refocus activity sheet (*Student Guided Practice Book*, page 93).

Math Fluency Games

Math Fluency Game Sets

Digital Math Fluency Games

Extend Learning

Ask students to choose a rule to make a table, such as $y = 3x$. Make a table with three or four values for x. Ask them how to use the table to determine whether the rule defines a function. Have students complete the Lesson 13 Extend Learning Task (filename: extendtask13.pdf).

Definition of Function *(cont.)*

Math in the Real World 30 min.

1. Refer students to the Math in the Real World: Functional Alphabet task (*Student Guided Practice Book*, page 95). Have a student read the task aloud. Tell students to explain or summarize the task to their partner. Have a few students share their summaries.
2. Ask students to think about what information they will need to solve the task and what the task is asking them to do. Then, have them share with a partner. Ask a few students to share aloud. Students should identify that Jarod and Jennie are drawing capital letters of the alphabet on coordinate planes. They need to find out if approximately 40% of the letters are functions. Have students work in groups of two or three to complete the task.
3. As students are working, circulate and ask focusing, assessing, and advancing questions:
   - *Is it sufficient to use the vertical line test with just one vertical line?*
   - *How can you tell if the letter passes the vertical line test?*
   - *How can you determine how many letters 10% would be?*

Sentence Frames for Explaining Reasoning

- *I agree/disagree with Jarod because _____.*
- *The letter _____ is a function because _____.*
- *The letter _____ is not a function because _____.*

4. Observe how students are solving the task and choose a few groups who solved the task in different ways to share their solutions and reasoning. There may be some disagreements about certain letters, so make sure to allow time for discussion. Make sure students explain their reasoning as they are sharing their solutions.
5. As groups are sharing their solution paths, reasoning, and strategies, ask questions:
   - *How can you explain what _____ said in a different way?*
   - *Do you agree or disagree with the reasoning? Why?*
   - *Which solution makes the most sense to you? Why?*

Lesson Reflection 5 min.

Have students reflect on their learning by answering the two questions about functions on the Reflection activity sheet (*Student Guided Practice Book*, page 96).

LESSON 13

Name:_____ Date:_____

Yes or No?

Directions: Determine whether each table, set of ordered pairs, or graph represents a function. Explain your reasoning.

1 **A.**

x	y
1	3
5	11
7	17

Is it a function?

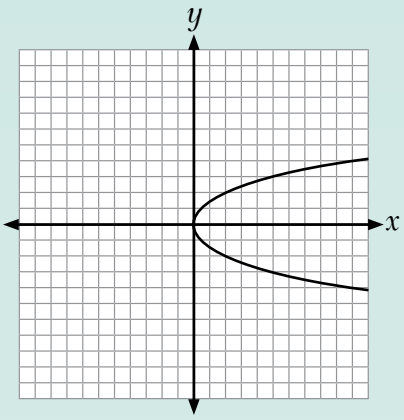
Yes No

B. {(3, 8), (5, 8), (7, 8)}

Is it a function?

Yes No

C.



Is it a function?

Yes No

Explain your reasoning.

_____

_____

_____

2 **A.**

x	y
-1	1
-4	16
-1	4

Is it a function?

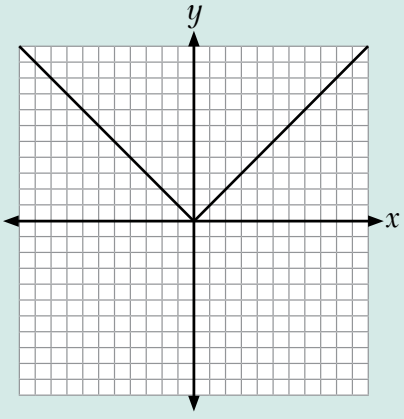
Yes No

B. {(-3, 4), (-5, 6), (-7, 8)}

Is it a function?

Yes No

C.



Is it a function?

Yes No

Explain your reasoning.

_____

_____

_____

Name: _____ Date: _____

LESSON 13

Function?

Directions: Determine whether each table, set of ordered pairs, or graph represents a function. Explain your reasoning.

1 **A.**

x	y
1	3
1	11
17	17

Is it a function?

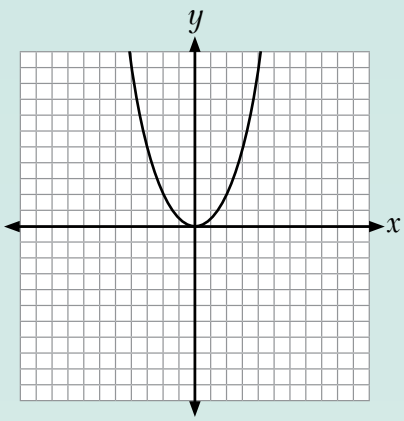
Yes No

B. {(3, 2), (5, -2), (-6, 2)}

Is it a function?

Yes No

C.



Is it a function?

Yes No

Explain your reasoning.

_____

_____

_____

2 **A.**

x	y
-3	4
1	4
3	4

Is it a function?

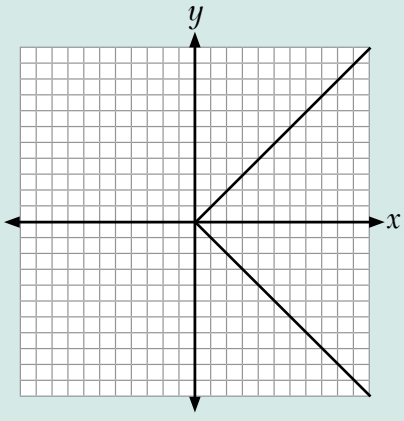
Yes No

B. {(5, 9), (-5, 9), (-6, 8)}

Is it a function?

Yes No

C.



Is it a function?

Yes No

Explain your reasoning.

_____

_____

_____

LESSON 13

Name: _____ Date: _____

Quick Check

Directions: Select all correct answers.

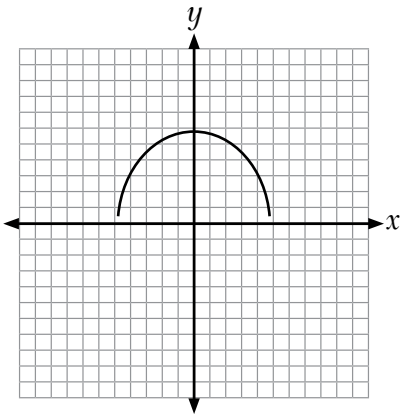
1 Which relation is not a function?

(A) {(5, 1), (-2, 7), (3, 7)}

(B)

x	y
-3	9
2	2
3	9

(C)



(D) All of these are functions.

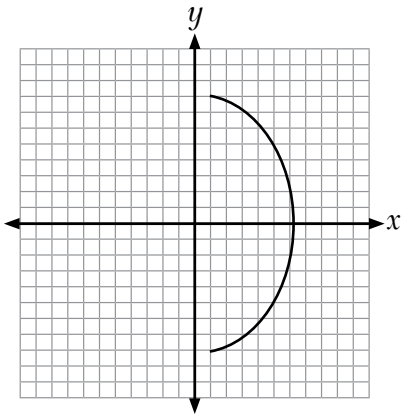
2 Which relation is a function?

(A) {(5, 1), (-5, 7), (5, -7)}

(B)

x	y
-3	9
2	4
-3	-9

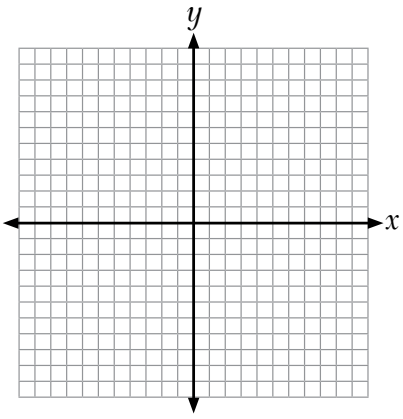
(C)



(D) None of these are functions.

Directions: Solve the problem.

3 Make a table that represents a function, write a set of ordered pairs that represents a function, and sketch a graph that does not represent a function. Explain your answers.



_____

_____

Name: _____ Date: _____

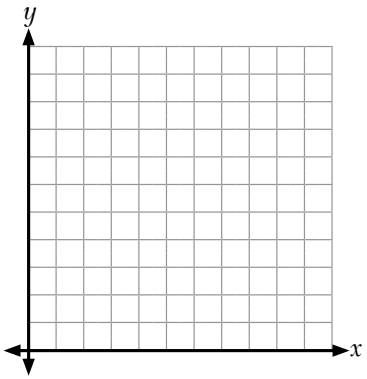
LESSON 13

Refocus

Directions: Determine if each relation is a function. Explain your reasoning.

1 Sketch the graph.

x	y
1	3
0	2
1	4



Is it a function?

Yes No

Explain your reasoning.

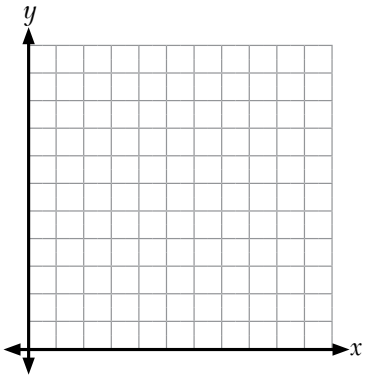
_____

_____

_____

2 Sketch the graph.

x	y
1	3
2	1
3	3



Is it a function?

Yes No

Explain your reasoning.

_____

_____

_____

LESSON 13

Name: _____ Date: _____

Independent Practice

Directions: Determine if each relation is a function. Explain your reasoning.

1.

x	y
-3	-1
1	3
6	9

Explain your reasoning.

_____

_____

_____

2. (4, 3), (4, 6), (-4, -3)

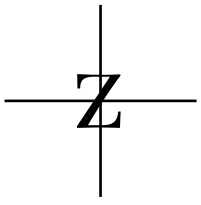
Explain your reasoning.

_____

_____

_____

3.



Explain your reasoning.

_____

_____

_____

Name: _____ Date: _____

LESSON 13

Math in the Real World

Functional Alphabet

Jarod and Jennie are drawing the capital letters of the alphabet on coordinate planes. Jarod told Jennie that only about 40% of the letters are functions. Do you agree with Jarod? Explain your reasoning.

Unpack the Problem

Make a Plan

Solution

Look Back and Explain

Name: _____ Date: _____

Reflection

1. Explain how you can determine whether a relation is a function.

2. Do you think it is possible to find a rule for a table that would not define a function? Explain your reasoning.

Name:_____ **Date:**_____

Pretest

1. Don wants to change 0.7777… into a fraction. What is the equivalent fraction?

(A) $\frac{4}{7}$

(B) $\frac{5}{7}$

(C) $\frac{7}{9}$

(D) $\frac{7}{11}$

2. Which fraction is **not** a repeating decimal?

(A) $\frac{1}{6}$

(B) $\frac{1}{9}$

(C) $\frac{5}{6}$

(D) $\frac{7}{8}$

3. Which statement is an **incorrect** comparison of $\sqrt{5}$ and $\sqrt{6}$?

(A) $\sqrt{6}$ is about 0.8 larger than $\sqrt{5}$.

(B) The difference between $\sqrt{5}$ and $\sqrt{6}$ is about 0.2.

(C) The square root of 6 is greater than the square root of 5.

(D) $\sqrt{5}$ and $\sqrt{6}$ are between the whole numbers 2 and 3.

4. Simplify: $(6^2)^3$

(A) 6

(B) 30

(C) 7,776

(D) 46,656

Name:_____ **Date:**_____

Performance Task 1: Finding Rational Answers

Part A

Mrs. Clark has posted questions for her 8th grade math class about rational and irrational numbers. Tony and Annie are answering the first set of questions.

1. Annie said that $\sqrt{49}$ and $\sqrt{3}$ are rational numbers. Is she correct? Explain your thinking.

_____

_____

_____

_____

_____

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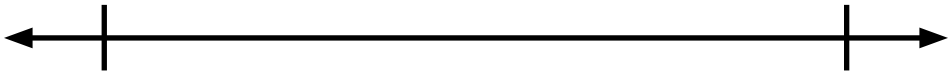
2. Tony stated that $\sqrt{2}$ is an irrational number.

A Locate $\sqrt{2}$ on the number line.



B How do you know where to place $\sqrt{2}$ on the number line? Is $\sqrt{2}$ irrational?

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