NCTM 2016

Session 450

Get Function-Minded:
Using Tasks to Jump Start Relationship Thinking

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Sample Tasks

1. Do Now: Making Relations (by: Carl Oliver)
2. Making Functions (by: Carl Oliver)
3. Task 1.2: Relations and Functions (by: LiemnNate)
4. Tasks 1.4: Mini-Mart Madness (by: LiemnNate)

*Complete "Unit 1: Functions and Relation" *(found at www.coast2coast.me/liem)**

DO NOW: Making Relations 1 Name_____ Date _____ Class _____

Relations are any relationship between items in one set to the items in the another set.
For each of the following relations:

A. Find the name of the two sets of items in each table.
B. Describe in words how the two sets of items are related.

1.

_____	_____
Scandal	ABC
Brooklyn 9-9	Fox
The Today Show	NBC
Sportscenter	ESPN

Describe the Relationship _____

_____

_____

2.

_____	_____
2	Red
4	Green
J	Brown
F	Orange

Describe the Relationship _____

_____

_____

3.

_____	_____
Red	3
Blue	4
Purple	6
White	5

Describe the Relationship _____

_____

_____

4.

_____	_____
12	A dozen
24	Two dozen
36	Three dozen
48	Four dozen

Describe the Relationship _____

_____

_____

5.

_____	_____
30 minutes	Half hour
60 minutes	One hour
180 minutes	Three hours
1440 minutes	Twenty four hours

Describe the Relationship _____

_____

_____

_____

6.

_____	_____
1 touchdown	7 points
1 field goal	3 points
4 touchdowns & 1 field goal	31
3 touchdowns & 1 field goal	24

Describe the Relationship _____

_____

_____

_____

Create two sets of items that have a relationship and describe the relationship below.

7.

_____	_____

Describe the Relationship _____

_____

_____

_____

8.

_____	_____

Describe the Relationship _____

_____

_____

_____

Making Functions Name_____ Date _____ Class _____

Functions are any relations that assign an item in the domain to exactly one item in the range.
For each of the following relation:

A. Find two items in the domain and range so that the relation can remain a function.
B. Describe in words how the two sets of items are related.

1.

Set 1	Set 2
1	2
3	6
20	40
8	16

Describe the Relationship _____

_____

_____

_____

2.

Set 1	Set 2
6	10
2	6
20	24
100	104

Describe the Relationship _____

_____

_____

_____

3.

Set 1	Set 2
40	25
100	85
5	-10
18	3

Describe the Relationship _____

_____

_____

_____

4.

Set 1	Set 2
2	23
6	63
10	103
-5	-47

Describe the Relationship _____

_____

_____

_____

5.

Set 1	Set 2
6	59
2	19
8	79
10	99

Describe the Relationship _____

_____

_____

_____

6.

Set 1	Set 2
2	5
6	13
50	101
10	21

Describe the Relationship _____

_____

_____

_____

Create two sets of items that have a relationship and describe the relationship below

7.

Set 1	Set 2

Describe the Relationship _____

_____

_____

_____

8.

Set 1	Set 2

Describe the Relationship _____

_____

_____

_____

1.2: Relations and Functions

When two sets are *related* in a specific way such that every element of one set is related to one or more elements in the other set we call it a **relation**.

A **relation** is can be thought of as a **set** of paired numbers consisting of *input* and *output* values.

The set of *input* values make up the **domain** of the relation.

The set of *output* values make up the **range** of the relation.

A **function** is a *relation* such that every *input* has only one *output*.

From the Common Core Standards (F-IF 1)

Understand that a function from one set (called the domain) to another set (called the range) ***assigns to each element of the domain exactly one element of the range****.*

Each chart below represents a relationship between two sets (a **relation**). Fill in each chart with the appropriate labels and or numbers. Explain, in writing, why your answers make sense.

Relation 1.

Pairs of Shoes	1	2	3	4		6	7
Number of Shoes		4			10		

Relation 2.

Weeks Until the Party	10	8	6		3	
Days Until the Party	70		42	35		7

Relation 3.

Hours in the Car on a Road Trip	0	1	2	3	4	5
	0	65	135	200		325

Relation 4.

	0	1	2	3	4	5
	0	60	120	180	240	

Relation 5.

	1	2		3	4	5	6	7	8	9	10	11	12
	31	28	29	31	30	31	30	31	31	30	31	30	31

Relation 6.

	1	2	3	8	20	
	3	4	5	10		50

Relation 7.

Number of Tickets (t)	1			2			3			4		
Price for t tickets ($)	Upper	Middle	Lower	Upper	Middle	Lower	Upper	Middle	Lower	Upper	Middle	Lower
	10	20	50	20		100	30	60				200

1. Mr. Tran thinks there are more possible outputs for 2, 3, and 4 in Relation 7. Explain why you agree or disagree (mathematically).

2. Based on your completed charts, which of the 7 relations are functions? Explain how you know.

Every relation has a **domain** and a **range**. The domain represent and range are sets of numbers.

3. What is the domain of Relation 5?

4. What is the range of Relation 1?

5. What is the range of Relation 2?

6. What is a "reasonable domain" for Relation 7. Explain your answer.

1.4: Mini Mart Madness aka A Mountain Doozey

A local Mini-Mart sells sodas in different ways:

Individual Sodas	***$1***
Six-Packs	***$4***
Twelve-Packs	***$7***

Does the picture match the scenario? Why or why not?

We might assume that everyone's choice is to buy sodas in the cheapest way possible, but who knows. Check out these people:

https://www.youtube.com/watch?v=QHsPgUJJsHQ

1.4: Presentation Questions

Considerations:

- What if the buyer doesn't care about how much the sodas will cost?
- Are there multiple options for people who don't know/care that there is a cheapest way, or don't plan ahead to save money?

Your Task

The relationship between *the number of sodas you want to buy "S"* and *the cost of buying those sodas "C"*. **Explore of this relation as thoroughly as possible for *up to* 15 sodas**

Also, explore the relationship between *the number of sodas you want to buy "S" and the least expensive way to by those sodas "L"*.

Discuss and justify whether or not these two *relations* are *functions*.

1.4: Scaffolding Questions

1. How much will it cost you to buy 2 sodas?

2. How much will it cost to buy 7 sodas?

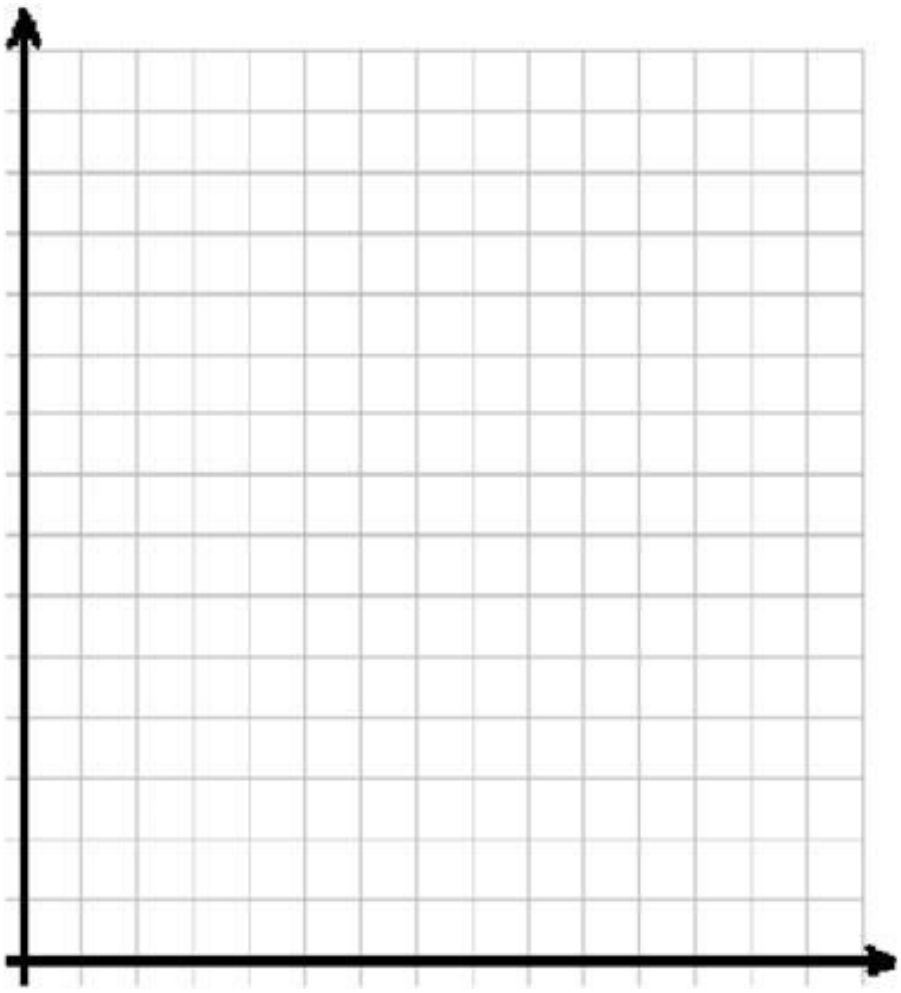
3. What is the cheapest way to buy 10 sodas?

4. I gave my nephew $10 and sent him to get 8 sodas for him and his friends. He came back with the sodas and $2 change. What did I have to explain to him?

5. 13 sodas can be bought 4 different ways. What are they and how much does each way cost?

6. Think about the relation with input 0 to 15 sodas and output which is the cost of buying those sodas.
    a. Display this relation with a table or a mapping.

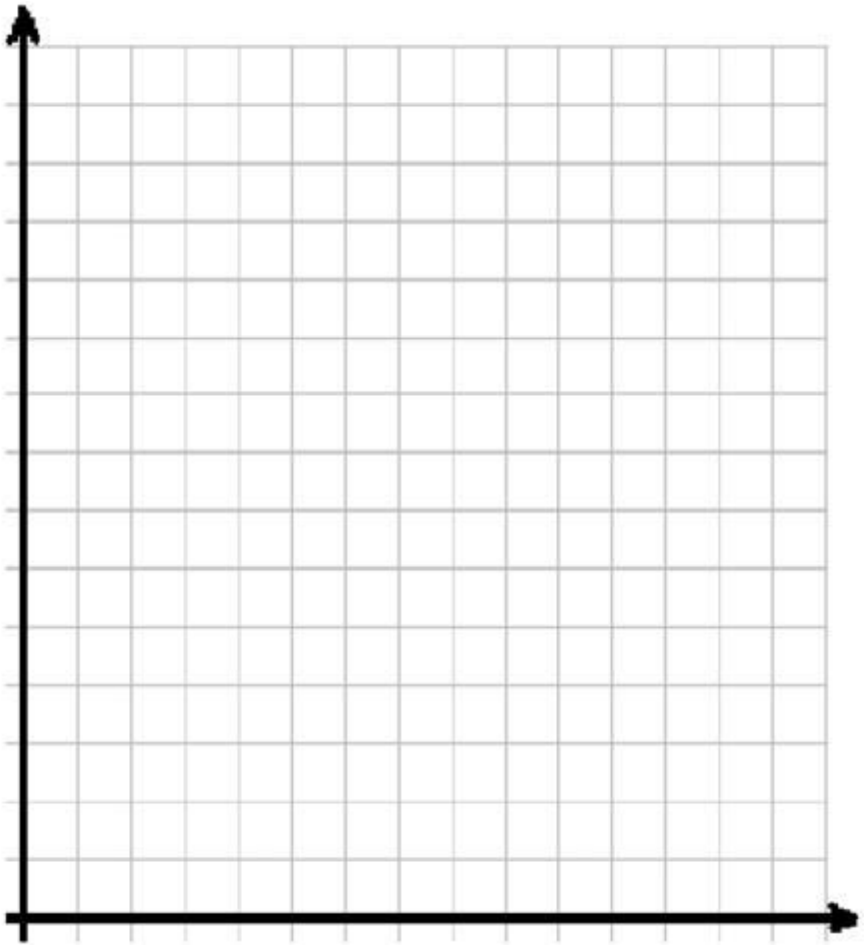
    b. Display this relation on the graph below



    c. Is this relation a function? Why or why not?

7. Now think the relation with input 0 to 15 sodas and output which is the cost of the cheapest way to buy that number of sodas.
    a. Display this relation with a table or a mapping.

    b. Display this relation with a Graph.



    a. What is the maximum value of this relation? What does it represent?

    a. Is this relation a function? Why or why not?

1.4: Follow Up Questions

1. Can you think of a scenario where it would make sense that someone would by 13 sodas by purchasing one six pack and 7 individual sodas.

2. Mr. Tran argues that 14 sodas can be bought in more ways than Mr. Goza thinks is possible. Tran says that you can buy 14 sodas by buying a twelve pack and 4 individual sodas which only costs $11. Mr. Goza says that shouldn't count because no one would ever buy 16 sodas to get 14 sodas. Tran asks, "Well then why do you think buying a 12-pack to get 10 sodas counts?" Do you agree with Tran or Goza? Which possibilities should count for this relation?

3. The mini-mart is considering selling 24 packs in the future. How much do you think they will charge considering how they have priced their other sodas? How did you decide on this price?

4. Create another scenario that can be described by a relation that is **not** a function. Explain why this relation is not a function.

5. Create another scenario that can be described by a relation that **is** a function. Explain why this relation is a function.

Challenge: Predict how many different ways you could buy 30 sodas. Is there a short way to find out the number of possibilities there are? Is there a pattern?

Super-Challenge: What is the cheapest way to buy 30 sodas? What is the cheapest way to buy S sodas?