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From Activity 9 (adding and subtracting rational expressions)

Skills Practice

4. a. What is a factor? a number that divides into another number exactly.
   b. What is a multiple? a number that can be divided by another number without a remainder
5. List the factors and multiples of 15.

   Factors: 1, 3, 5, 15

   Multiples: 15, 30, 45, 60, 75, …

6. Find the Least Common Multiple of the following:

   a. 3, 4, 6 — 12

   b. 4, 8, 16 — 16

   c. 3, 4, 8 — 24

   d. 3, 5, 7 — 105

7. Find the LCD for the following sets of fractions.

   a. $\frac{1}{3}+\frac{3}{4}+\frac{5}{6}$ — 12

   b. $\frac{2}{3}+\frac{8}{9}+\frac{7}{12}$ — 36

   c. $\frac{1}{3}+\frac{1}{5}+\frac{1}{7}$ — 105

8. Using the LCDs found in the previous exercise, add one set of fractions.

   a. $\frac{23}{12}$ b. $\frac{77}{36}$ c. $\frac{71}{105}$

9. When can finding the least common multiple (LCM) be done by multiplying the numbers together? In which situations above would multiplying the numbers together give you a common multiple but NOT a least common multiple?

When the numbers are all prime or if they don't share any common factors.
When one or more of the numbers share a common factor- if you multiply these together, you get a common multiple but not a LEAST common multiple.

10. Find the Least Common Multiple of the following:

    a. $x, x+2, x^2+2x$ — x^2+2x

    b. $(m+3), (m-3), m^2-9$ — m^2-9

    c. $3y, (y+3), y^2$ — $3y^2(y+3)$

11. Find the LCD for the following sets of fractions.

    a. $\frac{1}{6x}+\frac{3}{3x^2}+\frac{5}{6}$ — $6x^2$

    b. $\frac{2}{x+2}+\frac{8}{x-2}+\frac{7}{x^2-4}$ — x^2-4

    c. $\frac{1}{x-3}+\frac{1}{x+5}+\frac{1}{x-7}$ — $(x-3)(x+5)(x-7)$

Activity 13: Introduction to Relations and Functions

This is a whole-class, teacher-led lesson. This lesson should be done on whiteboards if they are available. Before this lesson, do the Real Number System activity in the appendix. To save time, have students start on it before class starts.

Think. Pair. Share.
Individually, think of several statements that fit this pattern. Fill in the blanks. When prompted by your instructor, share your statements with your group, and choose a few statements to share with the whole class.

___Mood_____ **depends on**__amount of sleep_

_____ **depends on** _____

_____ **depends on** _____

_____ **depends on** _____

_____ **depends on** _____

_____ **depends on** _____

_____ **depends on** _____

_____ **depends on** _____

Ask students to come up with several statements that follow this pattern. As they share their statements accept and write on the board all statements that the class agrees make a true statement. Complete consensus is not necessary. In the discussion, listen for or insert the word "relationship" to start students thinking toward the meaning of relation.

Class Discussion: After writing about 6 statements ask the class to identify, from the existing statements or ask students to provide additional statements, those that can be quantified. For example, "my mood during the day depends on whether or not I ate breakfast" (can be shortened on the board as "mood depends on breakfast") is not easily quantifiable. However, "my mood on depends on how many hours of sleep I got" could be quantified, if mood is measured on a numeric scale. Other statements will be more obviously quantifiable.

After exploring a few quantifiable statements, point out the use of the word "relationship" in your discussions and explain that in mathematics these relationships are called a "Relation."

In mathematics, these types of statements are called a _____

As a group, choose 1 or 2 "depends on" statements that can be described numerically, and make a list of numbers that represent the relationship. For example,

My mood* **depends on** hours of sleep	
1	0
4	3
7	6
10	12

*as measured on a numeric scale

_____ **depends on** _____

_____ **depends on** _____

Class Discussion: As students share their examples, guide the discussion toward the use of the words "input" and "output." Students will be inclined to associate input with the first blank, and output with the last blank, so make sure the process of the input/output relationship is clear.

Write on the board (and they should add to their notes) "A relation pairs an input with an output."

A _____ pairs an _____ with an _____.

Look for student examples that can and cannot be classified as functions. Ask students to put those examples on the board for the class to compare. If one type of relation is lacking, help students modify their responses in order to produce a function and a non-function. Through the discussion help students discover the pattern that occurs in a function. Have them check their own tables of numbers for the function pattern. Do not name the pattern until students show an understanding of the concept of function. Once this understanding is evident, tell student this pattern has a name – "function." Write on the board. "A function is a relation (a pairing) in which every input value has exactly one corresponding output value." (or a similar definition)

A _____ is a _____ in which every _____ value has exactly _____ corresponding _____ value.

Ask a student to explain how they understand the difference between a relation and a function. Continue asking until explanations are clear and correct.

Tell students: From now on we will be concerned with understanding and working with functions. Reinforce understanding by writing these statements on the board.

output depends on input

output is a function of input

_____ depends on _____

_____is a function of _____

Identify the input and output for each statement, then determine if the following statements are functions. Justify your decision. The following solutions may not apply depending on student justifications. Allow/encourage students to debate with each other and justify their ideas. If they conclude something is a function without much debate, you can ask what change could be made so it is not a function.

1. The cost of tuition is a function of the number of credit hours on a student's schedule.

Yes. 12 credits will only have one tuition cost on a standard tuition table.

2. The position of the sun in the sky depends on the time of day.

Yes. The sun is in only one position at any given time.

3. The height of a child depends on age.

No. There are multiple heights of children for each age.

4. The number of followers on your Instagram account each day.

Yes, if you only check once a day. No, if the number fluctuates through the day and varies.