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Inquiry Lesson-construct a concept
Unit: Number Systems
Grade: 9
Duration: 1.5 Class Periods
Date: November 7, 2010

Goal: Students will be able to distinguish the difference between rational numbers and non rational numbers.

NYSLS for Mathematics:
Students will understand numbers, multiple ways of representing numbers, relationships among numbers, and number systems.
7.N.2 Recognize the difference between rational and irrational numbers (e.g., explore different approximations of π)
Students will make and investigate mathematical conjectures
Students will solve problems that arise in mathematics and in other contexts.
7.PS.6 Represent problem situations verbally, numerically, algebraically, and graphically
Students will develop and evaluate mathematical arguments and proofs.
7.RP.4 Provide supportive arguments for conjectures
7.RP.5 Develop, verify, and explain and argument, using appropriate mathematical ideas and language
Students will select and use various types of reasoning and methods of proof.
7.RP.6 Support an argument by using a systematic approach to test more than one case
7.RP.7 Devise ways to verify results or use counterexamples to refute incorrect statements
7.RP.8 Apply inductive reasoning in making and supporting mathematical conjectures

NCTM Standards for School Mathematics:

Numbers and Operations Standard:
Students will understand numbers, ways of representing numbers, relationships among numbers, and number systems.
Develop meaning for integers and represent and compare quantities with them.
Reasoning and Proof Standard:
Students will and investigate mathematical conjectures

Objective: The student distinguishes between examples and nonexamples of rational numbers.

Materials: task sheet

Use of Technology: Students can use the smart board to sort the examples and non examples they generate.

Introduction:
Strategy: Inquiry
Tell students that today they will be investigating rational numbers and what it means. Distribute the task sheet. With the class organized in a single large group, ask students to analyze the examples and non examples at the top of the task sheet. Tell the students to record what they notice about each group of numbers. As students are working individually, monitor their progress and answer questions that arise.

Development:
After everyone has responded to the first three prompts on the task sheet, carry out a question and discussion session in which they will share and discuss their observations. Raise questions that lead the students to verbalize their thinking. Keep a record of individual student observations so students can consider the input of their classmates.

Using the record you have just recorded, have students compare their statements regarding the groups of numbers. Emphasize similarities and differences and guide discussion to the development of a generalized definition. If necessary bring students attention to the type of numbers in the group of examples and the type of numbers in the group of non examples.

Guided Practice:
To facilitate the development of commonly worded generalization, have students find other numbers to determine if a given example should be added to the example group or the non example group.

Independent Practice:
For homework, have students look up the following terms in the glossary of their text book:
integer
Tell students to generate a definition in their own words of a rational number. Tell them that their definitions should include the term integer. Then ask the students to use their definitions to write an example and non example of a rational number. (On the second day, students will share their definitions, examples and non examples. Ask questions and guide discussion to lead everyone to refine their definitions until a single, formal definition of a rational number is formed. Close this inquiry activity by having students use the definition to say why each non example isn't a rational number.

Closure:
To close this lesson, recap any commonly worded generalizations that were developed during class. Tell students that tomorrow they will continue the investigation and arrive at a formal definition for a ration number.

If time permits students may begin the homework assignment. Otherwise dismiss the class at the close of the lesson.

Accommodations and Modifications:
For students who demonstrate early mastery, students can help other students who are having difficulty.

Students who demonstrate early master may complete an alternate investigation in which they consider rational numbers that are decimals and write then as fractions. Next they could look at irrational numbers.

Students who struggle with finding rational numbers may use lists of integers to help them and calculators to simply certain numbers.

For students who need additional support, limit the number of exercises. Also, modify the exercise to include only a combination of two types of rational numbers.

Evaluation:
Students will be assessed by taking a chapter quiz. The chapter quiz will require students to demonstrate their understanding of rational numbers.

Task Sheet

Concept: Distinguishing which numbers are rational and which are not

Examples	Nonexamples
$2, \frac{5}{3}, .45, \sqrt{25}, -4$	$\sqrt{2}, e, \pi, i, \frac{\sqrt{6}}{4}$

Use the table above to complete the following exercises.

1. How are the examples alike?

2. How are the examples similar to the nonexamples?

3. How do the examples differ from the nonexamples?

4. Develop a proper definition of a rational number based on your observations from this table.

5. Use the definition to decide whether or not the following numbers are rational or not.
   a. 8
   b. $\sqrt{3}$
   c. $\sqrt{99}$
   d. 1.75
   e. -2