**Identifying Similarities and Differences Applied- Strategy # 1**

**Title:** Day 1- Rational Numbers: Rational v. Irrational, Fractions to Decimals

**Subject:** Math

**Grade Level:** 8th **Time Allotted:** 57 min.

**Materials Required:** Warm up sheets, PowerPoint with “purpose” slides, rational v. irrational comparison sheet, guided practice sheet, ticket out the door, comics for closure, homework problems.

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**Michigan Curriculum Framework:**

[CCSS.MATH.CONTENT.8.NS.A.1](http://www.corestandards.org/Math/Content/8/NS/A/1/)  
Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually…

**Objective(s):**

The student will…

1. Differentiate between rational and irrational numbers.
2. Convert fractions into decimals

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**Instructional Procedure:**

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| **Time**  **Allotted** | **Essential Element** |
| 5 min. | 1. **Anticipatory Set:**   Greet students at the door.  Warm-up: This lesson will be at the beginning of the year, so we will still be getting to know each other. With this mind, the warm-up will be a get to know you better type of activity. See attached warm-up activity. |
| 7 min. | 1. **State Purpose and Objective(s) of Lesson:**   By the end of today you will be able to…   * Tell me the difference between a rational and an irrational number * Convert fractions as decimals   Purpose:  “So, we are moving out of the range of just integers, and into the world of ‘rational’ numbers. Now, remember, integers are the whole numbers, including zero and negative numbers. So, today we are going to step out of our nice safe boat of the integers onto the uncharted waters of the rational numbers! How exciting!  Rational numbers have to do with numbers that are not just one nice round number like 0, 1, 2, 3, 4, -7, -9. Instead, rational numbers often are written as fractions or decimals. It is important that we know about rational numbers and feel comfortable working with them because in life we rarely just deal with just integers. (See slide show) For example, in my life whole pies do not exist. Sometimes *empty* pies, but never whole ones. So normally I get something that looks like this, and in this case I would say that I have eaten one third of the pie, or maybe that I still have 2/3 of the pie left to go before I’m done. That is a rational number.  Here’s another example of a rational number (stop watch). Rarely when we run a race do we finish with an exactly whole number. No, that is really hard! Just try stopping a stop watch sometime and tell me if you can get it to stop exactly on a whole number. It is going to be really hard. We almost ALWAYS have fractions of seconds added onto our time when we are racing. They aren’t whole numbers, they are rational numbers!  Height is the same way. Some people are 5 feet tall, some people are 4 ½ feet tall, and others are 6 feet and 10 inches. All of these are examples of rational numbers.  So, as you can see, rational numbers are super important to know about because they are all around you!” |
| 30 min. | **3. Plan for Instruction:**  **Objective 1**  “Now, I told you that rational numbers are not integers. But what I didn’t tell you is that not all numbers that are not integers are necessarily rational numbers. There are also a type of numbers called *ir*rational numbers that are not integers either. We are going to see if we can figure out what the difference between the two is.  **Strategy #1-** Give students two lists of numbers, categorized as rational and irrational, and ask students to try to describe all of the characteristics that are distinctive of each group. After working solo, they can conference with a partner, then group share out (7 min) See attached worksheet for in-depth view of this strategy in action!  Rules for Rational numbers (generated by students):   1. Can be written as a fraction such that the denominator and the numerator are both integers 2. When expanded to decimal form the decimal either terminates eventually or repeats eventually.   **Practice**: Is this irrational or rational? (6 minutes)  Do three together, three in partners with whiteboards (teacher circulate to see how students are doing)  **Objective 2- Convert Fractions into decimals (17 minutes)**  One of our characteristics of rational numbers is that the decimal ended or repeated. But what about our fractions and whole numbers, they don’t exactly fit this rule, do they?  Are fractions and decimals related?  We know that ½=.5 and that ¼=.25. Can all fractions be turned into decimals?  Let’s take a look at something. When we write, 4/5 (“four over five”), another way we can say this is “four divided by five”. What does 4 divided by 5 equal? Do the long division to come up with .8.  This is the same with EVERY fraction that we have…we can make it into a decimal just by dividing the top number by the bottom number! Let’s practice converting fractions into decimals  **Modeling and Guided Practice**: Practice converting fractions into decimals  See attached guided practice worksheet. The teacher will model the first three problems and then students are to try the next 3. Extra sheet included if additional practice is needed/if time warrants additional practice.  What do you guys notice about the decimals that we are getting? Do they match the rules we came up with for rational numbers? They all repeat or are terminating too! So, they follow our rule too!  **Independent Practice:** see “assessment” |
|  | **4. Differentiation Considerations (accommodations):**  Students needing additional time on their ticket out the door will be allowed to work through the closure activities if they need additional time.  Since the homework will be assigned but not due for two days, students who do not feel confident enough to try some problems on their own yet have the option to not do the homework so that they can have another day of in class practice before practicing on their own. |
| 8-15 min. (may work through closure) | **5. Assessment:** Have students complete the Ticket Out the Door (see attached) after modeling and guided practice. This will lead into the closure.  **Ticket Out the Door:** convert a fraction to a decimal, look at one last comic and classify each of the numbers as rational/irrational, self-assess on the day’s objectives. |
| 7 min. | **6. Closure:**  Look at rational number comics and have student explain them to their partner. Have students decide if the numbers they are looking at are rational or irrational and explain why to their partners. Students should write this on their partner white board again. Homework will be assigned but not due until two days later so that those students who feel like they already understand can start working on it and those who still feel like they need help can have another day of in class practice before being turned loose on their own. |

**Explanation of Identified Instructional Strategy:**

I chose to use a Venn Diagram to help the students learn the difference between rational and irrational numbers because I wanted them to discover it for themselves and not just hear me as a teacher tell them the difference. One of my objectives for my students was that they would be able to differentiate between rational and irrational numbers, and in order to do this I felt they really needed to sift through the similarities and differences for themselves. Originally I had considered just having the students look at two lists of numbers, one of rational numbers and one of irrational numbers, and then try to generate a definition for each before generating their own examples. While what I have done now is essentially the same thing, I felt that the addition of requiring the students to *describe* each number and then categorize the descriptions using the Venn would better scaffold their organization of ideas and formation of a definition of each type of number. For these reasons, I chose a summarizing strategy. Within the types of summarization strategies, I felt that a comparison matrix would be too complex for my purposes and that a t-chart or Y-chart would not allow for the very important section for identifying areas of overlap. Thus, I chose the Venn Diagram.

One of the cons of this use of the Venn Diagram is that students might think certain numbers can/cannot be rational numbers because they saw only a limited sample of examples of rational and irrational numbers. As a result they could do the process entirely correctly but come up with a rule that is wrong. However, I think that this ultimately could be a very valuable learning experience if we as a class discussed why new examples might be wrong or right and use new examples to further narrow our definitions.