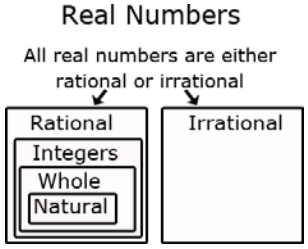
Unit 1: Rational Numbers and Decimal Expansion

Cluster: Know that there are numbers that are not rational, ~~and approximate them by rational numbers.~~

Nevada Academic Content Standard	What does this standard mean that a student will know and be able to do? (adapted from North Carolina *8th Grade Standards, Unpacked 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, and convert a decimal expansion which repeats eventually into a rational number.	Students understand that Real numbers are either rational or irrational. They distinguish between rational and irrational numbers, recognizing that any number that can be expressed as a fraction is a rational number. The diagram below illustrates the relationship between the subgroups of the real number system.  Students recognize that the decimal equivalent of a fraction will either terminate or repeat. Fractions that terminate will have denominators containing only prime factors of 2 and/or 5. This understanding builds on work in 7th grade when students used long division to distinguish between repeating and terminating decimals. Students convert repeating decimals into their fraction equivalent using patterns or algebraic reasoning. One method to find the fraction equivalent to a repeating decimal is shown below. Example 1: Change 0.4 to a fraction. • Let $x = 0.444444\ldots..$ • Multiply both sides so that the repeating digits will be in front of the decimal. In this example, one digit repeats so both sides are multiplied by 10, giving $10x = 4.4444444\ldots.$ • Subtract the original equation from the new equation. $10x = 4.4444444\ldots.$ $-x = 0.444444\ldots..$ $9x = 4$ • Solve the equation to determine $\frac{9x}{9} = \frac{4}{9}$ $x = \frac{4}{9}$ Additionally, students can investigate repeating patterns that occur when fractions have denominators of 9, 99, or 11. Example 2: $\frac{4}{9}$ is equivalent to $0.\overline{4}$, $\frac{5}{9} = 0.\overline{5}$, etc.

Approximate Time Frame: *1-2 weeks*

Terms:

- ✓ finite decimal
- ✓ fraction
- ✓ infinite decimal
- ✓ integer
- ✓ irrational number
- ✓ mixed number
- ✓ percent
- ✓ pi
- ✓ ratio
- ✓ rational number
- ✓ real number
- ✓ repeating decimal
- ✓ square root
- ✓ terminating decimal
- ✓ whole number

Resources

MGH – McGraw Hill, Glencoe Math (2015)
ML – McDougal Littell, Pre-Algebra Book; Larson, 2005
EX – Explorations in Core Math (Holt McDougal)
NY – *Engage* New York
IL – Illinois *Model Math Curriculum*
MAP – Math Assessment Project (MARS)

	Suggested Topics for Lessons	***Suggested Resources***
Prep for 8.NS.1	Know that when a fraction has a denominator that is product of 2's and/or 5's, it is a finite decimal	➢ NY Lesson 6, *Finite & Infinite Decimals*
8.NS.A.1	Write rational numbers as decimals and fractions (including fractions with repeating digits) SBAC Evidence - The student: 2. Converts a repeating decimal into a fraction.	➢ MGH 1.1 *Rational Numbers* (page 7) ➢ ML 5.1 *Rational Numbers* (page 219) ➢ EX 1-1 *Rational Numbers* (page 5) ➢ NY Lesson 7, *Infinite Decimals* ➢ IL Grade 8, Unit 1, go to Lesson 1, Segment 1 (pg 3), *Converting Decimals to Fractions* ➢ MAP *Translating Between Repeating Decimals & Fractions* ➢ *Lesson on Repeating and Terminating Decimals* (Dana Johnson) ➢ Learn Zillion Video Lesson: *Converting repeating decimals into fractions*
	Explain why $0.\overline{9}=1$	➢ NY Lesson 7, *Infinite Decimals* ➢ Purple Math *How can .9999 = 1*
8.NS.A.1	Categorize numbers in the subsets of real numbers SBAC Evidence - The student: 1. Classifies real numbers as rational or irrational.	➢ MGH 1.10 *Compare Real Numbers* (page 89) ➢ ML 9.4 *Real Numbers* (1st part of lesson, page 470) ➢ EX 3-7 *The Real Numbers* (starts on page 117) ➢ IL Grade 8, Unit 1, go to Lesson 1, Segment 2 (pg 6), *Identifying Rational and Irrational Numbers* ➢ MAP *Rational and Irrational Numbers 1* ➢ *Organizing Numbers* (Activity) (Virginia Department of Education) ➢ Online Practice in classifying (IXL) ➢ Notes on Classifying numbers in video form ➢ Learn Zillion Video Lessons: Understand rational and irrational numbers ➢ Khan Academy Lessons: Rational and irrational numbers
Review Activities/ Games		➢ Online Jeopardy Game, categories: *Decimals, Fractions, Equivalency, Comparing Fractions and Decimals, Ordering Fractions and Decimals* ➢ NC Resources Game: *Real Number Race*