TEKS Cluster: Representation and Comparison of Rational Numbers

6.2 **Number and operations.** The student applies mathematical process standards to represent and use rational numbers in a variety of forms.

Representation of Rational Numbers
Supporting Standards
6.2(A) classify whole numbers, integers, and rational numbers using a visual representation such as a Venn diagram to describe relationships between sets of numbers

Comparison of Rational Numbers
Readiness Standards
6.2(D) order a set of rational numbers arising from mathematical and real-world contexts
Supporting Standards
6.2(C) locate, compare, and order integers and rational numbers using a number line

6.2(A)

6.2 Number and operations. The student applies mathematical process standards to represent and use rational numbers in a variety of forms. The student is expected to:

(A) classify whole numbers, integers, and rational numbers using a visual representation such as a Venn diagram to describe relationships between sets of numbers

Stimulus

Word Problem	Verbal Description	Chart/Table	Graph
Equation/ Expression	Manipulatives	Diagram/Image*	Number Line
Base Ten Blocks	Measurement Tool	Formula	Geometric Figures

Item Types

Multiselect (2 pts)	Match Table Grid (2 pts)	Drag and Drop (1-2 pts)	Fraction Model (1-2 pts)
Hot Spot (1-2 pts)	Inline Choice (1-2 pts)	Number Line (1-2 pts)	Graphing (1-2 pts)
Text Entry (1-2 pts)	Equation Editor (1-2 pts)	Multiple Choice* (1 pt)	

Academic Vocabulary

integer*
rational number*
whole number*

Interesting Items

6.2(A) 2018 #36
6.2(A) 2015 #1

Role in Concept Development

Supports	6.2(D) order a set of rational numbers arising from mathematical and real-world contexts
Connection/ Relevance	Describing the relationship between whole numbers, integers, and rational numbers supports its application to comparing/ordering rational numbers.
When to Teach	Before/Prerequisite to 6.11(A)

Instructional Implications
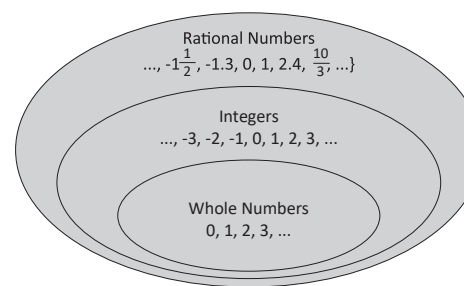
Students classify whole numbers, integers, and rational numbers and describe how these sets of numbers relate to each other. Instruction should include the use of visual representations (e.g., Venn diagram) to demonstrate the interrelationship between the sets of numbers.

The use of a number line may support students with this understanding, for example:
- Begin with a number line marked with all whole numbers
- Extend the number line to include the negative numbers (-1, -2, -3 ...) to reflect integers
- Discuss fractional and decimal values in between integers (-2.5, -0.05, 0, $\frac{-1}{-3}$, $1\frac{1}{2}$, $\frac{5}{4}$) to reflect rational numbers

Learning from Mistakes

Students may make the following mistakes:
- Confusing the placement of numbers within the Venn diagram as being exclusive to one set rather than realizing that certain sets are subsets of other sets*
- Thinking that any negative value (e.g., -2.8 or $-\frac{1}{2}$) is an integer and/or thinking that integers are only negative numbers*

TEKS Scaffold

TEKS	Student Expectation
8.2(D)	order a set of real numbers arising from mathematical and real-world contexts (R)

6.2(D)	**6.2 Number and operations.** The student applies mathematical process standards to represent and use rational numbers in a variety of forms. The student is expected to: **(D) order a set of rational numbers arising from mathematical and real-world contexts**

6.2(C)	locate, compare, and order integers and rational numbers using a number line (S)
5.2(B)	compare and order two decimals to thousandths and represent comparisons using the symbols >, <, or = (R)
4.3(D)	compare two fractions with different numerators and different denominators and represent the comparison using the symbols >, =, or < (R)

Stimulus

Word Problem*	Verbal Description*	Chart/Table*	Graph
Equation/ Expression	Manipulatives	Diagram/Image	Number Line
Base Ten Blocks	Measurement Tool	Formula	Geometric Figures

Item Types

Multiselect (2 pts)	Match Table Grid (2 pts)	Drag and Drop* (1-2 pts)	Fraction Model (1-2 pts)
Hot Spot (1-2 pts)	Inline Choice (1-2 pts)	Number Line (1-2 pts)	Graphing (1-2 pts)
Text Entry (1-2 pts)	Equation Editor (1-2 pts)	Multiple Choice* (1 pt)	

Content Builder (see Appendix for Tree Diagram)

- Order a set of rational numbers arising from mathematical context
- Order a set of rational numbers arising from real-world context

Instructional Implications

In conjunction with 6.2(C), students use number lines to order a set of rational numbers arising from mathematical and real-world contexts (e.g., newspaper advertisements, stock market values, temperatures, etc.). Students should order a mixture of rational number representations (e.g., order the following tool lengths from shortest to longest: $5\frac{1}{2}$", $2\frac{1}{4}$ ", 5", 5.75", 5.6"). Examples should include positive and negative rational numbers, including integers and zero (e.g., place the following values in order from greatest to least: $-\frac{3}{4}$, 25.5%, 0, 3.2, -2.7, $\frac{3}{2}$).

Learning from Mistakes

Students may make the following mistakes:
- Disregarding the sign of negative integers when ordering non-positive numbers
- Comparing the number of digits instead of applying their understanding of place value to determine the value of decimals (e.g., thinking 0.451 is greater than 0.98 because it has more digits)*
- Not understanding that 0.7 is equivalent to 0.70
- Dividing the denominator by the numerator to determine the decimal/fractional representation*
- Misunderstanding the context of a problem and not ordering decimals correctly (e.g., when ordering time from fastest to slowest, ordering from greatest to least)
- When comparing decimal and percentage values, neglecting to convert a decimal into a percent or vice versa to effectively compare*
- When comparing fractions, overgeneralizing that the size of the denominators is the only factor in comparing fractions*

Academic Vocabulary

equal to (=)
greater than (>)
greatest to least*
least to greatest* (coldest/warmest*)
less than (<)

Interesting Items

6.2(D) 2021 #24
6.2(D) 2018 #14
6.2(D) 2016 #15

6.2(C)

6.2 Number and operations. The student applies mathematical process standards to represent and use rational numbers in a variety of forms. The student is expected to:

(C) locate, compare, and order integers and rational numbers using a number line

Stimulus

Word Problem	Verbal Description	Chart/Table	Graph
Equation/ Expression	Manipulatives	Diagram/Image	Number Line*
Base Ten Blocks	Measurement Tool	Formula	Geometric Figures

Item Types

Multiselect (2 pts)	Match Table Grid (2 pts)	Drag and Drop (1-2 pts)	Fraction Model (1-2 pts)
Hot Spot (1-2 pts)	Inline Choice (1-2 pts)	Number Line (1-2 pts)	Graphing (1-2 pts)
Text Entry (1-2 pts)	Equation Editor (1-2 pts)	Multiple Choice* (1 pt)	

Academic Vocabulary

equal (=)
greater than (>)
greatest to least

least to greatest
less than (<)
inequality

Interesting Items

6.2(C) 2019 #16
6.2(C) 2016 #19

Role in Concept Development

Supports
- 6.2(D) order a set of rational numbers arising from mathematical and real-world contexts
- 8.2(D) order a set of real numbers arising from mathematical and real-world contexts

Connection/ Relevance

This standard describes the mathematical relationship found in integers and rational numbers; this relationship supports students' ability to compare and order by identifying the location of a value on a number line.

When to Teach
- With 6.2(D)
- Before 8.2(D)

Instructional Implications

According to 6.2 and in conjunction with 6.2(E)/6.4(E), students should be fluent in representing rational numbers in a variety of forms (e.g., $\frac{7}{10}$, 0.7, 70%). This standard applies that knowledge in comparing and ordering numbers. Students should compare/order a mixture of rational number representations (e.g., order the following: $-4\frac{3}{4}$, 4.667, 4.67%).

Instruction should connect the comparative language to symbols (>, <, =). It is critical that students understand how to correctly read and interpret each of the symbols instead of using a trick to remember directionality of the symbols (e.g., the alligator's mouth eats the bigger number).

The standard also has students ordering three or more rational numbers from least to greatest or greatest to least. The use of open number lines allows students to compare and order rational numbers more efficiently, especially when comparing and ordering negative rational numbers.

Learning from Mistakes

Students may make the following mistakes:
- Confusing the process of comparing and ordering positive rational numbers with negative rational numbers (e.g., thinking $-\frac{3}{2} > -0.25$ because $\frac{3}{2}$ is greater than 0.25)*