TEKS Cluster: Equations and Inequalities

8.8 **Expressions, equations, and relationships.** The student applies mathematical process standards to use one-variable equations or inequalities in problem situations.

Representation and Solutions of Equations/Inequalities

Readiness Standards

8.8(C) model and solve one-variable equations with variables on both sides of the equal sign that represent mathematical and real-world problems using rational number coefficients and constants

Supporting Standards

8.8(A) write one-variable equations or inequalities with variables on both sides that represent problems using rational number coefficients and constants

8.8(B) write a corresponding real-world problem when given a one-variable equation or inequality with variables on both sides of the equal sign using rational number coefficients and constants

8.8(C) Readiness

Subcluster: Representation and Solutions of Equations/Inequalities

TEKS Scaffold

TEKS	Student Expectation
A.5(A)	solve linear equations in one variable, including those for which the application of the distributive property is necessary and for which variables are included on both sides (R)
8.8(C)	**8.8 Expressions, equations, and relationships.** The student applies mathematical process standards to use one-variable equations or inequalities in problem situations. The student is expected to: **(C) model and solve one-variable equations with variables on both sides of the equal sign that represent mathematical and real-world problems using rational number coefficients and constants**
7.11(B)	determine if the given value(s) make(s) one-variable, two-step equations and inequalities true (S)
7.11(A)	model and solve one-variable, two-step equations and inequalities (R)
6.10(A)	model and solve one-variable, one-step equations and inequalities that represent problems, including geometric concepts (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

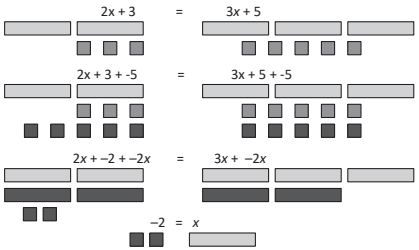
Multiselect (2 pts)	Match Table Grid (2 pts)	Drag and Drop (1-2 pts)	Fraction Model (1-2 pts)
Hot Spot (1-2 pts)	Inline Choice (1-2 pts)	Number Line (1-2 pts)	Graphing (1-2 pts)
Text Entry (1-2 pts)	Equation Editor (1-2 pts)	Multiple Choice* (1 pt)	

Content Builder (see Appendix for Tree Diagram)

- Model one-variable equations with variables on both sides of the equal sign representing mathematical problems using rational number coefficients and constants
- Solve one-variable equations with variables on both sides of the equal sign representing mathematical problems using rational number coefficients and constants
- Model one-variable equations with variables on both sides of the equal sign representing real-world problems using rational number coefficients and constants
- Solve one-variable equations with variables on both sides of the equal sign representing real-world problems using rational number coefficients and constants

Instructional Implications

Students should model and solve one-variable equations with variables on both sides of the equal sign (e.g., $\frac{1}{2}x + 3.1 = 5 - 0.6x$) using rational number coefficients and constants. Instruction should begin with the use of concrete objects (e.g., algebra tiles) using whole number coefficients and constants (e.g., $2x + 3 = 3x + 5$).



As students begin to associate the representation and manipulation of the concrete objects to the symbolic solving of the equation, then the abstract solving of equations with rational number coefficients and constants can be introduced.

$\frac{1}{2}x + 3.1 = 5 - 0.6x$

$\frac{1}{2}x + 3.1 + 0.6x = 5 - 0.6x + 0.6x$

$1.1x + 3.1 = 5$

$1.1x + 3.1 - 3.1 = 5 - 3.1$

$1.1x = 1.9$

$\frac{1.1}{1.1}x = \frac{1.9}{1.1}$

$x = \frac{1.9}{1.1}$

Learning from Mistakes

Students may make the following mistakes:

- Not understanding that an action is replicated on both sides of the equal sign to maintain equality when solving an equation (the value of the expression does not change throughout the solving of equation process)
- Treating unlike terms as if the terms are like terms (e.g., $2x + 3$ may be misrepresented as $5x$)
- Confusing the inverse operation for addition/subtraction and the inverse operation of multiplication/division yielding the incorrect usage of signs (e.g., $-3x = 6$; $\frac{-3x}{3} = \frac{6}{3}$; $x = 2$)*
- Not creating zero pairs on both sides of a one-variable, two-step equation or inequality, or forgetting to divide by the coefficient after creating zero pairs

Academic Vocabulary

coefficient
constant
variable

Interesting Items

8.8(C) 2023 #10
8.8(C) 2023 #36
8.8(C) 2022 #35
8.8(C) 2021 #28
8.8(C) 2019 #7
8.8(C) 2017 #23

8.8(A) Supporting

Subcluster: Representation and Solutions of Equations/Inequalities

8.8 Expressions, equations, and relationships. The student applies mathematical process standards to use one-variable equations or inequalities in problem situations. The student is expected to:

8.8(A) **(A) write one-variable equations or inequalities with variables on both sides that represent problems using rational number coefficients and constants**

Stimulus

Word Problem*	Verbal Description	Chart/Table	Graph
Equation/ Expression*	Ordered Pairs	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

equation*
greater than/more than
greater than or equal to
inequality
less than*/fewer than
less than or equal to
maximum/at most; met or exceed
minimum*/at least
variable

Interesting Items

8.8(A) 2021 #35
8.8(A) 2016 #52

Role in Concept Development

Supports

8.8(C) model and solve one-variable equations with variables on both sides of the equal sign that represent mathematical and real-world problems using rational number coefficients and constants

Connection/ Relevance

Writing an equation or inequality based on constraints or conditions within a problem reinforces an understanding of the process for modeling and solving one-variable equations that represent mathematical and real-world problems.

When to Teach

With and After 8.8(C)

Instructional Implications

Students should write one-variable equations with variables on both sides of the equal sign (e.g., $\frac{1}{3}x + 5.2 = 6x - \frac{3}{5}$) and one-variable inequalities with variables on both sides of the inequality (e.g., $\frac{1}{3}x + 5.2 < 6x - \frac{3}{5}$). Coefficients and constants are inclusive of positive and negative rational numbers.

Instruction should include problem situations that involve constraints and conditions for equations and inequalities. For example:

Company A charges \$45.50 per hour plus a \$75 site fee.
Company B charges \$61.50 per hour plus a \$52.25 site fee.

- At what hour will both companies charge the same amount? $45.50x + 75 = 61.50x + 52.25$
- What is the maximum number of hours you could hire Company B so it is cheaper than Company A? $45.50x + 75 \geq 48.20x + 61.50$)

Instruction should emphasize real-world examples of applying greater than/less than (e.g., the temperature must be warmer than 75° for the air conditioner to turn on; $x > 75$) vs. greater than or equal to/less than or equal to (e.g., maximum capacity of a ballroom is 300 people; $x \leq 300$).

Learning from Mistakes

Students may make the following mistakes:

- Confusing the inequality symbol that is appropriate to the problem situation*
- Confusing the contextual understanding of constant and constant rate of change in a real-world situation
- Misunderstanding constraints or conditions when the names for the inequality terms are not explicit (e.g., “at most,” “no more than,” “maximum,” etc.)*

8.8(B)

8.8 Expressions, equations, and relationships. The student applies mathematical process standards to use one-variable equations or inequalities in problem situations. The student is expected to:

(B) write a corresponding real-world problem when given a one-variable equation or inequality with variables on both sides of the equal sign using rational number coefficients and constants

Stimulus

Word Problem*	Verbal Description*	Chart/Table	Graph
Equation/ Expression*	Ordered Pairs	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

coefficient
constant
equation*
greater than or equal to
greater than/more than
inequality
less than or equal to
less than/fewer than*
maximum/at most; met or exceed
minimum*/at least
variable

Interesting Items

8.8(B) 2022 #42

Role in Concept Development

Supports

8.8(C) model and solve one-variable equations with variables on both sides of the equal sign that represent mathematical and real-world problems using rational number coefficients and constants

Connection/ Relevance

Writing a corresponding real-world problem when given a one-variable equation or inequality with variables on both sides reinforces an understanding of the process for modeling and solving one-variable equations that represent mathematical and real-world problems.

When to Teach

With and After 8.8(C)

Instructional Implications

Students write corresponding real-world problems given one-variable equations or inequalities with variables on both sides of the equal sign. For example:

One-variable equation with variables on both sides	**One-variable inequality with variables on both sides**
Given the equation $50.2 - \frac{1}{6}x = \frac{1}{2}x - \frac{3}{5}$	Given the inequality $0.4x + 110.25 > 0.6x - 110.25$
The temperature of a glass of water A is 50.2°F and is dropping $\frac{1}{6}$ °F each hour. The temperature of a glass of water B is $\frac{3}{5}$ °F below zero and is rising $\frac{1}{2}$ °F each hour. When will the two glasses of water be the same temperature?	The eighth grade class is selling magazine subscriptions and receives 40% of the money from subscriptions sold plus a $110.25 bonus from the publisher. The publisher receives 60% of the money from subscriptions sold. How many subscriptions must the class sell in order to make more money than the publisher?

Instruction should ensure that students have experience writing inequality scenarios for both inclusive (≥) and exclusive values (>). Problems should involve both positive and negative rational number constants and coefficients.

Learning from Mistakes

Students may make the following mistakes:

- Confusing the name of the inequality symbol
- Omitting the "or equal to" portion of an inequality
- Confusing the constant (*y*-intercept) with the constant rate of change (slope) in a real-world situation