7th Grade Math

ELG 7.4: Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

Vertical Progression:

5th Grade	**5.OA.A Write and interpret numerical expressions.** o **5.OA.A.1** Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.
6th Grade	**ELG 6.6 Reason about and solve one-variable equations and inequalities.** o **6.EE.B.5** Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. o **6.EE.B.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. o **6.EE.B.7** Solve real-world and mathematical problems by writing and solving equations of the form x + p = q and px=q for cases in which p, q, and x are all nonnegative rational numbers. o **6.EE.B.8** Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form x > c or x < c have infinitely many solutions; represent solutions of such inequalities on number line diagrams.
7th Grade	**ELG 7.4 Solve real-life and mathematical problems using numerical and algebraic expressions and equations.** o **7.EE.B.3** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. *For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.* o **7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities**.** o **7.EE.B.4.a** Solve word problems leading to equations of the form px + q = r and p(x + q) = r, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?* o **7.EE.B.4.b** Solve word problems leading to inequalities of the form px + q > r or px + q < r, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. *For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.*
8th Grade	**ELG 8.3 Understand the connections between proportional relationships, lines, and linear equations.** o **8.EE.B.5** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. **ELG 8.4 Analyze and solve linear equations and pairs of simultaneous linear equations.** o **8.EE.C.7** Solve linear equations in one variable. o **8.EE.C.7.a** Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers).

	o **8.EE.C.7.b** Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. o **8.EE.C.8** Analyze and solve pairs of simultaneous linear equations. o **8.EE.C.8.c** Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.*

Students will demonstrate command of the ELG by:

- Solving multi-step real-life problems using the appropriate operations and strategies, such as mental math, modeling, and calculator.
- Solving multi-step real-life problems using positive and negative numbers.
- Converting between fractions, decimals, and percents.
- Applying properties of operations to write equivalent expressions.
- Rewriting expressions in different forms in problem context to help understand problems.
- Fluently solving word problems leading to equations of the form px + q = r and p(x + q) = r, where p, q, and r are specific rational numbers.
- Comparing algebraic solutions to arithmetic solutions.
- Constructing and evaluating simple equations and inequalities to solve word problems.
- Constructing and interpreting the graph of a solution set for an inequality.

Vocabulary:

- coefficient
- constant term
- distributive property
- equation
- inequalities
- inverse operations
- order of operations
- properties of operations
- rational number
- solution set
- variable

Sample Instructional/Assessment Tasks:

1) **Standard(s): 7.EE.B.3**

Source: Illustrative Mathematics www.illustrativemathematics.org

Item Prompt:

Below is a table showing the number of hits and the number of times at bat for two Major League Baseball players during two different seasons:

Year/Player	Derek Jeter	David Justice
1995	12 Hits in 48 at Bats	104 Hits in 411 at Bats
1996	183 Hits in 582 at Bats	45 Hits in 140 at Bats

A player's *batting average* is the fraction of times at bat when the player gets a hit.

1. For each season, find the players' batting averages. Who has the better batting average?
2. For the combined 1995 and 1996 seasons, find the players' batting averages. Who has the better batting average?
3. Are the answers to (a) and (b) consistent? Explain.

Correct Answer(s)

1. David Justice had a slightly higher batting average than Derek Jeter in both 1995 (25.3% vs. 25.0%) and 1996 (32.1% vs. 31.4%). Students can turn these ratios into fractions or percents to compare the averages. They may make decisions by looking solely at the number of at bats or the number of hits but not in relationship to one another.

2. If we combine the data for the two seasons, then Derek Jeter had 12 + 183 = 195 total hits in 48 + 582 = 630 total at bats. So Derek Jeter had a higher batting average of 31.0% for the 1995 and 1996 seasons *combined* compared with David Justice's batting average of 27.0%.

3. Even though David Justice had a higher batting average than Derek Jeter in 1995 and in 1996, Derek Jeter's average was higher for the two years combined. This is due to the fact that the two seasons do not carry the same weight when the data is combined. Derek Jeter had a very high batting average in 1996 when he had most of his at bats. David Justice, on the other hand, took most his hits in 1995 and his average in this season is much lower than Derek Jeter's average in 1996. It is the batting average from the season in which the players took the majority of their at bats that has the biggest influence on the overall batting numbers and this is why Derek Jeter comes out ahead.

2) Standard(s): 7.EE.B.4

Source: NC. DPI

Item Prompt:

Steven has $25 dollars to spend. He spent $10.81, including tax, to buy a new DVD. He needs to save $10.00 but he wants to buy a snack. If peanuts cost $0.38 per package including tax, what is the maximum number of packages that Steven can buy? Show your work.

Correct Answer(s)

x = number of packages of peanuts

$25 \geq 10.81 + 10.00 + 0.38x$

$x \approx 11.03$ Steven can buy 11 packages of peanuts.