Grade 7 Mathematics, Quarter 1, Unit 1.1

# Addition and Subtraction of Rational Numbers

## Overview

**Number of instructional days:** 15 (1 day = 45 minutes)

### Content to be learned

- Add and subtract across the rational number system (i.e., add and subtract positive and negative fractions, decimals, and integers)
- Describe situations in which opposite quantities combined to make zero.
- Show that a number and its opposite (additive inverses) have a sum of zero.
- Express the value of $p + q$ as a distance equivalent to the absolute value of $q$ from $p$. Illustrate the sum on a number line to represent $p + q$ where $p$ and $q$ represent positive or negative numbers.
- Interpret sums of rational numbers in a real-world context.
- Understand subtraction of rational numbers as adding the additive inverse [i.e., $p - q = p + (-q)$, where $p$ and $q$ represent positive and negative numbers].
- Illustrate that the distance between two rational numbers on a number line is the absolute value of their difference.
- Apply subtraction of rational numbers to real-world contexts.
- Apply properties of operations as strategies to add and subtract across the rational number system.

### Mathematical practices to be integrated

Make sense of problems and persevere in solving them.

- Make conjectures about the form and meaning of the solution.
- Transform expressions using properties of operations to get the information they need.
- Explain correspondences between equations and number line models.
- Use concrete objects or pictures to help conceptualize and solve a problem.
- Check answers to problems using a different method and continually ask, “Does this make sense?”
- Understand the approaches of others and identify correspondences between different approaches.

Reason abstractly and quantitatively.

- Make sense of quantities and their relationships in problem situations.
- Create a coherent representation of the problem.
- Attend to the meaning of quantities, not just how to compute them.
- Use different properties of operations.

Use appropriate tools strategically.

- Use tools (e.g., integer models, number lines) to model and solve a problem.
- Recognize both the insight to be gained from the employment of the tools and their limitations.

### Essential questions

- What are some real-life situations where two opposite quantities combine to make zero?
- What is the value of a number and its opposite? How could you model the value of a number and its opposite?
- How is the value of $p + q$ related to the distances of $p$ and $q$ on a number line? How is this illustrated on the number line for $q < 0$? $q > 0$?
- Without calculating, how can you predict if the sum of two rational numbers will be positive, negative, or zero?
- How is the difference between two numbers related to their distance apart on a number line?
- Without calculating, how can you predict if the difference of two rational numbers will be positive, negative, or zero?
- How can any subtraction problem be rewritten as an addition problem?
- How can you record the steps taken in the model using numbers and symbols?
- What are the rules for adding and subtracting rational numbers? Justify your answer with examples.

## Written Curriculum

### Common Core State Standards for Mathematical Content

| The Number System | 7.NS |
|---|---|

**Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.**

7.NS.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

a. Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.*

b. Understand $p + q$ as the number located a distance $|q|$ from $p$, in the positive or negative direction depending on whether $q$ is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.

c. Understand subtraction of rational numbers as adding the additive inverse, $p – q = p + (–q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.

d. Apply properties of operations as strategies to add and subtract rational numbers.

## Common Core Standards for Mathematical Practice

### 1 Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

### 2 Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

### 5 Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

## Clarifying the Standards

*Prior Learning*

In grade 2, students began adding and subtracting whole numbers. In grade 3, they multiplied and divided whole numbers. By the end of grade 4, students fluently added and subtracted using the standard algorithm and multiplied and divided using strategies based on place value, properties of operations, and/or relationships between multiplication and division; they also began to add and subtract with like denominators and began multiplication of fractions. Grade 5 brought addition and subtraction with unlike denominators and began basic division of fractions. By the end of grade 6, students had a complete understanding of all operations with whole numbers, fractions, and decimals. In grade 6, students were introduced to integers and were expected to locate an integer on the number line, interpret absolute value, and compare and order integers. However, integer operations were not mentioned in grade 6.

*Current Learning*

In grade 7, students extend previous understanding of all operations to include whole numbers, fractions, and decimals, and they extend their prior knowledge to include positive and rational numbers. Based on prior knowledge and use of a vertical and horizontal number line, students represent addition and subtraction of integers. They apply properties of operations as strategies to add and subtract rational numbers.

*Future Learning*

Knowledge of rational numbers in grade 7 will help determine irrational numbers and their approximations in grade 8.

## Additional Findings

It is challenging to maintain fluency in skill sets covered in earlier primary grades. It is important for teachers to understand that conceptual analysis of fractions and rational numbers is internalized by students. They are developmentally capable of fluency of whole numbers, fractions, decimals, and basic integers by grade 7.

According to *A Research Companion to Principles and Standards for School Mathematics* (p. 99),

- "What makes this content difficult to teach is the teachers' lack of faith in their students' abilities to retain skill sets in which a complete understanding is expected. This in itself would make it troublesome for students to learn."
- "The goal in this line of work, specifying what it might mean to understand a complicated idea like fractions, is to 'consider any mental content (percepts, images, concepts, thoughts, words, etc.) as a result of operations'(Cecatto, 1947, as cited in Bettoni, 1998). That is, one must describe *consapevolezza operativa*, or conceptual operations (translated literally as 'operating knowledge'), to answer the question, 'Which mental operations do we perform in order to conceive a situation in the way we conceive it?' (Bettoni, 1998)"

### Grade 7 Mathematics, Quarter 1, Unit 1.2

# Multiplication and Division of Rational Numbers—Decimals, Fractions, Percents, and Integers

## Overview

**Number of instructional days:** 15 (1 day = 45 minutes)

### Content to be learned

- Multiply and divide rational numbers (i.e., positive and negative fractions, decimals, and integers).
- Extend and apply knowledge of properties of operations particularly the distributive property to multiply and divide rational numbers.
- Apply rules for multiplying signed numbers across the rational number system [e.g., (–1/2)( –1/2) = 1/4].
- Interpret products and quotients of rational numbers by describing real-world contexts.
- Recognize that quotient of integers (with nonzero divisors) is a rational number.
- Apply properties of operations as strategies to multiply and divide rational numbers.
- Convert rational numbers to a decimal using long division, being aware that the decimal form of a rational number terminates in 0 or repeats.
- Solve real-world problems involving the four operations across the rational number system.

### Mathematical practices to be integrated

Make sense of problems and persevere in solving them.

- Find relevant information in a problem.
- Determine what strategy to use in solving a problem.
- Attempt to solve a problem with a chosen strategy.
- Check to see if the solution is reasonable; if not, try another strategy.

Reason abstractly and quantitatively.

- Make sense of quantities in the problem and their relationships.
- Represent quantities symbolically.
- Create a coherent representation of an abstract notion.

Model with mathematics.

- Solve problems in everyday life using the math they know according to their grade level of exposure.
- Identify important information in a problem.
- Analyze information given.
- Look at their solutions/conclusions and decide if they are reasonable.

### Essential questions

- Without calculating, how can you determine if the product or quotient will be positive or negative?
- What is the difference between multiplying and dividing rational numbers? Justify your answer with examples.
- How did you apply the properties of operations in your calculations?
- How do you recognize what operation(s) is needed in a problem situation?
- What is a rational number? How can rational numbers be represented? When are some forms more efficient than other forms that depict the same quantity?
- For related problems, how does the product (quotient) compare to its related product (quotient). For example, ask, "How does the product of 1/4 × –5 compare to the product of 3/4 × –5?"
- Why would it be a good idea for a teacher to show many different forms of the same rational number? Justify your answer with examples—select one rational number and show at least four forms of this number (at least one must be visual).
- What are some real-life situations where you would use your skills (+, –, ×, /) with rational numbers?

## Written Curriculum

### Common Core State Standards for Mathematical Content

| **The Number System** | **7.NS** |
|---|---|

**Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.**

7.NS.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.

b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If *p* and *q* are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts.

c. Apply properties of operations as strategies to multiply and divide rational numbers.

d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

7.NS.3 Solve real-world and mathematical problems involving the four operations with rational numbers.[1]

[1] Computations with rational numbers extend the rules for manipulating fractions to complex fractions.

## Common Core Standards for Mathematical Practice

### 1 Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

### 2 Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

### 4 Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

## Clarifying the Standards

*Prior Learning*

In grade 4, students added and subtracted mixed numbers with like denominators and/or by using the properties of operations  and the relationship between addition and subtraction. They began work involving multiplying a fraction by a whole number using models.

In grade 5, students interpreted a fraction *a/b* as a division situation. They multiplied a fraction by a fraction and a whole number by a fraction. Students also divided a whole number by a unit fraction and divided unit fractions by whole numbers.

In grade 6, students applied and extended previous understandings of multiplication and division to divide fractions by fractions.

*Current Learning*

In grade 7, students apply and extend previous understandings of multiplication and division of fractions to multiply and divide rational numbers to solve real-world problems. Adding, subtracting, multiplying, and dividing across the rational number system is the culminating work of operations in grade 7. There are no other explicit standards for operations beyond grade 7; because so much other grade 7 content, such as in the Expressions and Equations domain, is dependent on rational number arithmetic, fluency with rational number should be the goal in grade 7.

*Future Learning*

Grade 8 students will expand their understanding of the number system to include irrational numbers. They will learn that there are numbers that are not rational and approximate them by rational numbers. Students will solve linear equations with rational number coefficients.

## Additional Findings

According to *A Research Companion for Principles and Standards for School Mathematics,* "For example, many students understand '*a/b*' as denoting a part-whole relationship, for example, that '3/7' means 'three out of seven.'(Brown, 1993) This understanding is unproblematic until they attempt to interpret 7/3. Students often will think, if not say aloud, '7/3 sort of doesn't make sense. You can't have 7 out of 3.' (Mack, 1993, p. 91;1995)"

According to *Principles and Standards for School Mathematics,* "In the middle grades, students should expand their repertoire of meanings, representations, and uses for nonnegative rational numbers. They should recognize and use fractions not only in the ways they have in lower grades—as measures, quantities, parts of a whole, locations on a number line, and indicated divisions—but also in new ways. For example, they should encounter problems involving ratios (e.g., 3 adult chaperones for every 8 students), rates (e.g., scoring a soccer goal on 3 of every 8 penalty kicks), and operators (e.g., multiplying by 3/8 means generating a number that is 3/8 of the original number). In the middle grades, students also need to deepen their understanding of decimal numbers and extend the range of numbers and tasks with which they work." (p. 216)

### Grade 7 Mathematics, Quarter 1, Unit 1.3

# Understanding Expressions and Equations

## Overview

**Number of instructional days:** 10 (1 day = 45 minutes)

### Content to be learned

- Use properties of operations to add and subtract linear expressions containing rational numbers.
- Use properties of operations to factor and expand algebraic linear expressions containing rational numbers.
- Apply properties of operations to generate and rewrite equivalent expressions and equations.
- Recognize advantages that different forms of expressions can offer such as insights as to how quantities are related to each other and/or shed light on the context of the problem.

### Mathematical practices to be integrated

Make sense of problems and persevere in solving them.

- Transform algebraic expressions to get the information they need.
- Check answers to problems using a different method and continually ask, "Does this make sense?"
- Monitor and evaluate their progress and change course if necessary.

Look for and make use of structure.

- See complicated things such as algebraic expressions as single objects or as being composed of several objects. For example, see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers $x$ and $y$.
- See $7 \times 8$ equals the well-remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the Distributive Property.

### Essential questions

- How can you clearly state the meaning (including the units) of the variables?
- What mathematics does this expression represent? What real-world situation might this expression describe?
- How are equations and expressions different? (e.g., An equation states that two expressions are equivalent.)
- How can you expand an expression? When do you find expanded form useful?
- How can you prove two expressions are equivalent?
- What other ways can you rewrite this expression?
- How did rewriting the expression shed light on the context or how quantities are related?

- When can you combine (or separate) terms in an expression?
- How many different ways can you rewrite $5x$?
- How can you factor an expression? When is factoring an expression useful?
- What is the relationship between the Distributive Property and factoring an algebraic expression?

# Written Curriculum

## Common Core State Standards for Mathematical Content

| **Expressions and Equations** | **7.EE** |
| --- | --- |

**Use properties of operations to generate equivalent expressions.**

7.EE.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

7.EE.2 Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. *For example, $a + 0.05a = 1.05a$ means that "increase by 5%" is the same as "multiply by 1.05."*

## Common Core Standards for Mathematical Practice

**1 Make sense of problems and persevere in solving them.**

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**4 Model with mathematics.**

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**7 Look for and make use of structure.**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see $7 \times 8$ equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as $2 \times 7$ and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers $x$ and $y$.

**8 Look for and express regularity in repeated reasoning.**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

## Clarifying the Standards

### *Prior Learning*

In the K–5 number and operations work, students used properties of operations to write expressions in different ways (e.g., 2 + 3 = 3 + 2). They learned the “any order any grouping” property to calculate expressions more efficiently [e.g., 7 + 6 + 3 as (7 + 3) + 6].

In grade 3, students used letters to represent unknowns. In grade 5, students used parentheses, brackets, or braces in numerical expressions and evaluated expressions with these symbols. They viewed expressions as describing calculation.

In grade 6, students wrote expressions to generalize repeated calculations. They interpreted expressions and related them to real-world context. Students used order of operations and properties of operations to rewrite simple expressions such as $2(3 + 8x)$ or $10 - 2p$.

*Current Learning*

In grade 7, students continue to use properties of operations to generate equivalent expressions. However, students work with general linear expressions with more operations and whose manipulations entail all forms of rational numbers, including the rules for signed numbers (e.g., distributing a negative rational number). A general linear expression consists of a sum of terms containing rational values, including rational coefficients (e.g., $-1/2 + 2x + 5/8 + 3x$). Students apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients for the purpose of generating equivalent expressions. They understand that rewriting a problem in different forms can shed light on a problem.

*Future Learning*

In grade 8, integer exponents and radical signs are added to the algebraic expressions, and students must evaluate these symbols in solving or simplifying an expression. Students will also work with large numbers using scientific notation in solving and simplifying expressions and equations.

## Additional Findings

"Working with variables and equations is an important part of the middle-grades curriculum. Students' understanding of variable should go far beyond simply recognizing that letters can be used to stand for unknown numbers in equations (Schoenfeld and Arcavi 1988). The following equations illustrate several uses of variable encountered in the middle grades:

$$27 = 4X + 3$$

$$1 = t(1/t)$$

$$A = LW$$

$$y = 3x$$

"The role of variable as a place holder is illustrated in the first equation: $x$ is simply taking the place of a specific number that can be found by solving the equation. The use of variable in denoting generalized arithmetic pattern is shown in the second equation; it represents an identity when $t$ takes on any real value except 0. The third equation is a formula, with $A$, $L$ and $W$ representing the area, length, and width, respectively, of a rectangle. The third and fourth equations offer examples of covariation: in the fourth equation, as $x$ takes on different values, $y$ also varies." (*Principles and Standards for School Mathematics*, p. 225)

According to *A Research Companion to Principles and Standards for School Mathematics* (p. 124), "For students to 'understand the meaning of equivalent forms of expressions, equations, inequalities and relations,' however, teachers cannot simply entertain questions about the equivalence of equations or about the equivalence of expressions when those inquiries arise. Students also need opportunities to ask questions that cut across expressions and equations or across expressions and relations, questions that explore differences between types of equivalence—such questions as the following:

- From what is written on paper, how can I tell that $3(x + 2) = 3x + 6$ as an equation to solve is different from simplifying $3(x + 2)$ and writing $3(x + 2) = 3x + 6$? Or is the difference between the two not possible to discern simply by examining the strings themselves? Why is the equals sign used in two such different ways?