Brooke CHARTER SCHOOLS

No calculators

7th Grade Math
2.10

Standard:	**Big Idea:**
• **7.EE.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. • **8.EE.7**: Solve linear equations with one variable.	Sometimes I need to use the Distributive Property, combine like terms and use the Property of Equality to solve multi-step equations.

Point:

- Solve multi-step equations with integers that require distribution and combining like terms.

Vocab: ***Indicates this is the first lesson this vocab is used***

- **The Distributive Property**: A number multiplied by the sum of 2+ terms gives the same answer as multiplying that number by each term in parentheses separately and adding the products together.
- **Term**: Single numbers, variables or a product of a coefficient and a variable separated by addition or subtraction in an expression, equation or inequality.
- **Variable**: An amount with an unknown value expressed with a symbol.
- **Coefficient**: A number which multiplies a variable.
- **Constant**: A known value expressed as a number.
- **Simplify**: To make a number or an expression simpler while keeping the value the same.
- **Like terms**: Terms that are either both constants or both have the same variable raised to the same power that can be combined.
- **Combining like terms**: Adding like terms together to simplify an expression.
- **Simplify**: To make a number or an expression simpler while keeping the value the same.
- **Equation**: A math statement containing an equal sign that shows that two expressions have the same value.
- **Isolate a variable**: Rearranging an equation to get the variable by itself so that you can determine its value.
- **Solution**: A value that, when substituted back into the equation or inequality, gives a true statement.
- **The Property of Equality**: An equation remains equal even after applying the same operation with the same term on both sides of the equation.

Extra Materials:

None

Misconceptions:

- Forgetting to distribute to the second term in parentheses.

As well as the misconceptions from the past few lessons:

- You can't add or subtract terms with variables on both sides of an equation
- Mistakes with integer operation rules.
- Not dividing by -1 when the coefficient of a variable is negative.
    - Ex. -x = 5 is not a final solution
- Not recognizing that subtracting a term is equivalent to a term with a negative coefficient.

- Ex. 50 – 3x = -10
  -50 -50
  –3x = -60

- Leaning on inverse operations versus the sign of the term when determining to add or subtract on both sides.
  - Ex. 12 - 5x = 48
  - Subtract 12 on both sides because it's a positive 12.
  - DON'T add 12 on both sides because there is subtraction in the expression.

No calculators

7th Grade Math
2.10

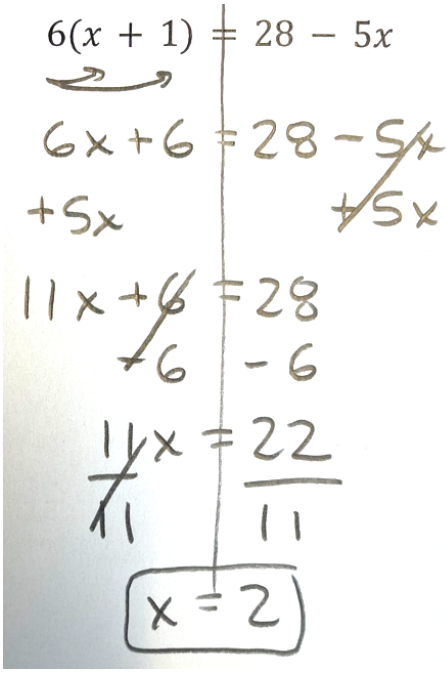
Notes for teachers:
In this lesson, students will combine what they have learned in the last few lessons with what they know about the Distributive Property. The equations students will solve today, all require students to distribute *then* use the Property of Equality.

The Distributive Property, combining like terms, and solving equations with variables on both sides have all been taught in this unit so today is just a matter of putting it all together and showing work clearly step by step. Solving equations today takes many steps!

Misconceptions could range class to class. You may see distributing errors, you may see errors solving with variables on both sides, you may see errors applying the Property of Equality correctly. Keep an eye out for a common misconception to base your discussion on.

Throughout class, enforce students justify their work by mentioning the Distributive Property, combining like terms and Property of Equality for EACH step of the problem.

Problem Solving Task (25 min):
1. What value of *x* makes this equation true?



**Note: this can be correctly solved in more than one way.*

Discussion: Core questions that should be asked, and potential answer

- **Ask**: What math strategies, or properties, do you need to do in order to start solving this problem?
  - *(Make sure students are being specific.)*
  - *You need to use the Distributive Property on the left side of the equal sign*
  - *You need to use the Property of Equality to isolate the variable*

If there was a common misconception that several students made, post student work with the misconception and have students evaluate the work. Potential mistakes include:

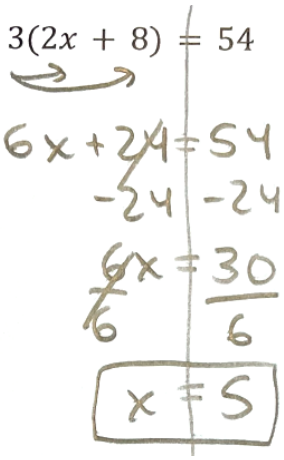
- Forgetting to distribute to both terms
- Errors due to confusion with variables on both sides
- Moving terms around but not isolating the variable(s) to one side and the constants to the other side

	● **Ask**: Evaluate this work. Is this correct? Are there any places where math properties were not correctly used? ○ *(If lots of students agree and don't see the mistake, tell them something is wrong and see if they can figure it out by starting at the first step.)* Show correct work. ● **Ask**: Evaluate this work. Is this correct? Are there any places where math properties were not correctly used? ○ *(See what students say and again have students justify it's correct using math properties).* ● **Ask**: How was this equation solved efficiently? ○ *Distribution happened first* ○ *Then added 5x on both sides.* ● **Ask**: Why might you choose to add 5x on both sides *instead* of subtract 6x on both sides? ○ *If we add 5x to both sides the variable terms will simplify to positive 11x.* ○ *But if we subtracted 6x on both sides, the variable terms will simplify to -11x.* ● **Say**: Both work, however, strategically moving variable terms to keep the coefficient positive often makes your equation easier to solve. ● **Ask**: So what are today's keys to success? How can we solve any equation correctly and efficiently? **Notes:** *Possible notes depending on the misconception you addressed in your discussion.*

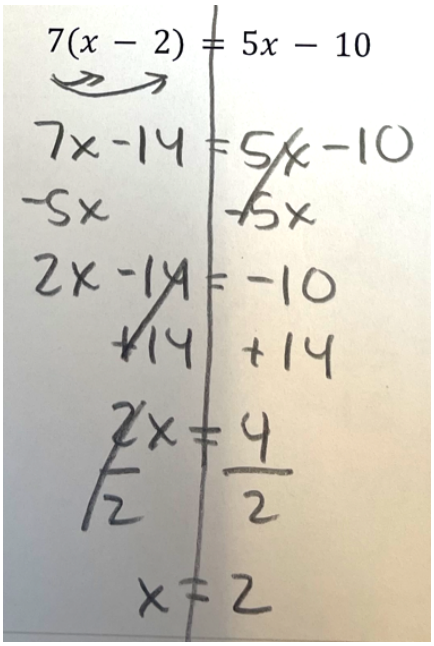
	• **Ultimate goal: isolate the variable on one side and the constants on the other side.** • **Distribute first!**
Section A (10 min): • Solve equations with distributive property and combining like terms	Since so much of this lesson is combining previous teaching points, I would push your class to do a lot of independent work. This is a great lesson to pull groups for targeted instruction. Let students work at their own pace and move to the next Section if they finish earlier than others. Consider posting answers to #1a and #1b then showing exemplar work for #1c and have a student explain their thought process.
Section B (*remaining time*): • Solve equations with distributing, variables on both sides and combining like terms	So that students are prepared for the Exit Ticket, prioritize having students complete #2a, #2b and #2c. Review these three equations by posting exemplar work.
Section C (*only if time*): • Challenge problems	#3 is from the 7th Grade NYS 2017 Item 13 (State 61%)

Exit Ticket (5 min):
#2 is from the 8th Grade MCAS 2023 Item 1 (Brooke 78%, State 59%)

1. Solve for x.



2. What value of *x* makes this equation true?



(A) -4

(B) -2

(C) 2

(D) 6

Brooke CHARTER SCHOOLS

No calculators

7th Grade Math
2.10

Name: _____

Classwork

Problem Solving Task:

1.	What value of *x* makes this equation true? $6(x + 1) = 28 - 5x$

Section A:

1. Solve for *x*.

a. $4(3x - 8) = 40$

b. $2(x + 4) = 38$

c. $3(9 + 2x) + 10x = 59$

Section B:

2. Solve.

a. $3(y + 2) =- 14 - y$

b. $14 - 6k =- 5(2k - 6)$

c. $8(5 + 6v) =- 9 - v$

d. $13x + 24 + 2x = 3(2x - 1)$

Section C:

3. Solve.

a. $10 - 4(2d + 9) = 40 - 9d$

b. $-2(1 + 6b) - 2(8b + 1) = -32$

Name: _____

Exit Ticket

1.	Solve for *x*. $3(2x + 8) = 54$
2.	What value of *x* makes this equation true? $7(x - 2) = 5x - 10$ (A) -4 (B) -2 (C) 2 (D) 6

BCS Brooke CHARTER SCHOOLS

No calculators

7th Grade Math
2.10

Name: _____

Homework

Math Class:

Solve for *x*. **Show your work in detail like you did in class!**

1. $4(2x - 8) = 40$	**2.** $-3(x - 2) = 12$
3. $8(x - 6) = 4x + 22$	**4.** $35 + 8x = -3(-5 - 4x)$

Mixed Bag!

3.	Factor completely. **a.** $36x + 15$ **b.** $-18x - 42$ **c.** $8x + 48 - 24y$
4.	Simplify. $4x - 10x + 12 + x - 7 + y$