**Solving with Distributive Property**

**Section 1**

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| 00:00:01 | TEACHER: How do you solve linear equations using the |
| 00:00:03 | distributive property? In the warm up, you practiced using the distributive property by multiplying the number outside of the parentheses to all the terms inside the parentheses. To begin this lesson, you'll practice using the distributive property to solve equations. |

**Section 2**

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| 00:00:01 | TEACHER: Let's discuss how to solve an equation using the |
| 00:00:03 | distributive property. Take a look at the equation on the right. We have negative 6 times the quantity 2x minus 5 equals 6. First thing you want to do before you distribute is check to see if you can combine any like terms inside the parentheses. In this case, we can't. We have a 2x and we have a negative 5 inside those |
| 00:00:21 | parentheses-- not like terms. So let's go over into our steps to use the distributive property to solve this equation. Step one is going to be use the distributive property to remove the parentheses. I'm going to multiply the negative 6 through the parentheses to both terms inside. |
| 00:00:37 | This gives me negative 6 times 2x minus negative 6 times 5, and still equal to 6. Let's simplify this down a little bit before moving on to step two. So negative 6 times 2x is negative 12x, minus negative 6 times 5 is negative 30, equals 6. And one more thing I can simplify. I'll go ahead and make the minus negative 30 a plus 30. |
| 00:01:05 | So negative 12x plus 30 equals 6. So now step two says, use the subtraction or addition property of equality to isolate the variable term. So in this case, since I have negative 12x plus 30, I'll isolate the variable term using the inverse operation of subtraction. I'm going to subtract 30 from both sides. This gives me negative 12x equals 6 minus 30, which is |
| 00:01:29 | negative 24. So lastly, I'm going to isolate the variable by using the multiplication or division property of equality. In this case, since it's negative 12 times x, the inverse operation would be division. I'm going to divide both sides by negative 12. This gives me x equals negative 24 divided by negative 12, which comes out to x equals 2. |

**Section 5**

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| 00:00:01 | TEACHER: Let's talk about identifying the steps we use |
| 00:00:03 | when we use the distributive property to solve equations. So here we're gonna use the steps to solve this equation, and we'll determine which properties justify each step. So our original equation is 4 times the quantity 3x minus 5 equals negative 50. So you can see down at step one, we're given the equation 12x minus 20 equals negative 50. So what's happened here is the 4 has been distributed into |
| 00:00:29 | the parentheses. So, the property that justifies this step is the distributive property. Now moving down to step two, we're given the equation 12x equals negative 30. So they've isolated the variable term, in this case by adding 20 to both sides. So the property that justifies that step is the addition |
| 00:00:54 | property of equality. Finally, in step three, we're given x equals negative 2.5, the answer. So they isolated the variable by dividing both sides by 12. The property that justify that step is the division property of equality. It's important to remember that we first isolate the variable term using addition or subtraction and then |
| 00:01:26 | isolate the variable itself using multiplication or division. |

**Section 7**

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| 00:00:01 | TEACHER: Let's talk about how we verify a solution when we |
| 00:00:04 | use the distributive property to solve an equation. So let's look at the steps used to find this solution. First, the distributive property is used to distribute the 10 into the parentheses, and we're left with 10a minus 40 equals 90. Next, the inverse operation of addition is used to isolate the variable term. So when we add 40 to both sides, we're left with 10a |
| 00:00:32 | equals 130. Then finally, the inverse operation of division is used to isolate the variable itself. And we're left with a equals 13. So if a equals 13 is the correct solution, we should be able to substitute it back into the original equation and end up with a balanced equation. Let's go ahead and try that. |
| 00:00:54 | So I'm gonna plug in 13 for a. And I'll end up with 10 times 13 minus 4 equals 90. Now since I have like terms in my parentheses at this point, I don't need to use the distributive property. I can just follow order of operations. So 10 times 13 minus four makes 9 equals 90. 10 times 9 is 90. So 90 equals 90. |
| 00:01:21 | It's a balanced equation, so we know our solution is correct. It's important to note that if you've got an unbalanced equation, anything other than 90 on the left-hand side, you made an error in your calculations, and you need to go back and retry the problem. |

**Section 9**

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| 00:00:01 | TEACHER: You've been answering the question, how do you solve |
| 00:00:02 | linear equations using the distributive property? Real-world scenarios can be a little different than the numerical ones you've been solving using the distributive property. Let's say your sent to the store to buy your soccer team apples. And you want to buy each member 1 apple, and 2 apples for each of the two coaches. |
| 00:00:24 | Now while you're on your way, somebody calls you and tells you to double that order. You can use the distributive property to figure out how many apples you should be buying. Recall that so far in this lesson, you've been using the distributive property and the properties of equality along with inverse operations to help solve equations. We'll now apply all that you've used |
| 00:00:45 | to real-world scenarios. |

**Section 10**

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| 00:00:01 | TEACHER: Let's talk about representing |
| 00:00:02 | a real-world scenario. So in this case, Janice is building a fence around a rectangular garden in her backyard. The area of the garden will be 240 square feet. The width of the garden is x feet shorter than its length, which is 20 feet. How many feet of fencing does Janice need? So what we want to do is come up with an equation to model |
| 00:00:23 | the situation. First thing we'll do is draw a picture of what's going on. So since it's a rectangular garden, we'll go ahead and draw a rectangle. Let's label what we can in our rectangle. So we're given some information about the dimensions. The width is x feet shorter than its |
| 00:00:40 | length, which is 20 feet. For the length, I'll represent it using the number 20. Now, the width is x feet shorter than that, so we can use the expression 20 minus x to represent the width. Since we're given the area of the garden, let's go ahead and replace the A in the equation A equals l times w with the actual area of the garden. That's 240. |
| 00:01:07 | Now, the length of our garden is 20, so I'll replace the l with 20. And then the width, we wrote the expression 20 minus x, so I can replace the w with 20 minus x. This gives us the equation 240 equals 20 times 20 minus x, which models the situation given in the word problem. |

**Section 12**

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| 00:00:00 | TEACHER: Let's discuss solving a real-world linear equation. |
| 00:00:05 | So let's review what we set up with the Janice's Rectangular Garden word problem. Remember the length of it was 20 feet. The width of it, we represented with the expression 20 minus x. And then, the area of the garden gave us the equation 240 equals 20 times 20 minus x. So let's go ahead and solve that equation for x. |
| 00:00:27 | First thing we're going to do is distribute the 20 into the parentheses, multiplying both terms inside by 20. This will give us the equation 240 equals 20 times 20 minus 20 times x. Simplifying this a little bit, we get 240 equals 400 minus 20x. So now we'll apply inverse operations to isolate our variable term. |
| 00:00:54 | So since we have a positive 400 on the same side as the negative 20x, we'll subtract 400 from both sides to isolate the negative 20x. This is going to give us negative 160 equals negative 20x. Finally, to isolate the variable, we'll undo this multiplication by using division. So divide both sides by negative 20. |
| 00:01:20 | And we end up with 8 equals x, which is the same thing as x equals 8. So let's evaluate what that means. Is 8 the width of the garden? Well, the answer to that is no. Remember, the width of the garden is represented by the expression 20 minus x. So to find the width of the garden, we'll just plug 8 into |
| 00:01:43 | that expression for x, which gives us 20 minus 8. Evaluating that, 20 minus 8 is 12. So the width of our garden is 12 feet. |

**Section 14**

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| 00:00:01 | TEACHER: Let's talk about how we can verify that the answer |
| 00:00:03 | we got in our real-world scenario is correct. So we came out with x equals 8, and thus the width of our garden was 20 minus x or 20 minus 8, which gives us a width of 12. And of course, we were given that the length was 20. So there are two ways we can verify that our solution is correct. One way is to just plug in the value for x in |
| 00:00:26 | the original equation. So, if I replace x with 8, I end up with 240 equals 20 times 20 minus 8. OK, well this is going to give us the equation 240 equals 20 times 12, which gives us 240 equals 240. Checks out. The other way to do it is just multiply out the length and width of the rectangle that we found to verify that it is |
| 00:01:00 | actually 240, the area that we were given. In that case, we just start with 240 equals a width of 12 times a length of 20. And we still get 240 equals 240. Both methods of verification work. And in both cases we get 240 equals 240, so our answer does check out. So finally, let's answer the question we were asked, how |
| 00:01:25 | much fencing does Janice need? Well, remember that the perimeter of a rectangle is given by 2 times the length plus 2 times the width. So all we need to do is substitute the values in for the length and width of our rectangle. So the perimeter is 2 times 20 plus 2 times 12, which gives us 40 plus 24 or a perimeter of 64 feet. This means that Janice needs to go and |
| 00:01:55 | by 64 feet of fencing. |