CITYTUTOR DC

Sixth Grade Math Lesson Materials

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G6 Unit 5:

Expressions and Equations

G6 U5 Lesson 1

Use models to write equations and solve for unknown values

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G6 U5 Lesson 1 - Students will use tape diagrams and equations to solve for unknown values in an equation

Warm Welcome (Slide 1): Tutor choice.

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will explore tape diagrams and equations. In previous grades, you used tape diagrams or bar models to represent equations. By the end of this session, you will be able to use tape diagrams to represent and solve equations. Let's begin by understanding what a tape diagram is. A tape diagram, also known as a bar model, is a visual representation that helps us solve and understand mathematical problems. It uses bars to represent quantities or parts of a whole.

Let's Talk (Slide 3): Have you ever used tape diagrams/bar models before? How did you use them and how were they useful for modeling or solving a problem? Possible Answer Answers, Key Points:

- I used them to represent equations, to show the parts and the whole.
- I used them to represent story problems that join or take away or have equal groups.
- They can be helpful because they help show what's happening in a story and they can help give us hints on how to solve to find the unknown.

That's right! Bar models, or tape diagrams, can be really helpful because they are a visual representation of equations or story problems. They are a great tool to help us solve problems.

Let's Talk (Slide 4): Today, we are going to use tape diagrams to help us represent equations with unknowns. Let's start by looking at this picture/tape diagram/bar model. **What do you notice and wonder about this image?** Possible Answer Answers, Key Points:

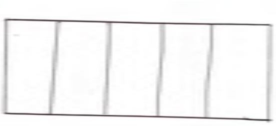
- There are two parts, 5 and 3, and they join together to make the whole, 8.
- This tape diagram shows addition AND it shows subtraction, since they're opposites.

Yes, this tape diagram represents a whole (8) split into two parts (5 and 3). **What are some real life scenarios or situations that this bar model can represent?** Possible Answer Answers, Key Points:

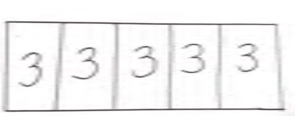
- I have \$5 and got \$3 more and now altogether I have \$8.
- I have 5 pink slimes and 3 blue slimes and altogether I have 8 slimes
- I have 8 pieces of candy and ate 5, now I have 3 left.

Very good thinking! This tape diagram can represent lots of different scenarios and many different equations. It could show addition, where we're joining two parts 5 and 3 or it could show subtraction where we're starting with the whole and taking away a part to be left with the other part.

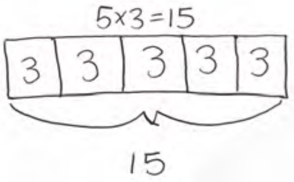
Let's Think (Slide 5): That tape diagram showed addition and subtraction, now let's make a tape diagram that represents the multiplication equation 5 x 3 = 15. We know that multiplication is the same as "groups of," so another way to say 5 times 3 is 5 groups of 3.So, we need to make a tape diagram that has 5 groups with 3 items in each group.



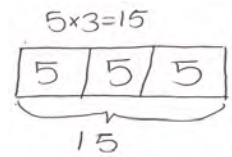
First, I am going to draw a big rectangle to show 1 whole. Then, I'm going to split my whole into five equal groups because I know we have 5 groups in this equation.



I know that I have five groups OF three, which means there are three in each group. So, I'm going to put 3 in each group–3 in this group, 3 in this group (*narrate as you write*).



Finally, let's figure out what 5 times 3 is. We see 3 and 3 and 3 and 3 and 3...five groups of three. Since we know both the number of groups, 5, and how many items are in each group, 3, I can multiply them together to get my whole, 15!



Note: Some students may think to create a tape diagram that represents 3 groups of 5 (shown to the right), while the answer is the same, that model does not represent the given equation.

Let's Think (Slide 6): Now we are going to add variables to our equations and tape diagrams. Variables are letters that represent an unknown amount. You've probably also seen a question mark or letters as placeholders or "substitutes" for unknown values. Basically, anytime we see something in an equation or tape diagram that isn't a number, it's a substitute for the unknown, it's what we're trying to solve for. Look at the tape diagram on this slide. **What do you notice?** Possible Answer Answers, Key Points:

- There are two parts that make up the whole.
- Six is one part, the other part is X, or unknown, and the total is 8.
- I see that 6 and X together make 8.
- James has cookies, Ashley has some cookies and together they have 8 cookies.

That's right! It represents the number of cookies that James and Ashley have. James has 6 cookies, and Ashley has an unknown number of cookies...X! An **unknown number** is some amount of cookie that we do not know. Here, there is the letter "x" as a substitute for Ashley's quantity because we do not know the value.

Let's think of some equations that represent the situation in the tape diagram. We know that 6 represents James' 6 cookies, plus the "x",which represents the unknown amount of Ashley's cookies, is equal to 8.

$$6 + X = 8$$

$$X + 6 = 8$$

One equation we can write is James' cookies and Ashley's cookies makes 8 cookies, so 6 plus X equals 8.

We also know that addition is commutative, we can switch the order. So, we can start with Ashley cookies and add James' cookie and that still gives us 8, so X plus 6 equals 8.

And finally, we can also write subtraction number sentences for the same tape diagram.

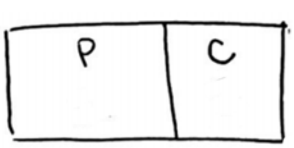
$$8 - 6 = X$$

$$8 - X = 6$$

So, we start with all 8 cookies, take away James' 6 cookies and we're left with Ashley's cookies. So, 8 minus 8 equals X.

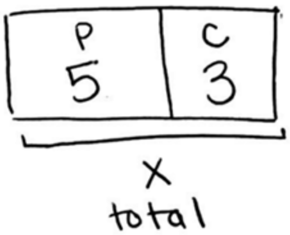
Or, we can switch the parts. We can still start with all 8 cookies and take away Ashley's cookies and we'll be left with James' cookies. So, 8 minus X equals 6.

Let's Think (Slide 7): We drew a tape diagram from an equation then we wrote equations from a tape diagram, now we'll do one more problem where we'll create a tape diagram from a story problem. Listen as I read it, "Jasmine spent some amount of money at the store. She bought a pizza for $5 and chips for $3."Let's think about how we can represent this situation with a tape diagram.



First, I will draw a whole rectangle to show that I spent all of this money. Let's split it into two parts to show that we spent some money on pizza and some on chips, I'll label each piece with a "P" for pizza and a "C" for chips.

So, we know from the story that we spent $5 on pizza and $3 on chips, so I'll go back and label the exact amount for each part.



And finally, the last part of the story says, "How much money did Jasmine spend at the store?" That's what we're trying to solve. We know that Jasmine spent money on pizza AND cookies, so we need to count that money together. So let's draw a bracket to show that we're counting both parts. I'm going to label that with X as the unknown, that's what we're solving for.

Finally, let's think of some equations that represent this tape diagram. Everyone, on your paper or white board, write down some equations that we can use to represent this tape diagram. Possible Answer Answers, Key Points:

- 5 + 3 = X so I know that x, the total/whole represents the number 8.
- 3 + 5 = X because we can add our parts in any order.
- X - 5 = 3 because we can start with the whole and take away a part to find the other part, but that's hard to solve.
- X - 3 = 5 because we can start with the whole amount and take away the other part but that's also hard to solve.

Nice thinking! When we use tape diagrams to represent equations and stories, we can use what we know about operations to help us solve for unknowns!

Let's Try it (Slides 8-9): Now let's practice using tape diagrams to represent equations and making equations that represent tape diagram diagrams. Remember tape diagram, also known as a bar model, is a visual representation that helps us solve and understand mathematical problems. It uses bars to represent quantities or parts of a wholeWe will practice equations. We will work on this first page with partners.

WARM WELCOME

Today we will use tape diagrams and equations to solve for unknown values in an equation.

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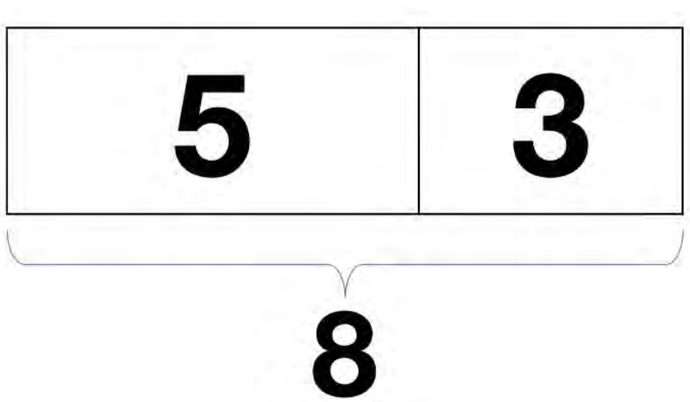
Let's Talk:

Have you ever used tape diagrams/bar models before?

How did you use them and how were they useful for modeling or solving a problem?

Let's Talk:

What do you notice and wonder about this tape diagram/ bar model? What is a story we can tell about this model?



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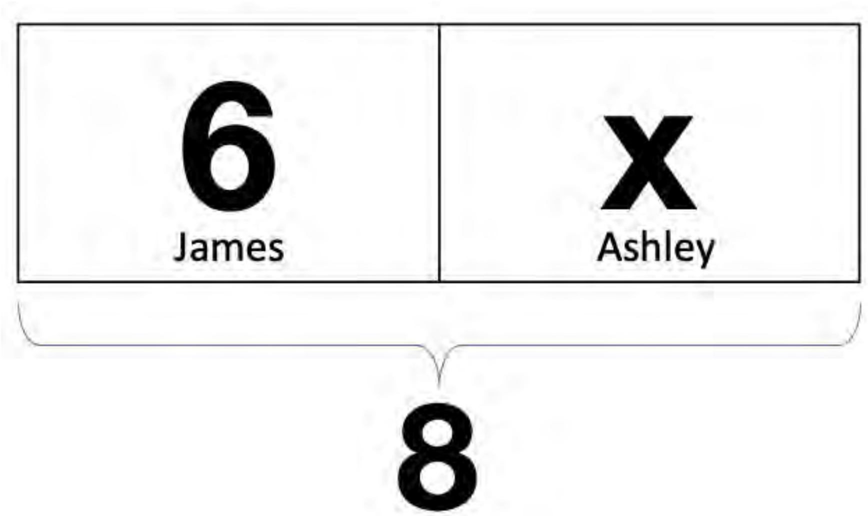
Let's Think:

Let's make a tape diagram to represent the equation.

$$5 \times 3 = 15$$

Let's Think:

What are some equations can we write to represent this tape diagram?



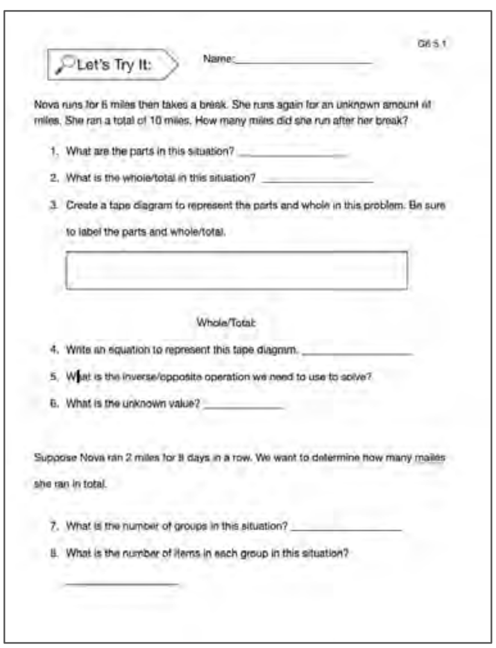
Let’s Think:

Let's draw a tape diagram to represent this situation.

Jasmine spent some amount of money at the store. She bought a pizza for $5 and chips for $3. How much money did Jasmine spend at the store?

Let’s Try It:

Let’s try using tape diagrams and equations to solve for unknown values together.



Let’s Try It: Name:____________ G6 5.1

Nova runs for 6 miles then takes a break. She runs again for an unknown amount of miles. She ran a total of 10 miles. How many miles did she run after her break?

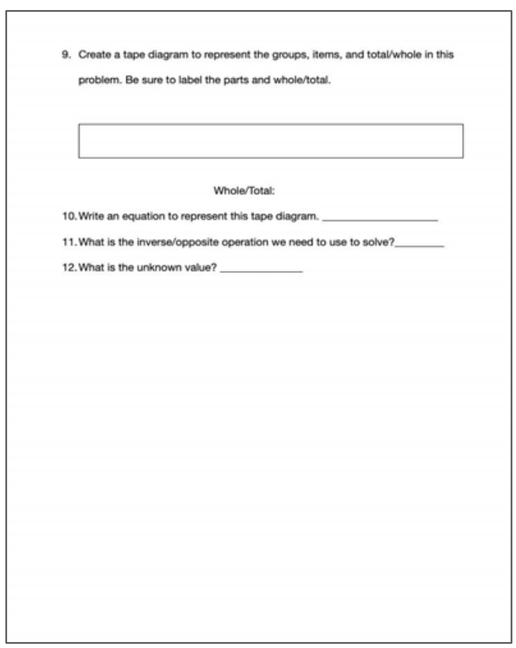
1. What are the parts in this situation? ____________
2. What is the whole/total in this situation? ____________
3. Create a tape diagram to represent the parts and whole in this problem. Be sure to label the parts and whole/total.

Whole/Total:

4. Write an equation to represent this tape diagram. ____________
5. What is the inverse/opposite operation we need to use to solve?
6. What is the unknown value? ____________

Suppose Nova ran 2 miles for 8 days in a row. We want to determine how many mailes she ran in total.

7. What is the number of groups in this situation? ____________
8. What is the number of items in each group in this situation? ____________



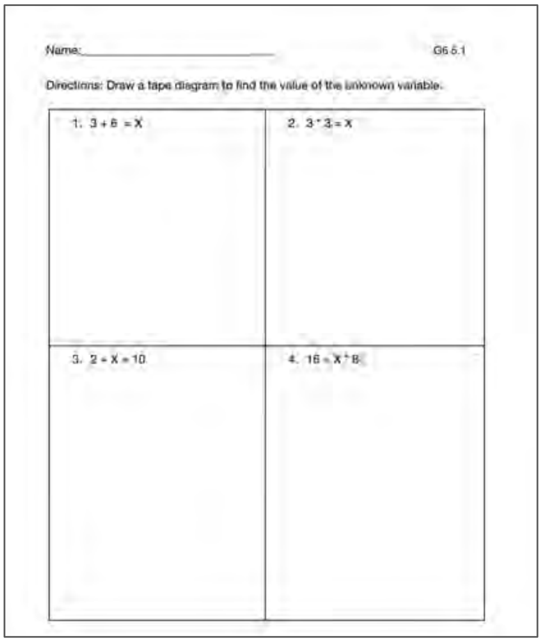
9. Create a tape diagram to represent the groups, items, and total/whole in this problem. Be sure to label the parts and whole/total.

Whole/Total:

10. Write an equation to represent this tape diagram. ____________
11. What is the inverse/opposite operation we need to use to solve?____________
12. What is the unknown value? ____________

On your Own:

Now it’s your turn to use tape diagrams and equations to solve for unknown values.



Name:________________________ G6 6.1

Directions: Draw a tape diagram to find the value of the unknown variable.

1. $3 + 6 = X$	2. $3 * 3 = X$
3. $2 * X = 10$	4. $16 = X * 8$

Nova runs for 6 miles then takes a break. She runs again for an unknown amount of miles. She ran a total of 10 miles. How many miles did she run after her break?

1. What operation does the problem represent? _______________________
2. What are the parts in this situation? ______________________
3. What is the whole/total in this situation? ______________________
4. What is our unknown in this situation? ______________________
5. What can we use to represent our unknown value?____________
6. Create a tape diagram to represent the parts and whole in this problem. Be sure to label the parts and whole/total.

Whole/Total:

7. Write an equation to represent this tape diagram. ______________________

Suppose Nova ran 2 miles for 8 days in a row. We want to determine how many miles she ran in total.

8. What operation does the problem represent? ____________________

9. What is the number of groups in this situation? ____________________

10. What is the number of items in each group in this situation? ____________________

11. What is our unknown in this situation? ____________________

12. What can we use to represent our unknown value? _______________

13. Create a tape diagram to represent the groups, items, and total/whole in this problem. Be sure to label the parts and whole/total.

Whole/Total:

14. Write an equation to represent this tape diagram. ____________________

Name:________________________________

Directions: Create a tape diagram to match the given equations.

1. $3 + 6 = X$	2. $3 * 3 = X$
3. $2 + X = 10$	4. $16 = X * 8$

Name: Answer key

Nova runs for 6 miles then takes a break. She runs again for an unknown amount of miles. She ran a total of 10 miles. How many miles did she run after her break?

1. What operation does the problem represent? Subtraction
2. What are the parts in this situation? 6, Unknown
3. What is the whole/total in this situation? 10
4. What is our unknown in this situation? miles after break
5. What can we use to represent our unknown value? X (any variable)
6. Create a tape diagram to represent the parts and whole in this problem. Be sure to label the parts and whole/total.

6	X

Whole/Total: 10

7. Write an equation to represent this tape diagram. $10 - 6 = X$ $6 + X = 10$

Suppose Nova ran 2 miles for 8 days in a row. We want to determine how many miles she ran in total.

8. What operation does the problem represent? multiplication

9. What is the number of groups in this situation? 8

10. What is the number of items in each group in this situation? 2

11. What is our unknown in this situation? total

12. What can we use to represent our unknown value? t (any variable)

13. Create a tape diagram to represent the groups, items, and total/whole in this problem. Be sure to label the parts and whole/total.

2	2	2	2	2	2	2	2

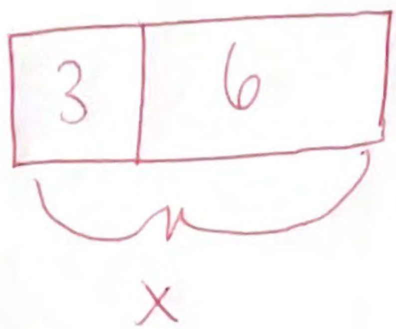
Whole/Total: 16

14. Write an equation to represent this tape diagram. $2 \times 8 = 16$

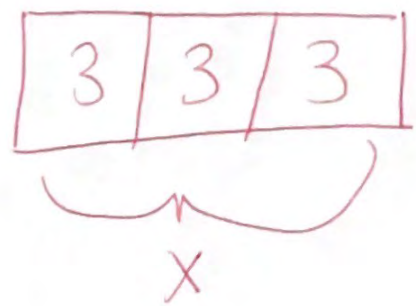
Name: Answer Key

Directions: Create a tape diagram to match the given equations.

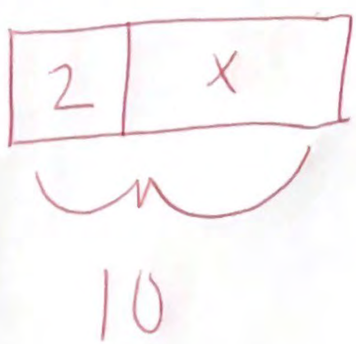
1. $3 + 6 = X$



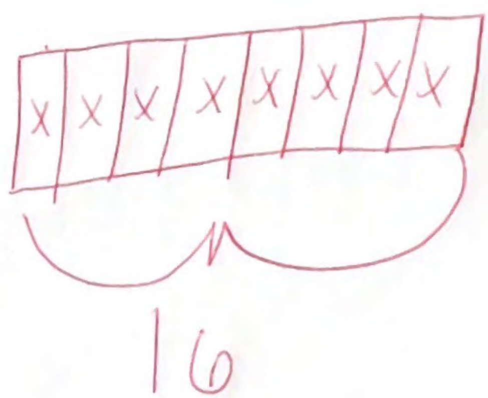
2. $3 * 3 = X$



3. $2 + X = 10$



4. $16 = X * 8$



G6 U5 Lesson 2

Use given values to see if an equation is true or false

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G6 U5 Lesson 2 - Students will replace variables with given values to see if an equation is true or false

Warm Welcome (Slide 1): Tutor choice

Let's Review (Slide 2): Before we start today's lesson let's review two important ideas. First, **what does an equal sign mean in an equation?** Possible Answer Answers, Key Points:

- An equal sign means that the value on both sides are the same value/equal to each other.
- An equal sign means that whatever value is on the left side is the exact same value on the right side
- An equal sign means that both sides are balanced/ the same
- For example, if we have 3 + 2 = 5, it means that adding 3 + 2 has the same value or is equal to 5. Both sides are balanced.

That's right, an equal sign means that the two sides of the equation are equal or balanced. An equal sign is a symbol in an equation that goes in between the left side and right side of the equation. The symbol represents that both sides have the same exact value. If the value on the left side of the equal sign is 10 then the value on the right side must be 10 for the equation to be true. That's going to be important today.

Second, let's discuss…**what is a variable?** Possible Answer Answers, Key Points:

- A variable is a letter that substitutes for a number when we do no know the value
- A variable is like a mystery number that we do not know so we label it with a letter

That is correct! A variable is a placeholder for a number we don't know yet. The letter is taking the place of the unknown number until you figure out its value.

Frame the Learning/Connect to Prior Learning (Slide 3): Today we will explore equations with variables and determine whether they are true or false. Previously we explored modeling equations with variables using tape diagrams/bar models. Remember, variables are letters that serve as placeholders or substitutes for some unknown value in an equation. By the end of this lesson you will be able to replace a variable with a given number and determine if that equation is true or false.

Let's Talk (Slide 4): Let's start by discussing some important points that will be useful for today's lesson. What does it mean if something is true or false? Give me an example of something you know is true or false. Possible Answer Answers, Key Points:

- If something is true that means that it is correct or real.
- For example I know that if I say the grass is green it is true because I can see the grass is the color green.
- If something is false then it is incorrect or not real.
- For example, I know that if I say the grass is blue that is false because I can see that grass is green.

That's right! If something is true, if it is real or correct. When something is true it can be proven as a fact. However, something is false if it is not real or incorrect or cannot be proven true.

Let's Think (Slide 5): Those are some great big ideas that will help us with our objective today. Today we will determine if an equation is true or false. An equation is true if both sides have the same value and are equal or balanced. One way you can think of this is like a seesaw, for an equation to be true, both sides have to have the same value so the seesaw is balanced. Now, let's practice replacing variables with given values and determining if an equation is true or false. I will model the process for you.

$$2y + 4 = 14$$

Considering the equation 2y + 4 = 14, I am going to write this equation. In this equation, 'y' is the variable. You can use any letter as a variable. To determine if the equation is true or false, we need to substitute a given value for 'y'.

$$2(5) + 4 = 14$$

Let's say we are given the value y = 5. That means that every time we see the variable y, we can replace or substitute it with the number 5. Let’s look at the equation 2(y) + 4 = 14. I am going to rewrite this equation but instead of y I will write the number 5 in its place.

$$10 + 4 = 14$$

After I substitute the given value into the equation, I will solve the equation. I know that 2 times 5 is 10. So, now our equation simplifies to 10 plus 4.

$$14 = 14$$

I know 10 plus 4 is 14. By performing the calculations, we find that 14 equals 14. I know this is true because 14 is the same exact number and value as 14. Since both sides of the equation are equal or the same, the equation is true.

Let’s Think (Slide 7): Let’s look at the equation 3x - 7 = 16. This time we are given the value x = 7.

$$3x - 7 = 16$$

First, let’s write our original equation 3x - 7 = 16. In this equation, 'x' is the variable. You can use any letter as a variable. To determine if the equation is true or false, we need to substitute a given value for 'x'.

$$3(7) - 7 = 16$$

Let's say we are given the value x = 7. That means that every time we see the variable x, we can replace or substitute it with the number 7. Let’s look at the equation 3x - 7 = 16. I am going to rewrite this equation but instead of x I will write the number 7 in its place.

$$21 - 7 = 16$$

After I substitute the value into the equation, I will begin to simplify or solve it. I know that 3 times 7 is 21. Now my equation simplifies to 21 minus 7 equals 16.

$$14 \neq 16$$

When we do 21 minus 7 we get 14. By performing the calculations, we see that the left side of the equation is 14 while the right is 16. So, this equation is not true because 14 is a different number and value than 16. Since both sides of the equation are not equal, the equation is false or not true.

Let’s Try it (Slides 8): Now let’s work on replacing variables with given values to see if the value makes the equation true or false. Remember if both sides are equal once you substitute the given value and solve then the equation is true. And, if one side is a different value than the other side (bigger or smaller), then the equation is false!

WARM WELCOME

Let's Review:

What does an equal sign mean in an equation?

What is a variable?

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Today we will replace variables with given values to see if an equation is true.

Let's Talk:

What does it mean if something is true or false? Give an example of something you know is true or false.

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Let's Think: **Is this equation true or false?**

$$2y + 4 = 14$$

Given Value: $y = 5$

Let's Think: **Is this equation true or false?**

$$3x - 7 = 16$$

Given Value: $x = 7$

Let's Try It:

Let's determine if the given value makes an equation true together.

Name:_______________________ G6 5.3

Equation: 5y - 3 = 17 Given Value: y = 6

1. What variable represents the unknown value? ________________
2. Rewrite the equation with the given value substituted for the variable. ____________
3. What operation do you need to do first?________________
4. What operation do you need to do second? ________________
5. If the given value is substituted are both sides equal?________________
6. Does the given value make the equation true or false?________________

Equation: 5y+ 8 = 43 Given Value: y = 7

7. What variable represents the unknown value? ________________
8. Rewrite the equation with the given value substituted for the variable. ____________
9. What operation do you need to do first?________________
10. What operation do you need to do second?________________
11. If the given value is substituted are both sides equal?________________
12. Does the given value make the equation true or false?________________

Equation: 7x+ 2 = 40 Given Value: y = 6

13. What variable represents the unknown value? ________________
14. Rewrite the equation with the given value substituted for the variable. ____________
15. What operation do you need to do first?________________
16. What operation do you need to do second? ________________
17. If the given value is substituted are both sides equal?________________
18. Does the given value make the equation true or false?________________

Equation: 2x+ 7 = 15 Given Value: y = 4

19. What variable represents the unknown value? ________________
20. Rewrite the equation with the given value substituted for the variable. ____________
21. What operation do you need to do first?________________
22. What operation do you need to do second? ________________
23. If the given value is substituted are both sides equal?________________
24. Does the given value make the equation true or false?________________

On your Own:

Now it's time for you to determine if the given value makes an equation true on your own.

Name:__________________ G6 Lesson 5.2 Independent Practice

Directions: Draw a tape diagram/model an equation with the inverse operation to help you solve for the unknown.

1. What is the value of x that makes the equation x + 14 = 26 true ?	2. What is the value of y that makes the equation 11 * y = 88 true ?
3. What is the value of x that makes the equation 26 - x = 12 true?	4. What is the value of y that makes the equation 72 / y = 9 true?

Equation: $5y - 3 = 17$ Given Value: $y = 6$

1. What variable represents the unknown value? ________________________
2. Rewrite the equation with the given value substituted for the variable. ________________
3. What operation do you need to do first?________________________
4. What operation do you need to do second? ________________________
5. If the given value is substituted are both sides equal?________________________
6. Does the given value make the equation true or false?________________________

Equation: $5x + 8 = 43$ Given Value: $x = 7$

7. What variable represents the unknown value? ________________________
8. Rewrite the equation with the given value substituted for the variable. ________________
9. What operation do you need to do first?________________________
10. What operation do you need to do second?________________________
11. If the given value is substituted are both sides equal?________________________
12. Does the given value make the equation true or false?________________________

Equation: $7y+ 2 = 40$ Given Value: $y = 6$

13. What variable represents the unknown value? ________________________
14. Rewrite the equation with the given value substituted for the variable. ________________
15. What operation do you need to do first?________________________
16. What operation do you need to do second? ________________________
17. If the given value is substituted are both sides equal?________________________
18. Does the given value make the equation true or false?________________________

Equation: $2y + 7 = 15$ Given Value: $y = 4$

19. What variable represents the unknown value? ______________________
20. Rewrite the equation with the given value substituted for the variable. _______________
21. What operation do you need to do first?______________________
22. What operation do you need to do second?______________________
23. If the given value is substituted are both sides equal?______________________
24. Does the given value make the equation true or false?______________________

Name: ____________________________________

Directions: Substitute the variables for the given values to determine if both sides of the equation are equal. If they are equal then the equation is true. If not, the equation is false.

1. Determine if the equation 8x + 3 = 35 true or false with the given values? Given value: x= 4	2. Determine if the equation 3y + 4 = 25 is true or false with the given values? Given value: y = 4
3. Determine if 9c - 4 = 40 is true or false with the given values? Given value: c = 6	4. Determine if the equation 4a + 5 = 31 is true or false with the given values? Given value: a = 4

Name: Answer key

G6 U5 Lesson 2 - Let's Try It!

Equation: 5y - 3 = 17 Given Value: y = 6

1. What variable represents the unknown value? y
2. Rewrite the equation with the given value substituted for the variable. 5(6) - 3 = 17
3. What operation do you need to do first? multiplication
4. What operation do you need to do second? Subtraction
5. If the given value is substituted are both sides equal? no
6. Does the given value make the equation true or false? false

$5(6) - 3 = 17$
$30 - 3 = 17$
$27 \neq 17$

Equation: 5x + 8 = 43 Given Value: x = 7

7. What variable represents the unknown value? x
8. Rewrite the equation with the given value substituted for the variable. 5(7)+8=43
9. What operation do you need to do first? multiplication
10. What operation do you need to do second? addition
11. If the given value is substituted are both sides equal? yes
12. Does the given value make the equation true or false? true

$5(7) + 8 = 43$
$35 + 8 = 43$
$43 = 43$

Equation: 7x+ 2 = 40 Given Value: y = 6

13. What variable represents the unknown value? y
14. Rewrite the equation with the given value substituted for the variable. 7(6)+2=40
15. What operation do you need to do first? multiplication
16. What operation do you need to do second? addition
17. If the given value is substituted are both sides equal? no
18. Does the given value make the equation true or false? false

$7(6) + 2 = 40$
$42 + 2 \neq 40$
$44 \neq 40$

Equation: $2x + 7 = 15$ Given Value: $y = 4$

19. What variable represents the unknown value? y

20. Rewrite the equation with the given value substituted for the variable. $2(4) + 7 = 15$

21. What operation do you need to do first? multiply

22. What operation do you need to do second? add

23. If the given value is substituted are both sides equal? yes

24. Does the given value make the equation true or false? true

$2(4) + 7 = 15$

$8 + 7 = 15$

$15 = 15$ ✓

Name: Answer key

G6 U5 Lesson 2 - Independent Practice

Directions: Substitute the variables for the given values to determine if both sides of the equation are equal. If they are equal then the equation is true. If not, the equation is false.

1. Determine if the equation $8x + 3 = 35$ true or false with the given values? Given value: $x = 4$ $8(4)+3=35$ $32+3=35$ $35=35$ ✓ True	2. Determine if the equation $3y + 4 = 25$ is true or false with the given values? Given value: $y = 4$ $3(4)+4=25$ $12+4=25$ $16 \neq 25$ False
3. Determine if $9c - 4 = 40$ is true or false with the given values? Given value: $c = 6$ $9(6)-4=40$ $54-4=40$ $50 \neq 40$ False	4. Determine if the equation $4a + 9 = 31$ is true or false with the given values? Given value: $a = 31$ $4(31)+9=31$ $124+9=31$ $132 \neq 31$ False

G6 U5 Lesson 3

Interpret and solve equations that represent the same situation

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G6 U5 Lesson 3 - Students will interpret and solve equations that represent the same situation

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today, we're going to work on interpreting and solving equations that represent real life scenarios. By the end of this lesson, you'll be able to interpret and solve equations representing the same situation. Let's get started.

Let's Talk (Slide 3): Let's start off by discussing what we already know about equations. **What do you know about equations?** Possible Answer Answers, Key Points:

- An equation is a mathematical statement that shows two expressions are equal.
- An equation is when the value of the left of the equal sign is the exact same value on the right of the equal sign.
- Equations use the equal sign and other symbols.
- Equations can be used to represent lots of different situations–joining, taking apart, making equation groups, dividing!

Yes, that is correct. An equation is a math statement that shows two values or expressions that are equal to each other. It is like having a scale and both sides have to be exactly the same value for it to be even or balanced. When both sides of the equal sign are the exact same, like 10 and 10, the equation is true. We also know that equations use symbols. Every equation has the equal sign, which shows that both sides are the same. But equations also use other symbols like the plus sign to show that you're joining two things or the minus sign to show that you're taking away. We also sometimes see the multiplication sign to show groups or the division sign to show splitting a whole into groups.

So now that we know that equations show two values or expressions that are equal to each other, let's think about how we can use equations to represent real life. **Give an example of an equation that represents a real life situation.** Possible Answer Answers, Key Points:

- Any real life example that represents an equation.
- If I have 2 brothers and 5 sisters, I have 7 siblings in all. An equation is 5+2=7.
- There are 3 people with long hair and 5 people with short hair at the table. That means there are 8 people in all. So. an equation that represents that is 3+5=8.

Let's Think (Slide 5): Great job brainstorming equations in real life, they're all around us and they're really helpful if we're figuring out something we don't know! Let's pretend we're planning a class field trip to an amusement park. Each student has to pay an entrance fee of $5. I'm going to write an equation on the board, and I'll explain what each variable represents as we go.

$$s \times c = t$$

In this equation, s represents the number of students attending the field trip, c represents the cost of entry for each student, and t is the total cost you will spend all together. We have to multiply the cost of entry by the number of students because we will pay that price per student.

$$s \times c = t$$
$$\downarrow \quad \downarrow$$
$$10 \times 5 = t$$

Now, let's substitute the known values into the variables of this equation to find the total cost of the trip. Let's say we have 10 students and the cost is $5 for each student to enter. We need to think about the total cost. We can substitute 10 for s because s represents students. Then, we can substitute 5 for c because c represents the cost. So, to find the total cost we need to multiply 10x5.

$$S \times C = t$$
$$10 \times 5 = t$$
$$50 = t$$

Now, let's simplify or solve the equation to find the total cost. I know that 10 times 5 is equal to 50. So t, or the total cost, is equal to 50.

The total cost of the field trip is $50 dollars.

And finally, let's write our answer as a sentence. The total cost for the field trip is 50 dollars.

Let's Think (Slide 6): Now, let's change the scenario slightly. Let's use the same equation s * c = t. But, this time there are 20 students and the cost is still $5 to enter the park. I need to think about how I can determine the total cost of the trip.

$$S \times C = t$$
$$20 \times 5 = t$$
$$100 = t$$

Let's start with the equation, we multiply the number of students by the cost for each student to find the total cost of the trip. Just like before, in this equation, s represents the number of students attending the field trip, c represents the cost of entry for each student, and t is the total cost you will spend all together. We have to multiply the cost of entry by the number of students because we will pay that price per student.

So, now, let's substitute the known values into the variables of this equation to find the total cost of the trip. I will replace the variable s with the value 20 because 20 students are going on the trip. Now, let's replace the variable c with the value 5 because it represents the cost per person. Now I have the equation 20 * 5 = 100.

Finally, let's simplify or solve the equation. We know that 20 times 5 is equal to 100. So the total cost of the trip is 100.

The total Cost of the Field trip is $100 dollars.

Now, let's write our answer as a sentence. The total cost for the field trip is 100 dollars.

Now, this is why equations are helpful. They help us find unknowns in the same situation, even when the variables change–we used the same equation to find the total cost even when the number of students changed and we could use the same equation if the price goes up or down. The structure of the equation remains the same; it's just the values that change based on different scenarios. So, regardless of the specific values, as long as we have s * c = t we can find the total cost for any given scenario.

Let's Try It (Slide 6-7) Now let's try interpreting and solving equations that represent real-world situations together. Remember, pay attention to the units (students, tickets, cost!) and make sure you understand what each variable represents in each case.

WARM WELCOME

Today we will interpret and solve equations that represent the same situation.

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Let's Talk:

What do you know about equations?

Give an example of an equation that represents a real life situation.

Let's Think:

Let's create an equation to match a trip to an amusement park

- Equation: s * c = t
    - There are 10 students going to the park
    - Each student must pay $5 to enter the park
    - What is the total cost?

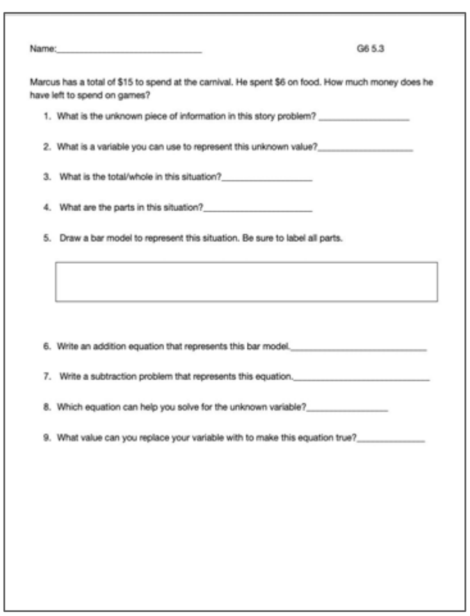
Let's Think:

Let's create an equation to match a trip to an amusement park

- Equation: s * c = t
- There are 20 students going to the park
- Each student must pay $5 to enter the park
- What is the total cost?

Let's Try It:

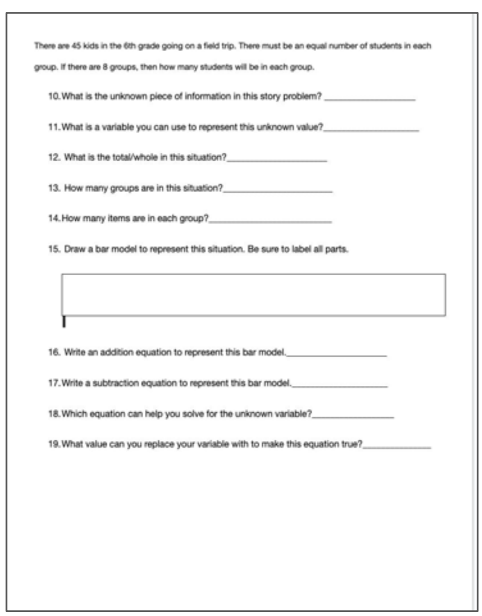
Now let's try interpreting and solving equations that represent the same situation together.



Name:______________________ G6 5.3

Marcus has a total of $15 to spend at the carnival. He spent $6 on food. How much money does he have left to spend on games?

1. What is the unknown piece of information in this story problem? ______________
2. What is a variable you can use to represent this unknown value?______________
3. What is the total/whole in this situation?______________
4. What are the parts in this situation?______________
5. Draw a bar model to represent this situation. Be sure to label all parts.
6. Write an addition equation that represents this bar model.______________
7. Write a subtraction problem that represents this equation.______________
8. Which equation can help you solve for the unknown variable?______________
9. What value can you replace your variable with to make this equation true?______________

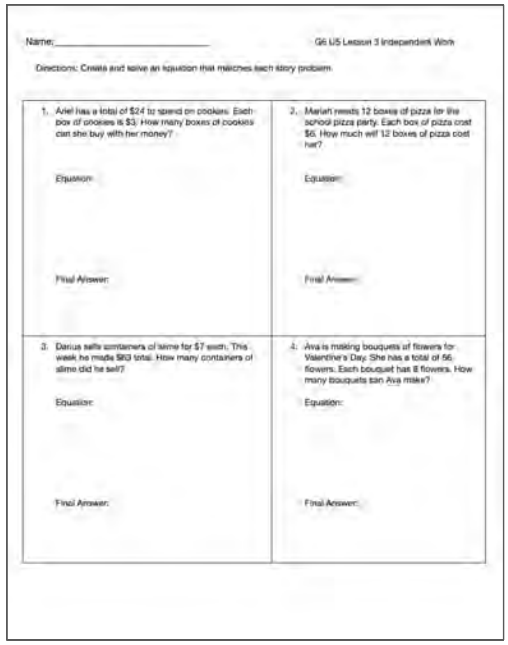


There are 45 kids in the 6th grade going on a field trip. There must be an equal number of students in each group. If there are 8 groups, then how many students will be in each group.

10. What is the unknown piece of information in this story problem? ______________
11. What is a variable you can use to represent this unknown value?______________
12. What is the total/whole in this situation?______________
13. How many groups are in this situation?______________
14. How many items are in each group?______________
15. Draw a bar model to represent this situation. Be sure to label all parts.
16. Write an addition equation to represent this bar model.______________
17. Write a subtraction equation to represent this bar model.______________
18. Which equation can help you solve for the unknown variable?______________
19. What value can you replace your variable with to make this equation true?______________

On your Own:

Now let's try interpreting and solving equations that represent the same situation on your own.


Name:__________________________ G6 U5 Lesson 3 Independent Work

Directions: Create and solve an equation that matches each story problem.

1. Ariel has a total of $24 to spend on cookies. Each box of cookies is $3. How many boxes of cookies can she buy with her money? Equation: Final Answer:	2. Mariah needs 12 boxes of pizza for the school pizza party. Each box of pizza cost $6. How much will 12 boxes of pizza cost her? Equation: Final Answer:
3. Darius sells containers of slime for $7 each. This week he made $63 total. How many containers of slime did he sell? Equation: Final Answer:	4. Ava is making bouquets of flowers for Valentine's Day. She has a total of 56 flowers. Each bouquet has 8 flowers. How many bouquets can Ava make? Equation: Final Answer:

Name:______________________________________ G6 U5 Lesson 3 - Let's Try It!

Marcus went to the carnival. He has spent $20 on rides and $8 on food. How much money did he spend in total?

1. What is the unknown piece of information in this story problem? ___________________

2. What is a variable you can use to represent this unknown value?____________________

3. What variable can you use to represent the rides?___________________

4. What variable can you use to represent the food?_______________________

5. Draw a bar model to represent this situation. Be sure to label all parts.

6. Write an equation with variables that represents this situation.____________________________

7. Substitute the variables and rewrite the equation.____________________________

8. Solve the equation._________________

There are 48 kids in the 6th grade going on a field trip. There must be an equal number of students in each group. If there are 8 groups, then how many students will be in each group.

9. What is the unknown piece of information in this story problem? ___________________

10. What is a variable you can use to represent this unknown value?____________________

11. What variable can you use to represent the rides?___________________

12. What variable can you use to represent the food?_______________________

13. Draw a bar model to represent this situation. Be sure to label all parts.

14. Write an division equation to represent this bar model.____________________

15. Write a multiplication equation to represent this bar model.___________________

16. Which equation can help you solve for the unknown variable?________________

17. What value can you replace your variable with to make this equation true?_____________

Name:_______________________________________ G6 U5 Lesson 3 - Independent Practice

Directions: Create and solve an equation that matches each story problem.

1. Ariel has a total of $24 to spend on cookies. Each box of cookies is $3. How many boxes of cookies can she buy with her money? Equation: Final Answer:	2. Mariah needs 12 boxes of pizza for the school pizza party. Each box of pizza cost $6. How much will 12 boxes of pizza cost her? Equation: Final Answer:
3. Darius sells containers of slime for $7 each. This week he made $63 total. How many containers of slime did he sell? Equation: Final Answer:	4. Ava is making bouquets of flowers for Valentine's Day. She has a total of 56 flowers. Each bouquet has 8 flowers. How many bouquets can Ava make? Equation: Final Answer:

Name: Answer Key

G6 U5 Lesson 3 - Let's Try It!

Marcus went to the carnival. He has spent \$20 on rides and \$8 on food. How much money did he spend in total?

1. What is the unknown piece of information in this story problem? Total
2. What is a variable you can use to represent this unknown value? M (any variable)
3. What variable can you use to represent the rides? r (any variable)
4. What variable can you use to represent the food? f (any variable)
5. Draw a bar model to represent this situation. Be sure to label all parts.

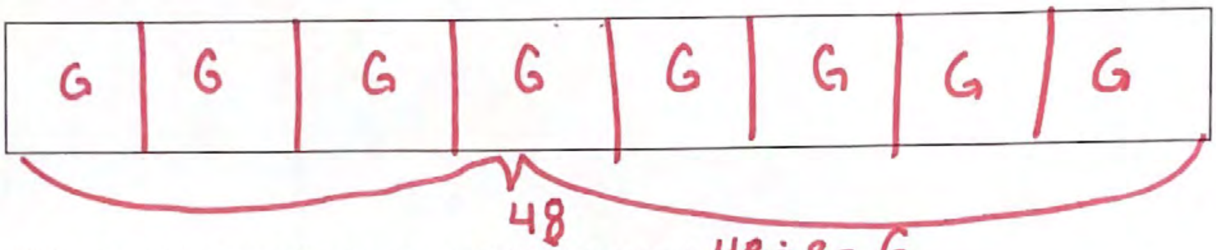
8	20

6. Write an equation with variables that represents this situation. $8 + 20 = x$
7. Substitute the variables and rewrite the equation. $8 + 20 = 28$
8. Solve the equation. 28

There are 48 kids in the 6th grade going on a field trip. There must be an equal number of students in each group. If there are 8 groups, then how many students will be in each group.

9. What is the unknown piece of information in this story problem? Number in each group
10. What is a variable you can use to represent this unknown value? G (any)
11. What variable can you use to represent the rides? r (any)
12. What variable can you use to represent the food? f (any)

13. Draw a bar model to represent this situation. Be sure to label all parts.



14. Write an division equation to represent this bar model. 48 ÷ 8 = G

15. Write a multiplication equation to represent this bar model. 8 · G = 48

16. Which equation can help you solve for the unknown variable? 48 ÷ 8 = G

17. What value can you replace your variable with to make this equation true? 6

48 ÷ 8 = 6

Name: Answer Key

G6 U5 Lesson 3 - Independent Practice

Directions: Create and solve an equation that matches each story problem.

1. Ariel has a total of $24 to spend on cookies. Each box of cookies is $3. How many boxes of cookies can she buy with her money?

   Equation: $\frac{24}{3} = \frac{3 \cdot x}{3}$

   $8 = x$

   Final Answer: 8 boxes of cookies

2. Mariah needs 12 boxes of pizza for the school pizza party. Each box of pizza cost $6. How much will 12 boxes of pizza cost her?

   Equation: $12 \cdot 6 = x$

   $72 = x$

   Final Answer: $72

3. Darius sells containers of slime for $7 each. This week he made $63 total. How many containers of slime did he sell?

   Equation: $\frac{x \cdot 7}{7} = \frac{63}{7}$

   $x = 9$

   Final Answer: 9 containers

4. Ava is making bouquets of flowers for Valentine's Day. She has a total of 56 flowers. Each bouquet has 8 flowers. How many bouquets can Ava make?

   Equation:

   $\frac{56}{8} = \frac{8x}{8}$

   $7 = x$

   Final Answer: 7 bouquets

G6 U5 Lesson 4

Divide using fractions when solving equations in the form of px= q

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G6 U5 Lesson 4 - Students will divide using fractions when solving equations in the form of px= q

Warm Welcome (Slide 1): Tutor choice

Let's Review (Slide 2): What is a reciprocal? Possible Answer Answers, Key Points:

- Reciprocal is a flipped or inverted version of a fraction or a number.
- It is when the numerator and denominator switch spots
- For example, if you have the fraction 2/3, its reciprocal would be 3/2.
- The reciprocal of 3 is ⅓. The reciprocal of ⅓ is 3.

That is correct! A reciprocal is a flipped version of a fraction or a number. For example in the fraction ⅔ the numerator is 2 and the denominator is 3. In the reciprocal equations the numerator and denominator switch spots. So, the numerator would be 3 and the denominator would be 2…three halves (*write fractions to show*).

Frame the Learning/Connect to Prior Learning (Slide 3): Today, we're going to practice dividing using fractions when solving equations in the form of px = q. By the end of this lesson, you'll be able to confidently apply this skill to solve various equations. Are you ready? Let's get started!

Let's Talk (Slide 4): Let's open with a brainstorm, **who can remind us of what it means to divide two numbers?** Possible Answer Answers, Key Points:

- Dividing is the process of finding out how many times one number fits into another number.
- Dividing is splitting a total into equal groups.

That's right! Dividing is when you split a total into equal groups! It's like when you have a big bag of skittles and you want to give it to pass them out to your friends so that everyone gets the same amount. Dividing is all about making things fair and even. When you know your total but are missing either your groups or items then you can divide by the number that the variable is being multiplied by. Division works because it is the inverse of multiplication.

Let's Think (Slide 4): Now, let's move on to dividing using fractions. Let's consider the equation 1/4x = 3. Remember, we want to isolate or get x by itself in order to determine the unknown value.

$$\frac{1}{4}x = 3$$

Let's start by rewriting the original equation.

$$\frac{4}{1}\cdot\frac{1}{4}x = 3\cdot\frac{4}{1}$$

Since we have a fraction, we need to multiply by the reciprocal of the fraction on the left side to isolate the variable or get it by itself. In this case, we multiply both sides by the reciprocal of 1/4, which is 4/1. Whenever you have a fraction that is being multiplied by a variable you will have to multiply by the reciprocal to get the variable alone or isolated. We'll multiply both sides of the equation by 4/1.

$$x = \frac{3}{1}\cdot\frac{4}{1}$$

The left side simplifies to x because the two fractions cancel each other out. On the right side, we have to multiply these two numbers. Since one is a fraction, I am going to turn my whole number 3 into a fraction by putting a 1 under my whole number. Now I have 3/1, this does not change my value because it is saying I have 3 ones, which is 3. Simplifying, on the right we have 4 times 3 which equals 12.

$$x = 12$$

Finally, let's write an equation that represents what my variable x is equal to. So, I will write x = 12.

$$\frac{1}{4}x = 3$$

Now let's double check our work by plugging the value back in for the variable and seeing if it is correct. First I will write my original equation ¼ x equals 3.

$$\frac{1}{4}(12) = 3$$

We just solved for x and found that it was 12. Let's plug 12 in to make sure that we get the same answer. So, ¼ times 12 equals 3. Let's solve.

$$\frac{1}{4} \times \frac{12}{1} = \frac{12}{4}$$

Since one is a fraction, I am going to turn my whole number into a fraction by putting a 1 as the denominator. Let's multiply across the top and bottom. On the top 1 times 12 is 12 and on the bottom 4 times 1 is 4.This simplifies to the equation 12/4 equals 3

$$\frac{12}{4} = 3$$

Looking at the equation 12/4 equals 3. I need to think to myself, " Is this true?" So, I need to simplify 12/4 to determine if it is actually equal to 3. I can skip count by 4 until I get to 12. Skip count: 4 , 8, 12. That means 12/4 or 12 divided by 4 equals 3.

$$3 = 3$$

So, our equation is correct because 3 does equal 3, they are the exact same number and have the same value.

Let's Think (Slide 4): Great job walking through all of those steps with me. Now we are going to try another example. Be sure to pay attention and ask questions while I model each step. Let's think about how we can solve the equation 3/4x = 6.

$$\frac{3}{4}x = 6$$

Let's start off by writing the original equation.

$$\frac{4}{3} \cdot \frac{3}{4}x = \frac{6}{1} \cdot \frac{4}{3}$$

Since we have a fraction, we need to multiply by the reciprocal of the fraction on the left side to isolate the variable or get it by itself. We will multiply both sides by the reciprocal of 3/4, which is 4/3. Since one is a fraction, I am going to turn my whole number in a fraction by putting a 1 as the denominator. We'll multiply both sides of the equation by 4/3.

$$x = \frac{24}{3}$$

The left side simplifies to x because the two fractions cancel each other out. We have to do some math on the right. Now we multiply our numbers 6 times 4 is 24 and 3 times 1 is 3. So , we have x = 24/3, which is 24 divided by 3. I can skip count by 3's to solve and x = 4.

$$x = 8$$

I know that x = 24/3, and 24 divided by 3 is 8. I can skip count by 3's to solve and x = 8. Finally, I will write an equation that represents what my variable x is equal to. So, I will write x = 8.

$$\frac{3}{4} \cdot 8 = 6$$

Now let's double check our work by plugging the value back in for my variable and seeing if it is correct. First let's rewrite the original equation and plug the variable back in, so instead of x, I'm going to write 78.

$$\frac{3}{4} \cdot \frac{8}{1} = 6$$

Since one is a fraction, I am going to turn my whole number into a fraction by putting a 1 as the denominator under 8. Now that I substituted my value for my variable I need to solve my equation. I know that 3 times 8 is equal to 24 and 4 times 1 equals 4. So my equation simplifies to 24/4 or 24 divided by 4

$$\frac{24}{4} = 6$$

Looking at the equation 24/4 equals 6. I need to think to myself, “ Is this true?” So, I need to simplify 24/4 to determine if it is actually equal to 6. I can skip count by 4 until I get to 24. Skip count: 4 , 8, 12, 16, 20, 24. That means 24/4 or 24 divided by 4 equals 6.

$$6 = 6$$

So, our equation is correct because 6 does equal 6, they are the exact same number and have the same value.

Let’s Try it (Slides 7-8): Great job, everyone! You all demonstrated excellent understanding of dividing using fractions when solving equations in the form of px = q. Remember we want to isolate or get x alone by multiplying both sides of the equation by the reciprocal. Be sure to double check your answers by substituting them back into the original equations. Simplify the fractions to their simplest form and ensure you have found the correct value of x. Keep practicing this skill, and you'll become even more proficient.

WARM WELCOME

Let's Review:

What is a reciprocal? Give an example.

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We will divide using fractions when solving equations in the form of px= q.

Let's Talk:

What does it mean to divide two numbers? Give an example.

Let's Think: Let's work together to solve.

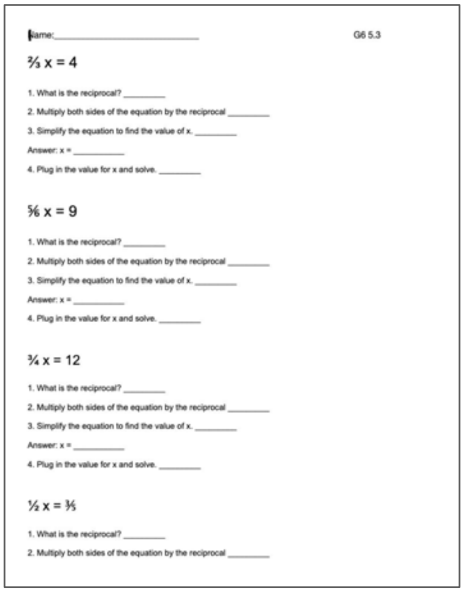
$$\frac{1}{4}x = 3.$$

Let's Think: Let's work together to solve.

$$\frac{3}{4}x = 6$$

Let's Try It:

Let's try to divide using fractions when solving equations in the form of px= q together.



Name:____________________ G6 5.3

$\frac{2}{3}x = 4$

1. What is the reciprocal? ________
2. Multiply both sides of the equation by the reciprocal ________
3. Simplify the equation to find the value of x. ________

Answer: x = ________

4. Plug in the value for x and solve. ________

$\frac{5}{6}x = 9$

1. What is the reciprocal? ________
2. Multiply both sides of the equation by the reciprocal ________
3. Simplify the equation to find the value of x. ________

Answer: x = ________

4. Plug in the value for x and solve. ________

$\frac{3}{4}x = 12$

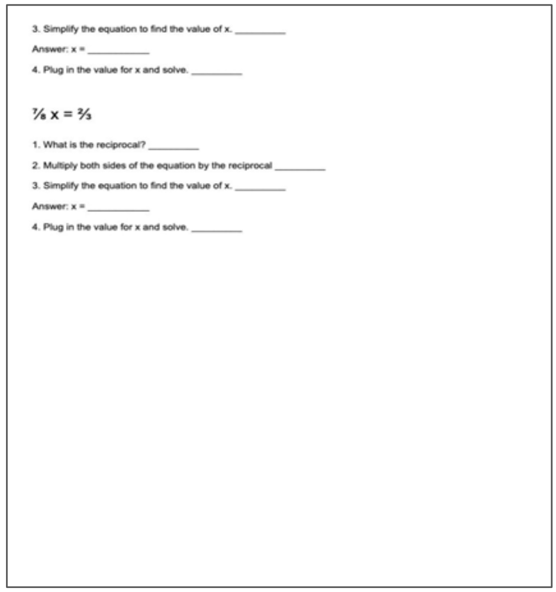
1. What is the reciprocal? ________
2. Multiply both sides of the equation by the reciprocal ________
3. Simplify the equation to find the value of x. ________

Answer: x = ________

4. Plug in the value for x and solve. ________

$\frac{1}{2}x = \frac{3}{5}$

1. What is the reciprocal? ________
2. Multiply both sides of the equation by the reciprocal ________



3. Simplify the equation to find the value of x. ________

Answer: x = ________

4. Plug in the value for x and solve. ________

$\frac{7}{8}x = \frac{2}{3}$

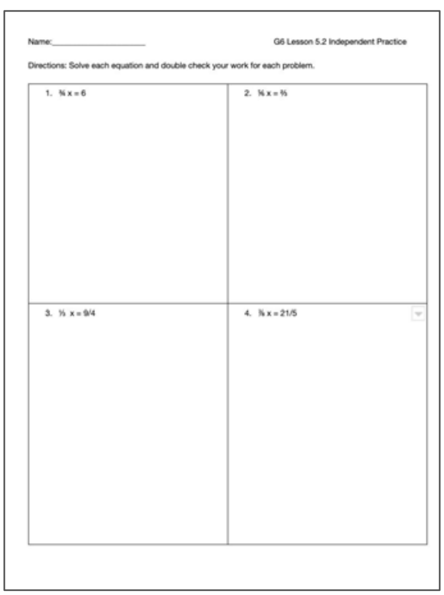
1. What is the reciprocal? ________
2. Multiply both sides of the equation by the reciprocal ________
3. Simplify the equation to find the value of x. ________

Answer: x = ________

4. Plug in the value for x and solve. ________

On your Own:

Now it is your turn to divide using fractions when solving equations in the form of px= q together.



Name:________________ G6 Lesson 5.2 Independent Practice

Directions: Solve each equation and double check your work for each problem.

1. $\frac{3}{4}x = 6$	2. $\frac{1}{6}x = \frac{5}{6}$
3. $\frac{1}{3}x = 9/4$	4. $\frac{3}{5}x = 21/5$

$\frac{2}{3}x = 4$

1. What is the reciprocal? _________

2. Multiply both sides of the equation by the reciprocal.

3. Simplify the equation to find the value of x.

   Answer: x = ___________

4. Plug in the value for x and solve. _________

$\frac{5}{6}x = 9$

1. What is the reciprocal? _________

2. Multiply both sides of the equation by the reciprocal.

3. Simplify the equation to find the value of x.

   Answer: x = ___________

4. Plug in the value for x and solve. _________

$\frac{3}{4}x = 12$

1. What is the reciprocal? _________

2. Multiply both sides of the equation by the reciprocal

3. Simplify the equation to find the value of x.

   Answer: x = ___________

4. Plug in the value for x and solve. _________

$\frac{1}{2}x = \frac{3}{5}$

1. What is the reciprocal? _________

2. Multiply both sides of the equation by the reciprocal

3. Simplify the equation to find the value of x.

Answer: x = ___________

4. Plug in the value for x and solve. _________

$\frac{7}{8}x = \frac{2}{3}$

1. What is the reciprocal? _________

2. Multiply both sides of the equation by the reciprocal.

3. Simplify the equation to find the value of x.

Answer: x = ___________

4. Plug in the value for x and solve. _________

Name:____________________________________ G6 U5 Lesson 4 - Independent Work

Directions: Solve each equation and double check your work for each problem.

1. Solve. $\frac{3}{4}x = 6$	2. Solve $\frac{5}{6}x = \frac{2}{3}$
3. Solve $\frac{1}{3}x = 9/4$	4. Solve $\frac{7}{8}x = 21/5$

Name: Answer Key G6 U5 Lesson 4 - Let's Try It!

$\frac{2}{3}x = 4$

1. What is the reciprocal? 3/2
2. Multiply both sides of the equation by the reciprocal $\frac{3}{2} \cdot \frac{2}{3}x = \frac{4}{1} \cdot \frac{3}{2} = \frac{12}{12}$
3. Simplify the equation to find the value of x. 12/2 $x = \frac{12}{2}$

Answer: x = 6

4. Plug in the value for x and solve. $\frac{2}{3} \cdot \frac{6}{1} = 4$, $\frac{12}{3} = 4$, $4 = 4$

$\frac{5}{6}x = 9$

1. What is the reciprocal? 6/5
2. Multiply both sides of the equation by the reciprocal $\frac{6}{5} \cdot \frac{5}{6}x = \frac{9}{1} \cdot \frac{6}{5}$
3. Simplify the equation to find the value of x. 10 4/5 $x = \frac{54}{5}$, $x = 10\frac{4}{5}$

Answer: x = 10 4/5 or 54/5

4. Plug in the value for x and solve. $\frac{5}{6} \cdot \frac{54}{5} = 9$, $\frac{270}{30} = 9$, $9 = 9$

$\frac{3}{4}x = 12$

1. What is the reciprocal? 4/3
2. Multiply both sides of the equation by the reciprocal $\frac{4}{3} \cdot \frac{3}{4}x = \frac{12}{1} \cdot \frac{4}{3} = \frac{48}{3}$
3. Simplify the equation to find the value of x. $x = \frac{48}{3}$

Answer: x = 48/3

4. Plug in the value for x and solve. $\frac{3}{4} \cdot \frac{48}{3} = 12$, $\frac{144}{12} = 12$, $12 = 12$

$\frac{1}{2}x = \frac{3}{5}$

1. What is the reciprocal? 2/1
2. Multiply both sides of the equation by the reciprocal

3. Simplify the equation to find the value of x. _________

Answer: x = 6/5   1 1/5

4. Plug in the value for x and solve. _________

$\frac{2}{1} \cdot \frac{1}{2} x = \frac{3}{5} \cdot \frac{2}{1}$

$x = \frac{6}{5}$

$x = 1\frac{1}{5}$

$\frac{1}{2} \cdot \frac{6}{5} = \frac{3}{5}$

$\frac{6}{10} = \frac{3}{5}$

$3/5 = 3/5$

$\frac{7}{8} x = \frac{2}{3}$

1. What is the reciprocal? 8/7

2. Multiply both sides of the equation by the reciprocal _________

3. Simplify the equation to find the value of x. _________

Answer: x = 16/21

4. Plug in the value for x and solve. _________

$\frac{8}{7} \cdot \frac{7}{8} x = \frac{2}{3} \cdot \frac{8}{7}$

$x = \frac{16}{21}$

$\frac{7}{8} \cdot \frac{16}{21} = \frac{2}{3}$

$\frac{112}{168} = \frac{2}{3}$

$\frac{2}{3} = \frac{2}{3}$

Name: Answer Key

G6 U5 Lesson 4 - Independent Practice

Directions: Solve each equation and double check your work for each problem.

1. ¾ x = 6 $\frac{4}{3} \cdot \frac{3}{4}x = \frac{6}{1} \cdot \frac{4}{3} = \frac{24}{3}$ $x = \frac{24}{3}$ $x = 8$	2. ⅚ x = ⅔ $\frac{6}{5} \cdot \frac{5}{6}x = \frac{2}{3} \cdot \frac{6}{5} = \frac{12}{15}$ $x = 12/15$
3. ⅓ x = 9/4 $\frac{3}{1} \cdot \frac{1}{3}x = \frac{9}{4} \cdot \frac{3}{1} = \frac{27}{4}$ $x = \frac{27}{4}$ $x = 6\,3/4$	4. ⅞ x = 21/5 $\frac{8}{7} \cdot \frac{7}{8}x = \frac{21}{5} \cdot \frac{7}{8} = \frac{147}{40}$ $x = 3\frac{27}{40}$

G6 U5 Lesson 5

Create and solve an equation that represents a situation with an unknown amount by writing equations with variables

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G6 U5 Lesson 5 - Students will write an equation that represents a situation with an unknown amount by writing equations with variables

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will create and solve equations that represent situations with unknown amounts using variables. It will help us better understand variables and how or why they are used in equations. In previous lessons we made sense of and solved equations with variables. Now we will make our own equations that relate to the real world.

Let's Talk (Slide 3): Let's begin by talking about what we already know about equations and variables. **What is a variable? Give an example.** Possible Student Answers, Key Points:

- It's like a placeholder for a value or values.
- Variables in math to represent unknown numbers or quantities.
- For example 5 + x = 8.

That is correct. Variables are letters that allow us to create equations and solve puzzles by figuring out what values can replace the letter and make the equation true. So, think of a variable as a placeholder that can hold different numbers and help us solve math problems. **Think of a real-life situation where you have encountered or come across unknown quantities or used variables.** Possible Student Answers, Key Points:

- Any real life example that represents an equation with an unknown.
- I had 8 dollars and I need X more dollars to have 20 dollars in all.

That is correct! There are many different situations in which we have used variables or unknown quantities or numbers in the real world. This could be ordering a certain amount of food for an unknown total. Another example is collecting money for an unknown amount of time until we reach a set goal. We can always use variables to show the unknown, or what we're trying to solve…it's just like leaving something blank!There are so many different scenarios that this will help us solve in our real life.

Let's Think (Slide 4): Today you will create and solve equations that represent situations with unknown amounts. This will be helpful for you in the real world in various aspects of planning. Look at the question on this slide, let's imagine a girl named Janay goes to a toy store that sells action figures for $12 each. Janay bought some action figures and spent a total of $60.

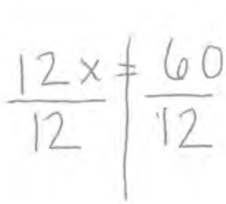
Let's use variables to determine the number of action figures Janay bought. I am going to use the variable x to represent the number of action figures Janay bought. Let me think of an equation that matches this situation. Well the price is $12 per action figure so I can multiply 12 by X or the number of action figures to help me determine the total cost. So that would look like 12x because 12 is next to the variable, I know that means multiplication. Now I know she spent a total of $60 so that would go on the right of my equal sign because 12 times "x" is equal to my total of 60.

$12x = 60$

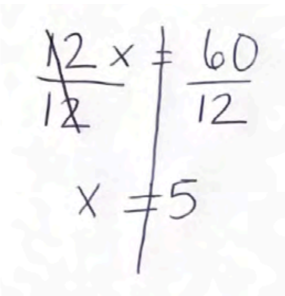
The equation would be 12x = 60. Look, 12 represents the cost per action figures, times x represents that amount of action figures, and 60 is my total money spent on action figures.

$12x \mid 60$

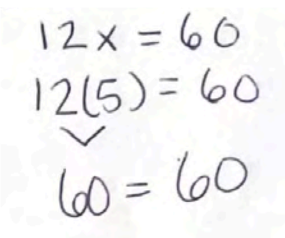
Now I need to solve my equation for X to determine the total amount of action figures she bought with her $60. So let's look at this equation. I know I need to isolate "X" or get "X" alone. First, I need to draw a straight line down the equal sign to separate the values on my left and right side.



Next, I need to start on the side of the equal sign that my variable is on. I see my variable “X” is on the left side of my equal sign. So let me see I have 12x or 12 times X but I want to isolate “X” or get “X” alone or by itself. I know that division is the inverse or opposite of multiplication so If I divide 12x by 12 then I will get 1 X or just “X”. If I divide by 12 on the left of the equal sign then I must divide by 12 on the right side as well, in order to keep the equation balanced.



So I know that 60 divided by 12 means I am splitting 60 into 12 equal groups, so I can skip count by 12 until I get to 60 to see my total number of groups or action figures. Skip count with me…12, 24, 36, 48, 60. That is 5 groups , therefore x = 5. This means that Janay bought 5 action figures for $12 each with a total of $60 spent.



Finally, I need to check my work! I can plug the value for the variable into the original equation and solve it to see if it is correct. So I have 12x = 60, I plug in my variable and get 12(5) = 60. I know that 12 times 5 is equal to 60 so this is correct. That means that Janay bought 5 action figures! I’m going to go back to the story problem and write that as a sentence to make sure it makes sense, “Janay bought 5 action figures.”

Let’s Try it (Slide 5): Now let’s practice creating or writing equations with variables to represent the unknown value and solve for the value. Remember, a variable is like a placeholder for an unknown amount or value. It is just a letter “substituting” for a certain value. Once you determine the value, you can replace the variable with the number. We will work on the first page together and the second page independently.

WARM WELCOME

We will create and solve an equation that represents a situation with an unknown amount by writing equations with variables.

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Let's Review:

What is a variable in an equation? Give an example.

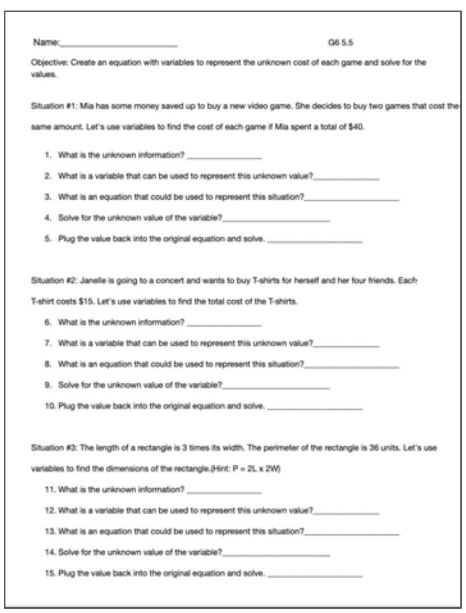
Let's Talk:

Think of a real-life situation where you have encountered or come across unknown quantities or used variables.

Let's Think:

Janay goes to a toy store that sells action figures for $12 each. Janay bought some action figures and spent a total of $60. Let's use variables to determine the number of action figures Janay bought.

Let's Try It:



Name:____________________ G6 5.5

Objective: Create an equation with variables to represent the unknown cost of each game and solve for the values.

Situation #1: Mia has some money saved up to buy a new video game. She decides to buy two games that cost the same amount. Let's use variables to find the cost of each game if Mia spent a total of $40.

1. What is the unknown information? ______________
2. What is a variable that can be used to represent this unknown value?____________
3. What is an equation that could be used to represent this situation?_________________
4. Solve for the unknown value of the variable?____________________
5. Plug the value back into the original equation and solve. _________________

Situation #2: Janelle is going to a concert and wants to buy T-shirts for herself and her four friends. Each T-shirt costs $15. Let's use variables to find the total cost of the T-shirts.

6. What is the unknown information? ______________
7. What is a variable that can be used to represent this unknown value?____________
8. What is an equation that could be used to represent this situation?_________________
9. Solve for the unknown value of the variable?____________________
10. Plug the value back into the original equation and solve. _________________

Situation #3: The length of a rectangle is 3 times its width. The perimeter of the rectangle is 36 units. Let's use variables to find the dimensions of the rectangle.(Hint: P = 2L x 2W)

11. What is the unknown information? ______________
12. What is a variable that can be used to represent this unknown value?____________
13. What is an equation that could be used to represent this situation?_________________
14. Solve for the unknown value of the variable?____________________
15. Plug the value back into the original equation and solve. _________________

On your Own:

Create an equation with variables to represent the unknown cost of each game and solve for the values.

Situation #1: Mia has some money saved up to buy a new video game. She decides to buy two games that cost the same amount. Let's use variables to find the cost of each game if Mia spent a total of $40.

1. What is the unknown information? ________________
2. What is a variable that can be used to represent this unknown value?______________
3. What is an equation that could be used to represent this situation?_____________________
4. Solve for the unknown value of the variable?________________________
5. Plug the value back into the original equation and solve. _____________________

Situation #2: Janelle is going to a concert and wants to buy T-shirts for herself and her four friends. Each T-shirt costs $15. Let's use variables to find the total cost of the T-shirts.

6. What is the unknown information? ________________
7. What is a variable that can be used to represent this unknown value?______________
8. What is an equation that could be used to represent this situation?_____________________
9. Solve for the unknown value of the variable?________________________
10. Plug the value back into the original equation and solve. _____________________

Situation #3: The length of a rectangle is 3 times its width. The perimeter of the rectangle is 36 units. Let's use variables to find the dimensions of the rectangle.(Hint: P = 2L x 2W).

11. What is the unknown information? ________________
12. What is a variable that can be used to represent this unknown value?______________
13. What is an equation that could be used to represent this situation?_____________________
14. Solve for the unknown value of the variable?________________________
15. Plug the value back into the original equation and solve. _____________________

Directions: Create equations with variables to represent the unknown value and solve for the values. Be sure to plug the value back into the original equation to double check your work.

1. A farmer has 21 cows and sheep on the farm. The number of cows is twice the number of sheep. Let's use variables to find the number of cows and sheep.	2. The total cost of buying some items is $80. Each item costs $8. Let's use variables to find the number of items.
3. Alexis is twice as old as her brother. The sum of their ages is 30. Let's use variables to find their ages.	4. The sum of two consecutive numbers is 35. Let's use variables to find the unknown numbers.

Name: Answer Key

G6 U5 Lesson 5 - Let's Try It!

Objective: Create an equation with variables to represent the unknown cost of each game and solve for the values.

Situation #1: Mia has some money saved up to buy a new video game. She decides to buy two games that cost the same amount. Let's use variables to find the cost of each game if Mia spent a total of $40.

1. What is the unknown information? cost of each game
2. What is a variable that can be used to represent this unknown value? c (any)
3. What is an equation that could be used to represent this situation? $2c = 40$; $\frac{2c}{2} = \frac{40}{2}$; $c = 20$
4. Solve for the unknown value of the variable? 20
5. Plug the value back into the original equation and solve.

$2 \cdot 20 = 40$

$40 = 40$

Situation #2: Janelle is going to a concert and wants to buy T-shirts for herself and her four friends. Each T-shirt costs $15. Let's use variables to find the total cost of the T-shirts.

6. What is the unknown information? total cost
7. What is a variable that can be used to represent this unknown value? t (any)
8. What is an equation that could be used to represent this situation? $5(15) = t$
9. Solve for the unknown value of the variable? $75 = t$
10. Plug the value back into the original equation and solve.

$5(15) = 75$

$75 = 75$

Situation #3: The length of a rectangle is 3 times its width. The perimeter of the rectangle is 36 units. Let's use variables to find the dimensions of the rectangle.(Hint: P = 2L x 2W)

11. What is the unknown information? L, W
12. What is a variable that can be used to represent this unknown value? L, W
13. What is an equation that could be used to represent this situation? $2(3w + w) = 36$; $6w + 2w = 36$; $\frac{8w}{8} = \frac{36}{8}$; $w = 4.5$
14. Solve for the unknown value of the variable? $W = 4.5$

Name: Answer Key

G6 U5 Lesson 5 - Independent Practice

Directions: Create equations with variables to represent the unknown value and solve for the values. Be sure to plug the value back into the original equation to double check your work.

1. A farmer has 21 cows and sheep on the farm. The number of cows is twice the number of sheep. Let's use variables to find the number of cows and sheep.

$C = 2S$

$C + S = 21$

$2S + S = 21$

$\frac{3S}{3} = \frac{21}{3}$

$S = 7$

$21 - 7 = 14$

7 sheep 14 cows

2. The total cost of buying some items is $80. Each item costs $8. Let's use variables to find the number of items.

$\frac{8I}{8} = \frac{80}{8}$

$I = 10$

10 items

3. Alexis is twice as old as her brother. The sum of their ages is 30. Let's use variables to find their ages.

$A = 2B$

$A + B = 30$

$2B + B = 30$

$\frac{3B}{3} = \frac{30}{3}$

$B = 10$ Brother is 10

$A = 2B$

$A = 2(10)$

$A = 20$ Alexis is 20

4. The sum of two consecutive numbers is 35. Let's use variables to find the unknown numbers.

$N + (N+1) = 35$

$2n + 1 = 35$

$-1 \quad -1$

$\frac{2n}{2} = \frac{34}{2}$

$n = 17$

17, 18

G6 U5 Lesson 6

Use equations to solve problems with percentages

G6 U5 Lesson 6 - Students will use equations to solve problems with percentages

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will use equations to help us solve problems with percentages. It is important that we understand percentages because percentages are everywhere in our everyday lives! We already have created and solved equations with variables, today we'll use percentages.

Let's Talk (Slide 3): You all spent a lot of time in earlier units working with percentages. So, let's warm our brains out by discussing, **what is a percentage?** Possible Answer Answers, Key Points:

- A percentage is a certain amount out of 100.
- A percentage is like a ratio but it's always out of 100.
- Percentages are similar to fractions, like 50% is the same as one-half.

Yes, that is correct. A percent is an amount out of one hundred. Percentages are used in people's everyday lives and are all around us. It is important to think about how we might use this in the real world. **Can you think of real-life situations where percentages are used?** Possible Answer Answers, Key Points:

- When something is on sale for a certain percent off, like 20% off all jackets.
- On a test when you get a grade, like 80%.
- When you leave a tip or a service fee, like 15%.

Yes that is correct! Percentages are used to compare numbers all around us in our daily lives. We see percentages on test scores, goals, tips, service fee, sales, and so many other places. This is why it is so important to learn today's lessons because you will use this in your daily lives.

Let's Think (Slide 4): Great job discussing percentages and how they apply to our lives. Learning about percentages will help us navigate daily life because percentages are all around us. When we're solving problems about percentages, we have to think carefully about what we know and what we don't know. Let's imagine our favorite store is having a 20% off sale on all items. You want to buy a shirt that originally costs $25. How much will the shirt cost after the discount?

So, we know that the original short costs 25 dollars and we know that the discount is going to be 20% of $25. So we need to figure out the discount, or how much we'll save on the sale, and take that away from the original price. In other words, we could use an equation to help us solve.

$$\text{original price} - \left[\text{original price} \cdot \text{discount } \%\right] = x$$

First we need to calculate the discount, which we do by multiplying the original price by the percentage discount. And then we start with the original price and take away that discount to find the total of the shirt. So, original price minus (original price times the discount percentage).

$$25 - (.20 \times 25) = x$$
$$25 - (5) = x$$
$$20 = x$$

Now that we have our equation. We can plug in our numbers to help us find the total. First, let's identify the information given to me. We know the original cost of the shirt…$25 and the discount percentage…20%.

So, .20 times 25, I can move the decimal over one and think of it as 2 times 25, which is easy…50! And then I need to move the decimal back over one time. So, that's 5.

This means that I get a $5 discount off of my shirt.

If I get $5 of the shirt that means that the original price, 25, minus 5 is 20. This means that after the 20% off sale, I will pay $20 for the shirt.

That was one example of how a story might ask us about percentages, where we're finding a percentage of an original and taking that amount away. But, we also might also have problems where we're finding a percentage and adding it back to the original price or amount. Let me show you.

Let's Think (Slide 5): Let's imagine you spent $25 on dinner. You want to leave a 20% tip. How much will you spend on dinner? This sounds really similar, I see the same two pieces of information, let's read a little bit closer to think about what's happening here. So, I went to dinner and I spent $25 on dinner. Now, I want to leave a tip, or something extra for the server who helped me..20% to be exact…so I need to figure out how much I spent on dinner…the $25 for dinner and the extra tip for the server. So, this problem is different because I'm not taking the percentage away, I'm adding it.

$$\text{original price} + \left[\text{original price} \cdot \text{discount } \%\right] = x$$

$$25 + (25 \times .2) = x$$

$$25 + 5 = x$$

$$30 = x$$

In order to solve this problem, I need to find the amount I'm going to tip, 20% of $25 and add that back to the original amount. Here, the percent equation I can use is the original price PLUS the original price times the percentage, and that will give me the total cost of my dinner.

So, let me plug my values in. I know that the original price of dinner was $25. And, to find how much I'm going to tip, I need to multiply $25 times 20%, or 0.2.

We just did the same math in my previous problem. We know that 25 times 0.2 is 5. But, instead of taking that 5 away, I need to ADD it to the original price because that's the tip, or extra money, that I'm adding for my server.

So, I will end up paying $30 for my dinner. I'll pay $25 for food plus the $5 tip (20% of $25!), which is $30 in all.

Let's Try it (Slides 6-7): Now let's try solving equations with percentages. Remember to think carefully about what you're trying to figure out and use a percent formula to help you solve. Be sure to plug in the correct value in for the correct spot in the equation. We will work on the first worksheet step by step together.

WARM WELCOME

We will use equations to solve problems with percentages

Let's Talk:

What is a percentage? Think of real-life situations where percentages are used.

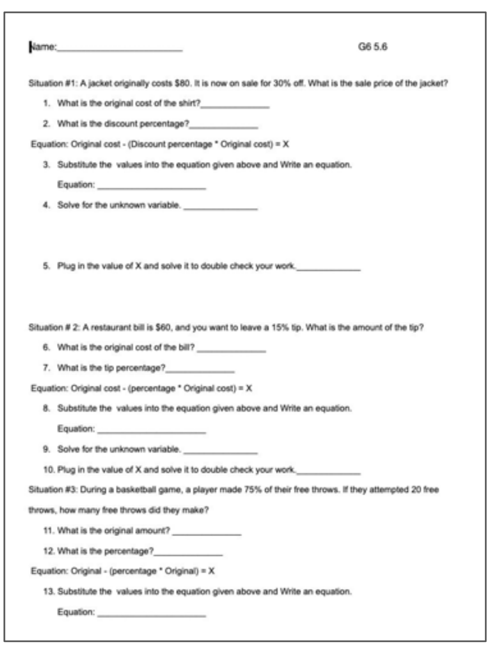
Let's Think:

Let's imagine our favorite store is having a 20% off sale on all items. You want to buy a shirt that originally costs $25. How much will the shirt cost after the discount?

Let's Think:

Let's imagine you spent $25 on dinner. You want to leave a 20% tip. How much will you spend on dinner?

Let's Try It:



Name:____________________ G6 5.6

Situation #1: A jacket originally costs $80. It is now on sale for 30% off. What is the sale price of the jacket?

1. What is the original cost of the shirt?____________
2. What is the discount percentage?____________

Equation: Original cost - (Discount percentage * Original cost) = X

3. Substitute the values into the equation given above and Write an equation.

   Equation: ________________

4. Solve for the unknown variable. ____________
5. Plug in the value of X and solve it to double check your work.____________

Situation # 2: A restaurant bill is $60, and you want to leave a 15% tip. What is the amount of the tip?

6. What is the original cost of the bill? ____________
7. What is the tip percentage?____________

Equation: Original cost - (percentage * Original cost) = X

8. Substitute the values into the equation given above and Write an equation.

   Equation: ________________

9. Solve for the unknown variable. ____________
10. Plug in the value of X and solve it to double check your work.____________

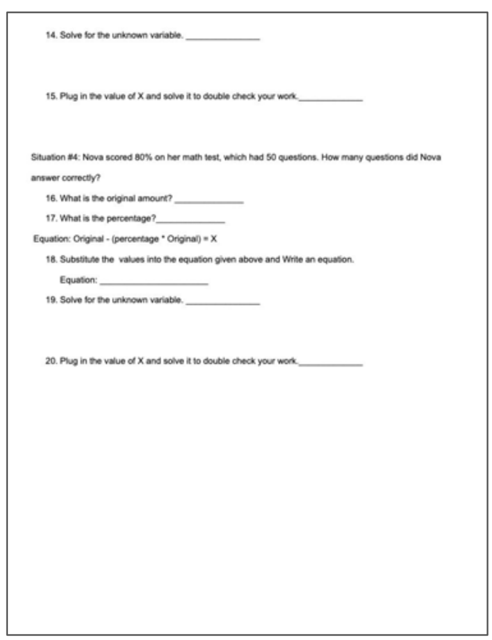
Situation #3: During a basketball game, a player made 75% of their free throws. If they attempted 20 free throws, how many free throws did they make?

11. What is the original amount? ____________
12. What is the percentage?____________

Equation: Original - (percentage * Original) = X

13. Substitute the values into the equation given above and Write an equation.

    Equation: ________________



14. Solve for the unknown variable. ____________
15. Plug in the value of X and solve it to double check your work.____________

Situation #4: Nova scored 80% on her math test, which had 50 questions. How many questions did Nova answer correctly?

16. What is the original amount? ____________
17. What is the percentage?____________

Equation: Original - (percentage * Original) = X

18. Substitute the values into the equation given above and Write an equation.

    Equation: ________________

19. Solve for the unknown variable. ____________
20. Plug in the value of X and solve it to double check your work.____________

On your Own:

Name:________________ G6.U5.L6

Directions: Create an equation to solve the percentage problems below.

1. Jaya ordered $75 worth of food on a delivery app. The app charged her a 20% delivery fee. What is the final price for her delivery order?	2. During a sale, a store offered a 40% discount on all clothing items. If Tom bought a shirt that was originally priced at $30, what was the sale price of the shirt?
3. A laptop is on sale for 15% off its original price of $800. What is the sale price of the laptop?	4. Jamie received a 20% discount on a new bicycle that originally costs $140. How much did Jamie pay for the bicycle?

Situation #1: A jacket originally costs $80. It is now on sale for 30% off. What is the sale price of the jacket?

1. What is the original cost of the shirt?______________
2. What is the discount percentage?______________

    Equation: original cost - (discount percentage * original cost) = X

3. Substitute the values into the equation given above and write an equation.

    Equation: ______________________

4. Solve for the unknown variable. _______________
5. Plug in the value of X and solve it to double check your work._____________

Situation # 2: A restaurant bill is $60, and you want to leave a 15% tip. What is the amount of the tip?

6. What is the original cost of the bill? ______________
7. What is the tip percentage?______________

    Equation: original cost - (percentage * original cost) = X

8. Substitute the values into the equation given above and Write an equation.

    Equation: ______________________

9. Solve for the unknown variable. _______________
10. Plug in the value of X and solve it to double check your work._____________

Situation #3: During a basketball game, a player made 75% of their free throws. If they attempted 20 free throws, how many free throws did they miss?

11. What is the original amount? ______________
12. What is the percentage?______________

    Equation: original - (percentage * original) = X

13. Substitute the values into the equation given above and Write an equation.

    Equation: ______________________

14. Solve for the unknown variable. _______________
15. Plug in the value of X and solve it to double check your work._____________

Name ____ G6 U5 Lesson 6 - Independent Work

Directions: Create an equation to solve the percentage problems below.

1. A store is offering a 25% discount on a toy that originally costs $40. How much will the toy cost after the discount?	2. At a bakery, the donuts are 30% off the original price of $20 a dozen. How much are the donuts after the sale price?
3. Thomas ordered food from a delivery food service. His food cost a total of $55. He was charged a 15% service fee. How much did he spend in total on the food delivery?	4. Jane spent $125 at a restaurant on her dinner. She plans on leaving a 25% tip for her waitress. How much money will she spend in total with the bill and tip combined?

Name: Answer key G6 U5 Lesson 6 - Let's Try It!

Situation #1: A jacket originally costs $80. It is now on sale for 30% off. What is the sale price of the jacket?

1. What is the original cost of the shirt? $80
2. What is the discount percentage? 30% .30

Equation: Original cost - (Discount percentage * Original cost) = X

3. Substitute the values into the equation given above and Write an equation.

   Equation: $80-(.30 \cdot 80)=x$

4. Solve for the unknown variable. 56

   $80-(.3 \cdot 80)=x$

   $80-24=x$

   $56=x$

5. Plug in the value of X and solve it to double check your work.

   $80-(.3 \cdot 80)=56$

   $80-24=56$

   $56=56$

Situation # 2: A restaurant bill is $60, and you want to leave a 15% tip. What is the amount of the tip?

6. What is the original cost of the bill? 60
7. What is the tip percentage? 15% .15

Equation: Original cost - (percentage * Original cost) = X

8. Substitute the values into the equation given above and Write an equation.

   Equation: $60-(.15 \cdot 60)$

9. Solve for the unknown variable. 51
10. Plug in the value of X and solve it to double check your work.

   $60-(.15 \cdot 60)=51$

   $60-9=51$

   $51=51$

Situation #3: During a basketball game, a player made 75% of their free throws. If they attempted 20 free throws, how many free throws did they miss?

11. What is the original amount? 20
12. What is the percentage? .75

Equation: Original - (percentage * Original) = X

13. Substitute the values into the equation given above and Write an equation.

   Equation: $20-(.75 \cdot 20)=x$

   $20-15=x$

   $x=5$

Name: Answer Key

G6 U5 Lesson 6 - Independent Practice

Directions: Create an equation to solve the percentage problems below.

1. A store is offering a 25% discount on a toy that originally costs $40. How much will the toy cost after the discount? $40-(.25\cdot 40)=x$ $40-10=x$ $30=x$	2. At a bakery, the donuts are 30% off the original price of $20 a dozen. How much are the donuts after the sale price? $20-(.3\cdot 20)=x$ $20-6=x$ $14=x$
3. Thomas ordered food from a delivery food service. His food cost a total of $55. He was charged a 15% service fee. How much did he spend in total on the food delivery? $55+(.15\cdot 55)=x$ $55+8.25=x$ $\$63.25=x$	4. Jane spent $125 at a restaurant on her dinner. She plans on leaving a 25% tip for her waitress. How much money will she spend in total with the bill and tip combined? $125+(.25\cdot 125)=x$ $125+31.25=x$ $\$156.25=x$

G6 U5 Lesson 7

Use diagrams to differentiate between equal and equivalent expressions

G6 U5 Lesson 7 - Students will use diagrams to differentiate between equal and equivalent expressions

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today, we will build on our knowledge of the distributive property, which we've been learning about since third grade. We will jog on memory on how to use the distributive property in order to create equivalent expressions. This skill will be important as we continue exploring equations.

Let's Talk (Slide 3): Today, we will talk about the similarities and differences between equal expressions and equivalent expressions. Let's start with reviewing what we already know about the distributive property. So…**what do you already know about the distributive property?** Possible Answer Answers, Key Points:

- When you have a number outside a set of parentheses and inside the parentheses.
- It says that when you have a number outside a set of parentheses and inside the parentheses, there is an addition or subtraction, you can share or distribute the number to each part inside the parentheses.

Yes, that is correct. The distributive property explains how multiplication can be distributed over addition or subtraction.The property applies to both numbers and variables.

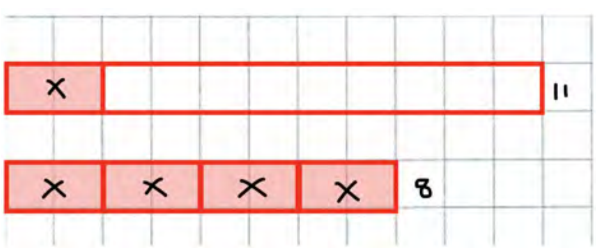
Let's Think (Slide 4): Today we'll explore how the distributive property can help us find equivalent expressions. Remember, an expression is like a math sentence with numbers, variables, and operations, but it doesn't have an equal sign. For example, 2 + 3 and 4 + 2 and X + 1 are expressions (*write*). These are all expressions because they have a combination of numbers, variables, and operations like addition or subtraction but there is no equal sign involved. Today expressions will be important to our learning.

Now let's learn how to use diagrams to figure out which expressions are equivalent and which are just sometimes equal. Let's talk about the difference between equal expressions and equivalent expressions. An equal expression is when two expressions have the same value when the variable is set to a particular value, but not all values.

For example, the two expressions x + 9 and 4x are equal ,when x = 3. If we look at the diagram, when x-3 we have 3+9 which is 12 for the first expression. Then for the second expression, we have 4(3) which is 12. So when x=3, the two expressions are equal. But, they aren't always equal depending on what the variable is.

And, when we do the math and substitute 3 for x, we see that 3+9 is 12 and 4x2 is 12. We can see that they're equal in both the diagram (*point)* and with the equations.

Let's Think (Slide 5): Let's explore whether they're equal when x=2. Let's use diagram substitution to prove whether they are or are not equal..



Let's model x + 9 and 4x when x = 2. I would represent x + 9 by making a box around 2 units and labeling it x. Then I would connect a group of 9 more and would have a total of 11 blocks.

Next, let's represent 4x when x = 2. That would be four sets of 2 so I would make four groups of 2, which makes 8 in all.

When I look at the diagram, I see that 11 and 8 aren't equal, therefore these expressions are not equal when x = 2.

So these expressions are equal when x = 3 but not when x=2 so that means that they aren't equivalent expressions.

Let's Think (Slide 6): That brings us to EQUIVALENT EXPRESSIONS, equivalent expressions are two expressions that will always have the same exact value no matter what value a variable is set to, whether x=2 or x=3 or any other value. They may look different but simplify to the same value each time.

So, let's look at the expression 4(x + 3). I want to think of an expression that is equivalent, this is making me think about the distributive property. We know that the distributive property creates an equivalent expression by distributing multiplication across the parentheses.

$$4(x+3)$$

Look, this 4 is outside the parentheses. So, we can distribute it to the X and the 3 (*draw arrows*).

$$4 \cdot x + 4 \cdot 3$$

First, let's distribute the outside term, 4, to the first term…x! So, 4 times x or 4x. Then we need to distribute or multiply the outside term, 4, to the second inside term 3, which is 4 times 3.

$$4x + 12$$

Now my expression is 4x plus 12. So I could rewrite this expression as 4x + 12.

$$4x+12 = 4(x+3)$$

Therefore 4(x + 3) and 4x + 12 are equivalent because equivalent expressions have the same value for any given values of the variables, so I can set them equal to each other. Even though the expressions look different, they both give us the same value for every value x.

$$4x+12 = 4(x+3)$$
$$4(5)+12 = 4(5+3)$$
$$20+12 = 4(8)$$
$$32 = 32$$

Let's test it to see if they're the same when x=5. We'll use the same equation and plug 5 in for the variable x on both sides.

Now, when we do the math we see that when x=5, the equations are equivalent, they both equal 32.

Now, everyone, pick your own value for X and plug it in to prove that the expressions are equivalent. (*Have students share out their value and whether the two expressions had the same value*).

Let's Try it (Slides 6): Now, we will work together. I will hand out worksheets with various expressions. Your task is to determine whether they are equal or equivalent. Remember, an equal expression is when two expressions have the same value when the variable is set to a particular value, but not all values. However, an equivalent expression is two expressions that will always have the same exact value no matter what value a variable is set to.

WARM WELCOME

We will use diagrams to differentiate between equal and equivalent expressions.

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Let's Talk:

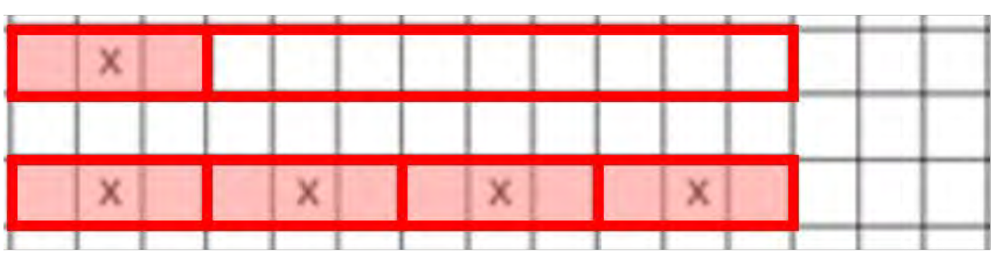
What do you already know about the distributive property?

Let's Think:

Equal Expressions

An equal expression is when two expressions have the same value when the variable is set to a particular value, but not all values.

x + 9 and 4x



x + 9 when x = 3

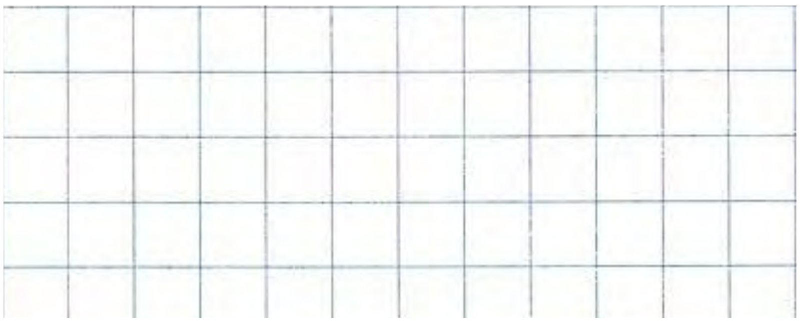
4x when x =3

Let's Think:

Let's draw a diagram to determine whether the expressions are equal.

Remember, an equal expression is when two expressions have the same value when the variable is set to a particular value, but not all values. Let's look at the same two expressions but change the given variable.

x + 9 and 4x



x + 9 when x = 2

4x when x =2

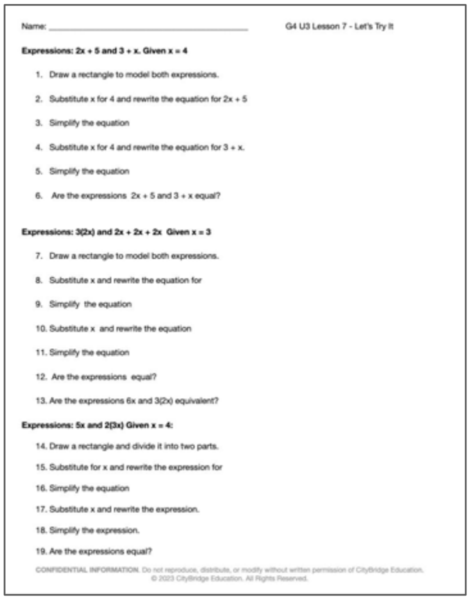
Let's Think: Equivalent Expressions

Equivalent expressions are two expressions that will always have the same exact value no matter what value a variable is set to. They may look different but simplify to the same value each time.

$$4 (x + 3)$$

Let's Try It:

Let's try to use diagrams to differentiate between equal and equivalent expressions together



Name: ______________________ G4 U3 Lesson 7 - Let's Try It

Expressions: 2x + 5 and 3 + x. Given x = 4

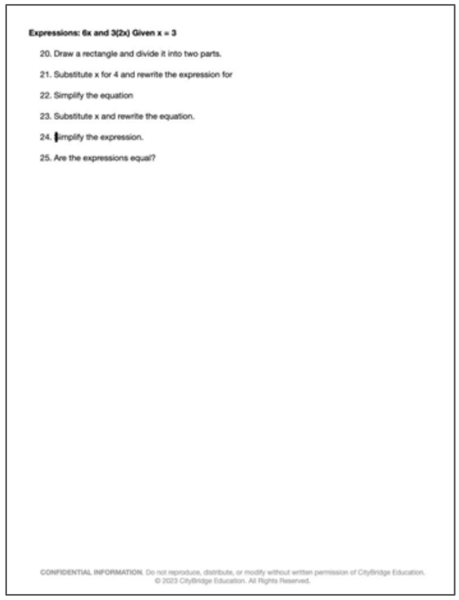
1. Draw a rectangle to model both expressions.
2. Substitute x for 4 and rewrite the equation for 2x + 5
3. Simplify the equation
4. Substitute x for 4 and rewrite the equation for 3 + x.
5. Simplify the equation
6. Are the expressions 2x + 5 and 3 + x equal?

Expressions: 3(2x) and 2x + 2x + 2x Given x = 3

7. Draw a rectangle to model both expressions.
8. Substitute x and rewrite the equation for
9. Simplify the equation
10. Substitute x and rewrite the equation
11. Simplify the equation
12. Are the expressions equal?
13. Are the expressions 6x and 3(2x) equivalent?

Expressions: 5x and 2(3x) Given x = 4:

14. Draw a rectangle and divide it into two parts.
15. Substitute for x and rewrite the expression for
16. Simplify the equation
17. Substitute x and rewrite the expression.
18. Simplify the expression.
19. Are the expressions equal?

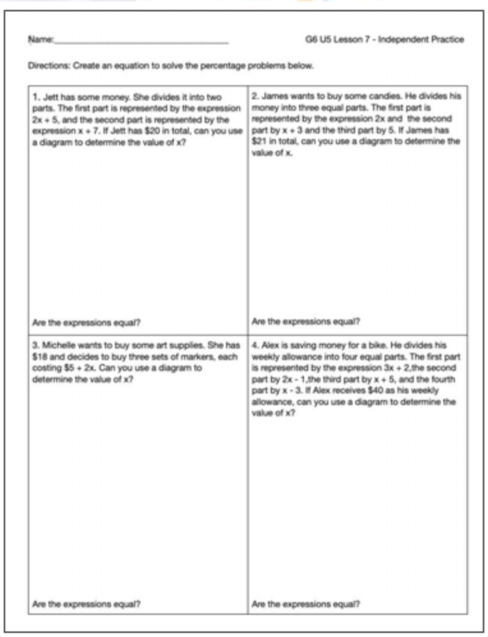


Expressions: 6x and 3(2x) Given x = 3

20. Draw a rectangle and divide it into two parts.
21. Substitute x for 4 and rewrite the expression for
22. Simplify the equation
23. Substitute x and rewrite the equation.
24. Simplify the expression.
25. Are the expressions equal?

On your Own:

Try to use diagrams to differentiate between equal and equivalent expressions on your own.



Name: ______________________ G6 U5 Lesson 7 - Independent Practice

Directions: Create an equation to solve the percentage problems below.

1. Jett has some money. She divides it into two parts. The first part is represented by the expression 2x + 5, and the second part is represented by the expression x + 7. If Jett has $20 in total, can you use a diagram to determine the value of x? Are the expressions equal?	2. James wants to buy some candies. He divides his money into three equal parts. The first part is represented by the expression 2x and the second part by x + 3 and the third part by 5. If James has $21 in total, can you use a diagram to determine the value of x. Are the expressions equal?
3. Michelle wants to buy some art supplies. She has $18 and decides to buy three sets of markers, each costing $5 + 2x. Can you use a diagram to determine the value of x? Are the expressions equal?	4. Alex is saving money for a bike. He divides his weekly allowance into four equal parts. The first part is represented by the expression 3x + 2,the second part by 2x - 1,the third part by x + 5, and the fourth part by x - 3. If Alex receives $40 as his weekly allowance, can you use a diagram to determine the value of x? Are the expressions equal?

Name: ____ G4 U3 Lesson 7 - Let's Try It

Expressions: 2x + 5 and 3 + x. Given x = 4

1. Draw a rectangle to model both expressions.

2. Substitute x for 4 and rewrite the equation for 2x + 5

3. Simplify the equation

4. Substitute x for 4 and rewrite the equation for 3 + x.

5. Simplify the equation

6. Are the expressions 2x + 5 and 3 + x equal?

Expressions: 3(2x) and 2x + 2x + 2x Given x = 3

7. Draw a rectangle to model both expressions.

8. Substitute x and rewrite the equation for

9. Simplify the equation

10. Substitute x and rewrite the equation

11. Simplify the equation

12. Are the expressions equal?

13. Are the expressions 6x and 3(2x) equivalent?

Expressions: 5x and 2(3x) Given x = 4:

14. Draw a rectangle and divide it into two parts.

15. Substitute for x and rewrite the expression for

16. Simplify the equation

17. Substitute x and rewrite the expression.

18. Simplify the expression.

19. Are the expressions equal?

Expressions: 6x and 3(2x) Given x = 3

20. Draw a rectangle and divide it into two parts.

21. Substitute x for 4 and rewrite the expression for

22. Simplify the equation

23. Substitute x and rewrite the equation.

24. Simplify the expression.

25. Are the expressions equal?

Name:___________________________________ G6 U5 Lesson 7 - Independent Work

Directions: Use diagrams and plug in the value of x to determine if the expressions are equivalent.

1. Draw two separate diagrams to represent the expressions 3 + 2 and 4 + 1. Are these expressions equal or equivalent? Explain your answer using the diagrams.	2. Draw two separate diagrams to represent the expressions 2 x 5 and 10. Are these expressions equal or equivalent? Explain your answer using the diagrams.
3. Draw two separate diagrams to represent the expressions 6 - 3 and 7 - 4. Are these expressions equal or equivalent? Explain your answer using the diagrams.	4. Draw two separate diagrams to represent the expressions 2 x 3 and 3 x 2. Are these expressions equal or equivalent? Explain your answer using the diagrams.

Name: Answer Key

G4 U3 Lesson 7 - Let's Try It

Expressions: 2x + 5 and 3 + x. Given x = 4

1. Draw a rectangle to model both expressions. | 2x | 5 | | 3 | x |
2. Substitute x for 4 and rewrite the equation for 2x + 5
   2(4) + 5
3. Simplify the equation
   8 + 5
   13
4. Substitute x for 4 and rewrite the equation for 3 + x.
   3+4
5. Simplify the equation
   7
6. Are the expressions 2x + 5 and 3 + x equal?
   No

Expressions: 3(2x) and 2x + 2x + 2x Given x = 3

7. Draw a rectangle to model both expressions. | 2x | 2x | 2x | | 2x | 2x | 2x |
8. Substitute x and rewrite the equation for 3(2·3)
9. Simplify the equation
   3(6)
   18
10. Substitute x and rewrite the equation 2·3 + 2·3 + 2·3
11. Simplify the equation
    6 + 6 + 6
    18
12. Are the expressions equal? Yes
13. Are the expressions 6x and 3(2x) equivalent? Yes

Expressions: 5x and 2(3x) Given x = 4:

14. Draw a rectangle and divide it into two parts. | 5x | | 3x | 3x |
15. Substitute for x and rewrite the expression for
    5·4
16. Simplify the equation
    20
17. Substitute x and rewrite the expression. 2(3·4)
18. Simplify the expression.
    2·12
    24
19. Are the expressions equal? No

Expressions: 6x and 3(2x) Given x = 3

20. Draw a rectangle and divide it into two parts.

21. Substitute x for 4 and rewrite the expression for

$6 \cdot 3$

22. Simplify the equation

18

23. Substitute x and rewrite the equation. $3(2 \cdot 3)$

24. Simplify the expression.

$3(6)$

18

25. Are the expressions equal?

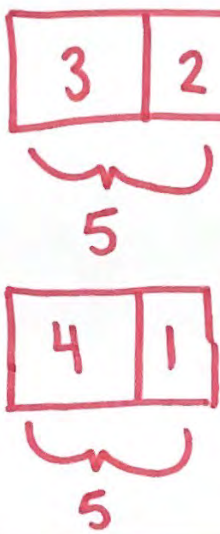
yes

Name: Answer Key

G6 U5 Lesson 7 - Independent Practice

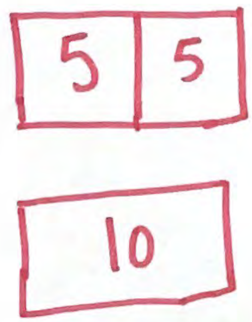
Directions: Use diagrams and plug in the value of x to determine if the expressions are equivalent.

1. Draw two separate diagrams to represent the expressions 3 + 2 and 4 + 1. Are these expressions equal or equivalent? Explain your answer using the diagrams.



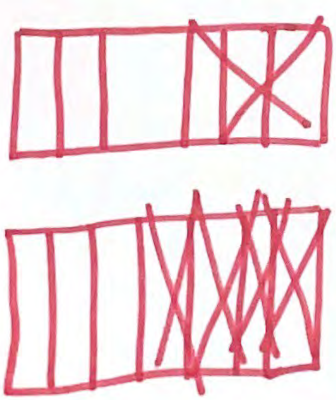
Equal but not equivalent

2. Draw two separate diagrams to represent the expressions 2 x 5 and 10. Are these expressions equal or equivalent? Explain your answer using the diagrams.



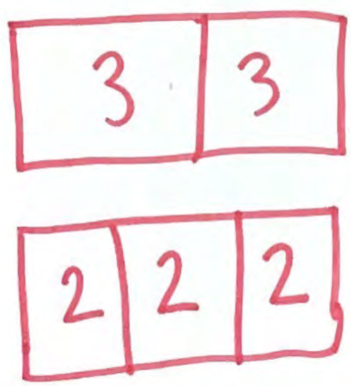
equivalent

3. Draw two separate diagrams to represent the expressions 6 - 3 and 7 - 4. Are these expressions equal or equivalent? Explain your answer using the diagrams.



equal

4. Draw two separate diagrams to represent the expressions 2 x 3 and 3 x 2. Are these expressions equal or equivalent? Explain your answer using the diagrams.



equal

G6 U5 Lesson 8

Use an area diagram to generate equivalent numerical expressions that are related by the distributive property

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G6 U5 Lesson 8 - Students will use an area diagram and the distributive property to write equivalent expressions with variables

Warm Welcome (Slide 1): Tutor choice

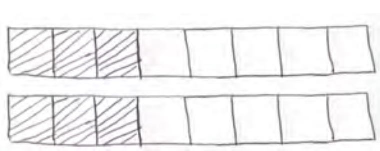
Frame the Learning/Connect to Prior Learning (Slide 2): Today's math lesson focuses on using area diagrams to generate equivalent numerical expressions related to the distributive property. By the end of this lesson, you will be able to apply the distributive property to simplify expressions and identify equivalent expressions. Remember, the distributive property is a powerful tool that helps us simplify expressions and solve more complex problems in the future.

Let's Talk (Slide 4): Today we'll be working with expressions. Remember expressions are a combination of numbers, operations , and variables, but there is no equal sign… 4 + 3 is an expression and x - y is also an expression. Today we will continue to talk about the distributive property and how it can help us simplify expressions. Let's start with a discussion, **what is the distributive property? Give an example**. Possible Answer Answers, Key Points:

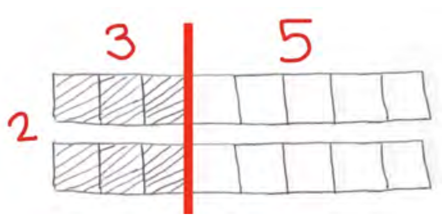
- The distributive property lets us multiply a number outside a set of parentheses with each term inside the parentheses to create an equivalent expression.
- For example 3(x+2) is the same as 3x + 6…you just distributed, or passed the 3 out to the two terms inside of the parentheses.

That's correct! The distributive property tells us how to distribute a number outside a set of parentheses to each term inside. For example, a(b + c) is the same as ab + ac because you first multiply a times b then you and then you bring down the addition sign add a times c or ac.

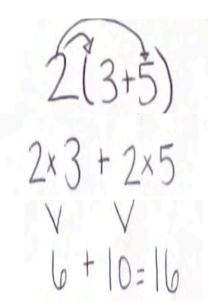
Let's Think (Slide 4): Let's think about how to use an area diagram or drawing to better understand the distributive property and generate equivalent numerical expressions. Let's look at the expression 2(3 + 5). Let's create an area diagram to model this expression.



So, we need to start with 3+5 (*point to equation*), so we'll draw 3 and 5 more, which is 8.But, look. This equation is saying that I need 3+5 two times because it says TWO times three plus five (*point to the two in the equation*). So I need to draw 3+5 again. So now I have two rectangles of 3 and 5, which is 8. I have 2 groups of 8.



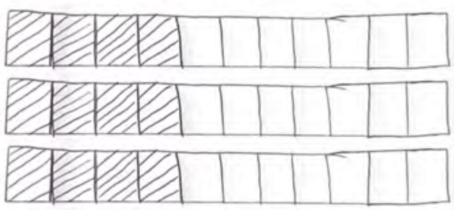
But, we know that the distributive property tells us that we can think of this equation a little differently. Instead of thinking of this as 2 groups of 3 and 5…which is 8. We can think of this as 2 groups of 3 (*draw line*) AND 2 groups of 5



Let's show that with the equation, since I have two of each number, 3 and 5. I need to multiply 2 by each number inside the parentheses then add them together because the original operation in the parentheses is addition, just like the model shows. I have 2 times 3 AND 2 times 5.

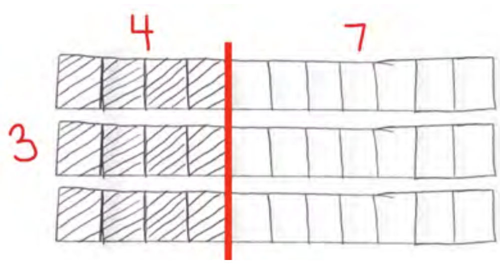
When we do the math, we know that 2 times 3 is 6, so 6 is my first term. I need to bring down the plus sign. I know that 2 times 5 is 10, so 10 is my second term. Now I have the expression 6 + 10 and I know that 6 and 10 is 16. Therefore for our original equation, 2(3 + 5) is equal to 2x3 + 2x5…they both simplify to 16!

Let's Think (Slide 5): Let's look at another expression and think about how we can draw a model to show the distributive property to help us find an equivalent expression. First, read the expression with me…3 times 4 plus 7!



So, we need to do 4+7, which is 11…3 times. So, here's one set of 4+7…and another 4+7… and finally one last set of 4+7 (*narrate as you draw*).

There, we modeled 3 groups of 4+7…11 and 11 and 11, which is 33.



But, we can think of 3(4+7) in a different way. Instead of 3 groups of 4 and 7, we could distribute the 3 (*draw line*). We could think of it as 3 groups of 4 (*point*) AND 3 groups of 7 (*point*).

And, 3 groups of 4 are 12 and 3 groups of 7 are 21. Now, when we add them together 12 and 21 is 33.

$$3(4+7)$$
$$3\times4+3\times7$$
$$12+21$$
$$33$$

Now, we'll apply the distributive property to the equation.

Since I have four of each number, 2 and 7. I need to multiply 4 by each number inside the parentheses then add them together because that is the original operation in the parentheses. So, 4 times 2 *(draw line)* PLUS (*point*) 4 times 7 (*draw line*).

Let's rewrite that to show how we distributed the 4 (*write*)...3x4 plus 3x7 and we know this expression, 4 x 2 + 4 x 7, is equivalent to the original expression 4(2 + 7), it's another way to write it.

So let's simplify and solve this expression. We know that 4x3 is 12 and 3x7 is 21. Now, we have 12+21, which is 33.

$$3(4+7)$$
$$3(11)$$
$$33$$

And, when we go back to the original expression, 3(4+7) and we solve it without distributing the 3. We add 4+7 and get 11. Then we need 3x11, which is also 330.

$$3(4+7)=3\times4+3\times7$$

This means that both of the expressions 4(2 + 7) and 4 x 2 + 4 x 7 are equivalent expressions and have the value of 33. We used the distributive property and a diagram to help us determine these expressions are equivalent.

Let's Try it (Slides 7-8): Now let's try simplifying different expressions using area diagrams to show the distributive property. Remember to draw the area diagrams or rectangles to model the distributive property, and use the distributive property to simplify the expressions.

WARM WELCOME

We will use an area diagram or rectangle to generate equivalent numerical expressions that are related by the distributive property.

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Let's Review:

What is an expression?

Let's Talk:

What is the distributive property? Give an example.

Let's Think:

Let's create an equivalent expression using the distributive property

$$2(3 + 5)$$

Let's Think:

Let's create an equivalent expression using the distributive property

$$3(4 + 7)$$

Let's Try It:

Lets try making equivalent expressions using the distributive property together.

Name:____________________________ G6 U5 Lesson 8 - Let's Try It!

Directions: Use an area diagram or rectangle to create equivalent numerical expressions that are related by the distributive property.

Formula: a (b + c) = ab + ac and a (b - c) = ab - ac

Expression #1: 4 (3 + 6):

Create an area diagram to represent the expression:

1. What is the term outside of the parentheses (a) ?____________
2. What is the first term inside the parentheses (b)?____________
3. What is the second term inside the parentheses(c)? ____________
4. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). ____________
5. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). ____________
6. Write an expression that represents an equivalent expression ab + ac. ____________
7. Simplify the expression ab + ac. ____________

Expression 2: 3 * (7 + 2):

Create an area diagram to represent the expression:

8. What is the term outside of the parentheses (a) ?____________
9. What is the first term inside the parentheses (b)?____________
10. What is the second term inside the parentheses(c)? ____________
11. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). ____________
12. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). ____________
13. Write an expression that represents an equivalent expression ab + ac. ____________
14. Simplify the expression ab + ac. ____________

Expression 3: 2* (10 - 1)

Create an area diagram to represent the expression:

15. What is the term outside of the parentheses (a) ?____________
16. What is the first term inside the parentheses (b)?____________
17. What is the second term inside the parentheses(c)? ____________
18. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). ____________
19. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). ____________
20. Write an expression that represents an equivalent expression ab - ac. ____________
21. Simplify the expression ab - ac. ____________

On your Own:

Try making equivalent expressions using the distributive property on your own.

Name:____________________________ G6 U5 Lesson 8 - Independent Practice

Directions: Create an area diagram and use the distributive property to generate equivalent numerical expressions that are related by the distributive property for each problem.

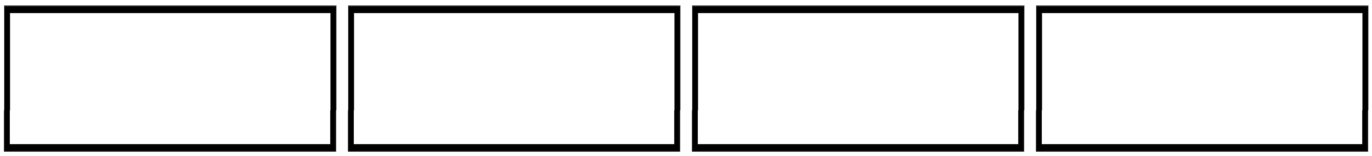
1. 2 (5 + 3)	2. 6 (2 + 4)
3. 3 (3 + 6)	4. 4 (2 + 7)

Name: ___________________________________

Directions: Use an area diagram or rectangle to create equivalent numerical expressions that are related by the distributive property. Formula: a (b + c) = ab + ac and a (b - c) = ab - ac

Expression #1: 4 (3 + 6):

Create an area diagram to represent the expression:



1. What is the term outside of the parentheses (a) ?_________________
2. What is the first term inside the parentheses (b)?_________________
3. What is the second term inside the parentheses(c)? _________________
4. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _________________
5. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _________________
6. Write an expression that represents an equivalent expression ab + ac. _________________
7. Simplify the expression ab + ac. _________________

Expression #2: 3 * (7 + 2):

Create an area diagram to represent the expression:

8. What is the term outside of the parentheses (a) ?_________________

9. What is the first term inside the parentheses (b)?_________________

10. What is the second term inside the parentheses(c)? _________________

11. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _________________

12. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _________________

13. Write an expression that represents an equivalent expression ab + ac. _________________

14. Simplify the expression ab + ac. _________________

Expression #3: 2* (10 + 1)

Create an area diagram to represent the expression:

15. What is the term outside of the parentheses (a) ?_________________
16. What is the first term inside the parentheses (b)?_________________
17. What is the second term inside the parentheses(c)? _________________
18. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _________________
19. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _________________
20. Write an expression that represents an equivalent expression ab + ac. _________________
21. Simplify the expression ab + ac. _________________

Expression #4: 6 * (12 + 3)

Create an area diagram to represent the expression:

22. What is the term outside of the parentheses (a) ?_________________
23. What is the first term inside the parentheses (b)?_________________
24. What is the second term inside the parentheses(c)? _________________

25. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). ________________

26. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). ________________

27. Write an expression that represents an equivalent expression ab + ac. ________________

28. Simplify the expression ab + ac. ________________

Name:____ G6 U5 Lesson 8 - Independent Work

Directions: Create an area diagram and use the distributive property to generate equivalent numerical expressions that are related by the distributive property for each problem.

1. Solve. $2(5+3)$	2. Solve. $6(2+4)$
3. Solve. $3(3+6)$	4. Solve. $4(2+7)$

Name: Answer key

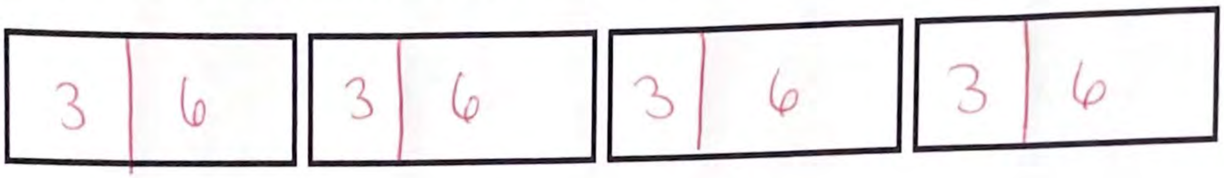
G6 U5 Lesson 8 - Let's Try It!

Directions: Use an area diagram or rectangle to create equivalent numerical expressions that are related by the distributive property.

Formula: a (b + c) = ab + ac and a (b - c) = ab - ac

Expression #1: 4 (3 + 6):

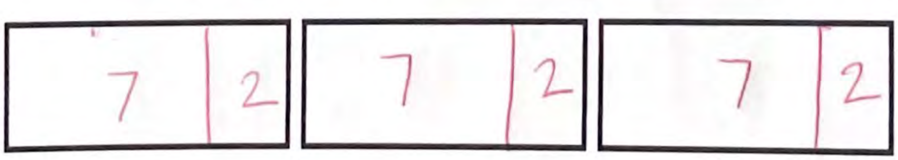
Create an area diagram to represent the expression:



1. What is the term outside of the parentheses (a) ? 4
2. What is the first term inside the parentheses (b)? 3
3. What is the second term inside the parentheses(c)? 6
4. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). 4 • 3 = 12
5. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). 4 • 6 = 24
6. Write an expression that represents an equivalent expression ab + ac. 4 • 3 + 4 • 6
7. Simplify the expression ab + ac. 12 + 24 = 36

Expression #2: 3 * (7 + 2):

Create an area diagram to represent the expression:



8. What is the term outside of the parentheses (a) ? 3

9. What is the first term inside the parentheses (b)? 7

10. What is the second term inside the parentheses(c)? 2

11. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). 3 • 7

12. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). 3 • 2

13. Write an expression that represents an equivalent expression ab + ac. 3 • 7 + 3 • 2

14. Simplify the expression ab + ac. 21 + 6 = 27

Expression #3: 2* (10 + 1)

Create an area diagram to represent the expression:

15. What is the term outside of the parentheses (a) ? 2

16. What is the first term inside the parentheses (b)? 10

17. What is the second term inside the parentheses(c)? 1

18. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). 2 • 10

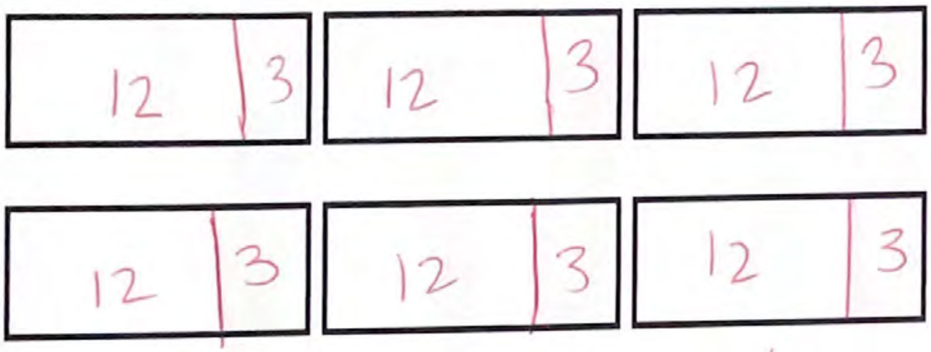
19. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). 2 • 1

20. Write an expression that represents an equivalent expression ab + ac. = 2 • 10 + 2 • 1
20 + 2 = 22

21. Simplify the expression ab + ac. 20+2 = 22

Expression #4: 6 * (12 + 3)

Create an area diagram to represent the expression:



22. What is the term outside of the parentheses (a) ? 6

23. What is the first term inside the parentheses (b)? 12

24. What is the second term inside the parentheses(c)? 3

25. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). 6•12

26. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). 6•3

27. Write an expression that represents an equivalent expression ab + ac. 6•12+6•3

28. Simplify the expression ab + ac. 72+ 9= 81

Name: Answer Key

G6 U5 Lesson 8 - Independent Practice

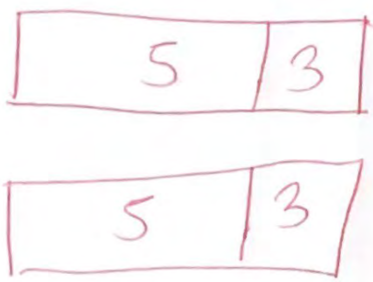
Directions: Create an area diagram and use the distributive property to generate equivalent numerical expressions that are related by the distributive property for each problem.

1. $2(5+3)$

$2 \cdot 5 + 2 \cdot 3$

$10 + 6$

16

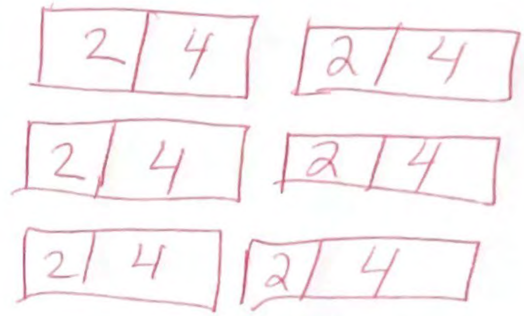


2. $6(2+4)$

$6 \cdot 2 + 6 \cdot 4$

$12 + 24$

36

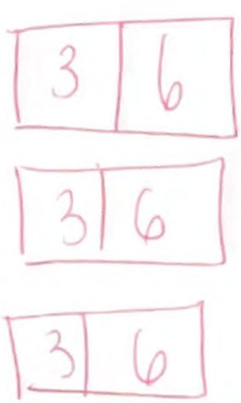


3. $3(3+6)$

$3 \cdot 3 + 3 \cdot 6$

$9 + 18$

27

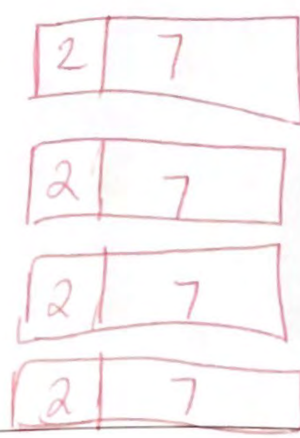


4. $4(2+7)$

$4 \cdot 2 + 4 \cdot 7$

$8 + 21$

29



G6 U5 Lesson 9

Use an area diagram and the distributive property to write equivalent expressions with variables

CITYTUTOR DC

G6 U5 Lesson 9 - Students will Use an area diagram and the distributive property to write equivalent expressions with variables.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Previously we used area diagrams and the distributive property to write equivalent expressions. Today, we'll use what we already know about diagrams and the distributive property to write equivalent expressions with variables. By the end of this lesson, you will be able to use area diagrams and the distributive property to write equivalent expressions with variables.

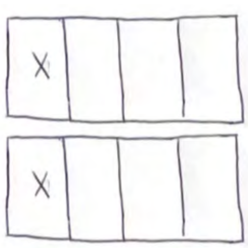
Let's Talk (Slide 3): Remember, the distributive property is a powerful tool that helps us simplify expressions and solve more complex problems in the future. Let's begin our math lesson by reviewing what we've learned about expressions and variables. An expression is a math sentence with numbers and operations. It is a combination of numbers, operations , and variables, but there is no equal sign.

Now that we reviewed expressions and the distributive property, let's remember what a variable is. **Everyone, think of an example of an expression with a variable.** Possible Answer Answers, Key Points:

- 3x + 5
- x - y
- 4 + x
- 10 - b

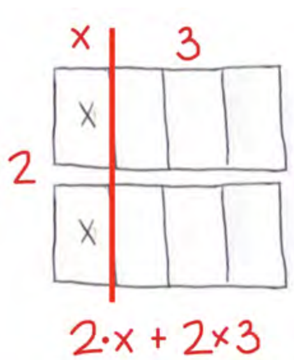
Very good! We can up with lots of examples of expressions with variables. Now, let's build on this knowledge and explore how we can use area diagrams and the distributive property to write equivalent expressions with variables. We use variables when we do not know the value of something yet, but we are still trying to figure it out. This might be like when we order food at a restaurant. We know how much each item is but we do not know the total until the server brings our bill.

Let's Think (Slide 5): Today we will write equivalent expressions with variables by using area diagrams. This will be similar steps to our previous lesson but we are replacing a value with a variable . Let's start with the example 2(x + 3).



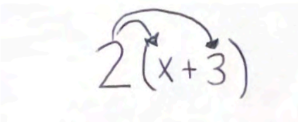
We can represent the expression 2(x + 3) using an area diagram or model. The expression means we have 2 groups of (x + 3). So, we can draw a model of x, which we don't know, and three more.

And, we need that TWICE, because the expression says TWO groups of x+3 (*point to equation*). So, I'll draw another x+3. There, now we have two groups of x+3.

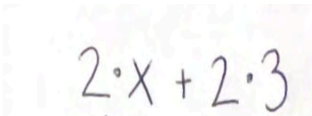


Just like yesterday, we can think of this area model a little differently. If I draw this line, instead of thinking of x+3 two times. I can distribute the two. So, 2 times x, or 2x (*point*) AND 2 times 3 (*point*).

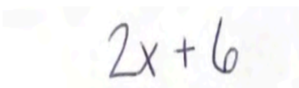
So, another way to write this expression is 2x (*point to model*) + 2x3 (*point to model*), I just distributed, or passed out, the 2.



Now, we'll use an equation to represent the distributive property and expand it. The distributive property says we can distribute or multiply the number outside the parentheses to each term inside (*draw arrows*).

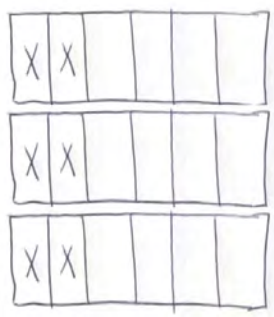


So, it becomes 2 * x + 2 * 3. I know that 2 times x equals 2x and 2 times 3 equals 6.

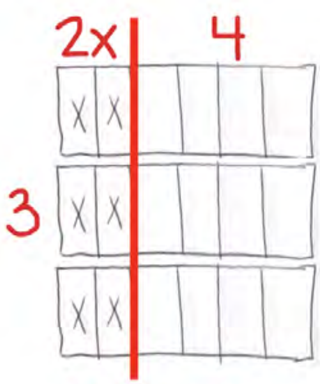


Now we have an equivalent expression, 2x + 6, which means the same thing and has the same value as 2(x + 3).

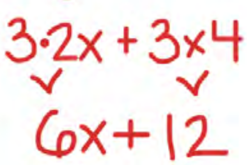
Let's Think (Slide 6): Let's try another example together. I need to write an equivalent expression for the expression 3(2x + 4).



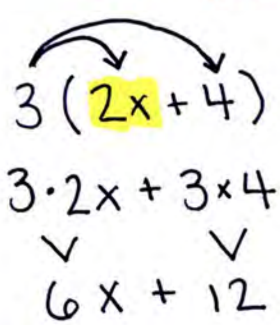
First, let's draw a rectangle that shows 2x, which is x and x and 4 more. The expression tells me that I need THREE groups of 2x+4, so let me draw two more of the exact same thing...2x and 4 more....2x and 4 more. There, I have three groups of 2x + 4.



Now, let's apply the distributive property to our area model. The distributive property says we can distribute the number outside the parentheses to each term inside. So, when I draw this line, I see that I have 3 groups of 2x AND s groups of 4 (point).



So, when I write that as an expression, I Have 3 times 2x PLUS 3 times 4. We can simplify that even more. We know that 3x2 is 6, so 6x, and we know that 3x4 is 12. So, 6x + 12. Now we have an equivalent expression, 6x + 12 which is the same or has the same value as 3(2x + 4).



Let's show how we did that with the expression. So, we started with 3(2x+4). We know that the distributive property tells us that we can distribute or pass out the term outside the parentheses to the terms inside the parenthesis (*draw arrows*). Now, this is where it gets a tiny bit tricky, this is one whole term…2x (*highlight*). So we can have 3 times 2x PLUS 3 times 4 (*write).*

And, we can simplify this…3x2 is 6 so now we have 6x plus…3x4 is 12. So, 6x+ 12 is equivalent to 3(2x+4).

Let's Try it (Slides 6-7): Today, we learned how to use area diagrams and the distributive property to write equivalent expressions with variables. Remember, area diagrams help us visualize expressions, and the distributive property allows us to simplify them. Now, let's try to use area diagrams and the distributive property to write equivalent expressions with variables.

WARM WELCOME

We will use an area diagram and the distributive property to write equivalent expressions with variables.

Let's Talk:

What is an example of example of an expression with a variable?

Let's Think:

Let's create an equivalent expression using the distributive property.

$$2\,(x + 3)$$

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Let’s Think:

Let’s create an equivalent expression using the distributive property.

$$3\,(\,2x + 4\,)$$

Let’s Try It:

Now let’s try it together.

Name:________________________ G6 U5 Lesson 9 - Let's Try It!

Directions: Use an area diagram or rectangle to create equivalent numerical expressions that are related by the distributive property with variables.

Formula: a (b + c) = ab + ac and a (b - c) = ab - ac

Expression #1: 4(3x + 2):

Create an area diagram to represent the expression:

1. What is the term outside of the parentheses (a) ?____________
2. What is the first term inside the parentheses (b)?____________
3. What is the second term inside the parentheses(c)? ____________
4. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). ____________
5. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). ____________
6. Write an expression that represents an equivalent expression ab + ac. ____________
7. Simplify the expression ab + ac. ____________

Expression 2: 3 (2x + 7):

Create an area diagram to represent the expression:

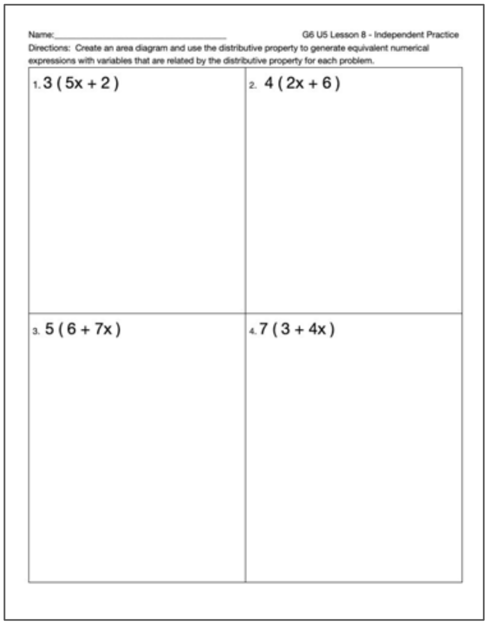
8. What is the term outside of the parentheses (a) ?____________
9. What is the first term inside the parentheses (b)?____________
10. What is the second term inside the parentheses(c)? ____________
11. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). ____________
12. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). ____________
13. Write an expression that represents an equivalent expression ab + ac. ____________
14. Simplify the expression ab + ac. ____________

Expression 3: 5 (4x + 5)

Create an area diagram to represent the expression:

15. What is the term outside of the parentheses (a) ?____________
16. What is the first term inside the parentheses (b)?____________
17. What is the second term inside the parentheses(c)? ____________
18. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). ____________
19. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). ____________
20. Write an expression that represents an equivalent expression ab + ac. ____________
21. Simplify the expression ab + ac. ____________

On your Own: Now let's try it on your own



Name:____________________ G6 U5 Lesson 8 - Independent Practice

Directions: Create an area diagram and use the distributive property to generate equivalent numerical expressions with variables that are related by the distributive property for each problem.

1. $3(5x + 2)$	2. $4(2x + 6)$
3. $5(6 + 7x)$	4. $7(3 + 4x)$

Name:____________________________________

Directions: Use an area diagram or rectangle to create equivalent numerical expressions that are related by the distributive property with variables.

<u>Formula: a (b + c) = ab + ac and a (b - c) = ab - ac</u>

Expression #1: 4(3x + 2):

Create an area diagram to represent the expression:

1. What is the term outside of the parentheses (a) ?_________________
2. What is the first term inside the parentheses (b)?_________________
3. What is the second term inside the parentheses(c)? _________________
4. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _________________
5. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _________________
6. Write an expression that represents an equivalent expression ab + ac. _________________
7. Simplify the expression ab + ac. _________________

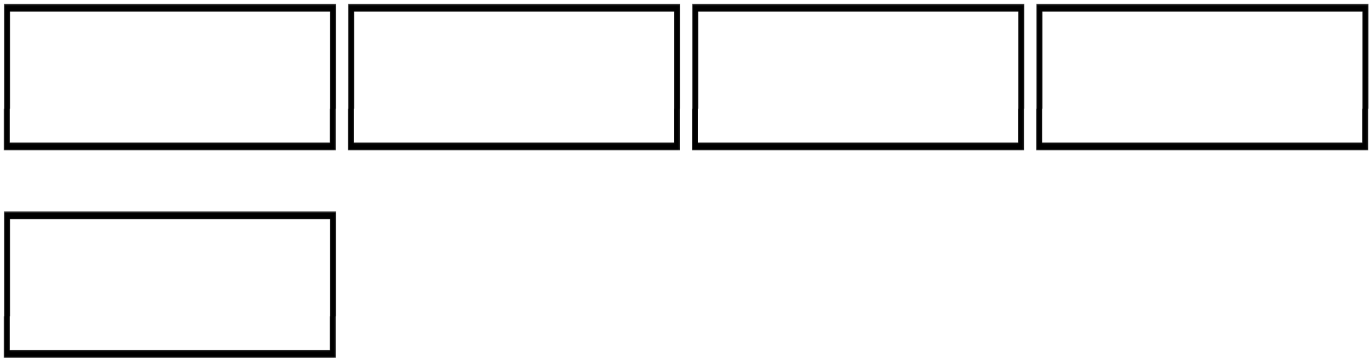
Expression #2: 3 (2x + 7):

Create an area diagram to represent the expression:

8. What is the term outside of the parentheses (a) ?________________
9. What is the first term inside the parentheses (b)?________________
10. What is the second term inside the parentheses(c)? ________________
11. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). ________________
12. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). ________________
13. Write an expression that represents an equivalent expression ab + ac. ________________
14. Simplify the expression ab + ac. ________________

Expression #3: 5 (4x + 5)

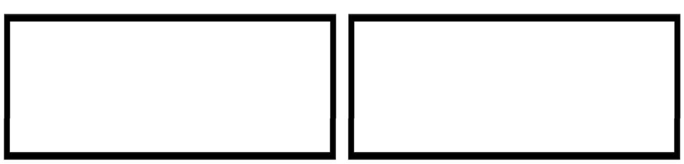
Create an area diagram to represent the expression:



15. What is the term outside of the parentheses (a) ?_________________
16. What is the first term inside the parentheses (b)?_________________
17. What is the second term inside the parentheses(c)? _________________
18. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _________________
19. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _________________
20. Write an expression that represents an equivalent expression ab + ac. _________________
21. Simplify the expression ab + ac. _________________

Expression #4: 2 (4 + 3x)

Create an area diagram to represent the expression:



22. What is the term outside of the parentheses (a) ?_________________
23. What is the first term inside the parentheses (b)?_________________
24. What is the second term inside the parentheses(c)? _________________

25. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _________________

26. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _________________

27. Write an expression that represents an equivalent expression ab + ac. _________________

28. Simplify the expression ab + ac. _________________

Name:______________________________________

Directions: Create an area diagram and use the distributive property to generate equivalent numerical expressions with variables that are related by the distributive property for each problem.

1. Solve. $3(5x + 2)$	2. Solve. $4(2x + 6)$
3. Solve. $5(6 + 7x)$	4. Solve. $7(3 + 4x)$

Name: Answer Key

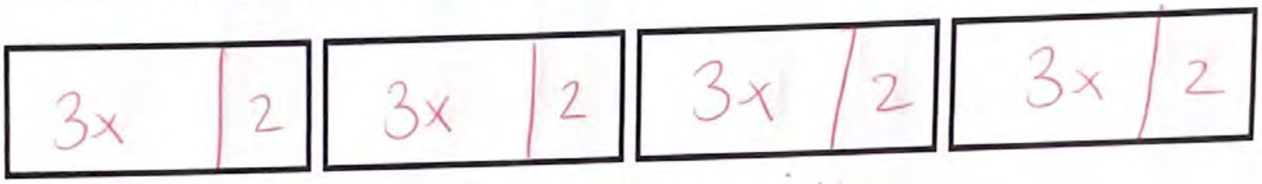
G6 U5 Lesson 9 - Let's Try It!

Directions: Use an area diagram or rectangle to create equivalent numerical expressions that are related by the distributive property with variables.

Formula: a (b + c) = ab + ac and a (b - c) = ab - ac

Expression #1: 4(3x + 2):

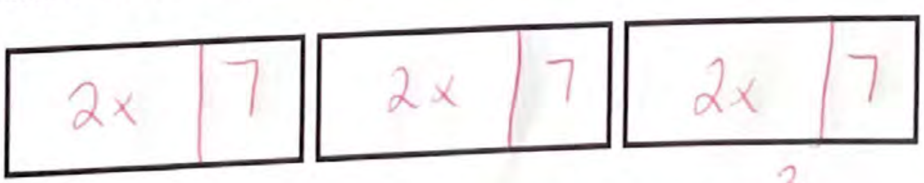
Create an area diagram to represent the expression:



1. What is the term outside of the parentheses (a) ? 4
2. What is the first term inside the parentheses (b)? 3x
3. What is the second term inside the parentheses(c)? 2
4. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). $4 \cdot 3x$
5. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). $4 \cdot 2$
6. Write an expression that represents an equivalent expression ab + ac. $4 \cdot 3x + 4 \cdot 2$
7. Simplify the expression ab + ac. $12x + 8$

Expression #2: 3 (2x + 7):

Create an area diagram to represent the expression:



8. What is the term outside of the parentheses (a) ? 3

9. What is the first term inside the parentheses (b)? 2x

10. What is the second term inside the parentheses(c)? 7

11. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). 3 • 2x

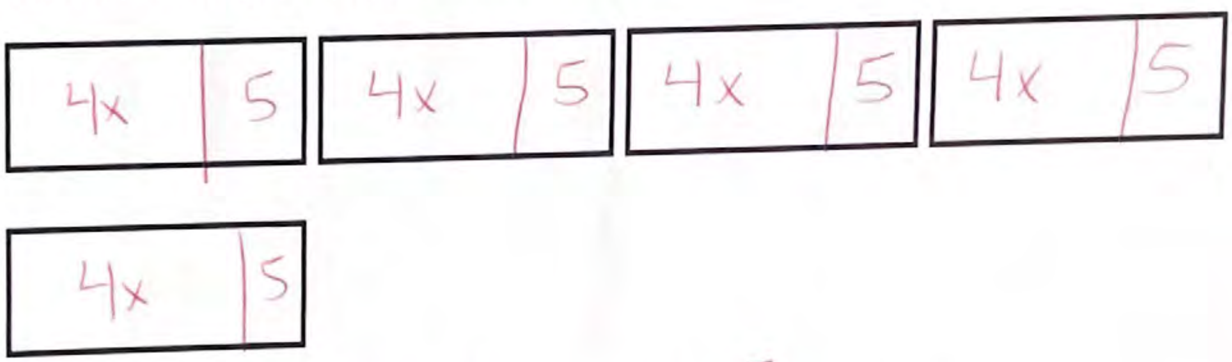
12. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). 3 • 7

13. Write an expression that represents an equivalent expression ab + ac. 3 • 2x + 3 • 7

14. Simplify the expression ab + ac. 6x + 21

Expression #3: 5 (4x + 5)

Create an area diagram to represent the expression:



15. What is the term outside of the parentheses (a) ? 5

16. What is the first term inside the parentheses (b)? 4x

17. What is the second term inside the parentheses(c)? 5

18. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). 5 • 4x

19. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). 5 • 5

20. Write an expression that represents an equivalent expression ab + ac. 5 • 4x + 5 • 5

21. Simplify the expression ab + ac. 20x + 25

Expression #4: 2 (4 + 3x)

Create an area diagram to represent the expression:

22. What is the term outside of the parentheses (a) ? 2

23. What is the first term inside the parentheses (b)? 4

24. What is the second term inside the parentheses(c)? 3x

25. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). $2 \cdot 4$

26. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). $2 \cdot 3x$

27. Write an expression that represents an equivalent expression ab + ac. $2 \cdot 4 + 2 \cdot 3x$

28. Simplify the expression ab + ac. $8 + 6x$

Name: Answer Key

G6 U5 Lesson 9 - Independent Practice

Directions: Create an area diagram and use the distributive property to generate equivalent numerical expressions with variables that are related by the distributive property for each problem.

1. $3(5x + 2)$

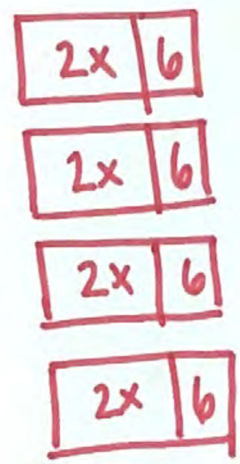
$3 \cdot 5x + 3 \cdot 2$

$15x + 6$

2. $4(2x + 6)$

$4 \cdot 2x + 4 \cdot 6$

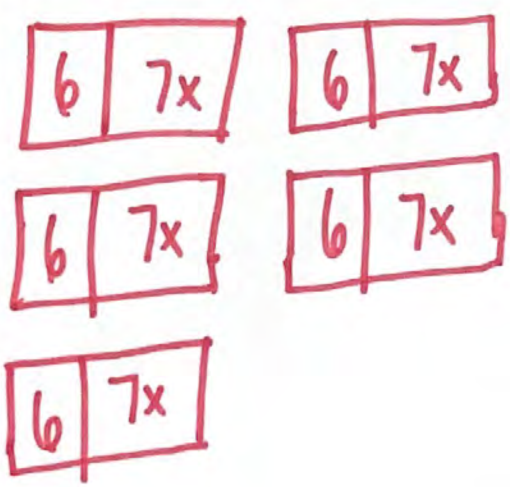
$8x + 24$



3. $5(6 + 7x)$

$5 \cdot 6 + 5 \cdot 7x$

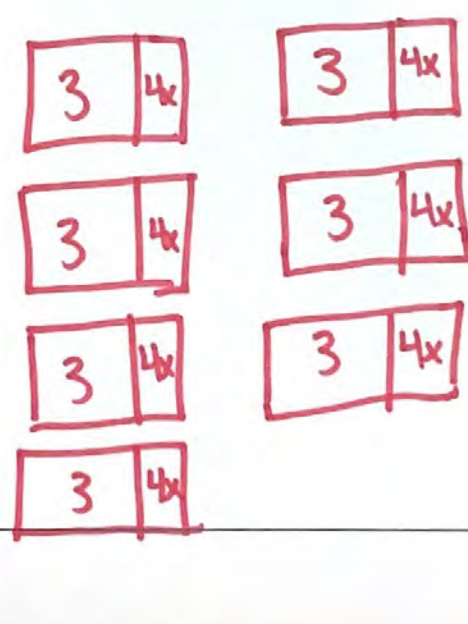
$30 + 35x$



4. $7(3 + 4x)$

$7 \cdot 3 + 7 \cdot 4x$

$21 + 28x$



G6 U5 Lesson 10

Use the distributive property to write equivalent expressions with variables

G6 U5 Lesson 10 - We will use the distributive property to write equivalent expressions with variables.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): We've become experts on the distributive property! We've been using models and expressions to show how the distributive property works and why it makes sense. Today, we'll continue that work but we'll just work with expressions, we're leaving the models and drawings behind! So, by the end of this lesson, you will be able to use the distributive property to write equivalent expressions with variables. Remember, the distributive property is a powerful tool that helps us simplify expressions and solve more complex problems in the future.

Let's Talk (Slide 3): Let's take a look at another student's work with the distributive property. This says, Amar used the Distributive Property to write an equivalent expression for 3(x+2y). Let's take a minute to look at how Amar solved it. Do you agree with what he did? Why or why not? Possible Answer Answers, Key Points:

- Amar used the distributive property but did it wrong.
- He passed the 3 to the y to get 3y but when he distributed it to the 2x, he added the two terms, 3 and 2, instead of multiplying them.
- He should've gotten 3y + 6x instead of 3x + 5x.

That's right! Amar was right in that he knew to distribute the 3 to both of the terms inside of the parenthesis but he got mixed up with his math. He needed to multiply 3x2, not add 3+2. So he should've gotten 3y + 6x instead.

Let's Think (Slide 4): Let's make sure we remember Amar's mistake today as we continue to practice the distributive property. Let's start with the example 2(4x + 5). We will use the distributive property to expand the expression. The distributive property says we can distribute the number outside the parentheses to each term inside.

$$2(4x+5)$$

$$2\cdot 4x + 2\cdot 5$$

$$8x + 10$$

First let's distribute 2 to the first term 4x, this creates 2 times 4x. Next, I need to distribute 2 to the second term,5. This is 2 times 5.

So, our expression is 2 times 4x plus 2 times 5.Now, I need to continue solving or simplifying this expression

Remember, what Amar did? we're not adding 2 and 4, we're multiplying them. So we have 8x and then we need to multiply 2x5, which is 10. So, 8x+10 is the new expression.

Let's Think (Slide 5): Let's try another example together. Let's use the distributive property to write an equivalent expression. Before we start, notice the operation in the parentheses is subtraction. So instead of adding the two terms we will subtract. The distributive property says we can distribute the number outside the parentheses to each term inside, we use the same process…we just have to be careful of the signs and operations.

$$5(3x-4)$$

First, we need to distribute the 5 to each term in the parentheses. So, 5 times 3x MINUS 5 times 4 (*point and draw arrow as you say it*).

$$5 \cdot 3x - 5 \cdot 4$$
$$15x - 20$$

Now let's write that out. We have 5 times 3x MINUS 5 times 4.

Now we can simplify that, 5x3 is 15 so we have 15x. And then we have to take away 5x4, which is 20. So, we have 15x - 20.

Let's Try it (Slides 6-7): Now, you have a strong understanding of using the distributive property to write equivalent expressions with variables. Remember to pay careful attention to the operations inside of the parenthesis.

WARM WELCOME

We will use the distributive property to write equivalent expressions with variables.

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Let's Talk:

Amar used the distributive property to write an equivalent expression for $3(x+2y)$. Do you agree with what he did? Why or why not?

$$3(y+2x)$$

$$3y + 5x$$

Let's Think:

Let's create an equivalent expression using the distributive property.

$$2(4x + 5)$$

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Let's Think:

Let's create an equivalent expression using the distributive property.

5 (3x - 4)

Let's Try It:

Now let's try it together.

Name:______________________________ G6 U5 Lesson 10 - Let's Try It!

Directions: Use an area diagram or rectangle to create equivalent numerical expressions that are related by the distributive property with variables.

Formula: a (b + c) = ab + ac and a (b - c) = ab - ac

Expression #1: 3 (5x + 6):

1. What is the term outside of the parentheses (a) ?_______________
2. What is the first term inside the parentheses (b)?_______________
3. What is the second term inside the parentheses(c)? _______________
4. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _______________
5. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _______________
6. Write an expression that represents an equivalent expression ab + ac. _______________
7. Simplify the expression ab + ac. _______________

Expression 2: 5 (4 + 8x) :

8. What is the term outside of the parentheses (a) ?_______________
9. What is the first term inside the parentheses (b)?_______________
10. What is the second term inside the parentheses(c)? _______________
11. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _______________
12. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _______________
13. Write an expression that represents an equivalent expression ab + ac. _______________
14. Simplify the expression ab + ac. _______________

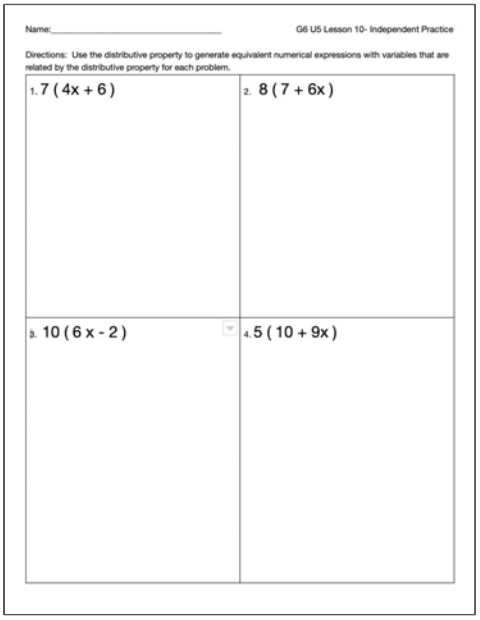
Expression 3: 4 (6x - 12)

15. What is the term outside of the parentheses (a) ?_______________
16. What is the first term inside the parentheses (b)?_______________
17. What is the second term inside the parentheses(c)? _______________
18. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _______________
19. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _______________
20. Write an expression that represents an equivalent expression ab + ac. _______________
21. Simplify the expression ab + ac. _______________

Expression 4: 8 (3 - 5x)

22. What is the term outside of the parentheses (a) ?_______________
23. What is the first term inside the parentheses (b)?_______________
24. What is the second term inside the parentheses(c)? _______________
25. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). _______________
26. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). _______________
27. Write an expression that represents an equivalent expression ab + ac. _______________
28. Simplify the expression ab + ac. _______________

On your Own: **Now let's try it on your own.**



Name:______________________________ G6 U5 Lesson 10- Independent Practice

Directions: Use the distributive property to generate equivalent numerical expressions with variables that are related by the distributive property for each problem.

1. $7 (4x + 6)$	2. $8 (7 + 6x)$
3. $10 (6x - 2)$	4. $5 (10 + 9x)$

Name:_______________________________________

Directions: Use an area diagram or rectangle to create equivalent numerical expressions that are related by the distributive property with variables.

Formula: a (b + c) = ab + ac and a(b - c) = ab - ac

Expression #1: 3(5x + 6):

1. What is the term outside of the parentheses (a) ?__________________
2. What is the first term inside the parentheses (b)?__________________
3. What is the second term inside the parentheses(c)? __________________
4. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). __________________
5. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). __________________
6. Write an expression that represents an equivalent expression ab + ac. __________________
7. Simplify the expression ab + ac. __________________

Expression #2: 5(4 + 8x) :

8. What is the term outside of the parentheses (a) ?__________________
9. What is the first term inside the parentheses (b)?__________________
10. What is the second term inside the parentheses(c)? __________________
11. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). __________________
12. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). __________________
13. Write an expression that represents an equivalent expression ab + ac. __________________
14. Simplify the expression ab + ac. __________________

Expression #3: 4 (6x - 12)

15. What is the term outside of the parentheses (a) ?__________________
16. What is the first term inside the parentheses (b)?__________________
17. What is the second term inside the parentheses(c)? __________________
18. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). __________________
19. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). __________________
20. Write an expression that represents an equivalent expression ab + ac. __________________
21. Simplify the expression ab + ac. __________________

Expression #4: 8 (3 - 5x)

22. What is the term outside of the parentheses (a) ?________________
23. What is the first term inside the parentheses (b)?________________
24. What is the second term inside the parentheses(c)? ________________
25. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). ________________
26. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). ________________
27. Write an expression that represents an equivalent expression ab + ac. ________________
28. Simplify the expression ab + ac. ________________

Name:____ G6 U5 Lesson 10- Independent Work

Directions: Use the distributive property to generate equivalent numerical expressions with variables that are related by the distributive property for each problem.

1. Solve. $7(4x + 6)$	2. Solve. $8(7 + 6x)$
3. Solve. $10(6x - 2)$	4. Solve. $5(10 + 9x)$

Name: Answer Key

G6 U5 Lesson 10 - Let's Try It!

Directions: Use an area diagram or rectangle to create equivalent numerical expressions that are related by the distributive property with variables.

Formula: a (b + c) = ab + ac and a (b - c) = ab - ac

Expression #1: 3 (5x + 6):

1. What is the term outside of the parentheses (a) ? 3
2. What is the first term inside the parentheses (b)? 5x
3. What is the second term inside the parentheses(c)? 6
4. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). 3 • 5x
5. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). 3 • 6
6. Write an expression that represents an equivalent expression ab + ac. 3 • 5x + 3 • 6
7. Simplify the expression ab + ac. 15x + 18

Expression #2: 5 (4 + 8x) :

8. What is the term outside of the parentheses (a) ? 5
9. What is the first term inside the parentheses (b)? 4
10. What is the second term inside the parentheses(c)? 8x
11. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). 5 • 4
12. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). 5 • 8x
13. Write an expression that represents an equivalent expression ab + ac. 5 • 4 + 5 • 8x

14. Simplify the expression ab + ac. 20 + 40x

Expression #3: 4 (6x - 12)

15. What is the term outside of the parentheses (a) ? 4

16. What is the first term inside the parentheses (b)? 6x

17. What is the second term inside the parentheses(c)? 12

18. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). 4 • 6x

19. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). 4 • 12

20. Write an expression that represents an equivalent expression ab + ac. ~~24~~ 4 • 6x + 4 • 12

21. Simplify the expression ab + ac. 24x + 48

Expression 4: 8 (3 - 5x)

22. What is the term outside of the parentheses (a) ? 8

23. What is the first term inside the parentheses (b)? 3

24. What is the second term inside the parentheses(c)? 5x

25. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ab). 8 • 3

26. Write an expression that represents the term outside of the parentheses times the first term inside the parentheses (ac). 8 • 5x

27. Write an expression that represents an equivalent expression ab + ac. 8 • 3 + 8 • 5x

28. Simplify the expression ab + ac. 24 + 40x

Name: Answer Key

G6 U5 Lesson 10- Independent Practice

Directions: Use the distributive property to generate equivalent numerical expressions with variables that are related by the distributive property for each problem.

1. $7(4x + 6)$ $7 \cdot 4x + 7 \cdot 6$ $28x + 42$	2. $8(7 + 6x)$ $8 \cdot 7 + 8 \cdot 6x$ $56 + 48x$
3. $10(6x - 2)$ $10 \cdot 6x - 10 \cdot 2$ $60x - 20$	4. $5(10 + 9x)$ $5 \cdot 10 + 5 \cdot 9x$ $50 + 45x$

G6 U5 Lesson 11

Evaluate and write expressions with exponents that are equal to a given number

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G6 U5 Lesson 11 - Students will evaluate and write expressions with exponents that are equal to a given number

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today, we will learn how to evaluate and write expressions with exponents that are equal to a given number. We will use our strong knowledge of expressions and operations and apply it to today's lesson.

Let's Talk (Slide 3): **Have you ever heard the term or phrase, "That is growing at an exponential rate"? What do you think that means?** Possible Student Answers, Key Points:

- Something grows or changes very quickly and keeps getting bigger and bigger at a faster and faster rate.
- Bacteria grows at an exponential rate because it grows very quickly.

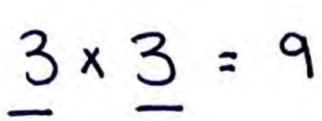
That is correct! Imagine you have a tiny plant, and every day it doubles in size, and then the next day, it doubles again, and it keeps doubling every day. That's exponential growth. Exponents involve numbers repeatedly multiplying at a fast rate, they're a new notation but how we figure out the total won't be new. Let me show you.

Let's Talk (Slide 4): So, Now let's look at this expression 3^2…we read this as three-squared. **Based on our discussion, what are you noticing and wondering about this expression?** Possible Student Answers/Key Points:

- I notice there is one big number and one small number
- I notice there is an exponent
- I wonder how you solve this expression or what is represents
- I wonder what you do with the two numbers.

That is correct, there are two different numbers, there is a big number, the base, and a little number, the exponent.

The big number is the base (*label*) and that is the number we repeatedly multiply. The small number is the exponent (*label)* and that's how many times we repeatedly multiply the base by itself. An exponent tells us how many times to multiply a number by itself. So, the base tells us what number we're multiplying again and again, and the exponent tells us how many times to do it.



So, to solve three-squared, or 3 to the power of two. We take the base and multiply it as many times as the exponent tells us to. So, we're going to multiply the base by the base. So, 3…that's the base times itself. So, 3x3 and that's 9...you see I multiplied the base…two times (*underline*) and that's 9. So, three-squared is 9!

Let's Think (Slide 4): Let's look at another one. Notice that this expression also has a 2 and a 3 but they're in different places.

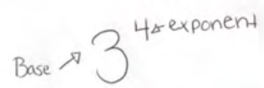
This time, 2 is the base (*underline*) and 3 is the exponent (*circle*). Remember, the exponent is a little number written as a superscript that tells us how many times to multiply a base number by itself.

In order to evaluate this expression, we need to multiply the base, 2, three times because the exponent is 3. So, 2 times itself…2…times itself again 2! Now, we have to be careful here…it looks kind of like repeated addition 2 and 2 and 2 but it's different. We need to multiply 2x2 and then multiply that BY 2!

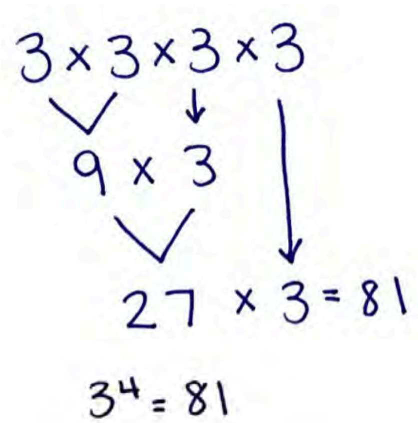
So, 2x2 is 4, that's quick. Now, I need to multiply 4 times 2 again. So, 4x2 is 8, that's also quick.

So 2x2x2 is 8, and that is the same as 2 to the power of 3 or 2 cubed.

Let's Think (Slide 6): Now, let's try writing an expression with an exponent that is equal to a given number, this is telling me to write an expression where the exponent is 4. We can pick any number for the base but the exponent has to be 4. So, let's choose 3 as our base.



So, 3 is the base and 4 is the exponent. That means that we're trying to solve the expression 3 to the power of 4.



So, in order to solve this expression. What's the number we're going to multiply again and again? 3! That's right, 3 is the base. And how many times should we multiply 3? Four times! Right, we need to do 3 times itself times itself times itself. So, 3x3x3x3..

First I have do 3 times 3, which is 9. Now we have another 3 to multiply so 9x3, that's still pretty easy…27! And finally, we have one more 3, so 27x3…that's a little harder. We can stack and add if we need to. Everybody do it, what's 27x3? 81!

Nice work, so 3 to the power of 4 is…81! We multiplied the base, 3, by itself four times. Notice we did not multiply 3 times 4 that would be adding 3 and 3 and 3 and 3, instead we're multiplying 3 and 3 and 3 and 3 and the number is MUCH bigger.

I want to point out how exponents make numbers get larger by an extremely fast rate. The expression 3^4 has small numbers but once you evaluate , you get a large number 81.

Let's Try it (Slides 7-8): Today, we learned how to evaluate and write expressions with exponents. Remember evaluating an expression with an exponent means multiplying the base, the big number, by itself repeatedly the number of times indicated by the exponent. Writing an expression with an exponent equal to a given number allows us to choose any base and set the exponent to the desired value. We will now have a chance to practice together.

WARM WELCOME

We will evaluate and write expressions with exponents that are equal to a given number.

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Let's Talk:

What do you think that means when something is "growing at an exponential rate"?

Let's Talk:

What do you notice and wonder about this expression?

$$3^2$$

Let's Think:

Let's evaluate this expression together.

$$2^3$$

Let's Think:

Let's write an expression that has an exponent as 4.

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Let's Try It:

Let's evaluate and write expressions with exponents together

Name:____________________ G6 U5 Lesson 11 - Let's Try It!

Formula: a^n

a = base(number you repeatedly multiply) **n** = exponent (how many times you multiply the base)

Expression: 5^2

1. What is the base? ____________
2. What is the exponent? __________
3. What number are you repeatedly multiplying by itself?____________
4. How many times are you repeatedly multiplying the base? ____________
5. Write a repeated multiplication expression that matches. ____________
6. Solve the expression. ____________

Expression: 4^3

7. What is the base? ____________
8. What is the exponent? __________
9. What number are you repeatedly multiplying by itself?____________
10. How many times are you repeatedly multiplying the base? ____________
11. Write a repeated multiplication expression that matches. ____________
12. Solve the expression. ____________

Expression: 6^4

13. What is the base? ____________
14. What is the exponent? __________
15. What number are you repeatedly multiplying by itself?____________
16. How many times are you repeatedly multiplying the base? ____________
17. Write a repeated multiplication expression that matches. ____________
18. Solve the expression. ____________

Write an expression with an exponent equal to 3.

19. What is the base? ____________
20. What is the exponent? __________
21. What number are you repeatedly multiplying by itself?____________
22. How many times are you repeatedly multiplying the base? ____________
23. Write a repeated multiplication expression that matches. ____________
24. Solve the expression. ____________

Write an expression with an exponent equal to 5.

25. What is the base? ____________
26. What is the exponent? __________
27. What number are you repeatedly multiplying by itself?____________
28. How many times are you repeatedly multiplying the base? ____________
29. Write a repeated multiplication expression that matches. ____________
30. Solve the expression. ____________

On your Own:

Let's try to evaluate and write expressions with exponents on your own.

Name:____________________ G6 U5 Lesson 11- Independent Practice

Directions: Practice evaluating and writing expressions with exponents that are equal to a given number.

1. Evaluate the expression 7^4.	2. Evaluate the expression 10^3.
3. Write and evaluate an expression with an exponent equal to 5, n = 5.	4. Write and evaluate an expression with an exponent equal to 6, n = 6.

Formula: a^n

a = base(number you repeatedly multiply) **n** = exponent (how many times you multiply the base)

Expression: 5^2

1. What is the base? ________________________
2. What is the exponent? ________________
3. What number are you repeatedly multiplying by itself?________________________
4. How many times are you repeatedly multiplying the base? ________________________
5. Write a repeated multiplication expression that matches. _____________________________
6. Solve the expression. ________________________

Expression: 4^3

7. What is the base? ________________________
8. What is the exponent? ________________
9. What number are you repeatedly multiplying by itself?________________________
10. How many times are you repeatedly multiplying the base? ________________________
11. Write a repeated multiplication expression that matches. _____________________________
12. Solve the expression. ________________________

Expression: 6^4

13. What is the base? ________________________
14. What is the exponent? ________________
15. What number are you repeatedly multiplying by itself?________________________
16. How many times are you repeatedly multiplying the base? ________________________
17. Write a repeated multiplication expression that matches. _____________________________
18. Solve the expression. ________________________

Write an expression with an exponent equal to 3.

19. What is the base? ________________________
20. What is the exponent? ________________
21. What number are you repeatedly multiplying by itself?________________________
22. How many times are you repeatedly multiplying the base? ________________________
23. Write a repeated multiplication expression that matches. _____________________________
24. Solve the expression. ________________________

Write an expression with an exponent equal to 5.

25. What is the base? ________________________
26. What is the exponent? ________________
27. What number are you repeatedly multiplying by itself?________________________
28. How many times are you repeatedly multiplying the base? ________________________
29. Write a repeated multiplication expression that matches. _____________________________
30. Solve the expression. ________________________

Name:_____________________________________ G6 U5 Lesson 11- Independent Work

Directions: Practice evaluating and writing expressions with exponents that are equal to a given number.

1. Evaluate the expression 7^4	2. Evaluate the expression 10^3
3. Write and evaluate an expression with an exponent equal to 5, n = 5.	4. Write and evaluate an expression with an exponent equal to 6, n = 6.

Name: Answer Key

Formula: a^n

a = base(number you repeatedly multiply) **n** = exponent (how many times you multiply the base)

Expression: 5^2

1. What is the base? 5
2. What is the exponent? 2
3. What number are you repeatedly multiplying by itself? 5
4. How many times are you repeatedly multiplying the base? 2
5. Write a repeated multiplication expression that matches. 5 • 5
6. Solve the expression. 25

Expression: 4^3

7. What is the base? 4
8. What is the exponent? 3
9. What number are you repeatedly multiplying by itself? 4
10. How many times are you repeatedly multiplying the base? 3
11. Write a repeated multiplication expression that matches. 4 • 4 • 4
12. Solve the expression. 4 • 4 • 4 → 16 • 4 → (64)

Expression: 6^4

13. What is the base? 6
14. What is the exponent? 4
15. What number are you repeatedly multiplying by itself? 6
16. How many times are you repeatedly multiplying the base? 4
17. Write a repeated multiplication expression that matches. 6 • 6 • 6 • 6

18. Solve the expression. 6 • 6 • 6 • 6

36 • 6 • 6

36 • 6 • 6

216 • 6

1,296

Write an expression with an exponent equal to 3.

19. What is the base? 5 (any number)

20. What is the exponent? 3

21. What number are you repeatedly multiplying by itself? 5

22. How many times are you repeatedly multiplying the base? 3

23. Write a repeated multiplication expression that matches. 5 • 5 • 5

24. Solve the expression. 5 • 5 • 5

25 • 5 = 125

Write an expression with an exponent equal to 5.

25. What is the base? 2 (any number)

26. What is the exponent? 5

27. What number are you repeatedly multiplying by itself? 2

28. How many times are you repeatedly multiplying the base? 5

29. Write a repeated multiplication expression that matches. 2 • 2 • 2 • 2 • 2

30. Solve the expression. 2 • 2 • 2 • 2 • 2

4 • 2 • 2 • 2

8 • 2 • 2

16 • 2

22

Name: Answer key

G6 U5 Lesson 11- Independent Practice

Directions: Practice evaluating and writing expressions with exponents that are equal to a given number.

1. Evaluate the expression 7^4.

$7 \cdot 7 \cdot 7 \cdot 7$

$49 \cdot 7 \cdot 7$

$343 \cdot 7$

2,401

2. Evaluate the expression 10^3.

$10 \cdot 10 \cdot 10$

$100 \cdot 10$

1,000

3. Write and evaluate an expression with an exponent equal to 5, n = 5.

2^5

$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$

$4 \cdot 2 \cdot 2 \cdot 2$

$8 \cdot 2 \cdot 2$

$16 \cdot 2$

32

4. Write and evaluate an expression with an exponent equal to 6, n = 6.

4^6

$4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4$

$16 \cdot 4 \cdot 4 \cdot 4 \cdot 4$

$64 \cdot 4 \cdot 4 \cdot 4$

$256 \cdot 4 \cdot 4$

$1{,}024 \cdot 4$

4,096

G6 U5 Lesson 12

Decide if expressions are equal by evaluating expressions and understanding what exponents mean

G6 U5 Lesson 12 - Students will decide if expressions are equal by evaluating expressions and understanding what exponents mean

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today, we are going to continue building our knowledge and skills of exponents and expressions. The objective of today's lesson is to decide if expressions are equal by evaluating expressions and understanding what exponents mean. By the end of this lesson, you'll be able to decide if expressions are equal and understand the significance of exponents

Let's Talk (Slide 3): Yesterday we learned about exponents and how to find the total when an exponent is in an expression. So, let's look at these two expressions…three squared and two cubed. We see that they both have a 2 and a 3. **But, using what you know about exponents are they the same? Why or why not?**

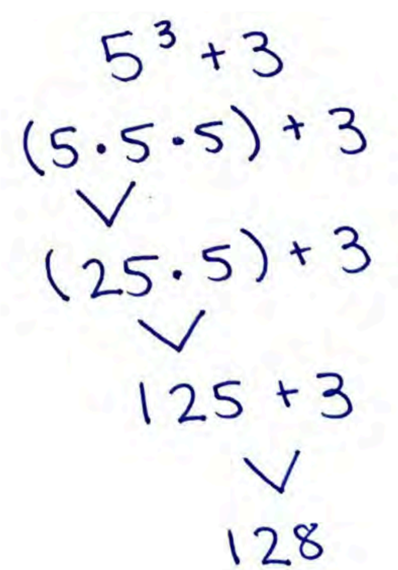
Possible Student Answers,Key Points:

- They aren't the same, 3 squared is 3x3, which is 9.
- 2 cubed is 2x2x2 which is 8.
- When you're solving exponents you have to look carefully at which number is the base and which number is the exponent and that helps you find the total.

That's right! These are totally different expressions because they have different bases and different exponents. Remember, an exponent is a small number written above and to the right of a base number. It tells us how many times we need to multiply the base by itself.

Let's Talk (Slide 4): In one short day you all have become really good at exponents. So, let's dig a little deeper and determine if expressions with exponents are equivalent. For example ,$5^3 + 3$ and $4^3 + 64$ are both expressions. Let's determine if these expressions are equivalent, or equal to each other.

Let's look at the expression $5^3 + 3$. The first thing I need to do is solve the exponent and determine the value of 5^3.



So, 5 is the base and 3 is the exponent so we have to do 5 times 5 times 5, let's put that in parenthesis since we need to solve it first.

We know that 5x5 is…25!

Then we have to multiply 25 by another 5…that's 125. And finally, we can add 3, which gets us to 128.

So, now we know that the expression $5^3 + 3$ is equal to 128.

But, this is asking us if they're equivalent. So now let's evaluate the expression $4^3 + 64$. The first thing we need to do is solve the exponent and determine the value of 4^3.

$$4^3 + 64$$

$$(4 \cdot 4 \cdot 4) + 64$$

So, 4 is the base and 3 is the exponent so we need to do 4x4x4 and then add 64. So, I'll put 4x4x4 in parenthesis.

$$(16 \cdot 4) + 64$$

Now, 4x4 is easy, that's 16.

$$64 + 64$$

Now we have to take 16 and multiply it by 4 again. And, 16x4 is 64.

So, 4^3 is equal to 64. Now, we need to add another 64.

$$128$$

So, 64 + 64 is 128. So, now we know the expressions $5^3 + 3$ and $4^3 + 64$ both have the same exact value and are equal because they both equal 128.

Remember, two expressions are equivalent if they equal the same thing. These two expressions both equaled 128 so they're equivalent. In order to find whether two expressions are equivalent we have to solve both of them, like we just did.

Let's Try it (Slides 6-7): Great job everyone! We started to explore exponents and evaluate expressions. You've gained a better understanding of how to deal with expressions involving exponents. Remember, to look carefully at the base and the exponent and do careful math to help you evaluate expressions.

WARM WELCOME

We will decide if expressions are equal by evaluating expressions and understanding what exponents mean.

Let's Talk:

Are these two expression the same? Why or why not?

$$3^2 \qquad 2^3$$

Let's Think:

Let's determine if these expressions are equivalent.

$$5^3 + 3 \text{ and } 4^3 + 64$$

Let's Think:

Let's determine if these expressions are equivalent.

$$4^3 - 6 \text{ and } 6^2 + 22$$

6^2

Let's Try It:

Now let's practice evaluating the expressions with exponents to determine if they are equivalent.

Name:____________________ G6 U5 Lesson 12 - Let's Try It!

1. Evaluate the expressions $2^2 + 5$ and 3×3 and determine if they are equivalent.

   1. What is the value of 2^2? __________
   2. What is the value of $2^2 + 5$? __________
   3. What is the value of 3×3? __________
   4. Are the expressions equivalent? __________

2. Evaluate the expressions $5^3 - 5^2$ and $5 (5 - 1)$and determine if they are equivalent.

   5. What is the value of 5^3? __________
   6. What is the value of 5^2? __________
   7. What is the value of $5^3 - 5^2$? __________
   8. What is the value of $5 (5 - 1)$? __________
   9. Are the expressions equivalent? __________

3. Evaluate the expressions 2^4 and $2 \times 2 \times 2 \times 2$ and determine if they are equivalent.

   10. What is the value of 2^4? __________
   11. What is the value of $2 \times 2 \times 2 \times 2$? __________
   12. Are the expressions equivalent? __________

4. Evaluate the expressions $(6 - 2)^3$ and 4^3 and determine if they are equivalent.

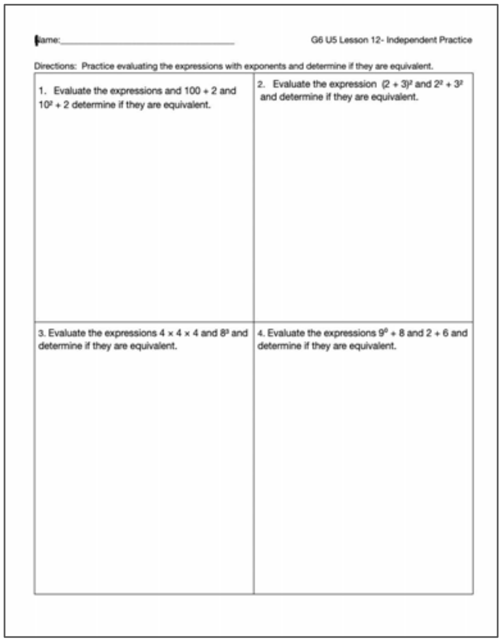
   13. What is the value of 6^3? __________
   14. What is the value of 2^3?__________
   15. What is the value of $(6 - 2)^3$? __________
   16. What is the value of 4^3? __________
   17. Are the expressions equivalent? __________

5. Evaluate the ex6^2 6^2 pressions $7^0 + 1$ and 1 and determine if they are equivalent.

   18. What is the value of 7^0? __________
   19. What is the value of $7^0 + 1$? __________
   20. Are the expressions equivalent? __________

On your Own:

Now practice evaluating the expressions with exponents on your own.


Name:____________________________ G6 U5 Lesson 12- Independent Practice

Directions: Practice evaluating the expressions with exponents and determine if they are equivalent.

1. Evaluate the expressions and $100 + 2$ and $10^2 + 2$ determine if they are equivalent.	2. Evaluate the expression $(2 + 3)^2$ and $2^2 + 3^2$ and determine if they are equivalent.
3. Evaluate the expressions $4 \times 4 \times 4$ and 8^3 and determine if they are equivalent.	4. Evaluate the expressions $9^0 + 8$ and $2 + 6$ and determine if they are equivalent.

1. Evaluate the expressions 2^2 +5 and 3 × 3 and determine if they are equivalent.

1. What is the value of 2^2? ______________
2. What is the value of $2^2 + 5$? ______________
3. What is the value of 3 × 3? ______________
4. Are the expressions equivalent? ______________

2. Evaluate the expressions $5^3 - 5^2$ and 5 (5 - 1)and determine if they are equivalent.

5. What is the value of 5^3? ______________
6. What is the value of 5^2? ______________
7. What is the value of $5^3 - 5^2$? ______________
8. What is the value of 5 (5 - 1)? ______________
9. Are the expressions equivalent? ______________

3. Evaluate the expressions 2^4 and 2 × 2 × 2 × 2 and determine if they are equivalent.

10. What is the value of 2^4? ______________
11. What is the value of 2 × 2 × 2 × 2 ? ______________
12. Are the expressions equivalent? ______________

4. Evaluate the expressions $(6 - 2)^3$ and 4^3 and determine if they are equivalent.

13. What is the value of 6^3? ______________
14. What is the value of 2^3?______________
15. What is the value of $(6 - 2)^3$? ______________
16. What is the value of 4^3? ______________
17. Are the expressions equivalent? ______________

5. Evaluate the ex6^2 6^2 pressions $7^0 + 1$ and 1 and determine if they are equivalent.

18. What is the value of 7^0? ______________
19. What is the value of $7^0 + 1$? ______________
20. Are the expressions equivalent? ______________

Name:______________________________________

Directions: Practice evaluating the expressions with exponents and determine if they are equivalent.

1. Evaluate the expressions and 100 + 2 and $10^2 + 2$ determine if they are equivalent.	2. Evaluate the expression $(2 + 3)^2$ and $2^2 + 3^2$ and determine if they are equivalent.
3. Evaluate the expressions $4 \times 4 \times 4$ and 8^3 and determine if they are equivalent.	4. Evaluate the expressions $9^0 + 8$ and 2 + 6 and determine if they are equivalent.

Name: Answer Key G6 U5 Lesson 12 - Let's Try It!

1. Evaluate the expressions $2^2 + 5$ and 3×3 and determine if they are equivalent.

1. What is the value of 2^2? 4
2. What is the value of $2^2 + 5$? 4+5=9
3. What is the value of 3×3? 9
4. Are the expressions equivalent? yes

2. Evaluate the expressions $5^3 - 5^2$ and $5(5 - 1)$and determine if they are equivalent.

5. What is the value of 5^3? 125
6. What is the value of 5^2? 25
7. What is the value of $5^3 - 5^2$? 125-25=100
8. What is the value of $5(5 - 1)$? 25-5=20
9. Are the expressions equivalent? no

3. Evaluate the expressions 2^4 and $2 \times 2 \times 2 \times 2$ and determine if they are equivalent.

10. What is the value of 2^4? 16
11. What is the value of $2 \times 2 \times 2 \times 2$? 16
12. Are the expressions equivalent? yes

4. Evaluate the expressions $(6 - 2)^3$ and 4^3 and determine if they are equivalent.

13. What is the value of 6^3? 216
14. What is the value of 2^3? 8
15. What is the value of $(6 - 2)^3$? 64
16. What is the value of 4^3? 64

Name: Answer Key

G6 U5 Lesson 12- Independent Practice

Directions: Practice evaluating the expressions with exponents and determine if they are equivalent.

1. Evaluate the expressions and 100 + 2 and $10^2 + 2$ determine if they are equivalent. $100+2=102$ $10^2+2=$ $100+2=102$ yes	2. Evaluate the expression $(2 + 3)^2$ and $2^2 + 3^2$ and determine if they are equivalent. $(2+3)^2$ $5^2=25$ 2^2+3^2 $4+9=13$ no
3. Evaluate the expressions 4 × 4 × 4 and 8^3 and determine if they are equivalent. $4 \cdot 4 \cdot 4$ $16 \cdot 4$ 64 $8 \cdot 8 \cdot 8$ $64 \cdot 8$ 512 no	4. Evaluate the expressions $9^0 + 8$ and 2 + 6 and determine if they are equivalent. $9^0+8=9$ $1+8=9$ $2+6=8$ no

G6 U5 Lesson 13

Use the order of operations to evaluate expressions with exponents, multiplication, division, addition, and subtraction

CITYTUTOR DC

G6 U5 Lesson 13 - Students will use the order of operations to evaluate expressions with exponents, multiplication, division, addition, and subtraction

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today, we're going to build on what you already know about the order of operations and apply it to expressions involving exponents.The objective of today's lesson is to use the order of operations to evaluate expressions with exponents, multiplication, division, addition, and subtraction.

Let's Talk (Slide 3): We will be combining our previous knowledge about order of operations and expressions involving exponents. **What have you learned so far about expressions with exponents?** Possible Student Answers/ Key Points:

- Expressions with exponents have numbers or variables raised to a certain power
- Exponents represent repeated multiplication
- Exponents have a base, that's the number we multiply by itself.

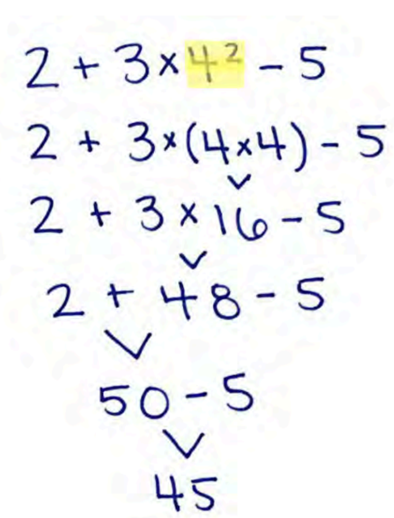
Let's Talk (Slide 4): That is correct! Exponents represent repeated multiplication. The base is the number that is repeatedly multiplied and the exponent tells you how many times it is multiplied by itself. **What do you know about order of operations?** Possible Student Answers/ Key Points:

- I know that the order of operations uses the acronym PEMDAS.
- PEMDAS stands for Parentheses, Exponents, Multiplication, Division, Addition, and Subtraction. This is the order used to solve expressions.

That is correct! As you've mentioned, we follow PEMDAS to solve expressions step by step. Today, we'll include exponents as well. Remember that exponents show repeated multiplication. For example, 3^2 means 3 × 3, and 4^3 means 4 × 4 × 4.

Let's Think (Slide 5): Today we will use the steps of PEMDAS in order to solve expressions. Let me review these steps

1. Parentheses/Brackets: We have to perform operations inside parentheses or brackets first.
2. Exponents: Then, we evaluate any exponents or powers.
3. Multiplication and Division: Next, we do multiplication and division from left to right.
4. Addition and Subtraction: Lastly, carry out addition and subtraction operations from left to right.



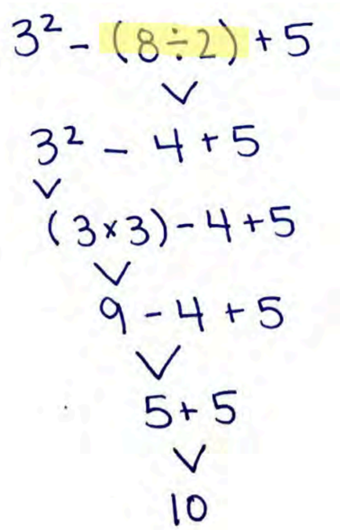
Let's use the steps to evaluate the expression 2 + 3 × 4^2 - 5. According to PEMDAS, the first step would be the parentheses but there are none in this expression. So, after that we have to solve exponents, so I'll start by evaluating 4^2, which is time same as 4x4. We know that 4x4 equals 16.

So I will write 16 under 4^2 and bring the rest of the expressions down. Now I have the expression 2 + 3×16 - 5. After exponents…we do multiplication and division. So, we need to do 3x16. Everybody, use your paper or whiteboard to solve 3x16…what is it? 48!

Now we have 2 + 48 - 5. Now, let's continue with the addition and subtraction from left to right. So, 2+48…that's 50.

Finally, I have 50 - 5, which is 45. So the expression 2 + 3×4^2 - 5 simplifies to 45.

Let's Think (Slides 6): Great job walking through that example with me. Now, let's try another example together. Be sure to pay attention to how I follow PEMDAS steps to solve the expression.



Let's look at the expression: 3^2 - (8 ÷ 2) + 5. According to PEMDAS, we first handle the parentheses, which is 8 divided by 2…that's a quick fact…4!

Next, we need to solve exponents, so let's evaluate 3^2, which is 3 x 3. I know that 3 times 3 equals 9.

Now, we don't have any multiplication or division so we skip to addition and subtraction from left to right. So, 9-4…that's 5. And, 5+5 more is 10. So, we just used PEMDAS to evaluate the expression…3^2 - (8 ÷ 2) + 5 and we found that it simplifies to 10.

Let's Try it (Slides 7-8): Today, we used the order of operations to evaluate expressions with exponents, multiplication, division, addition, and subtraction. I'm impressed with your hard work and understanding throughout the lesson. Remember to use PEMDAS as we work together to evaluate more expressions and follow each step carefully.

WARM WELCOME

We will use the order of operations to evaluate expressions with exponents, multiplication, division, addition, and subtraction.

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Let's Review:

What do you know about expressions with exponents?

Let's Talk:

What do you know about order of operations?

Let's Think: Let's use order of operations to evaluate.

$$2 + 3 \times 4^2 - 5$$

1. Parentheses/Brackets: Perform operations inside parentheses or brackets first.
2. Exponents: Evaluate any exponents or powers.
3. Multiplication and Division: Perform these operations from left to right.
4. Addition and Subtraction: Lastly, carry out addition and subtraction operations from left to right.

Let's Think: Let's use order of operations to evaluate.

$$3^2 - (8 \div 2) + 5$$

1. Parentheses/Brackets: Perform operations inside parentheses or brackets first.
2. Exponents: Evaluate any exponents or powers.
3. Multiplication and Division: Perform these operations from left to right.
4. Addition and Subtraction: Lastly, carry out addition and subtraction operations from left to right.

Let's Try It:

Let's use the order of operations to evaluate expressions with exponents together.

Name: ______________________ G6 U5 Lesson 13 - Let's Try It

Follow the following steps to solve expression
PEMDAS:
1. Parentheses
2. Exponents
3. Multiplication
4. Division
5. Addition
6. Subtraction

Expression #1: $2 + 3 \times 4^2 - 5$

1. What step of PEMDAS do you need to follow first?
2. Solve your first step.__________
3. Rewrite equation:__________
4. What step of PEMDAS do you need to complete next?__________
5. Solve your second step.__________
6. Rewrite equation:__________
7. What step of PEMDAS do you need to follow next?__________
8. Solve your third step.__________
9. Rewrite equation:__________
10. What step of PEMDAS do you need to follow next in this expression?__________
11. Solve your last step.__________

Expression #2: $3^3 - (6 + 2) \div 4$

1. What step of PEMDAS do you need to follow first?
2. Solve your first step.__________
3. Rewrite equation:__________
4. What step of PEMDAS do you need to complete next?__________
5. Solve your second step.__________
6. Rewrite equation:__________
7. What step of PEMDAS do you need to follow next?__________
8. Solve your third step.__________

9. Rewrite equation:__________
10. What step of PEMDAS do you need to follow next in this expression?__________
11. Solve your last step.__________

Expression #3: $5 \times (2 + 3)^2 \div 10 - 2$

12. What step of PEMDAS do you need to follow first?
13. Solve your first step.__________
14. Rewrite equation:__________
15. What step of PEMDAS do you need to complete next?__________
16. Solve your second step.__________
17. Rewrite equation:__________
18. What step of PEMDAS do you need to follow next?__________
19. Solve your third step.__________
20. Rewrite equation:__________
21. What step of PEMDAS do you need to follow next in this expression?__________
22. Solve your last step.__________

Expression #4: $4^2 + 6 - 3 \times 2^3$

23. What step of PEMDAS do you need to follow first?
24. Solve your first step.__________
25. Rewrite equation:__________
26. What step of PEMDAS do you need to complete next?__________
27. Solve your second step.__________
28. Rewrite equation:__________
29. What step of PEMDAS do you need to follow next?__________
30. Solve your third step.__________
31. Rewrite equation:__________
32. What step of PEMDAS do you need to follow next in this expression?__________

On your Own:

Now use the order of operations to evaluate expressions with exponents on your own

Name: ______________________ G6 U5 Lesson 13- Independent Practice

Directions: Use the order of operations (PEMDAS) to evaluate each expression.

1. $(7 - 3) \times 2 + 5^2$	2. $6 \div 3 + 2 \times 5^3 - 4$
3. $3.5 - (2 + 3) \times 2^2$	4. $10 - 2 \times (4 - 2)^2 + 3$

Name: ____

PEMDAS:

1. **P**arentheses
2. **E**xponents
3. **M**ultiplication
4. **D**ivision
5. **A**ddition
6. **S**ubtraction

Expression #1: $2 + 3 \times 4^2 - 5$

☐ What step of PEMDAS do you need to follow first? ☐ Solve your first step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to complete next? ☐ Solve your second step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to follow next? ☐ Solve your third step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to follow next in this expression? ☐ Solve your last step.	**Show your work here:**

Expression #2: $3^3 - (6 + 2) \div 4$

☐ What step of PEMDAS do you need to follow first? ☐ Solve your first step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to complete next? ☐ Solve your second step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to follow next? ☐ Solve your third step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to follow next in this expression? ☐ Solve your last step.	**Show your work here:**

Expression #3: $5 \times (2 + 3)^2 \div 10 - 2$

☐ What step of PEMDAS do you need to follow first? ☐ Solve your first step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to complete next? ☐ Solve your second step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to follow next? ☐ Solve your third step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to follow next in this expression? ☐ Solve your last step.	**Show your work here:**

Expression #4: $4^2 + 6 - 3 \times 2^3$

☐ What step of PEMDAS do you need to follow first? ☐ Solve your first step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to complete next? ☐ Solve your second step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to follow next? ☐ Solve your third step. ☐ Rewrite equation. ☐ What step of PEMDAS do you need to follow next in this expression? ☐ Solve your last step.	**Show your work here:**

Name:_______________________________________

Directions: Use the order of operations (PEMDAS) to evaluate each expression.

1. Solve. $(7 - 3) \times 2 + 5^2$	2. Solve. $6 \div 3 + 2 \times 5^3 - 4$
3. Solve. $35 - (2 + 3) \times 2^2$	1. Solve. $10 - 2 \times (4 - 2)^2 + 3$

Name: Answer Key G6 U5 Lesson 13 - Let's Try It

Follow the following steps to solve expression
PEMDAS:

1. Parentheses
2. Exponents
3. Multiplication
4. Division
5. Addition
6. Subtraction

Expression #1: $2 + 3 \times 4^2 - 5$

1. What step of PEMDAS do you need to follow first? Exponent
2. Solve your first step. $4^2=16$
3. Rewrite equation: $2+3 \cdot 16-5$
4. What step of PEMDAS do you need to complete next? multiplication
5. Solve your second step. $3 \cdot 16=48$
6. Rewrite equation: $2+48-5$
7. What step of PEMDAS do you need to follow next? add
8. Solve your third step. $2+48=50$
9. Rewrite equation: $50-5$
10. What step of PEMDAS do you need to follow next in this expression? subtract
11. Solve your last step. $50-5=45$

Expression #2: $3^3 - (6 + 2) \div 4$

1. What step of PEMDAS do you need to follow first? Parentheses
2. Solve your first step. $6+2=8$
3. Rewrite equation: $3^3-8 \div 4$
4. What step of PEMDAS do you need to complete next? Exponent
5. Solve your second step. $3^3=27$
6. Rewrite equation: $27-8 \div 4$
7. What step of PEMDAS do you need to follow next? Division
8. Solve your third step. $8 \div 4=2$

9. Rewrite equation: 27-2

10. What step of PEMDAS do you need to follow next in this expression? Subtraction

11. Solve your last step. 25

Expression #3: $5 \times (2 + 3)^2 \div 10 - 2$

12. What step of PEMDAS do you need to follow first? Parentheses

13. Solve your first step. 2+3=5

14. Rewrite equation: $5 \cdot 5^2 \div 10 - 2$

15. What step of PEMDAS do you need to complete next? Exponent

16. Solve your second step. $5^2 = 25$

17. Rewrite equation: $5 \cdot 25 \div 10 - 2$

18. What step of PEMDAS do you need to follow next? Division

19. Solve your third step. $25 \div 10 = 2.5$

20. Rewrite equation: $5 \cdot 2.5 - 2$

21. What step of PEMDAS do you need to follow next in this expression? 12.5 - 2

22. Solve your last step. 10.5 or $10\frac{1}{2}$

Expression #4: $4^2 + 6 - 3 \times 2^3$

23. What step of PEMDAS do you need to follow first? Exponent

24. Solve your first step. $4^2 = 16$

25. Rewrite equation: $16 + 6 - 3 \times 2^3$

26. What step of PEMDAS do you need to complete next? Exponent

27. Solve your second step. $2^3 = 8$

28. Rewrite equation: $16 + 6 - 3 \cdot 8$

29. What step of PEMDAS do you need to follow next? multiply

30. Solve your third step. $3 \cdot 8 = 24$

31. Rewrite equation: 16+6-24

32. What step of PEMDAS do you need to follow next in this expression? add

33. Solve your fourth step. 16+6=22

34. What step of PEMDAS do you need to follow next in this expression? Subtract

35. Solve your last step. 22-24= -2

Name: Answer key

Directions: Use the order of operations (PEMDAS) to evaluate each expression.

1. $(7 - 3) \times 2 + 5^2$ $4 \cdot 2 + 5^2$ $4 \cdot 2 + 25$ $8 + 25$ 33	2. $6 \div 3 + 2 \times 5^3 - 4$ $6 \div 3 + 2 \cdot 125 - 4$ $2 + 2 \cdot 125 - 4$ $2 + 250 - 4$ $252 - 4$ 248
3. $3\ 5 - (2 + 3) \times 2^2$ $35 - 5 \cdot 2^2$ $35 - 5 \cdot 4$ $35 - 20$ 15	4. $10 - 2 \times (4 - 2)^2 + 3$ $10 - 2 \cdot 2^2 + 3$ $10 - 2 \cdot 4 + 3$ $10 - 8 + 3$ $2 + 3$ 5

G6 U5 Lesson 14

Evaluate expressions with a variable, an exponent and another operation, and determine whether a given value is a solution to an equation

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G6 U5 Lesson 14 - Students will evaluate expressions with a variable, an exponent and another operation, and determine whether a given value is a solution to an equation.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will use everything we have learned about expressions, exponents, variables, and order of operations and tying it altogether. We will evaluate expressions with a variable, an exponent, and order of operations. We will use substitution to determine whether a given number is a solution to an equation.

Let's Talk (Slide 3): Let's talk about the word **simplify.** What does it mean to simplify? Give an example.
Possible Student Answers/Key Points:

- Simplify means to make something simpler.
- If we simplify a plan, we make it easier or quicker.
- When we simplify an expression, we combine like terms or terms that are the same.

That is correct, to simplify something we make it simpler or easier! When we're talking about simplifying expressions, we combine like terms. When we're combining like terms, we have to make sure that we follow the order of operations, known as PEMDAS.

- Parentheses/Brackets: We always perform operations inside parentheses or brackets first.
- Exponents: Then we evaluate any exponents or powers.
- Multiplication and Division: Next, we perform these operations from left to right.
- Addition and Subtraction: And finally, carry out addition and subtraction operations from left to right.

Let's Think (Slide 4): Today, we will learn to evaluate expressions with variables, exponents, and other operations. We will also determine whether a given value is a solution to an equation. So we are layering on the components of variables. Now I need to use order of operations or PEMDAS to evaluate the expression.

$3x^2+2x-5$

Let's look at the expression $3x^2$+ 2x - 5=51 and the given value for x is equal to 4. If x = 4.

$3(4)^2+2(4)-5$

First, let's substitute the given value of x. We need to replace each x with the value 4 in the expression.

$3\cdot 16+2(4)-5$

Next, we need to evaluate the exponents. We know that four-squared is the same as 4 times 4, which is 16. So, now we have 3x16 + 2(4) - 5. Now that we evaluated exponents, we need to multiply and divide from left to right. Let's multiply 3 times 16, which equals 48.

$48+2(4)-5$

So the equation is now 48 + 2 (4) - 5. Next, let's multiply 2 times 4, which is 8. And, since there is no division, I need to add and subtract left to right.

$48+8-5$

So my equation is now 48 + 8 - 5. Going from left to right, 48 plus 8 is equal to 56.

$56-5$

Finally, let's subtract 56 minus 5, which is 51.

51

Therefore, when x = 4, the value of the expression $3x^2$ + 2x - 5 is 51. This means that $3x^2$ + 2x - 5 = 51 is true when x =4.

Let's Try it (Slides 5): Today we evaluated expressions with variables, exponents, and other operations. We substituted a given value into an equation and used order of operations or PEMDAS to simplify the expression. We will continue to work on this together. Remember it is important to use the correct order of operations and use PEMDAS to follow each step.

WARM WELCOME

We will evaluate expressions with a variable, an exponent and another operation, and determine whether a given value is a solution to an equation.

Let's Talk:

What does it mean to simplify? Give an example.

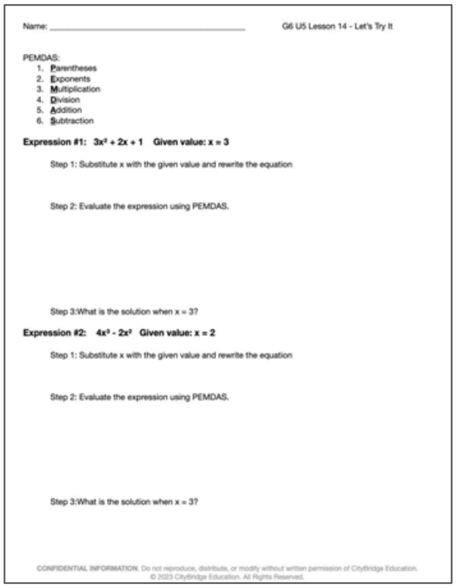
Let's Think:

Let's evaluate the expression when x = 4.

$$3x^2 + 2x - 5 = 51$$

Let's Try It:

Let's evaluate expressions with a given value together.



Name: ______________________ G6 U5 Lesson 14 - Let's Try It

PEMDAS:

1. Parentheses
2. Exponents
3. Multiplication
4. Division
5. Addition
6. Subtraction

Expression #1: $3x^2 + 2x + 1$ Given value: $x = 3$

Step 1: Substitute x with the given value and rewrite the equation

Step 2: Evaluate the expression using PEMDAS.

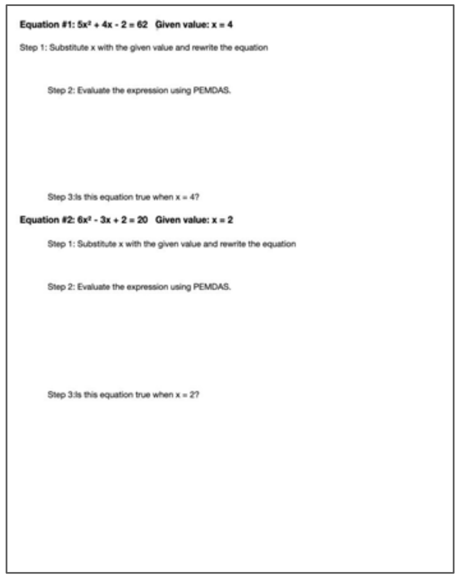
Step 3:What is the solution when $x = 3$?

Expression #2: $4x^3 - 2x^2$ Given value: $x = 2$

Step 1: Substitute x with the given value and rewrite the equation

Step 2: Evaluate the expression using PEMDAS.

Step 3:What is the solution when $x = 3$?



Equation #1: $5x^2 + 4x - 2 = 62$ Given value: $x = 4$

Step 1: Substitute x with the given value and rewrite the equation

Step 2: Evaluate the expression using PEMDAS.

Step 3:Is this equation true when $x = 4$?

Equation #2: $6x^2 - 3x + 2 = 20$ Given value: $x = 2$

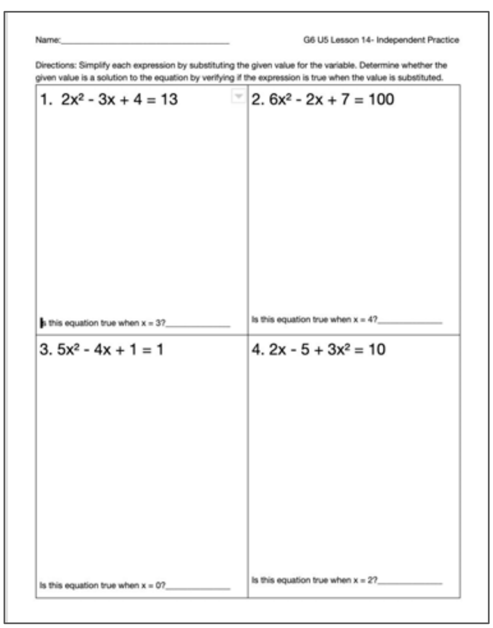
Step 1: Substitute x with the given value and rewrite the equation

Step 2: Evaluate the expression using PEMDAS.

Step 3:Is this equation true when $x = 2$?

On your Own:

Now try evaluating expressions with a given value on your own.



Name: ______________________ G6 U5 Lesson 14- Independent Practice

Directions: Simplify each expression by substituting the given value for the variable. Determine whether the given value is a solution to the equation by verifying if the expression is true when the value is substituted.

1. $2x^2 - 3x + 4 = 13$ Is this equation true when $x = 3$?__________	2. $6x^2 - 2x + 7 = 100$ Is this equation true when $x = 4$?__________
3. $5x^2 - 4x + 1 = 1$ Is this equation true when $x = 0$?__________	4. $2x - 5 + 3x^2 = 10$ Is this equation true when $x = 2$?__________

Name: ____ G6 U5 Lesson 14 - Let's Try It

PEMDAS:

1. **P**arentheses
2. **E**xponents
3. **M**ultiplication
4. **D**ivision
5. **A**ddition
6. **S**ubtraction

Expression #1: $3x^2 + 2x + 1$ Given value: x = 3

☐ Step 1: Substitute x with the given value and rewrite the equation. ☐ Step 2: Evaluate the expression using PEMDAS. ☐ Step 3:What is the solution when x = 3?	**Show your work here:**

Expression #2: $4x^3 - 2x^2$ Given value: x = 2

☐ Step 1: Substitute x with the given value and rewrite the equation. ☐ Step 2: Evaluate the expression using PEMDAS. ☐ Step 3:What is the solution when x = 2?	**Show your work here:**

Equation #3: $5x^2 + 4x - 2 = 62$ Given value: $x = 4$

☐ Step 1: Substitute x with the given value and rewrite the equation. ☐ Step 2: Evaluate the expression using PEMDAS. ☐ Step 3:What is the solution when x = 4?	**Show your work here:**

Equation #2: $6x^2 - 3x + 2 = 20$ Given value: $x = 2$

☐ Step 1: Substitute x with the given value and rewrite the equation. ☐ Step 2: Evaluate the expression using PEMDAS. ☐ Step 3:What is the solution when x = 2?	**Show your work here:**

Name:____ G6 U5 Lesson 14- Independent Work

Directions: Simplify each expression by substituting the given value for the variable. Determine whether the given value is a solution to the equation by verifying if the expression is true when the value is substituted.

1. Solve. $$2x^2 - 3x + 4 = 13$$ Is this equation true when x = 3?_______________	2. Solve. $$6x^2 - 2x + 7 = 100$$ Is this equation true when x = 4?_______________
3. Solve. $$5x^2 - 4x + 1 = 1$$ Is this equation true when x = 0?_______________	4. Solve. $$2x - 5 + 3x^2 = 10$$ Is this equation true when x = 2?_______________

Name: Answer key

PEMDAS:

1. Parentheses
2. Exponents
3. Multiplication
4. Division
5. Addition
6. Subtraction

Expression #1: $3x^2 + 2x + 1$ **Given value:** $x = 3$

Step 1: Substitute x with the given value and rewrite the equation

$3 \cdot 3^2 + 2 \cdot 3 + 1$

Step 2: Evaluate the expression using PEMDAS.

$3 \cdot 3^2 + 2 \cdot 3 + 1$

$3 \cdot 9 + 6 + 1$

$27 + 6 + 1$

$33 + 1 = 44$

Step 3:What is the solution when x = 3? 44

Expression #2: $4x^3 - 2x^2$ **Given value:** $x = 2$

Step 1: Substitute x with the given value and rewrite the equation

$4 \cdot 2^3 - 2 \cdot 2^2$

Step 2: Evaluate the expression using PEMDAS.

$4 \cdot 2^3 - 2 \cdot 2^2$

$4 \cdot 8 - 2 \cdot 4$

$32 - 2 \cdot 4$

$32 - 8 = 24$

Step 3:What is the solution when x = 3?

24

Equation #1: $5x^2 + 4x - 2 = 62$ Given value: $x = 4$

Step 1: Substitute x with the given value and rewrite the equation

$5 \cdot 4^2 + 4 \cdot 4 - 2 = 62$

Step 2: Evaluate the expression using PEMDAS.

$5 \cdot 4^2 + 4 \cdot 4 \cdot 2 = 62$

$5 \cdot 16 + 16 \cdot 2 = 62$

$80 + 32 = 62$

$112 = 62$

Step 3:Is this equation true when $x = 4$? NO

Equation #2: $6x^2 - 3x + 2 = 20$ Given value: $x = 2$

Step 1: Substitute x with the given value and rewrite the equation

$6 \cdot 2^2 - 3(2) + 2 = 20$

Step 2: Evaluate the expression using PEMDAS.

$6 \cdot 2^2 - 3(2) + 2 = 20$

$6 \cdot 4 - 6 + 2 = 20$

$24 - 6 + 2 = 20$

$18 + 2 = 20$

$20 = 20$

Step 3:Is this equation true when $x = 2$?

Yes

Name: Answer key

Directions: Simplify each expression by substituting the given value for the variable. Determine whether the given value is a solution to the equation by verifying if the expression is true when the value is substituted.

1. $2x^2 - 3x + 4 = 13$

$2 \cdot 3^2 - 3(3) + 4 = 13$

$2 \cdot 9 - 9 + 4 = 13$

$18 - 9 + 4 = 13$

$9 + 4 = 13$

$13 = 13$

Is this equation true when x = 3? yes

2. $6x^2 - 2x + 7 = 100$

$6 \cdot 4^2 - 2(4) + 7 = 100$

$6 \cdot 16 - 8 + 7 = 100$

$96 - 8 + 7 = 100$

$88 + 7 = 100$

$95 \neq 100$

Is this equation true when x = 4? No

3. $5x^2 - 4x + 1 = 1$

$5 \cdot 0^2 - 4(0) + 1 = 1$

$5 \cdot 0 - 0 + 1 = 1$

$0 - 0 + 1 = 1$

$0 + 1 = 1$

$1 = 1$

Is this equation true when x = 0? yes

4. $2x - 5 + 3x^2 = 10$

$2(2) - 5 + 3 \cdot 2^2 = 10$

$4 - 5 + 3 \cdot 4 = 10$

$4 - 5 + 12 = 10$

$-1 + 12$

$11 \neq 10$

Is this equation true when x = 2? no

G6 U5 Lesson 15

Create a table, graph, and equations to represent the relationship between quantities in a set of equivalent ratios

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G6 U5 Lesson 15 - Students will create a table, graph, and equations to represent the relationship between quantities in a set of equivalent ratios.

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today we will use what we already know about ratios to create tables, graphs, and equations to represent the relationship between quantities in a set of equivalent ratios. Ratios can be used in many everyday life situations.

Let's Review (Slide 3): Today, we will explore equivalent ratios and learn how to represent them using tables, graphs, and equations. Before we jump into our lesson let's review: **What is a ratio? Give an example.**
Possible Student Answers/Key Points:

- A ratio is a comparison between two quantities or numbers
- A ratio represents how much one quantity is in relation to another
- The three ways to write a ratio are with a colon a:b, or with the word to a to b or with a fraction a/b
- For example 1 cup of raisins for every 2 cups of peanuts.

Let's Talk (Slide 4): That is correct! Ratios compare relationships between different quantities and are often used to describe part-to part and part-to-whole relationships. W**here do we see or use ratios in everyday life?** Possible Student Answers/Key Points:

- In recipes, ratios are used to determine the correct proportion of ingredients. For instance, a cake recipe may call for a ratio of 2 cups of flour to 1 cup of sugar
- In sports, ratios are used to represent statistics and performance measurements. For instance, a basketball player's free throw success rate can be expressed as a ratio of successful shots to attempted shots.

That is correct! Ratios are encountered and used in many different aspects of everyday life. Ratios are useful for problem solving everyday problems.

Let's Think (Slide 5): Let's consider a fruit salad recipe that calls for the following ratio of fruits: 3 cups of strawberries for every 5 cups of blueberries. If we want to write a ratio comparing the amount of strawberries to the amount of blueberries, we can write it a few ways.

3:5 or 3 to 5 or 3/5

This can be written as 3:5, 3 to 5, and ⅗, those all compare the amount of strawberries to the amount of blueberries.

To find equivalent ratios, we will multiply and divide both parts of the original ratio by the same number. Let's imagine that we want to DOUBLE the recipe, which means we want to make 2 times the amount. In order to double the recipe we have to multiply both parts, the amount of strawberries and the amount of blueberries by 2.

$$\frac{3 \times 2}{5 \times 2} = \frac{6}{10}$$ or 6:10 or 6 to 10

6 cups of strawberries and 10 cups of blueberries

We can use any form of the ratio to find an equivalent ratio, let's use the fraction since we know how to find equivalent fractions really quickly. We originally have 3 cups of strawberries and to double it we multiply by 2, which is 6 cups of strawberries. Originally we had 5 cups of blueberries and to double it we multiply by 2, which is 10 cups of blueberries. So, our new equivalent ratio is 6/10. We can write that as 6:10 or 6 to 10.

So, if we're doubling the recipe, we need 6 cups of strawberries and 10 cups of blueberries.

But, let's imagine that it's a small party and we don't want to make the whole recipe, instead we want to only make HALF of the recipe. In order to cut the recipe in half we have to divide both parts, the amount of strawberries and blueberries by 2.

Originally we have 3 cups of strawberries and 5 cups of blueberries, let's use the fraction form of the ratio again, ⅗.

$$\frac{3 \div 2}{5 \div 2} = \frac{1.5}{2.5} \text{ or } 1.5 : 2.5 \text{ or } 1.5 \text{ to } 2.5$$

1.5 cups of strawberries and 2.5 cups of blueberries

To half it we divide both parts by 2. So, 3 cups of strawberries ÷ 2 = 1.5 cups of strawberries. And, 5 cups of blueberries ÷ 2 = 2.5 cups of blueberries. Our new equivalent ratio is 1.5:2.5, in other words we need 1.5 cups of strawberries and 2.5 cups of blueberries.

Let's Think (Slides 6): The last way that we can represent ratios is in a table. Let's create a table to represent the relationship between the quantities in the original and equivalent ratios.

	Strawberries	**Blueberries**
Original ×1	3 cups	5 cups
Double ×2	6 cups	10 cups
Half ÷2	1.5 cups	2.5 cups

We know that we're comparing the amount of strawberries to blueberries. So, in the original recipe, which is just x1, we had 3 cups of strawberries to 5 cups of blueberries. Then, when we did the math to double it, we had 6 cups of strawberries to 10 cups of blueberries. Finally, when we halved the recipe, we had 1.5 cups of strawberries to 2.5 cups of blueberries.

Let's Try it (Slides 5): Remember to use tables, graphs, and equations to represent the relationship between quantities in a set of equivalent ratios. We will use a variety of tools to generate equivalent ratios. This lesson will be crucial for 7th and 8th grade math as well as real-life problem solving skills. Let's practice some more problems together.

WARM WELCOME

We will create a table, graph, and equations to represent the relationship between quantities in a set of equivalent ratios.

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Let's Review:

What is a ratio? Give an example.

Let's Talk:

Where do we see or use ratios in everyday life?

Let's Think:

Let's consider a fruit salad recipe that calls for the following ratio of fruits: 3 cups of strawberries to 5 cups of blueberries.

Let's Think:

Let's create a table to represent the relationship between the quantities in the original and equivalent ratios.

	Strawberries	Blueberries
Original		
Double		
Half		

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Let's Try It:

Let's practice making equivalent ratios together.

Name:____________________ G6 U5 Lesson 15 - Let's Try It

Directions: Fill out each chart by using multiplication and division to create equivalent ratios.

Lemonade Recipe

Ratio:___ Multiplier: _____

Lemons	1	2	3			
Cups of Sugar	2	4		8		

Cookie Recipe

Cups of Chocolate Chips	2	4		8		
Cups of Sugar	3	6	9			

Ratio:___ Multiplier: _____

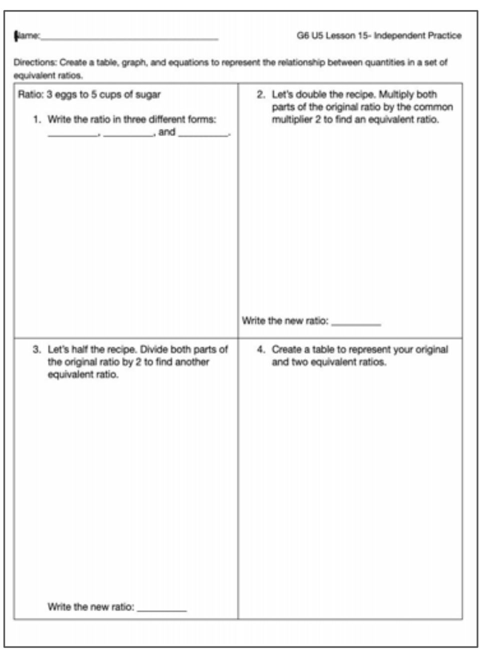
Pizza Recipe

Cups of Cheese	3					
Cups of Pepperoni	4					

Ratio:___ Multiplier: _____

On your Own:

Practice making equivalent ratios on your own.



Name:____________________ G6 U5 Lesson 15- Independent Practice

Directions: Create a table, graph, and equations to represent the relationship between quantities in a set of equivalent ratios.

Ratio: 3 eggs to 5 cups of sugar

1. Write the ratio in three different forms: _________, _________, and _________.
2. Let's double the recipe. Multiply both parts of the original ratio by the common multiplier 2 to find an equivalent ratio.

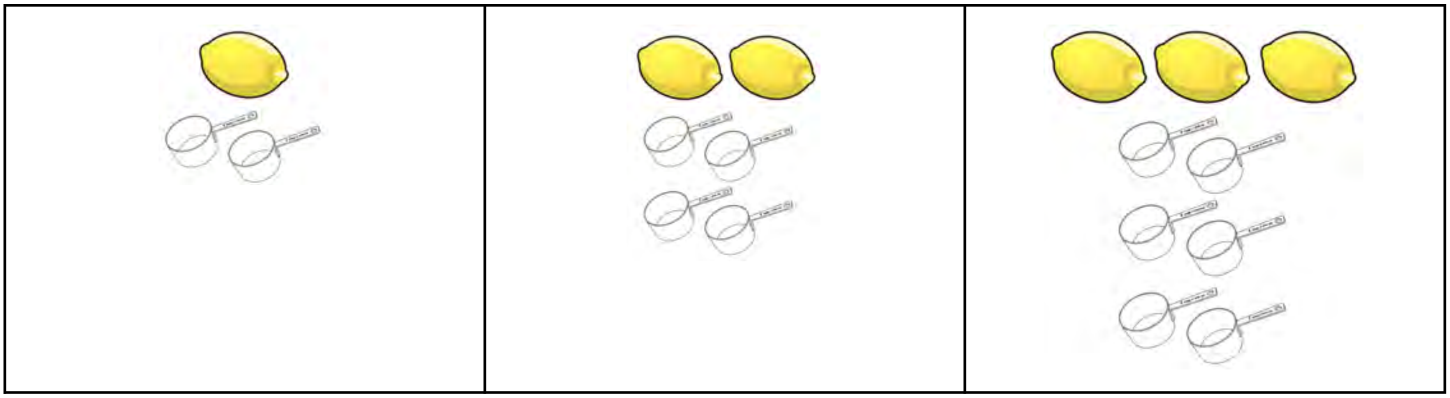
   Write the new ratio: _________
3. Let's half the recipe. Divide both parts of the original ratio by 2 to find another equivalent ratio.

   Write the new ratio: _________
4. Create a table to represent your original and two equivalent ratios.

Name: ____ G6 U5 Lesson 15 - Let's Try It

Directions: Fill out each chart by using multiplication and division to create equivalent ratios.

Lemonade Recipe



Lemons:	1	2	3			
Cups of Sugar:	2	4		8		
Ratio:_______ Multiplier: _______						

Cookie Recipe

Cups of Chocolate Chips	2	4		8		
Cups of Sugar	3	6	9			
Ratio:_______ Multiplier: _______						

Pizza Recipe

Cups of Cheese	3					
Cups of Pepperoni	4					
Ratio:_______ Multiplier: _______						

Name:____________________________________

Directions: Create a table, graph, and equations to represent the relationship between quantities in a set of equivalent ratios.

Ratio: 3 eggs to 5 cups of sugar

1. Write the ratio in three different forms: __________, __________, and __________.

2. Let's double the recipe. Multiply both parts of the original ratio by the common multiplier 2 to find an equivalent ratio.

Write the new ratio: __________

3. Let's half the recipe. Divide both parts of the original ratio by 2 to find another equivalent ratio.

Write the new ratio: __________

4. Create a table to represent your original and two equivalent ratios.

Name: Answer Key

Directions: Fill out each chart by using multiplication and division to create equivalent ratios.

Lemonade Recipe

Ratio: 1:2 Multiplier: 2

Lemons	1	2	3	4	5	6
Cups of Sugar	2	4	6	8	10	12

Cookie Recipe

Cups of Chocolate Chips	2	4	6	8	10	12
Cups of Sugar	3	6	9	12	15	18

Ratio: 2:3 Multiplier: _____

Pizza Recipe

Cups of Cheese	3	6	9	12	15	18
Cups of Pepperoni	4	8	12	16	20	24

Ratio: 3:4 Multiplier: _____

Name: Answer Key

Directions: Create a table, graph, and equations to represent the relationship between quantities in a set of equivalent ratios.

Ratio: 3 eggs to 5 cups of sugar

1. Write the ratio in three different forms: 3 to 5, 3 : 5, and 3/5.

2. Let's double the recipe. Multiply both parts of the original ratio by the common multiplier 2 to find an equivalent ratio.

$$\frac{3}{5} \cdot \frac{2}{2} = \frac{6}{10}$$

Write the new ratio: 6 : 10

3. Let's half the recipe. Divide both parts of the original ratio by 2 to find another equivalent ratio.

$$\frac{3}{5} \div \frac{2}{2} = \frac{1.5}{2.5}$$

Write the new ratio: 1.5 to 2.5

4. Create a table to represent your original and two equivalent ratios.

Eggs	Sugar
1.5	2.5
3	5
6	10

G6 U5 Lesson 16

Use graphs and equations to show different kinds of relationships involving area, volume, and exponents

G6 U5 Lesson 16 - Students will use graphs and equations to show different kinds of relationships involving area, volume, and exponents

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today, we are going to explore how graphs and equations can help us understand relationships involving area, volume, and exponents. We will use some key concepts related to ratios learned in our previous lessons.

Let's Review (Slide 3): Before we begin, let's quickly review some key concepts related to ratios and rates. **Can someone share an example of a ratio or rate?** Possible Student Answers/ Key Points:

- A ratio is a way to compare two quantities by showing how much of one thing there is compared to another thing, like the strawberry and blueberries we looked at yesterday.
- A rate is a special type of ratio that compares two different kinds of quantities with different units. It shows how fast or slow something is happening or changing.

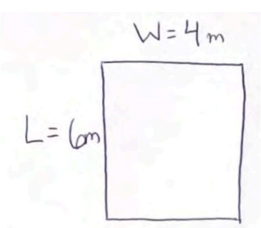
That is correct. Ratios compare two or more numbers with a colon, the word to, or a fraction. A rate compares two different kinds of quantities with different units. It shows how fast or slow something is happening or changing.

Let's Talk (Slide 4):! Now, **who can tell us what area and volume mean? Give an example, if possible!** Possible Student Answers/ Key Points:

- Area is the amount of space inside of a 2D shape, like how much space a rug takes up.
- The formula for area is a = length × width
- Volume is the amount of space inside of a 3D shape, like how much space there is inside of a toy chest.
- The formula for volume: v = length × width x height

That is correct! Area is the amount of space inside of a 2D shape, or a flat figure. The formula to determine area is a = length × width. However, volume is the amount of space inside of a 3D shape, like a cube or rectangular prism. The formula for volume is v = length × width x height.

Let's Think (Slide 5): We will use these formulas to help us to determine area and volume. We can substitute known values into the variables to solve for unknown values. Let's begin by looking at an example. Consider a rectangular garden with a length of 6 meters and a width of 4 meters. We want to find the area of this garden.



First, let's draw a model of the garden and label the dimensions. The problem tells us that it's a "rectangular" garden so we know that it's shaped like a rectangle. Now, let's label the length 6 meters and the width 4 meters.

$A = L \times W$

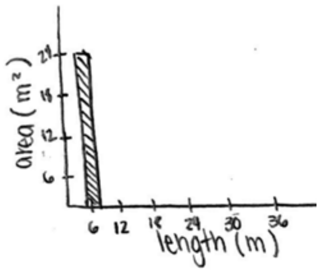
Now we know that the formula to find the area of a rectangle is to multiply the length times the width, let's write that down.

$A = 6m \times 4m$

So, in this case, the area is 6 meters × 4 meters.

$A = 24m^2$

When we do the math, we see that the area of the garden is 24 square meters. This means that the entire space of the garden is covered by 24 meters squared.

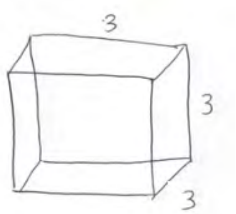


Now, let's use a graph to show the relationship between the length of the rectangle and the total area of the rectangle. We can level the x-axis with length and the units and the y-axis with total area and the units (*label*).

Then, we want to make sure that the increments of counting along both axes are the same, so let's count by 6 along each one (*label*).

Now we can make our graph. When the length was 6 meters, the total area was 24 square meters. So let's plot that on our graph. That makes sense because the total area is FOUR times as long as the length, since the rectangle has dimensions of 6 by 4.

Let's Think (Slide 6): Now, let's work on another example together. This says that a toy box, cube, has a length, width and height of 3 units. It's asking us to determine the amount of space the toy box has inside of it. Let's pause and make sure we understand what we just read. It's talking about a toy box, is that a 2D or 3D shape? 3D! That's right, it's a three-dimensional shape. We also know that because the problem tells us that the length, width, and height is 3 units. Anything that has a length, width, and height is three-dimensional. Finally, this says that the length, width, AND height are all 3 units, that means that this toy box must be a cube.



Let's draw a model of the toy box, it doesn't have to be perfect though (*draw cube*). Now we know that the length, widthI need to think how we can find the volume of this cube

$V = L \times W \times H$

In order to find the volume of a cube, we must use the formula for volume, L x W x H.

$V = 3 \times 3 \times 3$

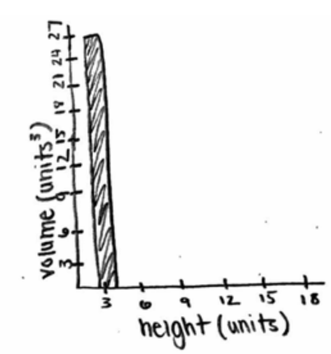
Since this is a cube the length, width, and height are the same , 3. The volume of this cube would be 3 units × 3 units × 3 units.

$V = 3 \times 3 \times 3$

This is like 3 to the third power. First, I will solve 3 times 3 which is 9.

$V = 9 \times 3$

So, now my equation is 9 times 3, which equals 27 cubic units. So the volume of the cube is 27 meters cubed . This means that the entire space inside the cube is 27 square meters.



Now, let's create a graph to compare the height of the cube to the total volume of the cube. Just like before, let's start by labeling the axes with height and volume since that's what we're comparing.

Then, we can label the numbers, let's count by 3 to make it a little easier. And finally, let's graph the data. We know that the height was 3 units and then the total volume was 27 cubic meters since we had to multiply length times height times width… 3 times 3 times 3, which is 27.

Let's Try it (Slides 7-8): Today, we explored how to use graphs and equations to represent relationships involving area, volume, and exponents. Now, we will work together through different scenarios involving area, volume, and exponents. Remember to use the correct formula and to plug the correct values in each formula and to use the correct unit. We will use graphs and equations to represent the relationships described in each scenario.

WARM WELCOME

We will use graphs and equations to show different kinds of relationships involving area, volume, and exponents

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Let's Review:

Tell me what you know about ratios. Give some examples.

Let's Talk:

What do you know about Area? What do you know about Volume?

Let's Think:

Let's create an equation to represent and solve for the area in this scenario.

A rectangular garden has a length of 6 meters and a width of 4 meters.

Let's Think:

Let's create an equation and graph to represent and solve for the volume in this scenario.

A toy box has a length, width and height of 3 units. Determine the amount of space the toy box has inside of it.

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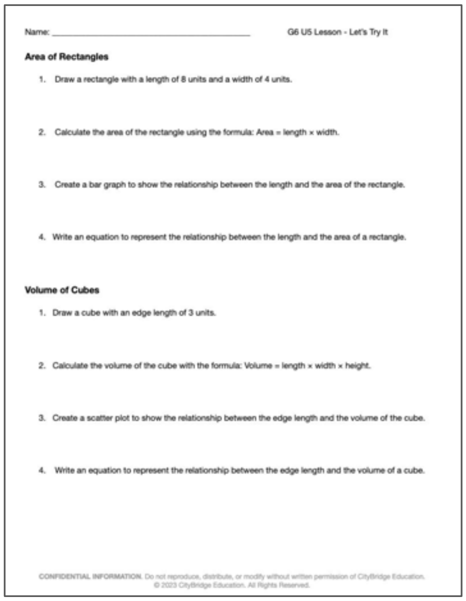
Let's Try It:

Let's practice using equations and graphs together.



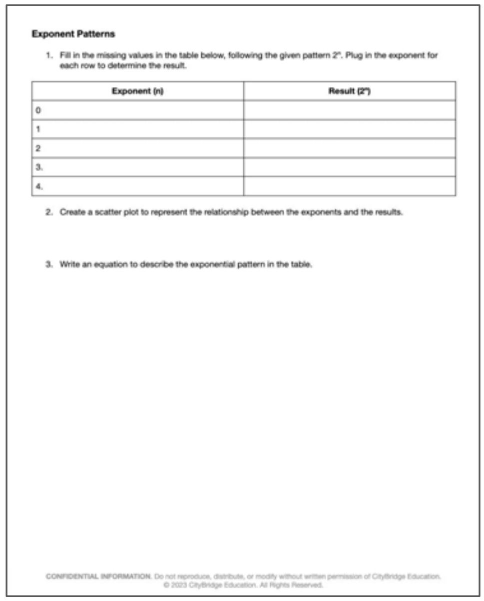
Name: ______________________ G6 U5 Lesson - Let's Try It

Area of Rectangles

1. Draw a rectangle with a length of 8 units and a width of 4 units.
2. Calculate the area of the rectangle using the formula: Area = length × width.
3. Create a bar graph to show the relationship between the length and the area of the rectangle.
4. Write an equation to represent the relationship between the length and the area of a rectangle.

Volume of Cubes

1. Draw a cube with an edge length of 3 units.
2. Calculate the volume of the cube with the formula: Volume = length × width × height.
3. Create a scatter plot to show the relationship between the edge length and the volume of the cube.
4. Write an equation to represent the relationship between the edge length and the volume of a cube.



Exponent Patterns

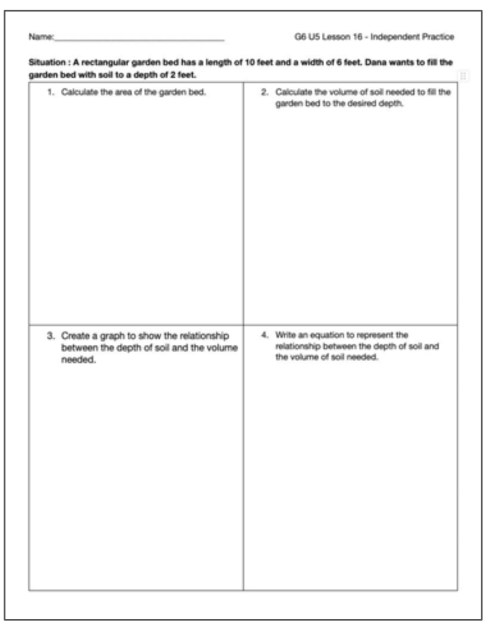
1. Fill in the missing values in the table below, following the given pattern 2^n. Plug in the exponent for each row to determine the result.

Exponent (n)	Result (2^n)
0	
1	
2	
3.	
4.	

2. Create a scatter plot to represent the relationship between the exponents and the results.
3. Write an equation to describe the exponential pattern in the table.

On your Own:

Now try practicing using equations and graphs on your own.



Name: ______________________ G6 U5 Lesson 16 - Independent Practice

Situation : A rectangular garden bed has a length of 10 feet and a width of 6 feet. Dana wants to fill the garden bed with soil to a depth of 2 feet.

1. Calculate the area of the garden bed.	2. Calculate the volume of soil needed to fill the garden bed to the desired depth.
3. Create a graph to show the relationship between the depth of soil and the volume needed.	4. Write an equation to represent the relationship between the depth of soil and the volume of soil needed.

1. Draw a rectangle with a length of 8 units and a width of 4 units.

2. Calculate the area of the rectangle using the formula: Area = length × width.

3. Create a graph to show the relationship between the length and the area of the rectangle.

4. Write an equation to represent the relationship between the length and the area of a rectangle.

Volume of Cubes

1. Draw a cube with an edge length of 3 units.

2. Calculate the volume of the cube with the formula: Volume = length × width × height.

3. Create a graph to show the relationship between the edge length and the volume of the cube.

4. Write an equation to represent the relationship between the edge length and the volume of a cube.

Exponent Patterns

1. Fill in the missing values in the table below, following the given pattern 2^n. Plug in the exponent for each row to determine the result.

Exponent (n)	Result (2^n)
0	
1	
2	
3.	
4.	

2. Create a scatter plot to represent the relationship between the exponents and the results.

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Situation : A rectangular garden bed has a length of 10 feet and a width of 6 feet. Dana wants to fill the garden bed with soil to a depth of 2 feet.

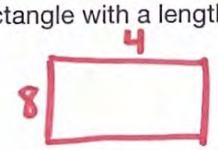
1. Calculate the area of the garden bed.	2. Calculate the volume of soil needed to fill the garden bed to the desired depth.
3. Create a graph to show the relationship between the depth of soil and the volume needed.	4. Write an equation to represent the relationship between the depth of soil and the volume of soil needed.

Name: Answer Key

G6 U5 Lesson 16 - Let's Try It

Area of Rectangles

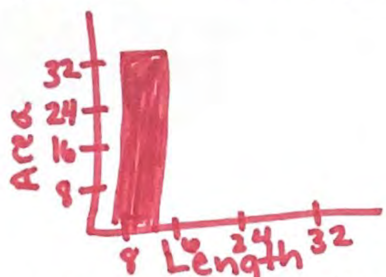
1. Draw a rectangle with a length of 8 units and a width of 4 units.



2. Calculate the area of the rectangle using the formula: Area = length × width.

$A = L \cdot W$
$A = 8 \cdot 4$
$A = 32u^2$

3. Create a graph to show the relationship between the length and the area of the rectangle.



4. Write an equation to represent the relationship between the length and the area of a rectangle.

8:32 $32 = 8 \cdot 4$

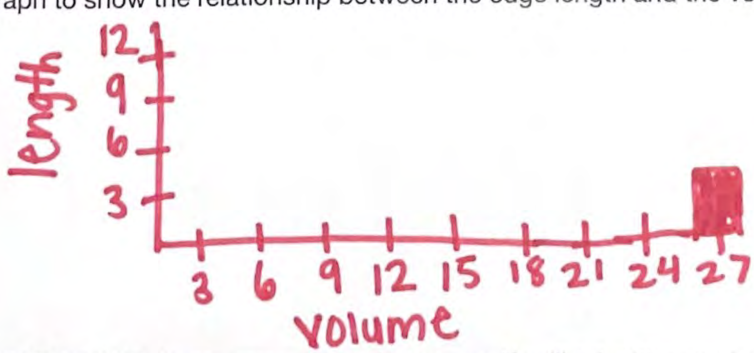
Volume of Cubes

1. Draw a cube with an edge length of 3 units.

2. Calculate the volume of the cube with the formula: Volume = length × width × height.

$V = L \times W \times H$
$V = 3 \cdot 3 \cdot 3$
$V = 27$

3. Create a graph to show the relationship between the edge length and the volume of the cube.



4. Write an equation to represent the relationship between the edge length and the volume of a cube.

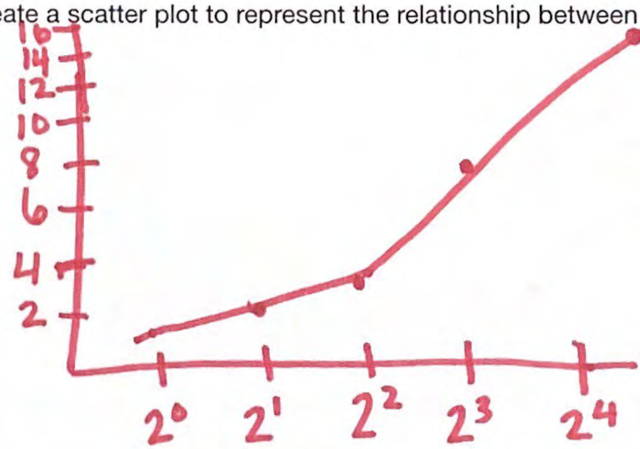
3:27 27=3·3

Exponent Patterns

1. Fill in the missing values in the table below, following the given pattern 2^n. Plug in the exponent for each row to determine the result.

Exponent (n)	Result (2^n)
0	$2^0 = 1$
1	$2^1 = 2$
2	$2^2 = 4$
3.	$2^3 = 8$
4.	$2^4 = 16$

2. Create a scatter plot to represent the relationship between the exponents and the results.



3. Write an equation to describe the exponential pattern in the table.

2^n

Name: Answer Key

G6 U5 Lesson 16 - Independent Practice

Situation : A rectangular garden bed has a length of 10 feet and a width of 6 feet. Dana wants to fill the garden bed with soil to a depth of 2 feet.

1. Calculate the area of the garden bed.

$A = L \cdot W$

$A = 10 \cdot 6$

$A = 60 ft^2$

2. Calculate the volume of soil needed to fill the garden bed to the desired depth.

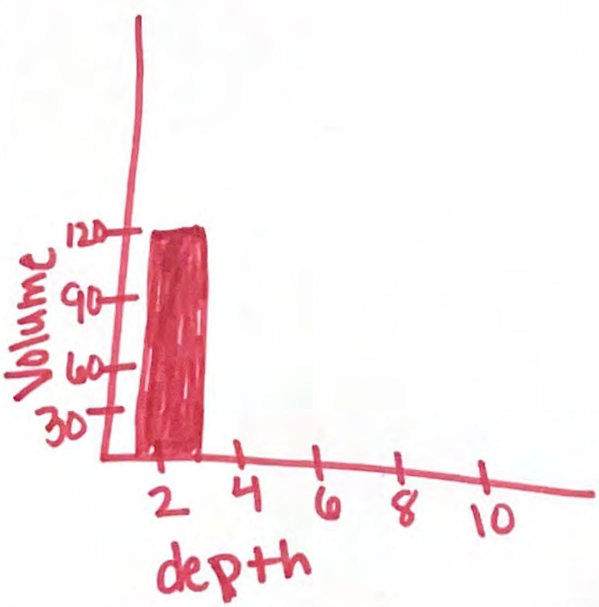
$V = L \cdot W$

$V = 10 \cdot 6 \cdot 2$

$V = 60 \cdot 2$

$V = 120 ft^3$

3. Create a graph to show the relationship between the depth of soil and the volume needed.



4. Write an equation to represent the relationship between the depth of soil and the volume of soil needed.

$120 = 10 \cdot 6 \cdot 2$

120:2