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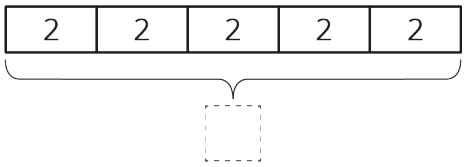
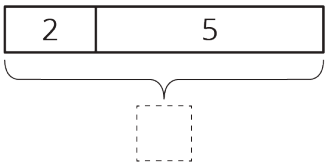
Unit 6, Lesson 1: Tape Diagrams and Equations

Let's see how tape diagrams and equations can show relationships between amounts.

1.1: Which Diagram is Which?

Here are two diagrams. One represents $2 + 5 = 7$. The other represents $5 \cdot 2 = 10$. Which is which? Label the length of each diagram.



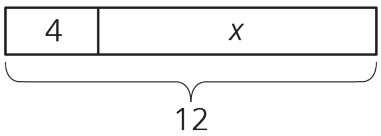


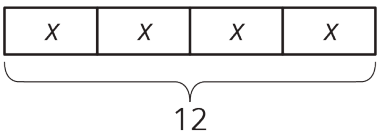
Draw a diagram that represents each equation.

1. $4 + 3 = 7$
2. $4 \cdot 3 = 12$

1.2: Match Equations and Tape Diagrams

Here are two tape diagrams. Match each equation to one of the tape diagrams.





1. $4 + x = 12$
2. $12 \div 4 = x$
3. $4 \cdot x = 12$
4. $12 = 4 + x$
5. $12 - x = 4$
6. $12 = 4 \cdot x$
7. $12 - 4 = x$
8. $x = 12 - 4$
9. $x + x + x + x = 12$

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1.3: Draw Diagrams for Equations

For each equation, draw a diagram and find the value of the unknown that makes the equation true.

1. $18 = 3 + x$

2. $18 = 3 \cdot y$

Are you ready for more?

You are walking down a road, seeking treasure. The road branches off into three paths. A guard stands in each path. You know that only one of the guards is telling the truth, and the other two are lying. Here is what they say:

- Guard 1: The treasure lies down this path.
- Guard 2: No treasure lies down this path; seek elsewhere.
- Guard 3: The first guard is lying.

Which path leads to the treasure?

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Lesson 1 Summary

Tape diagrams can help us understand relationships between quantities and how operations describe those relationships.

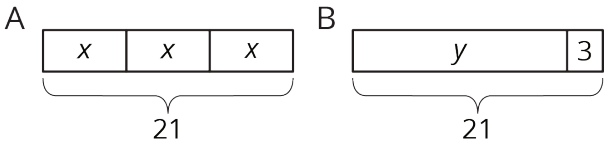

Diagram A has 3 parts that add to 21. Each part is labeled with the same letter, so we know the three parts are equal. Here are some equations that all represent diagram A:

$x + x + x = 21$

$3 \cdot x = 21$

$x = 21 \div 3$

$x = \frac{1}{3} \cdot 21$

Notice that the number 3 is not seen in the diagram; the 3 comes from counting 3 boxes representing 3 equal parts in 21.

We can use the diagram or any of the equations to reason that the value of x is 7.

Diagram B has 2 parts that add to 21. Here are some equations that all represent diagram B:

$y + 3 = 21$

$y = 21 - 3$

$3 = 21 - y$

We can use the diagram or any of the equations to reason that the value of y is 18.

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Unit 6, Lesson 1: Tape Diagrams and Equations

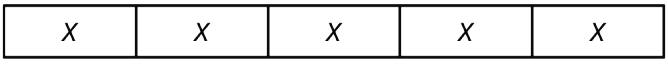
1. Here is an equation: $x + 4 = 17$

   a. Draw a tape diagram to represent the equation.

   b. Which part of the diagram shows the quantity x? What about 4? What about 17?

   c. How does the diagram show that $x + 4$ has the same value as 17?

2. Diego is trying to find the value of x in $5 \cdot x = 35$. He draws this diagram but is not certain how to proceed.



   a. Complete the tape diagram so it represents the equation $5 \cdot x = 35$.

   b. Find the value of x.

3. For each equation, draw a tape diagram and find the unknown value.

   a. $x + 9 = 16$

   b. $4 \cdot x = 28$

4. Match each equation to one of the two tape diagrams.

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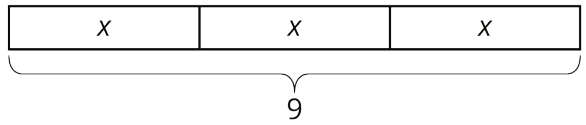
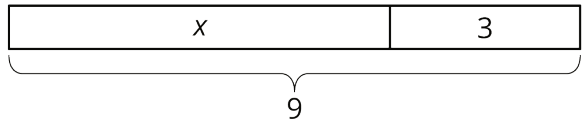
A



B



a. $x + 3 = 9$
b. $3 \cdot x = 9$
c. $9 = 3 \cdot x$
d. $3 + x = 9$
e. $x = 9 - 3$
f. $x = 9 \div 3$
g. $x + x + x = 9$

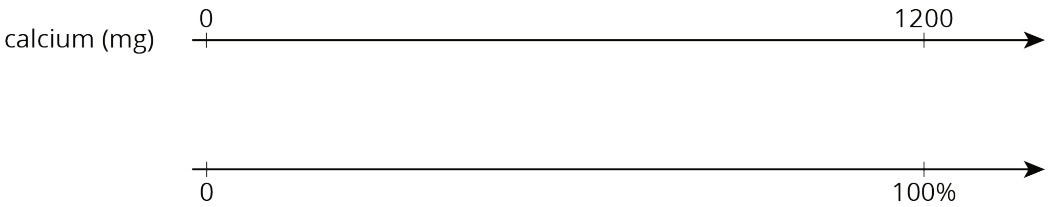
5. A shopper paid $2.52 for 4.5 pounds of potatoes, $7.75 for 2.5 pounds of broccoli, and $2.45 for 2.5 pounds of pears. What is the unit price of each item she bought? Show your reasoning.

(from Unit 5, Lesson 13)

6. A sports drink bottle contains 16.9 fluid ounces. Andre drank 80% of the bottle. How many fluid ounces did Andre drink? Show your reasoning.

(from Unit 3, Lesson 14)

7. The daily recommended allowance of calcium for a sixth grader is 1,200 mg. One cup of milk has 25% of the recommended daily allowance of calcium. How many milligrams of calcium are in a cup of milk? If you get stuck, consider using the double number line.



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(from Unit 3, Lesson 11)