NAME   DATE   PERIOD

Unit 6, Lesson 7: Reasoning about Solving Equations (Part 1)

Let's see how a balanced hanger is like an equation and how moving its weights is like solving the equation.

7.1: Hanger Diagrams

In the two diagrams, all the triangles weigh the same and all the squares weigh the same.

For each diagram, come up with . . .

1. One thing that *must* be true

2. One thing that *could* be true

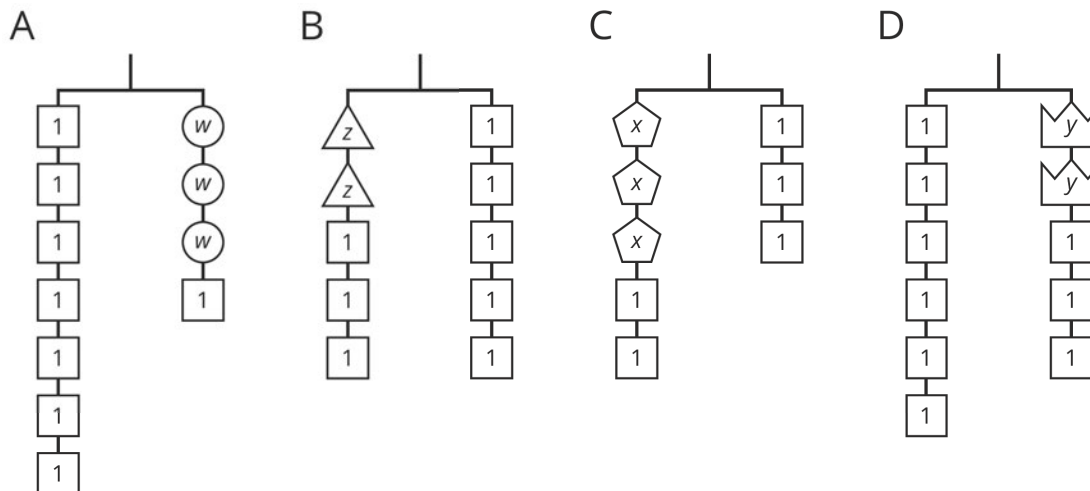3. One thing that *cannot possibly* be true

7.2: Hanger and Equation Matching

On each balanced hanger, figures with the same letter have the same weight.

- $2\boxed{} + 3 = 5$

- $3\boxed{} + 2 = 3$

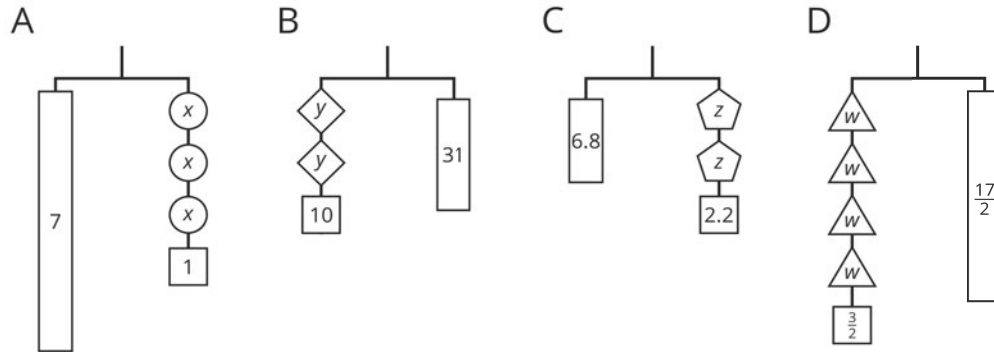- $6 = 2\boxed{} + 3$

- $7 = 3\boxed{} + 1$

1. Match each hanger to an equation. Complete the equation by writing x, y, z, or w in the empty box.

2. Find the solution to each equation. Use the hanger to explain what the solution means.

## 7.3: Use Hangers to Understand Equation Solving

Here are some balanced hangers where each piece is labeled with its weight. For each diagram:

1. Write an equation.

2. Explain how to figure out the weight of a piece labeled with a letter by reasoning about the diagram.

3. Explain how to figure out the weight of a piece labeled with a letter by reasoning about the equation.

Lesson 7 Summary

In this lesson, we worked with two ways to show that two amounts are equal: a balanced hanger and an equation. We can use a balanced hanger to think about steps to finding an unknown amount in an associated equation.

The hanger shows a total weight of 7 units on one side that is balanced with 3 equal, unknown weights and a 1-unit weight on the other. An equation that represents the relationship is $7 = 3x + 1$.
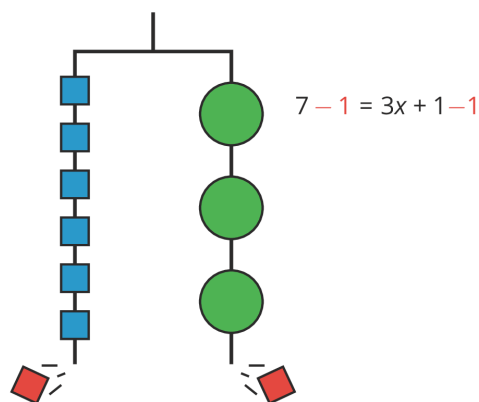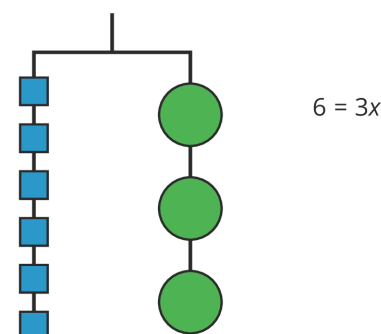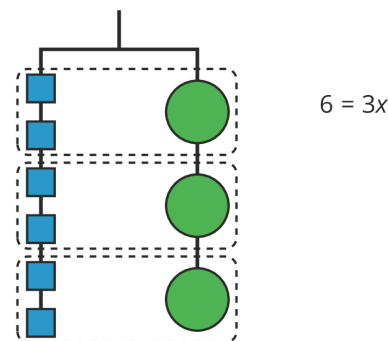

$7 = 3x + 1$
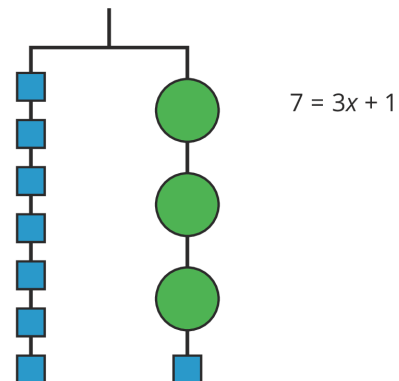
We can remove a weight of 1 unit from each side and the hanger will stay balanced. This is the same as subtracting 1 from each side of the equation.
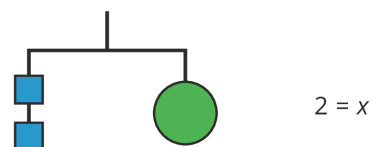
$7 - 1 = 3x + 1 - 1$

An equation for the new balanced hanger is $6 = 3x$.

$6 = 3x$

So the hanger will balance with $\frac{1}{3}$ of the weight on each side: $\frac{1}{3} \cdot 6 = \frac{1}{3} \cdot 3x$.

$6 = 3x$

The two sides of the hanger balance with these weights: 6 1-unit weights on one side and 3 weights of unknown size on the other side.

$2 = x$

Here is a concise way to write the steps above:

$7 = 3x + 1$
$6 = 3x$ after subtracting 1 from each side
$2 = x$ after multiplying each side by $\frac{1}{3}$

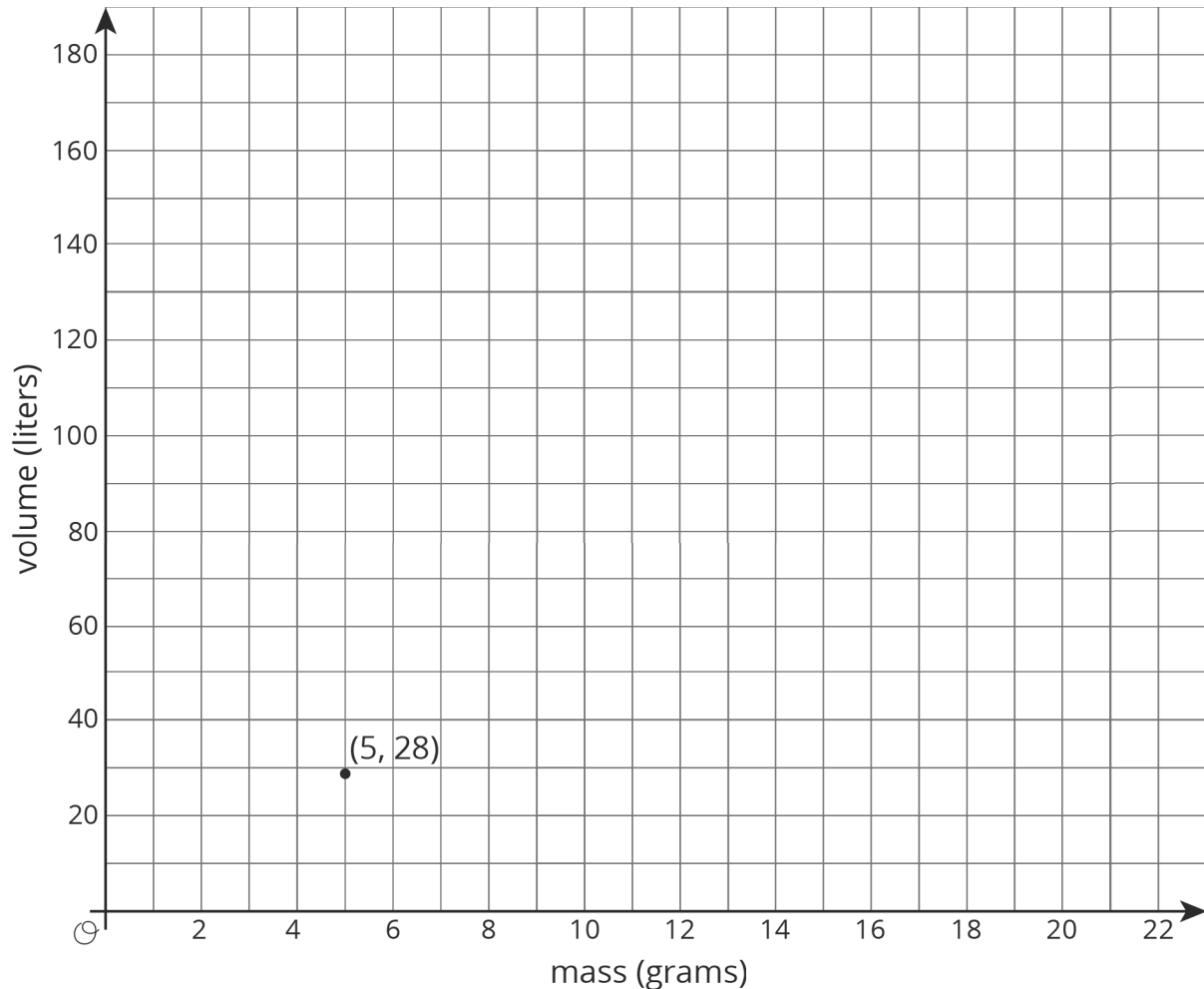NAME   DATE   PERIOD

Unit 6, Lesson 7: Reasoning about Solving Equations (Part 1)

1. There is a proportional relationship between the volume of a sample of helium in liters and the mass of that sample in grams. If the mass of a sample is 5 grams, its volume is 28 liters. (5, 28) is shown on the graph below.

a. What is the constant of proportionality in this relationship?

b. In this situation, what is the meaning of the number you found in part a?

c. Add at least three more points to the graph above, and label with their coordinates.

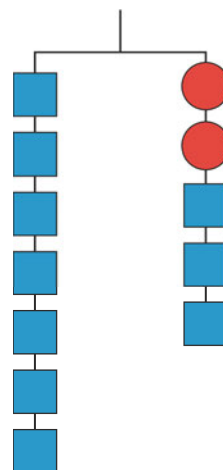d. Write an equation that shows the relationship between the mass of a sample of helium and its
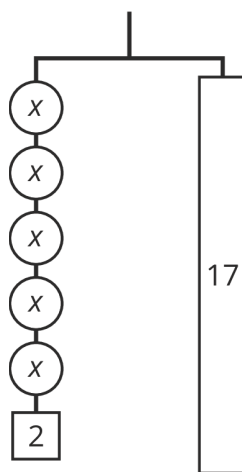
volume. Use m for mass and v for volume.

(from Unit 2, Lesson 11)

2. Explain how the parts of the balanced hanger compare to the parts of the equation.

$$7 = 2x + 3$$

3. Here is a hanger:

a. Write an equation to represent the hanger.

b. Draw more hangers to show each step you would take to find x. Explain your reasoning.

c. Write an equation to describe each hanger you drew. Describe how each equation matches its hanger.