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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

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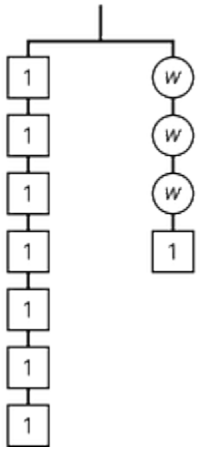
7.2 Hanger and Equation Matching

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

A



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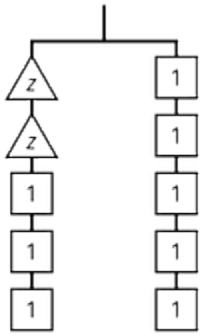

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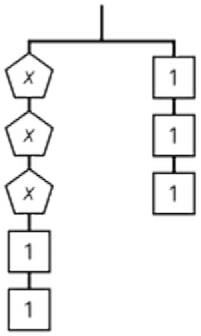

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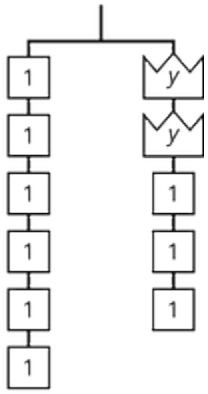

- $2\square + 3 = 5$
- $3\square + 2 = 3$
- $6 = 2\square + 3$
- $7 = 3\square + 1$

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.

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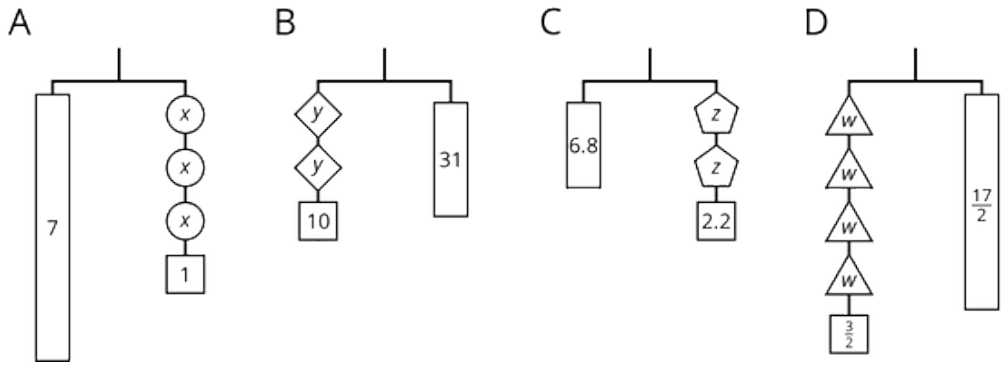
7.3 Use Hangers to Understand Equation Solving



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.

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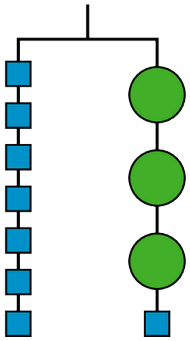
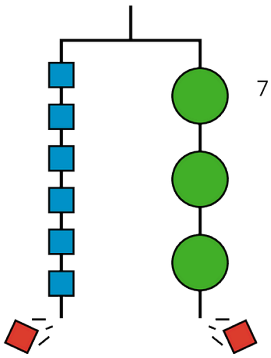
The hanger shows a total weight of 7 units on one side that is balanced with 3 equal, unknown weights and a 1-unit weight on the other. An equation that represents the relationship is $7 = 3x + 1$.



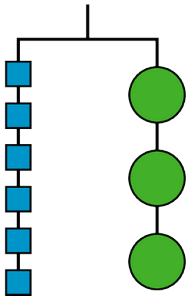
$7 = 3x + 1$

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.



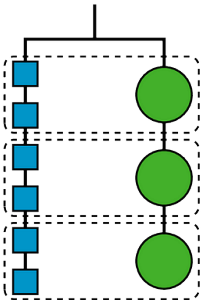
$7 - 1 = 3x + 1 - 1$

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



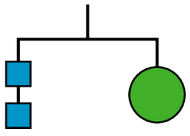
$6 = 3x$

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:

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$7 = 3x + 1$

$6 = 3x$ after subtracting 1 from each side

$2 = x$ after multiplying each side by $\frac{1}{3}$