Lesson 1: Hanging in the balance

Warm Up:
What's going on in your brain when you do math?

Think about how you use arithmetic to find the value of an expression like:

9 + 7 + 2 + 3 + 8 + 1 + 4 + 5

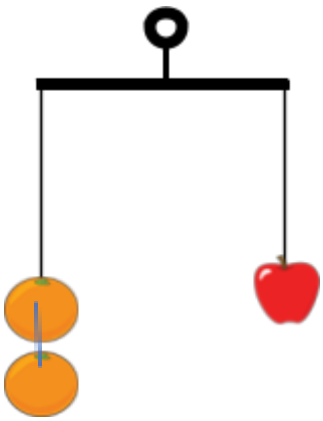
1. Share how you solved this problem with a partner. Did you and your partner find the answer the same way or did you use a different way?

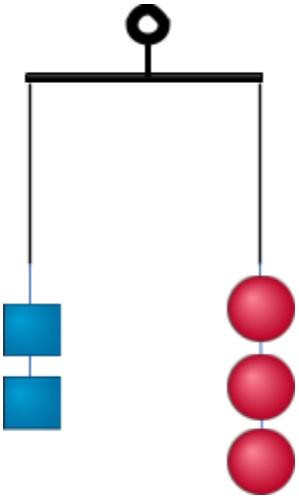
2. Come up with another strategy different from your original to figure out the sum. Show your work or explain your reasoning.

So, a lot is going on in our brains as we do math -- as we **juggle information, go off autopilot**, and try to **see things differently**. You might remember that we also talked about cognitive flexibility -- when you need to pivot to see things differently.

Hanger Models

Alexis remembers passing by food and gift shops on International Street. After a few rides they make their way back to International Street and see a gift shop that has the following mobiles on display.





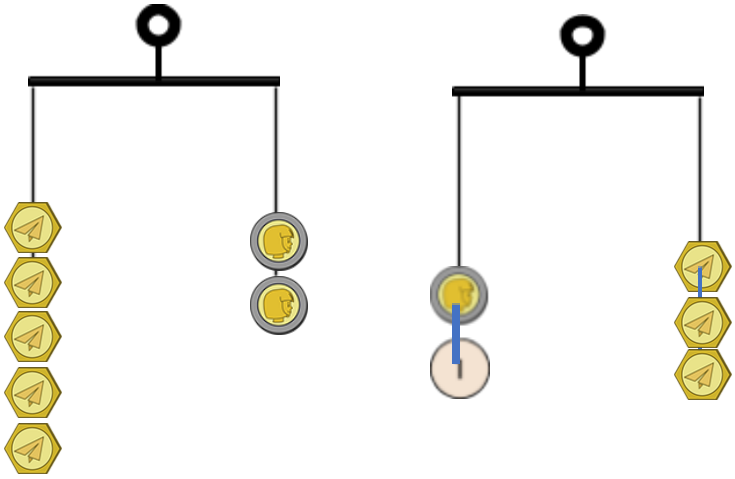
The group notices that all the hangers are balanced. Gabriel also remembers that his grandmother gave him money to buy a mobile for his sister. So, they enter the gift shop to look around and see many other mobiles on display.

3. Have you seen a mobile with hanging objects before? Why do you think some of these are balanced?

4. From the mobiles shown on the previous page, what do you know about the weights of some of the hanging objects?

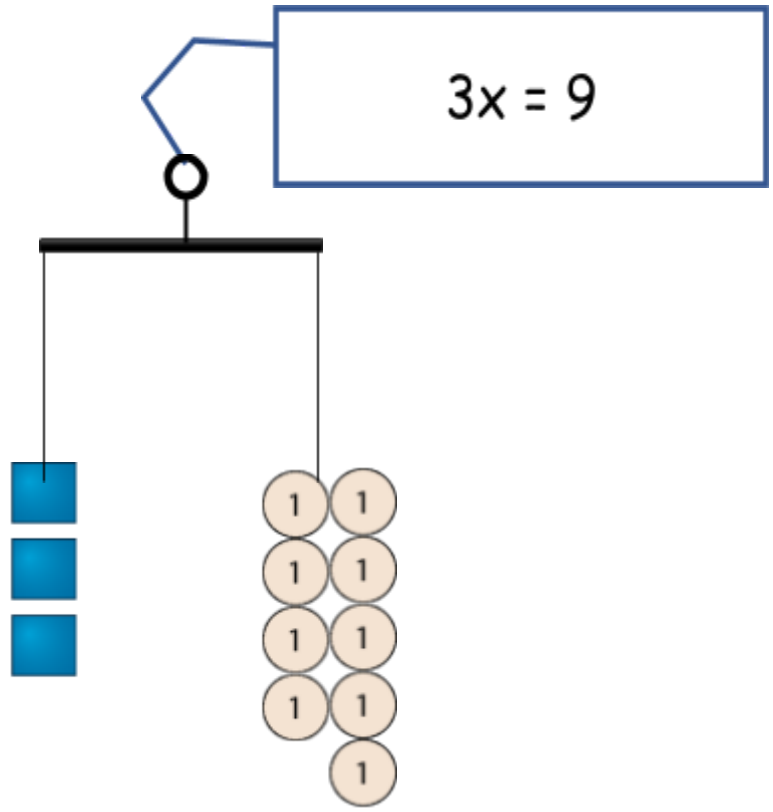
5. Sam says, “It looks like an orange is twice as heavy as an apple.” Do you agree or disagree with Sam? Explain.

6. Here are some other mobiles on display. These are also called hanger models. What are some ways to describe what is included on each hanger model?

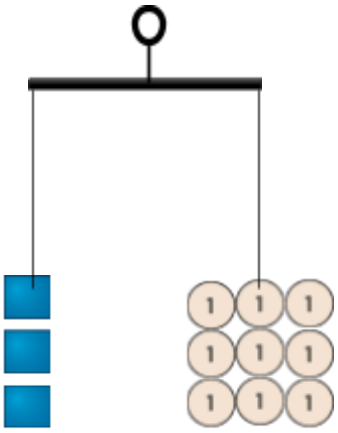


7. Describe both hanger models using mathematical expressions.

Kayla notices that many of the hanger models have a price tag that includes an abbreviation of the model on the back. It is a code that looks like this:

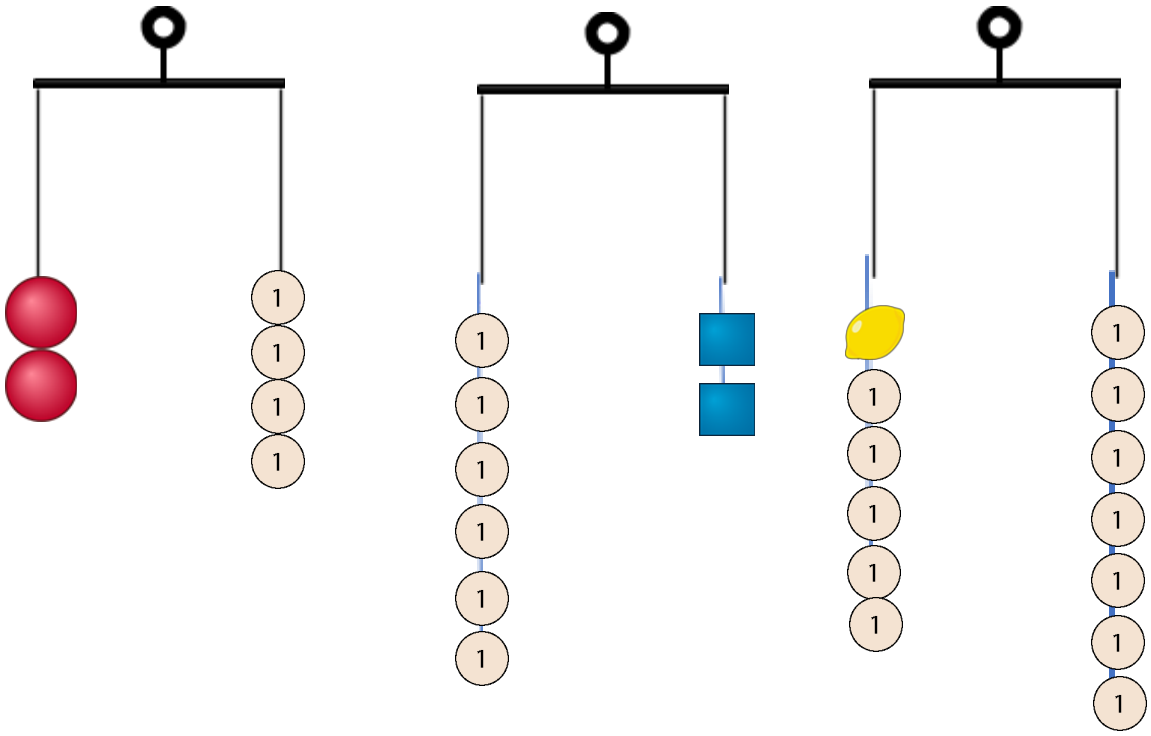


One strategy to figure out how much each square weighs is to rearrange the model to line up the weights with the squares, as shown below.



Now we can see that each blue square matches up to three of the one unit weights.

8. Below are a set of hanger models. Match each hanger model to the best equation that describes the hanger. Discuss with another student why you think your choices make sense.



a) $2y = 4$

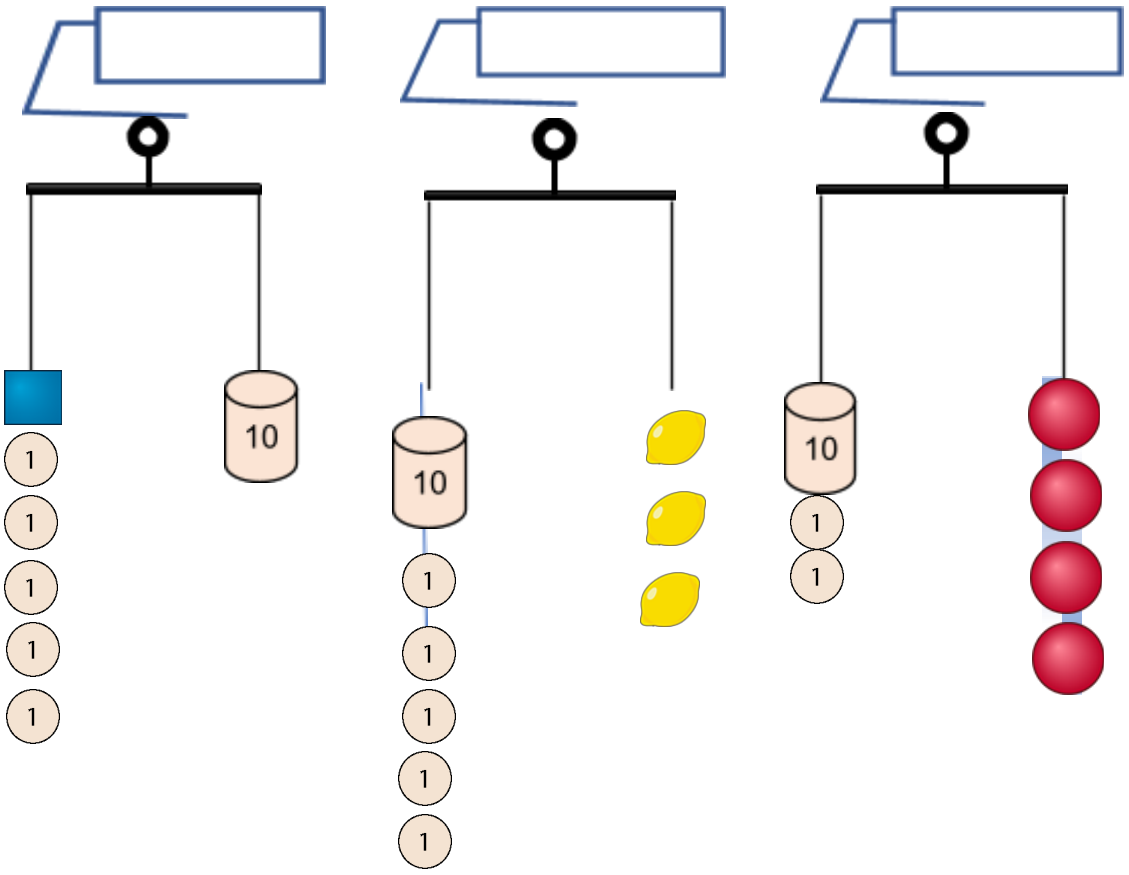
b) $a + 5 = 7$

c) $6 = x + x$

9. For the equations above, use what you know about equality to find a value for *a*, *x* and *y*.

a= _____ x= _____ y= _____

10. Some of the hanger models do not have abbreviations on the tag. Which equations would you use to describe each of these hanger models? Write them in the price tags attached.



11. Explain how you would find the weight of each shape used in your equations. Then, fill in the weight of each item below.

a. Blue Square= _____

b. Yellow Lemon= _____

c. Red Circle= _____

Summary

After hanging out in the gift shop, the group of friends learns about hanger models and codes. Hanger models can be used to describe equations. You can also find the weight of the variables for these equations using operations like subtraction and division.

We learned that when we subtract the same objects from both sides of a hanger model that is balanced, the model will stay balanced. We can also use the same method to solve equations – the codes for the balanced hanger models. When working with more than one object or group that are all the same, we can use division to find the weight of objects or groups.

12. Choose a shape to use for each variable and sketch a hanger model for the following price tag codes.

    a. $y + 5 = 8$

    b. $6 = 2c$