Understand Multiplication as Scaling

LESSON 21

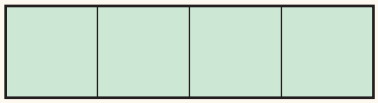
Dear Family,

This week your child is exploring multiplication as scaling.

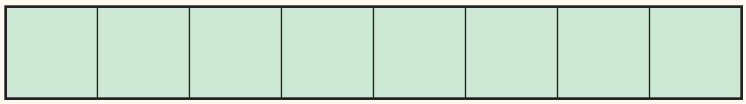
Scaling is resizing a quantity through multiplication. You can think of scaling as stretching or shrinking.

You can *stretch*, or increase, a quantity by multiplying the quantity by a factor greater than 1. You can *shrink,* or decrease, a quantity by multiplying the quantity by a factor less than 1.

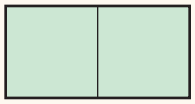
Look at the length of the bar below. It has a length of 4 units.



If you multiply the length by 2, you double the length of the bar.



If you multiply the original length by $\frac{1}{2}$, you shrink the bar to half its original length.



Your child is learning to generalize about multiplication and scaling. Multiplying by a number . . .

- greater than 1 increases the quantity.
- less than 1 decreases the quantity.
- equal to 1, such as $\frac{4}{4}$, means that the quantity stays the same.

Invite your child to share what he or she knows about multiplication as scaling by doing the following activity together.

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ACTIVITY MULTIPLICATION AS SCALING

Do this activity with your child to understand multiplication as scaling.

Use the examples below to talk with your child about multiplication as scaling.

- This is the actual size of a pencil that is 4 centimeters long.

- Ask your child the following questions.

1. *What if the pencil were twice as long? How long would it be? How do you know?*

2. *What if the pencil were half as long as the original pencil? How long would it be? How do you know?*

3. *What if the pencil were 3 times as long? Would it be shorter or longer than the original pencil? How do you know?*

4. *What if the pencil were $\frac{3}{4}$ as long? Would it be shorter or longer than the original pencil? How do you know?*

5. *What if the pencil were $\frac{4}{4}$ as long? How would the length of the pencil compare to the length of the original pencil?*

6. *What would it mean to multiply the length of the pencil by $\frac{7}{4}$? How would the length of the pencil change?*

Answers:

1. It would be two times the length of the original pencil, or 8 centimeters. It would be longer than the original pencil because we multiplied by a number greater than 1.

2. It would be half the length of the original pencil, or 2 centimeters. It would be shorter than the original pencil because we multiplied by a number less than 1.

3. It would be longer because we are multiplying by a number greater than 1.

4. It would be shorter because we are multiplying by a number less than 1.

5. It would be the same length as the original pencil because we are multiplying by a number equal to 1.

6. It would be longer because we are multiplying by a number greater than 1.

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