The Shadow Knows

Lesson 13

Building on	7.RP.A.2 Recognize and represent proportional relationships between quantities.
Addressing	8.G.A.5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.
Building toward	8.G.A.4 Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. 8.G.A.5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.

Let's use shadows to find the heights of an object!

OHMAGIF.COM

Today's Goal

❏ I can model a real-world context with similar triangles to find the height of an unknown object.
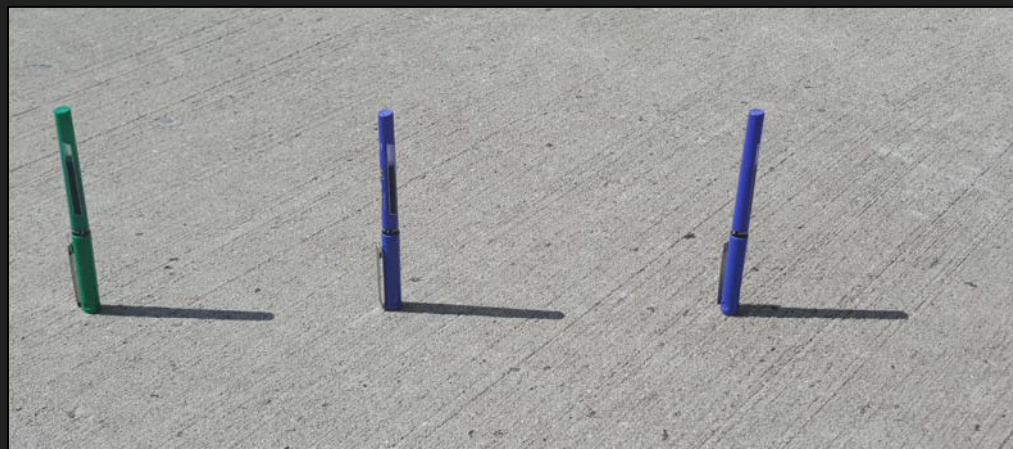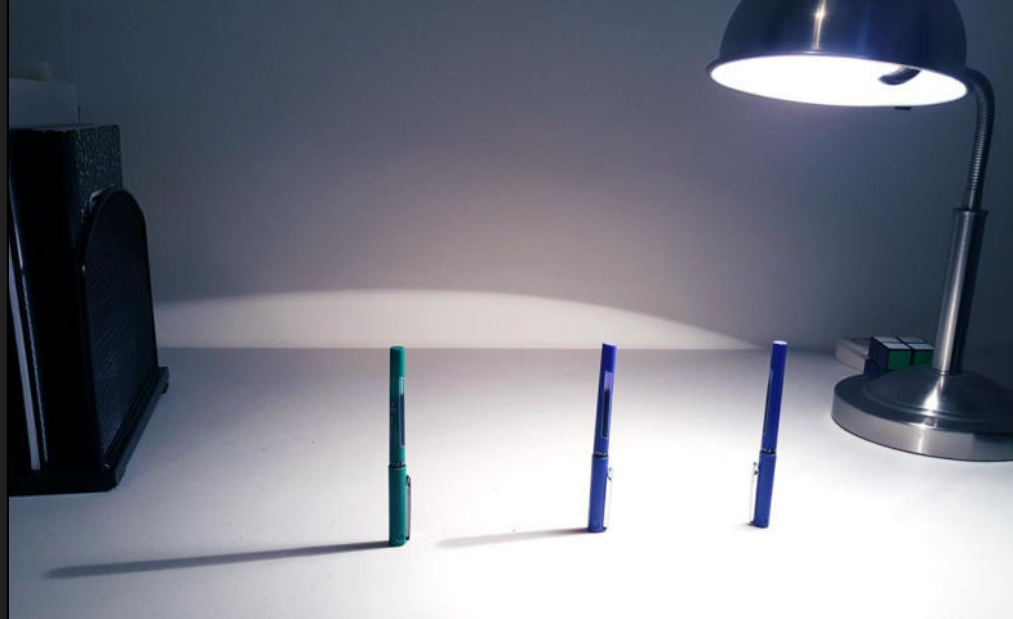
Notice and Wonder:
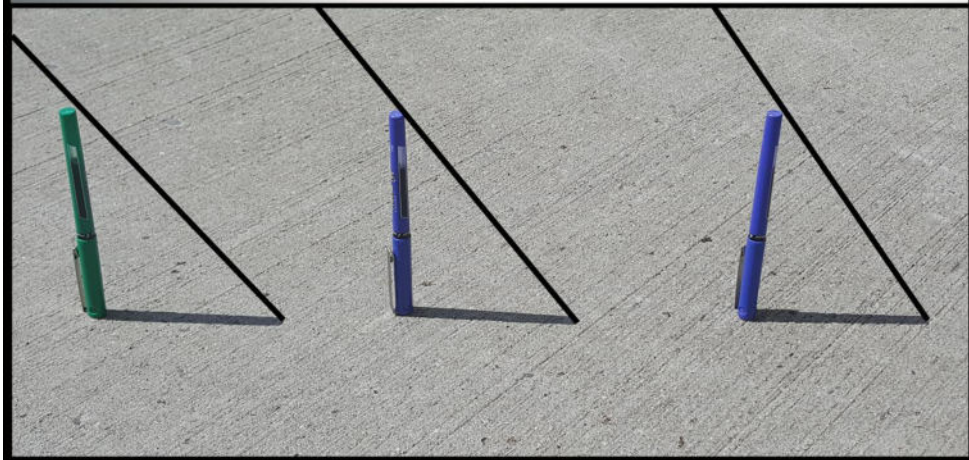
Long Shadows and

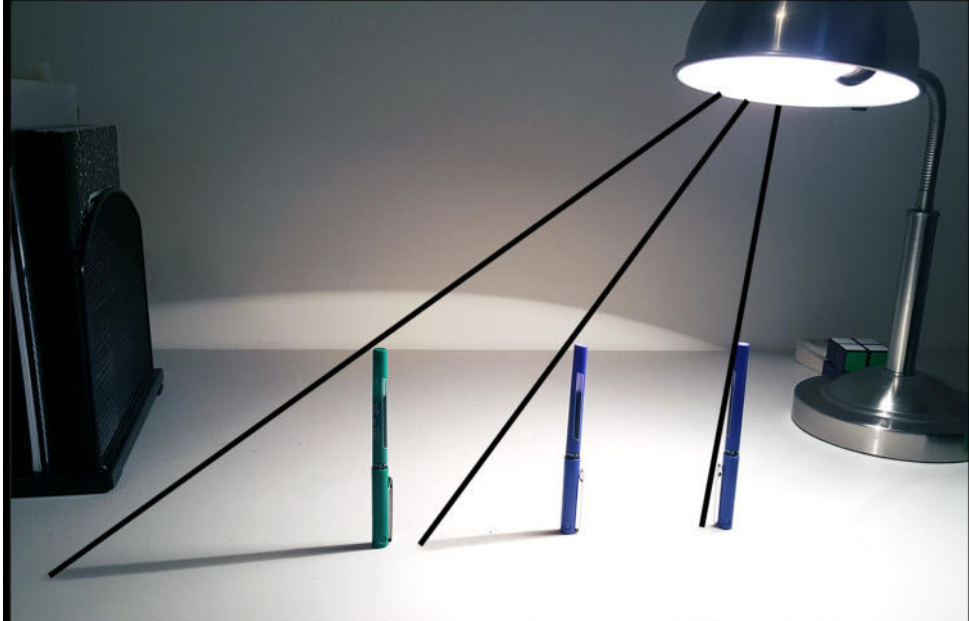# Short Shadows

Warm Up 13.1

- Collect and Display
- Notice and Wonder

What do you notice?
What do you wonder?

Why do the pens have the same length of shadows in the second picture, but not in the first picture?

Objects and Shadows

Activity 13.2

- Collect and Display

How would you measure the height of each person and the lamppost?

Even when something is too tall to measure directly, we can still figure out its height by using the length of its shadow!

Let's look for relationships in the table and use any relationships to make a conjecture about the height of the lamppost.

|	height (inches)	shadow length (inches)
younger boy	43	29
man	72	48
older boy	51	34
lamppost		114

Begin with Quiet Work Time. (2 min)

Share your thinking with your time and continue working together!

- What relationships do you notice between an object's height and the length of its shadow?

- What is your conjecture about the height of the lamppost?

	height (inches)	shadow length (inches)
younger boy	43	29
man	72	48
older boy	51	34
lamppost		114

The height to shadow length relationship is *not* exactly proportional. **What could be some reasons for this difference?**

	height (inches)	shadow length (inches)
younger boy	43	29
man	72	48
older boy	51	34
lamppost		114
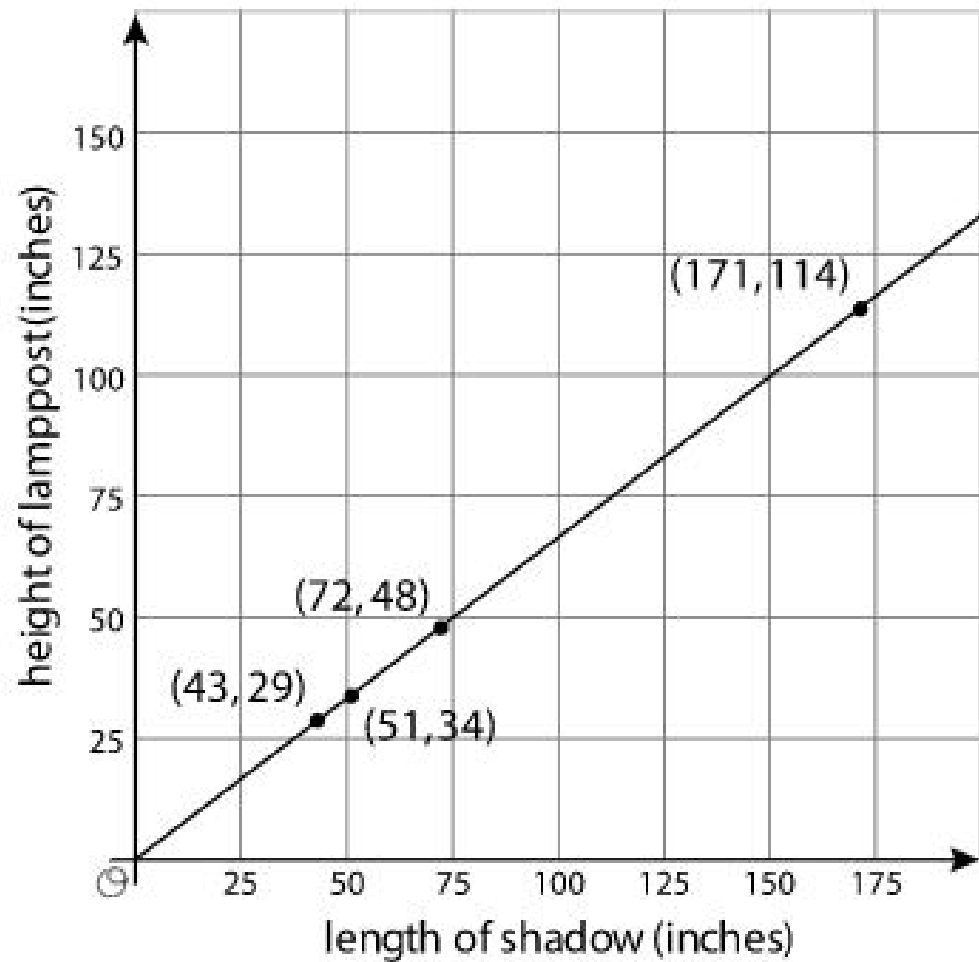
Justifying the Relationship

Activity 13.3
● Stronger and Clearer Each Time
● Collect and Display

Explain *why* the relationship between the height of these objects and the length of their shadows is approximately proportional.

It is often necessary to many simplifying assumptions when modeling a real-world situation.

For this task we have to assume that the light rays Coming from the sun are parallel, that the people and the lamppost are perpendicular to the ground, and that the ground is level.

The Height of a Tall Object

Activity 13.4

Let's apply what we've learned about shadow lengths of different objects to estimate the height of an object outside!

Your task:

➔ Go outside and bring along a measuring device, a pencil, and some paper.

➔ Choose an object whose height is loo large to measure directly. Your teacher may assign you an object.

➔ Use what you have learned to figure out the height of the object! Explain or show your reasoning.

What object did you reason about?

What was your procedure?

What did you notice?

DID YOU KNOW…

Over 2,000 years ago, the ancient Greek mathematician Eratosthenes also studied shadows closely!

He used shadows to estimate the circumference of the Earth…

… with an error of less than 2%!

Today's Goal

❑ I can model a real-world context with similar triangles to find the height of an unknown object.