Unit 1 Lesson 3: Shadow Math

Mathematical Goals

- Determine missing side lengths and areas of similar figures.

STANDARDS ADDRESSED IN THIS TASK

MCC9-12.G.SRT.2 Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.

MCC9-12.G.SRT.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.

MCC9-12.G.SRT.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them by requiring students to interpret and make meaning of a problem and find a logical starting point, and to monitor their progress and change their approach to solving the problem, if necessary.
2. Reason abstractly and quantitatively by requiring students to make sense of quantities and their relationships to one another in problem situations.
3. Construct viable arguments and critique the reasoning of others by engaging students on discussion of why they agree or disagree with responses, decide whether they make sense, and ask useful questions to clarify or improve the arguments.
4. Model with mathematics by expecting students to apply the mathematics concepts they know in order to solve problems arising in everyday situations, and reflect on whether the results are sensible for the given scenario.

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Jeannie is practicing on the basketball goal outside her house. She thinks that the goal seems lower than the 10 ft. goal she plays on in the gym. She wonders how far the goal is from the ground. Jeannie can not reach the goal to measure the distance to the ground, but she remembers something from math class that may help. First, she needs to estimate the distance from the bottom of the goal post to the top of the backboard. To do this, Jeannie measures the length of the shadow cast by the goal post and backboard. She then stands a yardstick on the ground so that it is perpendicular to the ground, and measures the length of the shadow cast by the yardstick. Here are Jeannie's measurements:

Length of shadow cast by goal post and backboard: 5 ft. 9 in.

Length of yardstick's shadow: 1 ft. 6 in.

Draw and label a picture to illustrate Jeannie's experiment. Using her measurements, determine the height from the bottom of the goal post to the top of the backboard.

If the goal is approximately 24 inches from the top of the backboard, how does the height of the basketball goal outside Jeannie's house compare to the one in the gym? Justify your answer.