Unit 3, Lesson 17

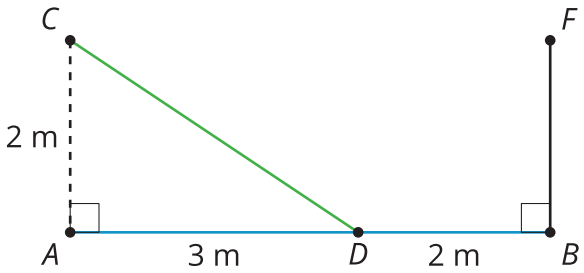
Reflection Similarity

Let's use similarity to solve problems.

17.1 Where Does It Point?

A person stands at point C, 2 meters away from a large mirror, and shines a green laser pointer onto the mirror at point D.

Estimate where along the wall, represented by BF, the laser will hit after it reflects from the mirror. Be prepared to share your reasoning.



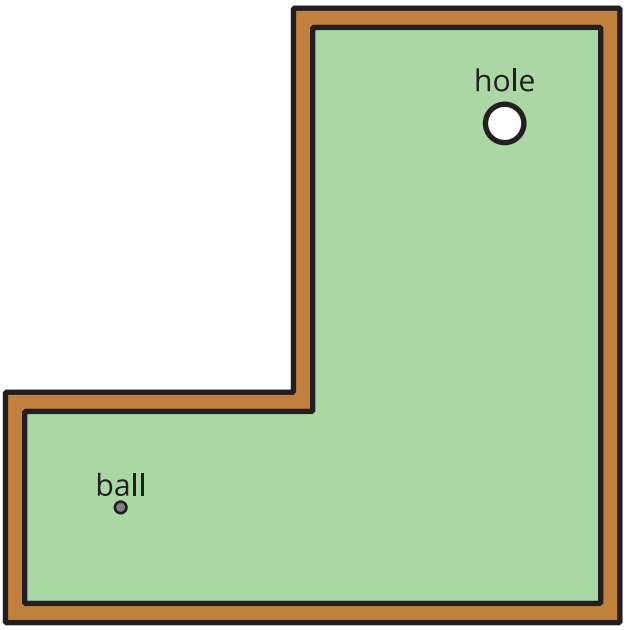
17.2 Bounce It In

You want to hit the cue ball (white) so that it bounces off the bottom rail of the table and then knocks the 5 ball (orange) into the upper right pocket, without hitting any other balls on the table.

Calculate the exact point on the bottom side to aim for, and then precisely draw the path of the ball.

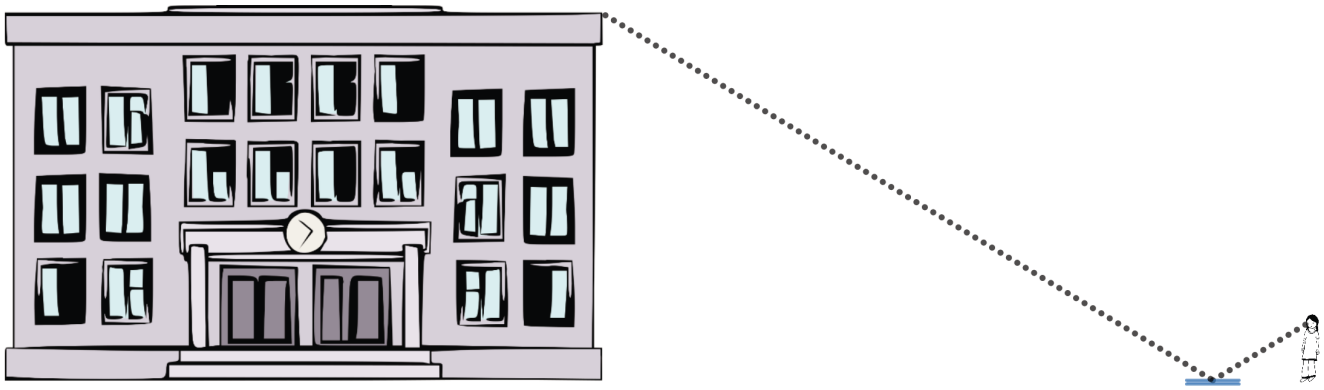
Are you ready for more?

How would you hit the ball so that it goes in the hole after one stroke?



17.3 Indirect Measurement (Mirrors)

Use mirrors to measure the height of a tall object. Label this image with the measurements you made.



Calculate the unknown height.

17.4 Indirect Measurement (No Mirrors)

What if you don't have a mirror when you're trying to measure the height of something too tall to measure directly? Brainstorm as many methods other than the mirror method as you can.

Add to your brainstorm by:

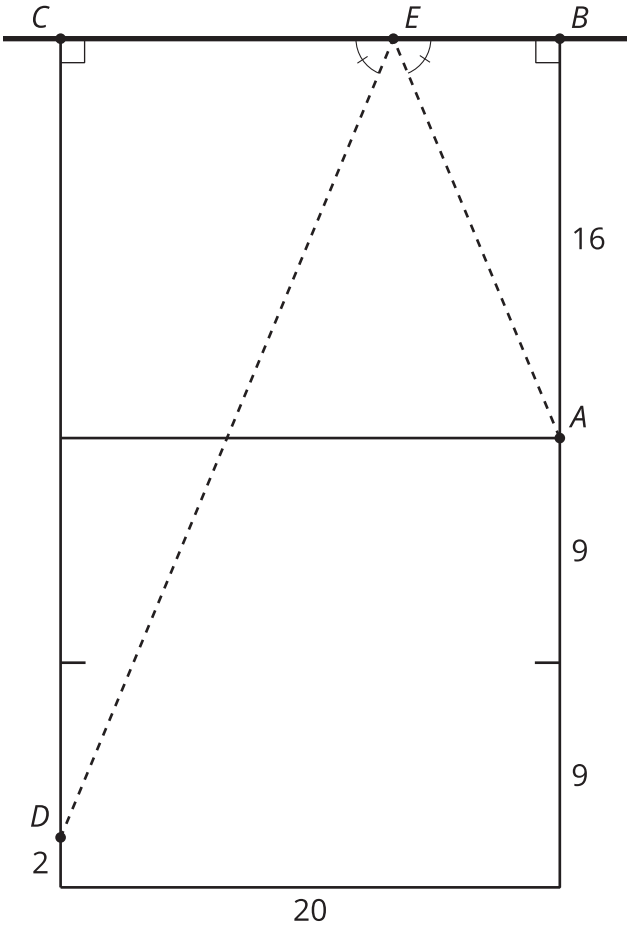
- Imagining that you have access to any tool you can think of.
- Imagining that you have only a piece of scrap paper and a pencil with you.

Pick a method you would like to try, and use it to measure the height of the object that your teacher assigns you.

Lesson 17 Summary

We know that two triangles are similar if they meet the Angle-Angle Triangle Similarity Theorem criteria. One way to create triangles with congruent angles is to use reflection. When light bounces off a mirror or a ball bounces off a hard surface, the angle at which it hits is the same as the angle at which it returns. In one-wall handball people bounce a ball off a wall and try to aim for a spot from which their opponent won't be able to return the ball.

$\angle CED \cong \angle BEA$



Where on the wall should we aim if we're standing at point A and want the ball to land at point D? We know the triangles are similar because of the Angle-Angle Triangle Similarity Theorem. Segment AB corresponds to segment DC. So the scale factor to go from triangle DCE to triangle ABE is $\frac{16}{32}$. Segments BE and CE also correspond so they must have the same scale factor. Because $\frac{16}{32} = \frac{1}{2}$, segments BE and CE must be in a $1 : 2$ ratio. Dividing the 20 foot wall into 3 equal parts tells us that $BE = 6\frac{2}{3}$. In practice it's easier to think about aiming for a third of the way along the wall from the right-hand side than it is to aim for a spot $6\frac{2}{3}$ feet away from point B.