The learner will understand and use measurement concepts.

2

Notes and textbook references

2.01 Determine the effect on perimeter, area or volume when one or more dimensions of two- and three- dimensional figures are changed.

A. Shrinking Triangles (Blackline Master II - 1)

Have students create a Serpinski Triangle by repeated shrinking. Students begin with a large triangle and locate the midpoints of each of its sides. When these midpoints are connected, four new, congruent triangles are formed. Students should be encouraged to find the lengths of the sides of the new triangle and how the area of the smaller triangles compares to the area of the larger.

The process is repeated several times to illustrate the process that results in the Serpenski triangle. With each reduction, students should find that the triangle lengths are halved and the area is only one-fourth of the original.

B. Stations (Blackline Masters II - 9 and II - 10)

Materials: Snap Cubes and a copy of the situations

Students will investigate how changing the dimensions of a figure, both proportionally and not, will affect the surface area and volume. Have students work in small groups and rotate between the four stations. You could also give each group the four situations to work on in one location rather than rotating through stations. Once all four stations or situations have been completed, have a discussion about the relationship between changing dimensions, surface area, and volume of similar figures versus figures that are not similar.

Notes and textbook references

C. 2-D/3-D Activities (Blackline Masters II - 6 and II - 7)

Materials: paper, pencil, graphics calculator

This activity will examine the effect of changing one of the dimensions of a rectangle on its area and its perimeter. The width of the rectangle will remain constant.

Use the Blackline Masters and pencil around the perimeter of 2 by 2, 2 by 3, 2 by 4, 2 by 5, 2 by 6 rectangles.

Compute the area of each rectangle and record the data in the following table. Look for patterns that will assist in developing a rule.

Notes and textbook references

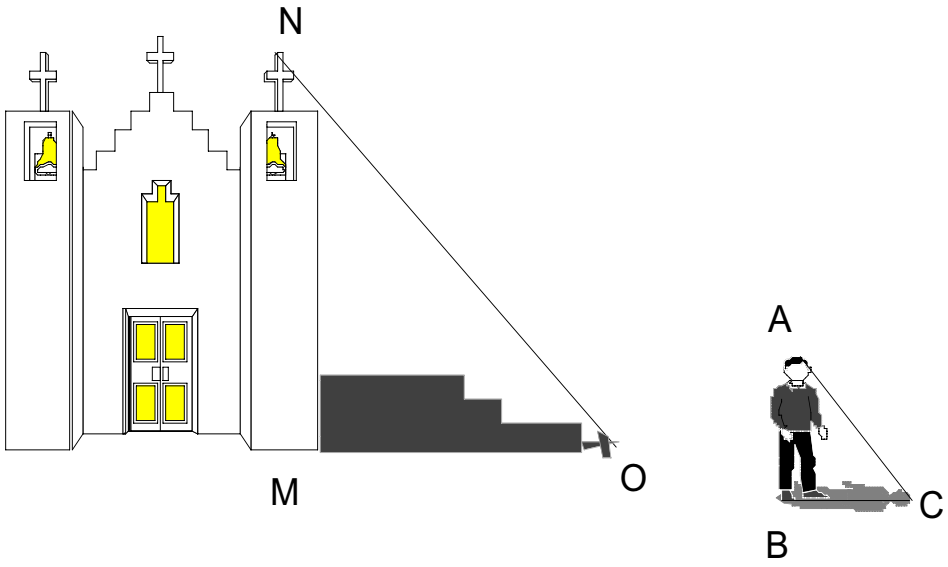
Tips for Problem Solving in Your Class

- Set the expectation that everyone thinks! State a problem and then give everyone a moment to think about it.
- Use think-pair-share to jumpstart your students' problem-solving processes. First they think over the question, then they talk it over in pairs, then each pair shares with a larger group.
- Don't let textbooks or other published supplementary materials thwart the problem-solving process. Be wary of texts that give many drill problems with one word problem that is solved the same way as the previous problems. Also watch out for problem sets that are all basically identical.
- Incorporate group problem solving into your lessons, so students have a chance to observe their peers.
- Use problems from a variety of sources. Ask questions in a variety of ways.
- Ask a variety of questions from the same problem source data. Students begin to anticipate what a question will be without having really read the problem. Keep them flexible in their expectations.
- Expose students to problems in which the numbers they read in the problem are not necessarily the ones they will "crunch" to solve the problem. Use price lists, menus and other materials so that students will search out meaning and not just begin to crunch numbers.

Notes and textbook references

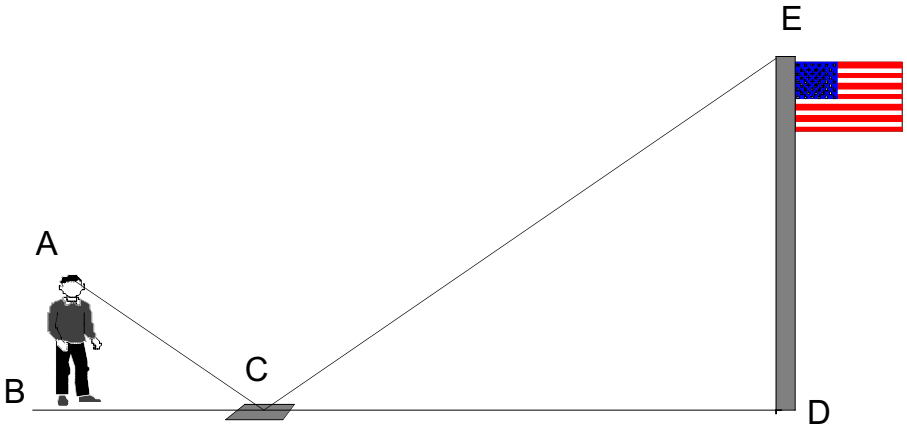
2.02 Apply and use concepts of indirect measurement.

A. Have students use similar figures to solve indirect measurement problems. They can measure the heights of buildings, trees, and flagpoles by using measurements involving the length of the shadows cast.



B. **Mirror, Mirror** (Blackline Masters II - 2 and II - 3)

Materials: Mirror with a point marked on it, tape measure, and calculator. Find the height of a basketball goal, flagpole, or other tall object using similar figures and mirrors. It is important that the surface where the mirror rests is level; therefore, an indoor object might be best. A light fixture in the gym could be a good object to use.



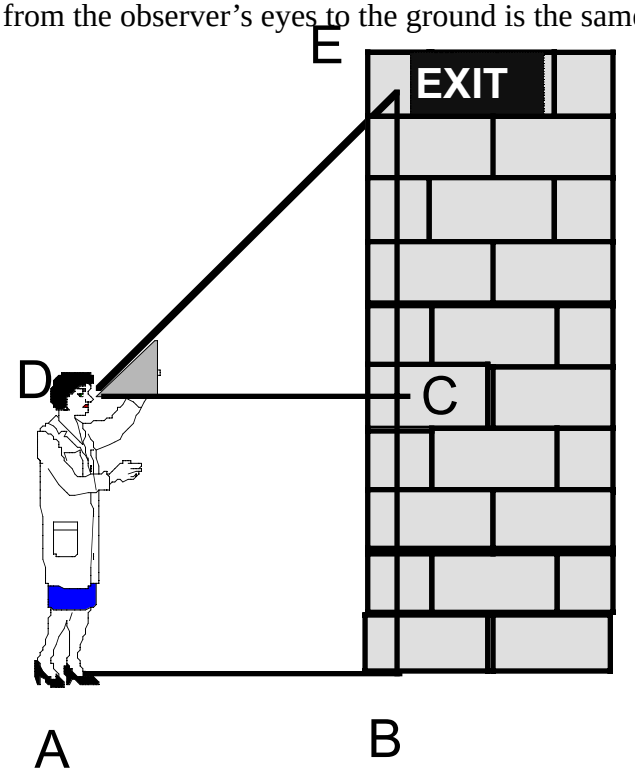
Notes and textbook references

C. Carolina Capers (Blackline Master II - 4)

Materials needed: Carolina Capers handout, ruler, and calculator.
Students will use properties of similar figures to find missing measurements.

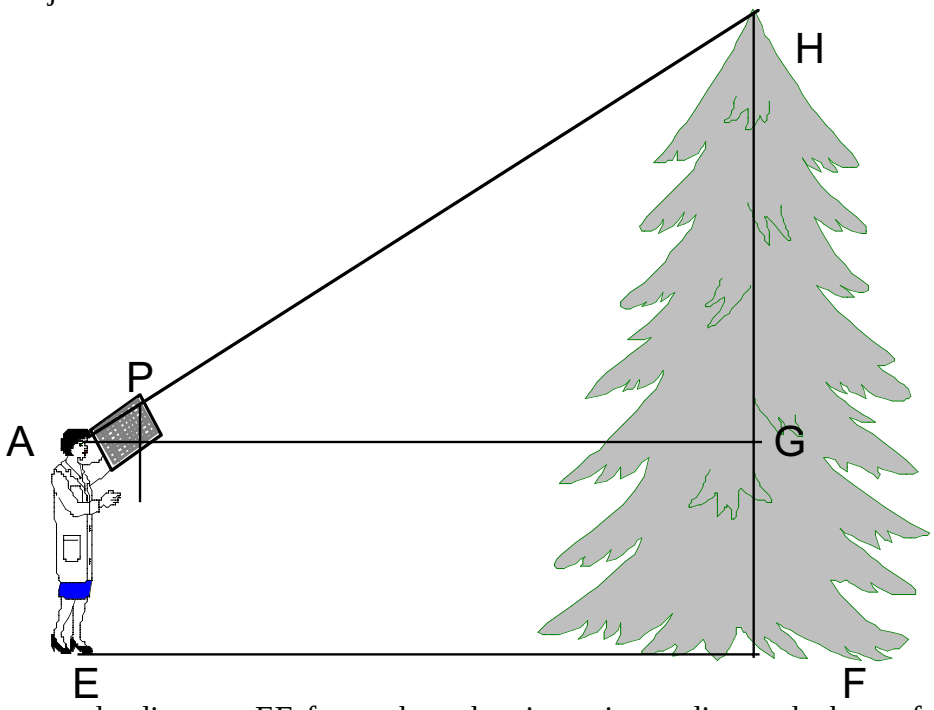
Extension: This problem may also be adapted to find the measures of rectangles in the larger flag, the size of the letters, star, etc. Students can also find the area and perimeter of the original flag. These measurements can then be expressed as ratios. The activity could be adapted to include historical landmarks such as the Outerbanks lighthouses, the Wright Brothers' monument, and the U.S.S. North Carolina.

D. Students may use the following technique to measure heights indirectly. Fold a square piece of paper along a diagonal to form a 45°- 45°- 90° triangle. Sight along the fold (diagonal) to the top of the object to be measured. Keep the bottom of the paper horizontal. The measurer may have to move closer to or away from the object until the line of sight is right. When the object can be sighted according to these directions, measure the distance from the measurer to a point directly below the object. Then the height of the object can be calculated. In the figure below, AB is the same distance as the measurement from the eye to point C. The distance from the observer's eyes to the ground is the same as the distance BC.

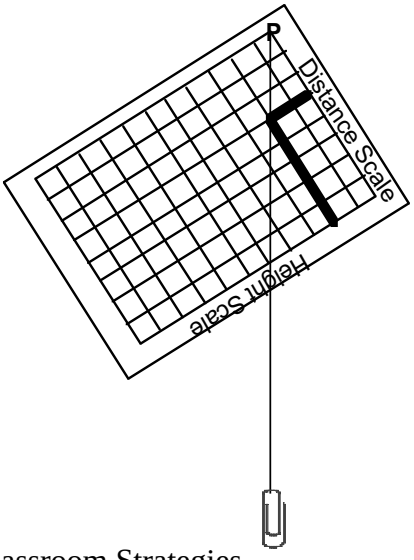


Notes and textbook references

E. Hypsometer (Blackline Master II - 5) Materials needed: Hypsometer pattern printed on cardstock, string, tape measure and weight. On the Hypsometer sheet, cut out the viewfinders and fold them as indicated so the viewer can sight through both holes. Attach a string to point P and a weight to the other end of the string. Sight through the viewers to the top of the object.



Measure the distance, EF, from where the viewer is standing to the base of the object. EF is the same distance as AG. The distance from the eye to the ground is the length of $\overline{AE}$ and $\overline{GF}$. While keeping the Hypsometer sighted at the top of the object, a second student locates the distance EF on the distance scale. From that point on the distance scale, trace along the line perpendicular to the distance scale until it intersects the string. From that point, trace a perpendicular line to the height scale. Add the measurement from the scale to AE to determine the actual height of the object.



F. Computer software such as Geometer's Sketchpad, Geometric Supposer, and even graphics programs such as PowerPoint can enable students to create and explore similar figures.

Notes and textbook references

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