4. True or false: If two kites are similar, then the ratio of the lengths of their corresponding diagonals is equal to the ratio of the lengths of their corresponding sides. If true, write a convincing argument to support the conjecture. If false, show a counterexample that proves it false.

5. If the corresponding sides of two similar triangles are in the ratio of 2 to 3, then what is the ratio of the perimeters (lesser to greater)? What is the ratio of the areas (lesser to greater)? Explain your reasoning.

Exercise Set 12.5

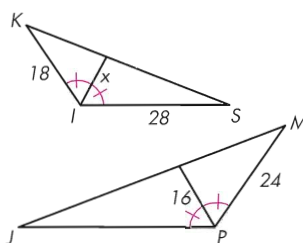Use your new conjectures to solve Exercises 1–12. All measurements are given in centimeters.

1.* $\triangle ICE \sim \triangle AGE$
$h = -?-$
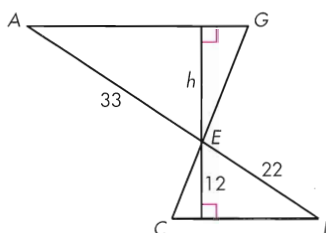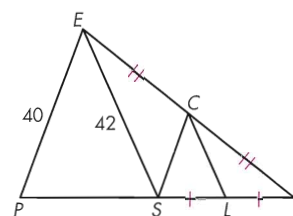

2. $\triangle SKI \sim \triangle JMP$
$x = -?-$

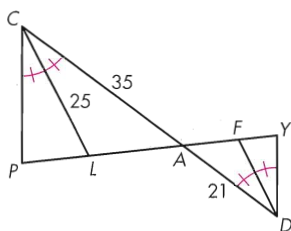**3.*** $\triangle PIE \sim \triangle SIC$
Point S is the midpoint of PI.
$CL = -?-$
$CS = -?-$

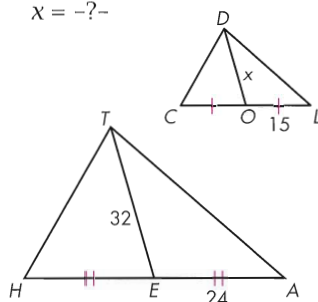**4.** $\triangle CAP \sim \triangle DAY$
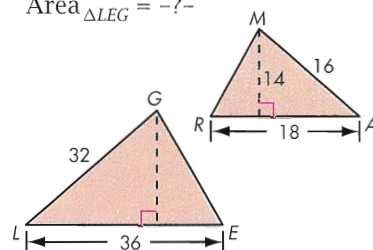$FD = -?-$

5.* $\triangle HAT \sim \triangle CLD$
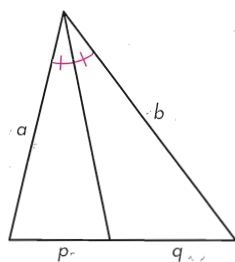$x = -?-$

6. $\triangle ARM \sim \triangle LEG$
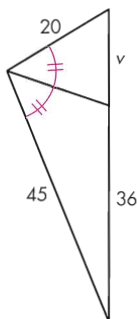$\text{Area}_{\triangle ARM} = -?-$
$\text{Area}_{\triangle LEG} = -?-$

7.* $a/b = -?-$
$a/p = -?-$
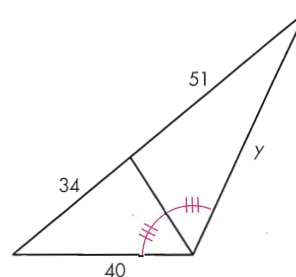

8. $v = -?-$

9. $y = -?-$

10.* $x = $ –?–
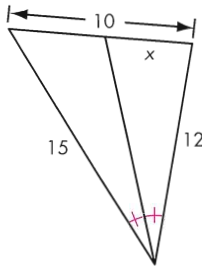
11.* $k = $ –?–
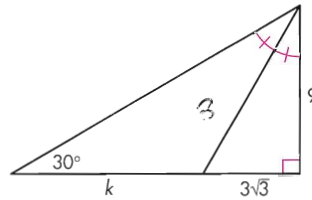
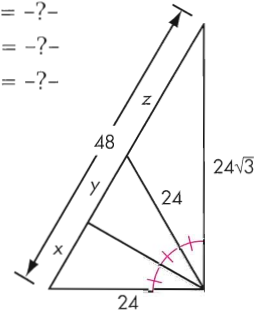**12.*** $x = $ –?–
$y = $ –?–
$z = $ –?–

13.* Aunt Teak has updated her will to leave a very valuable plot of land to her two nephews, Chip and Dale. The plot of land is in the shape of an isosceles right triangle whose equal legs measure 8 kilometers. The will states that the land is to be divided into two parts by bisecting one of the two equal angles. This gives two plots of land of unequal area. The first nephew to calculate the ratio of the two plots of land shall have first choice in selecting his inheritance. What is the ratio of the greater area to the lesser area?

14.* How would you divide a segment *AB* into a ratio of 2 to 3? Conjecture 106 gives you a way to do this, but how? To get you started, here are the first four steps.

|		
Step 1	Construct a segment of any length and label it *AB*.	
Step 2	Construct a second segment. Call its length *x*.	
Step 3	Construct two new segments, one with length 2*x* and the other with length 3*x*. (Any two of the three lengths 2*x*, 3*x*, and *AB* must have a sum greater than the third length. The three segments should make a triangle.)	
Step 4	Construct a triangle with lengths 2*x*, 3*x*, and *AB*. You're on your own from here!	
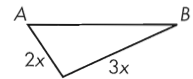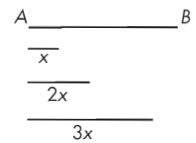
15.* Claudia Lewis and Luella Clark are freelance space explorers and entrepreneurs looking for adventure and quick riches around the moons of Jupiter. They have been searching the unexplored regions of Ganymede and Io for the rare ammonia-tellurium ice crystals called Jupiter's Needles. These rare crystals are in the shape of long, thin rods and are extremely valuable. Claudia has invested 70% of the money for this exploration, so she and Luella will split any rod they discover into the ratio of 7 to 3. If they were to discover the rod shown below, locate the point at which it should be divided. (Trace or copy the length shown below onto another sheet of paper and construct the point that divides the length into the ratio of 7:3.)
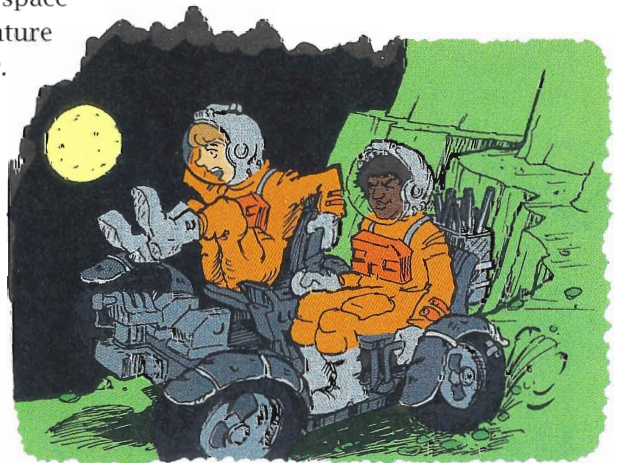

Lewis and Clark: Space Explorers

16. If a rectangle whose dimensions are *a* and *b* has length *a* doubled and width *b* cut in half, for what values of *a* and *b* is the newly-formed rectangle congruent to the original? Equal in perimeter to the original? Equal in area to the original? Similar but not congruent to the original? Explain.

17. A rectangle has been divided into four rectangles, each of which is similar to the original rectangle. What is the ratio of short side to long side in the rectangles?

18.* Use algebra to show that if $\frac{a}{b} = \frac{c}{d}$, then $\frac{a+b}{b} = \frac{c+d}{d}$.

19. In Chapter 6, you discovered that when you construct the four midsegments in a triangle, they divide the triangle into four congruent triangles. How do the four triangles compare to the original? Are they similar to the original?

This can also be done with parallelograms. Construct a parallelogram. How would you divide the parallelogram into four congruent parallelograms similar to the original?
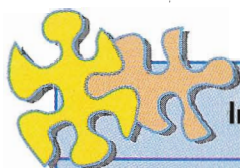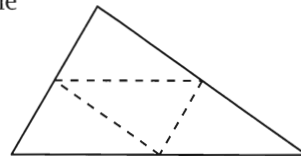
Improving Visual Thinking Skills—*TICK–TACK–NO!*

Is it possible to shade six of the nine squares of a three-by-three grid so that no three shaded squares are in a straight line (row, column, or diagonal)?
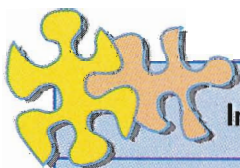
Improving Reasoning Skills—*Calculator Cunning*

Using the calculator shown at right, what is the largest number you can form by pressing the keys labeled 1, 2, and 3 exactly once each and the key labeled y^x at most once? You cannot press any other keys.