1. You have read, in "Under the Starry Pointed Pyramid", Chapter 3 from Mario Livio's *The Golden Ratio*, that if the Egyptians used roller drums to measure the length of the base of the pyramid, and palm fiber ropes to measure the height of the pyramid, then π would have been sure to appear in the Great Pyramid. Livio left out some details, so in this exercise, we will explore these ideas in more detail.

   (a) Suppose you take a wheel of diameter d and lay out a base whose sides are each one revolution of the wheel long. Then make the pyramid height equal in length to two diameters of the wheel. Show that this pyramid has (almost) the exact same shape as the Great Pyramid, by showing that the ratio of the height of the Great Pyramid to such a model of a pyramid is equal to the ratio of the side of the base of the Great Pyramid to side of the base of your model.

   Recall: The height of the Great Pyramid is 481.4 feet and the average length of the side of the base of the Great Pyramid is 755.79 feet.

   (b) Show that the Egyptians wouldn't have had to use a gigantic measuring wheel for this process to have worked. That is, show that if you measure the height in terms of diameters of the measuring wheel, then as long as the number of diameters you use to make the height is exactly twice the number of revolutions you use to make the side of the base, you get the same shaped pyramid.

   (c) Using the dimensions for the Great Pyramid given above, find the diameter of the measuring wheel required so that 100 revolutions of the wheel would produce one side of the base of the Great Pyramid and 200 diameters would give the height. Is this a reasonable sized for the measuring wheel? That is, is it likely the Egyptians would use a measuring wheel this size, if they constructed the pyramid this way?
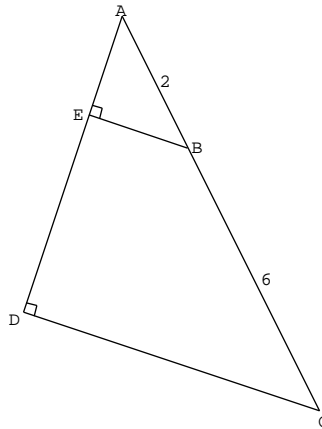
2. **Which are similar**

   (a) Which of the following pairs of figures are similar? If they are
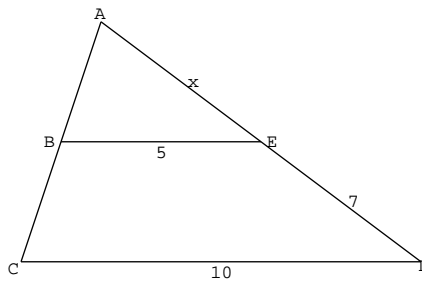   similar, explain why.

   i.
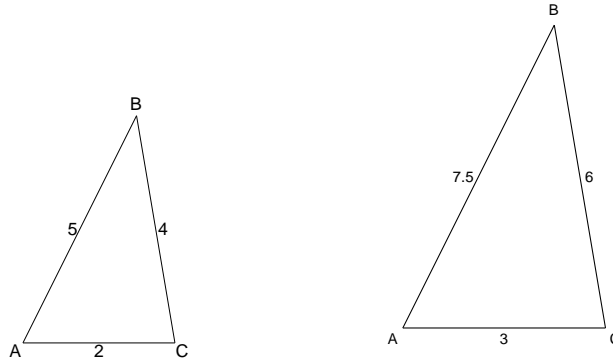
   ii. (Notice that the pair below consists of the big triangle and
       the smaller one inside it.)

   (b) For the pair(s) above that you decided were similar, find the scale
       factor of the sides.

3. Assume that the following pair of triangles are similar, and find the unknown value x.

A

x

B   E
    5

      7

C   10   D

4. P and Q, shown below (but not to scale), are similar polygons. If the perimeter of P is 10, what is the perimeter of Q?

5

Q

2

P