

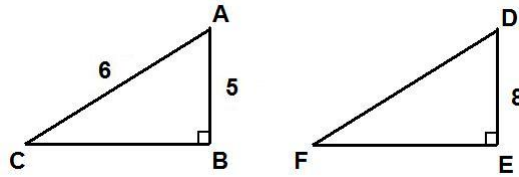
University of South Carolina
Math 222: Math for Elementary Educators II
Instructor: Austin Mohr
Section 002
Fall 2010

Quiz 2

Due Tuesday, October 19

1. Use a protractor and a ruler to draw triangles for the following. (If you don't have a protractor, you can print one using a template like the one at <http://thinkzone.wlonk.com/MathFun/protractor.png>.)
 - a. Draw two noncongruent triangles satisfying AA similarity. Show directly that they are similar by showing that all pairs of associated angles are congruent and all pairs of associated sides are proportional.
 - b. Draw two noncongruent triangles satisfying SAS similarity. Show directly that they are similar by showing that all pairs of associated angles are congruent and all pairs of associated sides are proportional.
 - c. Draw two nonsimilar triangles satisfying SSA. Show directly that they are not similar by finding some part of the definition of similarity that does not hold.
2. Determine which, if any, of the following congruence rules are true for quadrilaterals. If they are true, argue why you think they are true. If they are false, draw a pair of quadrilaterals (using a protractor and ruler) satisfying the rule but failing to be congruent.
 - a. SASA
 - b. SASAS
 - c. SSSS
 - d. SASSS
3. A *diagonal* of a quadrilateral is a line segment connecting opposite vertices (so every quadrilateral has exactly two diagonals).
 - a. Prove that the diagonals of a parallelogram bisect each other (that is, they cut each other perfectly in half).
 - b. Prove that the diagonals of a rhombus are perpendicular (that is, they intersect at right angles).

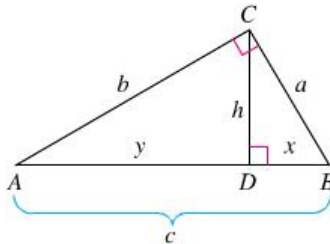
4. Solve for all missing sides and angles given that the two triangles below are similar and oriented the same way (so \overline{AB} really is associated with \overline{DE}).



5. Two different companies charge different amounts for service. Company A charges a \$200 activation fee and \$60 per month. Company B charges a \$100 activation fee and \$70 per month.
- Write two equations (one for each company) to describe the cost of using their services. Be sure to specify what your x and y mean.
 - Sketch the graph of your two equations together on the same set of axes.
 - Where do the lines intersect? What is the meaning of this point in context?
 - Compare the prices for one year of service from each of the companies.

Extra Credit

- A. Refer to the triangle below for the next four questions.



- Find three pairs of similar triangles. Explain why they are similar.
- Write the corresponding proportions for each set of similar triangles.
- Use part b and the figure to show that $a^2 = xc$ and $b^2 = yc$.
- Use part c to show that $a^2 + b^2 = c^2$. State this result in words using the legs of the hypotenuse of a right triangle.

Hints

- 1a.** Decide what you want the measures of your two angles to be and draw any two triangles having those angles. You get the measure of the third angle for free. To finish, show that the ratio of “big side” to “small side” is the same for every pair of associated sides.
- 1b.** Decide what you want the measures of your angle to be and draw any triangle having that angle. Next, draw another triangle having that angle whose adjacent sides are proportional to those of the first triangle (maybe twice as big). To finish, make sure that all associated angles are equal and that the third set of associated sides are proportional.
- 1c.** Decide on the lengths of your two sides and the measure of the non-included angle. Draw any triangle with these properties. Next, try to draw another one with these properties but different in some way from the first one.
- 2.** For each of these problems, play around with some sketches to decide whether or not you think it’s true. If it is not true, draw a pair of quadrilaterals demonstrating how it can fail. If it is true, argue why you only seem to have one option for the remaining sides and angles.
- 3.** If you draw the two diagonals, you split the parallelogram/rhombus into four triangles. Try to find out which of these triangles are congruent.
- 4.** Use trigonometric functions to find missing sides. Use inverse trigonometric functions to find missing angles. Use similarity to transfer information from one triangle to another.
- 5a.** Use $y = mx + b$ form. What is the meaning of m in the context of the problem? What about b ?
- 5b.** The value for b gives the y -intercept, and you can use m to find another point on the line.
- 5c.** Solve them as a system of equations.
- 5d.** If one year has passed, what should we use for x ?
- Aa.** It helps to redraw the three triangles separately and all oriented the same way. Try to figure out which similarity rules apply.
- Ab.** Write them all as “big side over small side” to keep from getting mixed up.

- Ac.** Look at your equations from b and see if you can apply some algebra to get the equations part c is asking for. You actually only need two of the equations.
- Ad.** Factor out the common value of c and find another way to write $x + y$. What famous theorem have you just proven 100% rigorously?