MAT-222-840

Team Problems for Chapter 4

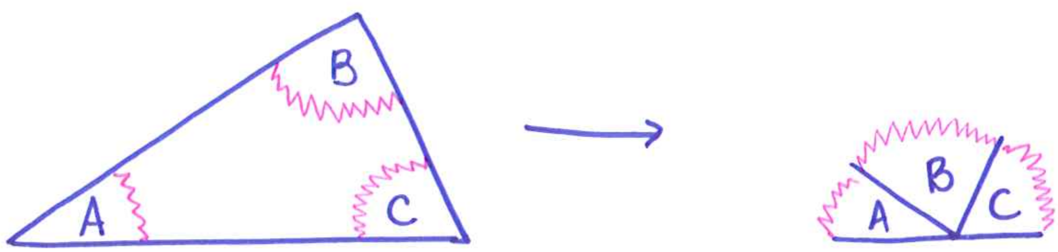
Name: Solutions

Spring 2017

Date: ____________________

Problem #1: Seeing that the Angles in a Triangle Add to 180° (by tearing)

1. Cut an acute triangle, a right triangle, and an obtuse triangle out of a piece of paper.
2. Label the three vertices of the acute triangle A, B, and C.
3. Tear (do not cut) all 3 corners off of your acute triangle. Then put the corners together vertex-to-vertex. Tape the vertices below, and label your figure "Vertices of an Acute triangle."



4. What do you notice? What does this tell you about the angles of your acute triangle?

Putting the 3 angles together forms a straight line, therefore $m\angle 1 + m\angle 2 + m\angle 3 = 180°$.

5. Repeat steps 2-4 with your right triangle and your obtuse triangle. Did you get the same results, or different results?

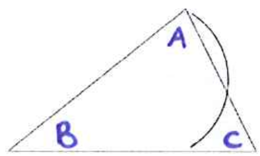
Same results – always adds up to 180°.

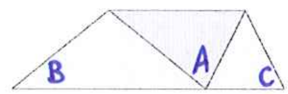
6. When you meet with your team on Tuesday, do you think they will have the same results, or different?

Same results

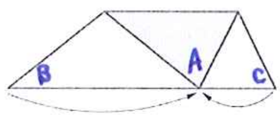
Problem #2: Seeing that the Angles in a Triangle Add to 180° (by folding)

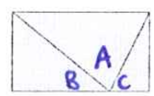
1. Cut an acute triangle, a right triangle, and an obtuse triangle out of a piece of paper.
2. As indicated below, fold the corner that is opposite the longest side (or a longest side) of your acute triangle down to meet the longest side. Do this in such a way that the fold line is parallel to the longest side of your acute triangle.





3. As indicated below, fold the other two corners of your acute triangle in to meet the vertex that is now along the longest side of the acute triangle. Your acute triangle's three vertices should meet at a single point.





4. What does this way of folding the triangle show you about the angles of an acute triangle?

The three angles in a triangle add together to form a straight line — the sum of the angles is 180°

5. Repeat steps 2-4 with your right triangle and your obtuse triangle. Did you get the same results, or different results?

Same results

6. What you meet with your team on Tuesday, do you think they will have the same results, or different?

Same results

Problem #3 Triangles and Quadrilaterals of Specified Side Lengths

NOTE: For this activity, make sure to get some straws and string before you leave class on 2/14.

1. Cut a 3-inch, a 4-inch, and a 5-inch piece of straw, and thread all three straw pieces onto a piece of string. Tie a knot so as to form a triangle from the three pieces of straw.

2. Now cut two 3-inch pieces of straw and two 4-inch pieces of straw, and thread all four straw pieces onto another piece of string in the following order: 3-inch, 4-inch, 3-inch, 4-inch. Tie a knot so as to form a quadrilateral from the four pieces of straw.

3. Compare your straw triangle and your straw quadrilateral. What is an obvious difference between them (other than the fact that the triangle is made of three pieces and the quadrilateral is made of four)? *Hint: One figure is "floppier" than the other.*

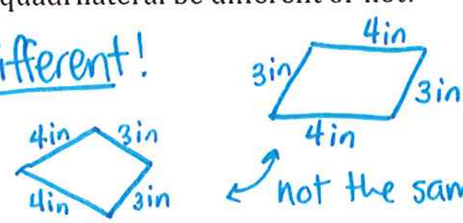
The straw triangle is "rigid" (holds its shape)
The quadrilateral is not rigid – angles change freely.

4. When you made your triangle, if you had strung your three pieces of straw in a different order, would your triangle be different or not?

No, it would have formed a triangle congruent to mine.

5. When you made your quadrilateral, if you had strung your four pieces in a different order, (say, 3-inch, 3-inch, 4-inch, 4-inch) would your quadrilateral be different or not?

It would have been different!



not the same shape.

6. The SSS Postulate from this chapter tells us that however you construct it, a triangle with side lengths 3-inches, 4-inches, and 5-inches will be congruent to any other such triangle. In future chapters when we talk about polygons with more sides (quadrilaterals, pentagons, and so forth) do you think we will have an SSSS Congruence Property, or an SSSSS Congruence Property?

In other words, do you think that having a list of all of the side lengths guarantees the shape of the polygon?

No! The straw quadrilateral shows that there are many quadrilaterals with identical side-lengths that are not congruent to each other.

Problem #4: Triangle Construction with Ruler, Protractor, and Compass

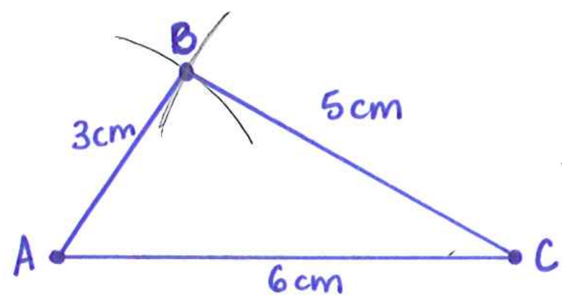
For each of the following, draw a triangle that has vertices A, B, and C and has the given specifications. Think about whether any other such triangle will necessarily be congruent to yours or not. If a postulate or theorem guarantees that your triangle WILL be congruent to any other such triangle, name it in the box below.

On Tuesday, check your triangles against those of your teammates. Are they congruent or not?

Triangle 1 Three side lengths are given:

From A to B is 3 cm.
From B to C is 5 cm.
From C to A is 6 cm.

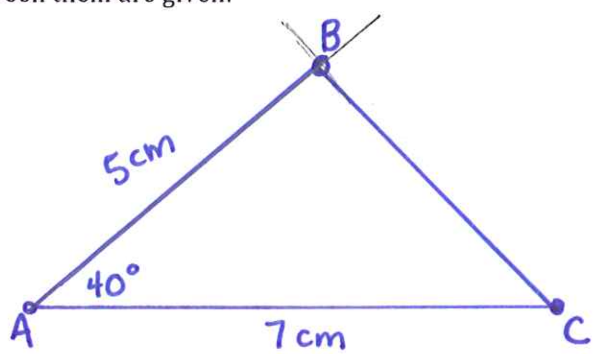
Postulate/Theorem?
SSS



Triangle 2 Two side lengths and the angle between them are given:

From A to B is 5 cm.
The angle at A is 40°.
From A to C is 7cm.

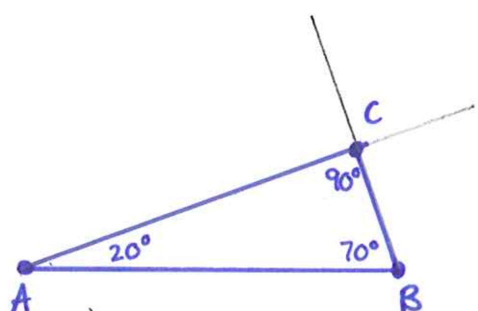
Postulate/Theorem?
SAS



Triangle 3 All three angles are given:

The angle at A is 20°.
The angle at B is 70°.
The angle at C is 90°.

Postulate/Theorem?
None

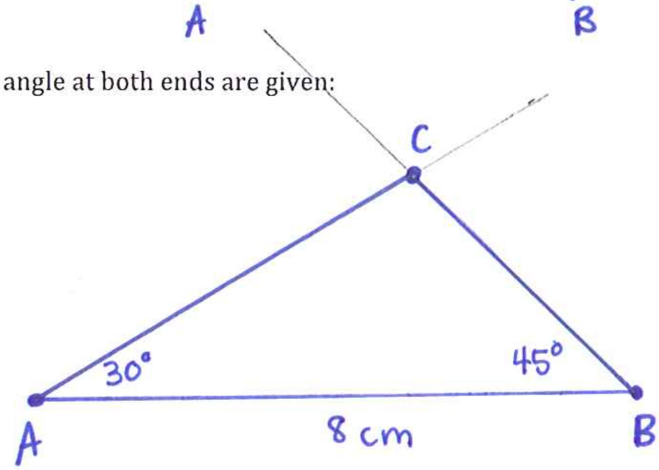


Note: your triangle might be larger or smaller than mine → not congruent!

Triangle 4 A side length and the angle at both ends are given:

The angle at A is 30°.
From A to B is 8 cm.
The angle at B is 45°.

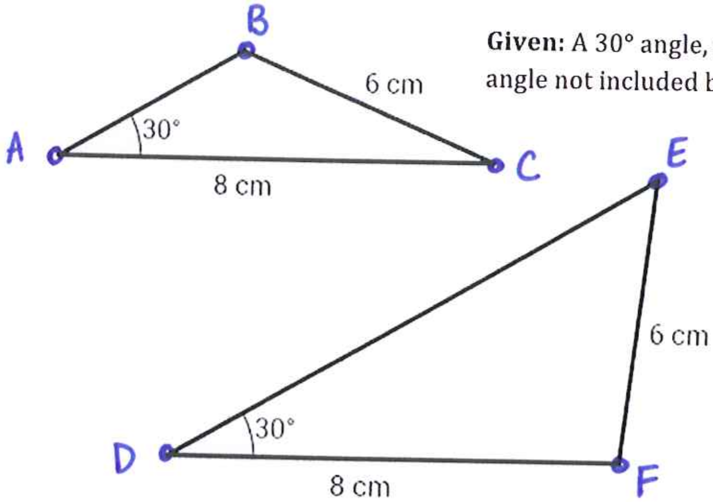
Postulate/Theorem?
ASA



Problem #~~6~~5: The Nonexistent Angle-Side-Side

Use the figures below to explain why we cannot prove that two triangles are congruent based on the congruence of two sides and a nonincluded angle. (SSA)

Given: A 30° angle, a side of length 8 cm, and a side of 6 cm, with the angle not included between the 6 cm and 8 cm sides.



$\triangle ABC$ has a 6 cm side adjacent to an 8 cm side adjacent to a 30° angle.

$\triangle DEF$. has a 6 cm side adjacent to an 8 cm side adjacent to a 30° angle.

But $\triangle ABC \ncong \triangle DEF$