Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Unit 6 – Proving Special Triangle Conjectures**

Monica

Geometry Period: \_\_\_\_

Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Directions:** Today you are going to explore if it’s possible for the medians, angle bisectors, and altitudes to be the same segment within a triangle. Use Geometer’s Sketchpad and follow the steps below. Use your discoveries to answer the questions.

**STEP 1:** Construct a scalene triangle. Label your points A, B, and C.

**STEP 2:** Confirm that your triangle is scalene by measuring the length of each segment. To do this, select each segment and choose “Length” under the “Measure” menu.

**STEP 3:** Construct the angle bisector of . To do this, select points A, B, and C (in that order) and choose “Angle Bisector” under the “Construct” menu. Label the point of intersection D.  is the angle bisector.

**STEP 4:** Construct the median. To do this, select and choose “Midpoint” under the “Construct” menu. Label this point M. Select points B and M and choose “Segment” under the “Construct” menu. is the median.

**STEP 5:** Construct the altitude. To do this, select point B and . Choose “Perpendicular Line” under the “Construct” menu. Label the point of intersection F. is the altitude. (Note: If the line does not intersect , drag your triangle to make it obtuse.)

**QUESTION #1:** Were the median, angle bisector, and altitude each the same segment or different segments? Why do you think this is the case? (Hint: Think of the two triangles formed by each segment. Are they congruent?)

**STEP 6:** Open a new sketch by selecting “New Sketch” under the “File” menu.

**STEP 7:** Construct an isosceles triangles. To do this, draw a circle by using the circle tool. Select the circle and choose “Point on Circle” under the “Construct” menu. Select the two points on the circle, and the center of the circle, and choose “Segments” under the “Construct” menu. This creates an isosceles triangle. Label your points A, B, and C. (Point B should be the center of the circle.)

**STEP 8:** Hide the circle. To do this select the circle and choose “Hide Circle” under the “Display” menu. Confirm that your triangle is isosceles by measuring the length of each segment. To do this, select each segment and choose “Length” under the “Measure” menu.

**STEP 9:** Construct the angle bisector of . To do this, select points A, B, and C (in that order) and choose “Angle Bisector” under the “Construct” menu. Label the point of intersection D.  is the angle bisector.

**STEP 10:** Construct the median. To do this, select and choose “Midpoint” under the “Construct” menu. Label this point M. Select points B and M and choose “Segment” under the “Construct” menu. is the median.

**STEP 11:** Construct the altitude. To do this, select point B and . Choose “Perpendicular Line” under the “Construct” menu. Label the point of intersection F. is the altitude.

**QUESTION #2:** Were the median, angle bisector, and altitude each the same segment or different segments? Why do you think this is the case? (Hint: Think of the two triangles formed by each segment. Are they congruent?)

**QUESTION #3:** Read the following conjecture: *If a triangle is isosceles, then the angle bisector is also the altitude and the median to the base.*

Let’s prove this conjecture! We will break it into two separate proofs. Some of the steps are completed for you. You need to fill in the statements with the corresponding reasons (or vice versa.)



Given: , 

Prove: 

|  |  |
| --- | --- |
| Statements | Reasons |
| 1.  | 1.  |
| 2.  | 2. Definition of an isosceles triangle |
| 3.  | 3.  |
| 4.  | 4.  |
| 5.  | 5.  |
| 6.  | 6. SAS |
| 7.  | 7.  |
| 8.  | 8.  |
| 9.  | 9.  |
| 10.  | 10. Simplify |
| 11.  | 11.  |
| 12.  | 12.  |



Given: , 

Prove: 

|  |  |
| --- | --- |
| Statements | Reasons |
| 1. | 1. Given |
| 2.  | 2. Definition of an isosceles triangle |
| 3.  | 3.  |
| 4.  | 4. Definition of bisect |
| 5.  | 5. Reflexive Property |
| 6.  | 6.  |
| 7.  | 7.  |
| 8.  | 8.  |
| 9.  | 9. Definition of a median |

**EXCEEDING STANDARDS:**

In an isosceles triangle, the altitude is also the angle bisector and the median. Prove this is true by completing the two proofs below.



Given: , 

Prove: 

Given: , 

Prove: 

