


10.2d Class Activity: The Converse of the Pythagorean Theorem

1. Mr. Riley's 8th grade class has been studying the Pythagorean Theorem. One day, he asked his class to find numbers a , b , and c where $a^2 + b^2 = c^2$, and draw triangles with those side lengths. 

Oscar determined that the numbers 5, 12, and 13 satisfy the Pythagorean Theorem as shown below:

$$a^2 + b^2 = c^2$$

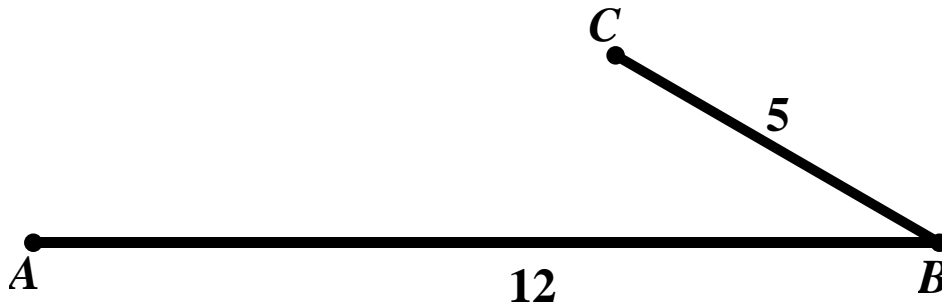
$$5^2 + 12^2 = 13^2$$

$$25 + 144 = 169$$

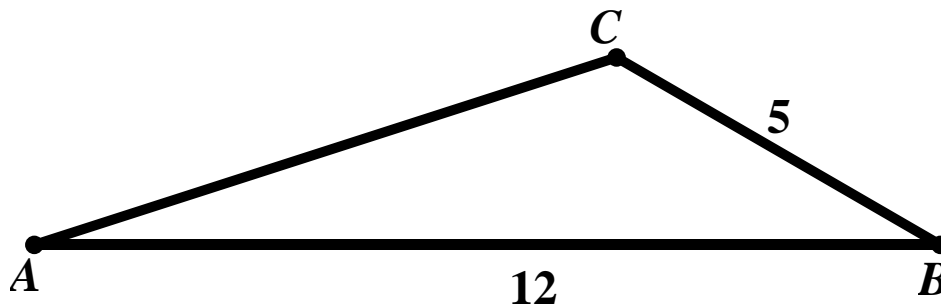
$$169 = 169$$

Mr. Riley then said, "OK, so you have found three numbers that satisfy the Pythagorean Theorem. Now, show me that the triangle formed with these side lengths is a right triangle."

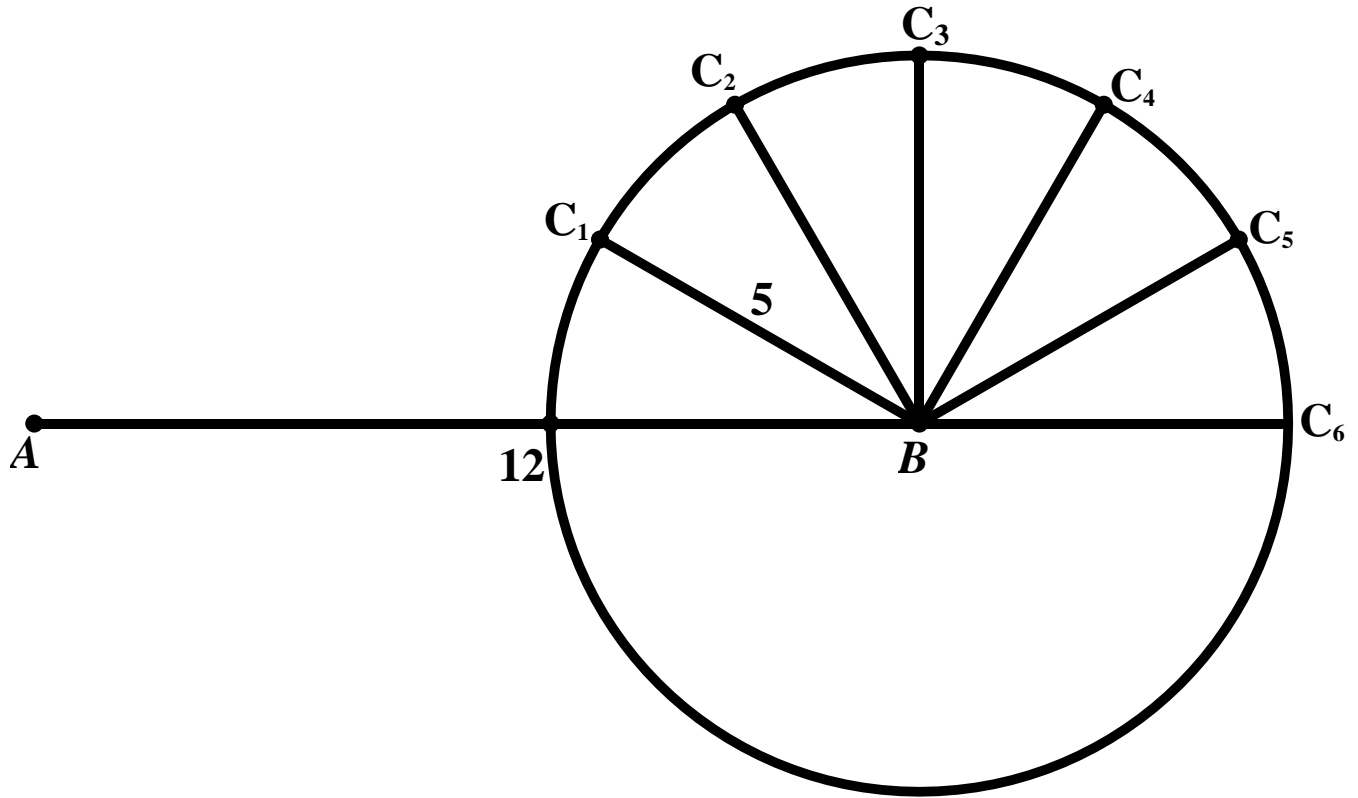
- a. Oscar continued working on the problem. He constructed a segment with a length of 12 cm and labeled the segment AB . From the endpoint B , he constructed a segment with a length of 5 cm and labeled the segment BC as shown in the picture below. Using a ruler, verify the lengths of the segments below.



- b. Then, he thought to himself, "I need to make the third side length AC equal to 13 because I know the triple 5, 12, 13 satisfies the Pythagorean Theorem." He connected A and C as shown below. He measured the length of AC and determined it did not measure 13 cm. Using a ruler, verify that AC does not measure 13 cm.



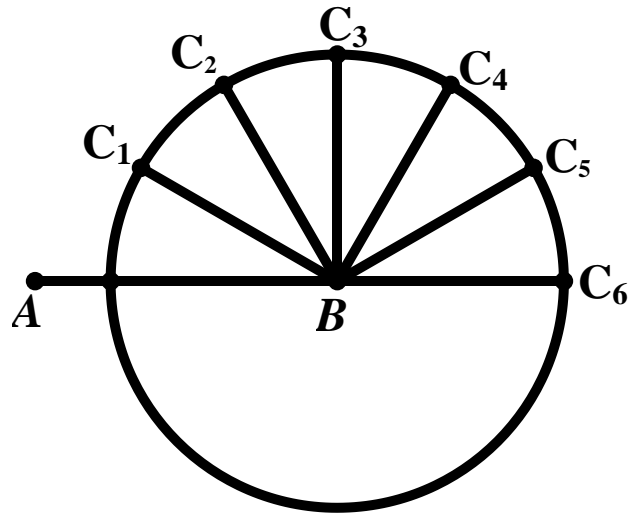
- c. Then, he thought to himself, “What if I rotate \overline{BC} around point B until AC measures 13 cm?” He began to rotate \overline{BC} clockwise about B in increments as shown below. Help Oscar to find the location of C on the circle below that will give him a triangle with side lengths 5, 12, and 13.




- d. What type of triangle is formed when AC equals 13 cm?

2. Lucy also found a set of numbers that satisfy the Pythagorean Theorem: 3, 4 and 5. Verify in the space below that Lucy’s numbers satisfy the Pythagorean Theorem.

3. Using a process similar to Oscar's, Lucy set out to prove that a triangle with side lengths 3, 4 and 5 is in fact a right triangle. In the picture below $AB = 4$ cm and $CB = 3$ cm. Help Lucy determine the location of C that will create a triangle with side lengths 3 cm, 4 cm, and 5 cm.



4. What type of triangle is formed when AC equals 5 cm?
5. Based on the problems above, what type of triangle is formed with side lengths that satisfy the Pythagorean Theorem? Write down the Converse of the Pythagorean Theorem. 

6. Do the side lengths given below satisfy the Pythagorean Theorem? Remember to distinguish between legs (shorter sides) and the hypotenuse (longest side) and enter them into the equation correctly.

a. 11, 60, 61	b. 2, 4, 6
c. 14, 50, 48	d. 1, 3, $\sqrt{10}$;
e. 2, 4, and $2\sqrt{5}$.	f. 5, 6, 8

7. Mr. Garcia then asks the class, “What if the tick marks in Lucy’s picture are each 2 cm instead of 1 cm? What are the measures of the side lengths that form the right triangle? Do they satisfy the Pythagorean Theorem?”



8. What if the tick marks in Lucy’s picture are each 3 cm? 0.1 cm? 10 cm? What are the measures of the side lengths that form the right triangles given these different scales and do they satisfy the Pythagorean Theorem?