**Activity 4.5.6 The Converse of the Pythagorean Theorem**



Given: $△ABC$ where $AC^{2}$ *+* $BC^{2}$= $AB^{2}$

Prove: $△ABC$ is a right triangle. (*We don’t yet know that* $∠C$ *is a right angle. See ? on figure at the right.*)

1. Construct a line perpendicular to $\overbar{BC}$ and then find point *D* on that line so that *DC = AC*  (*Construction is shown by marks on diagram below.*)

2. Construct $\overbar{DB}$ to form $∆BCD$.

3. Since *AC = DC* by construction then $AC^{2}$ *=\_\_\_\_\_.*

4. Adding *BC*2 to both sides of equation 3 gives $AC^{2}$ *+* $BC^{2}$ *=\_\_\_\_\_*+$BC^{2}$*.*

5. By construction, $△BCD$ is a \_\_\_\_\_\_\_\_\_\_ triangle.

By the Pythagorean Theorem *\_\_\_\_\_*2 *+ \_\_\_\_\_*2 = \_\_*\_\_\_*2.

6. From equations 4 and 5 we conclude that $AC^{2}$ *+* $BC^{2}$= $DB^{2} $by the \_\_\_\_\_\_\_\_\_ property.

7. We were given that $AC^{2}$ *+* $BC^{2}$= $\\_\\_\\_\\_$2. Therefore *\_\_\_\_\_*2 = \_\_*\_\_\_*2 by the \_\_\_\_\_\_\_\_\_\_\_\_ property and thus *DB = AB*.

8. *CB = CB* by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

9. Using information from steps 1, 7, and 8 we can prove that $△ABC≅△DBC$ by the \_\_\_\_\_ Congruence theorem.

10. m $∠$*BCD* = m $∠$*BCA* by \_\_\_\_\_\_\_\_\_\_\_\_\_\_.

11. m $∠$*BCD* = \_\_\_\_ because perpendicular lines form right angles.

12. $∠$\_\_\_\_\_\_\_ is a right angle because\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_; therefore, $ΔABC$ is a right triangle.

**Applications of the Converse of the Pythagorean Theorem**

13. In Ancient Egypt stonemasons used a rope with 12 equally spaced knots to make a right angle. See figure at the right. Explain why this method worked.

<http://www.eduswaplearning.com/Math/Pythagoras/Who-was-Pythagoras.html>

14. A “Pythagorean Triple” is a set of three numbers that could be the lengths of the sides of a right triangle. Determine whether or not each set of numbers is a Pythagorean Triple:

1. 7, 24, 25
2. 8, 9, 12
3. 8, 15, 17
4. 11, 13, 17
5. 11, 60, 61

15. a. Show that 5, 12, 13 is a Pythagorean triple.

b. Loretta says, “Since 5, 12, 13, is a Pythagorean triple, I know that 10, 24, 26 must also be a Pythagorean triple. I don’t even need to check to see whether 102 + 242 = 262.”

 Is Loretta correct? Explain why or why not.