Pythagorean Theorem Worksheet

1. State the Pythagorean Theorem and explain what each term in the formula represents.

2. In a right triangle, the lengths of the legs are 3 units and 4 units. Calculate the length of the hypotenuse.

3. A right triangle has a hypotenuse of length 13 units and one leg of 5 units. Find the length of the other leg.

4. If the legs of a right triangle are equal in length, and the hypotenuse is 10 units, find the length of each leg.

5. A ladder 15 feet long leans against a wall, reaching a height of 12 feet. How far is the base of the ladder from the wall?

6. A rectangular park has dimensions 30 meters by 40 meters. What is the length of the diagonal?

7. Verify if the triangle with vertices at (0, 0), (3, 0), and (3, 4) is a right triangle using the Pythagorean theorem.

8. A square has a side length of 8 units. What is the length of its diagonal?

9. Check if a triangle with side lengths 6, 8, and 10 is a right triangle.

10. Determine whether the triangle with side lengths 5, 7, and 9 is a right triangle.

11. A triangle has sides measuring 9 units, 12 units, and 15 units. Prove that it is a right triangle and find its area.

12. In a right triangle, the altitude to the hypotenuse divides it into two segments of lengths 4 units and 9 units. Find the length of the altitude.

Solutions

1. **Solution:** The Pythagorean Theorem states $a^2 + b^2 = c^2$, where a and b are the legs of a right triangle, and c is the hypotenuse.

2. **Solution:** Using $a^2 + b^2 = c^2$, $c = \sqrt{3^2 + 4^2} = 5$.

3. **Solution:** $b = \sqrt{13^2 - 5^2} = \sqrt{169 - 25} = \sqrt{144} = 12$.

4. **Solution:** Let $a = b$. Then $a^2 + a^2 = 10^2$. $2a^2 = 100$, $a^2 = 50$, $a = \sqrt{50} = 5\sqrt{2}$.

5. **Solution:** $a = \sqrt{15^2 - 12^2} = \sqrt{225 - 144} = \sqrt{81} = 9$.

6. **Solution:** $c = \sqrt{30^2 + 40^2} = \sqrt{900 + 1600} = \sqrt{2500} = 50$.

7. **Solution:** $a^2 + b^2 = c^2$. $3^2 + 4^2 = 5^2$. True. It is a right triangle.

8. **Solution:** $c = \sqrt{8^2 + 8^2} = \sqrt{64 + 64} = \sqrt{128} = 8\sqrt{2}$.

9. **Solution:** $6^2 + 8^2 = 10^2$. $36 + 64 = 100$. True. It is a right triangle.

10. **Solution:** $5^2 + 7^2 \neq 9^2$. False. It is not a right triangle.

11. **Solution:** $9^2 + 12^2 = 15^2$. $81 + 144 = 225$. True. Area $= \frac{1}{2} \times 9 \times 12 = 54$.

12. **Solution:** Using the property, $h = \sqrt{4 \cdot 9} = \sqrt{36} = 6$.