Apply the converse of Pythagoras' theorem to word problems, proofs, and comparisons, justifying your reasoning.

1. A triangle has perimeter 56 and two sides 15 and 20. Could it be right-angled? Explain.

2. A triangle has perimeter 70 and two sides 21 and 29. Could it be right-angled? Explain.

3. A triangle has side lengths $3k, 4k, 5k$. Prove it is always right-angled for positive k.

4. One side of a triangle is 25. Find two other whole-number sides so the triangle is right-angled, and prove your triple works.

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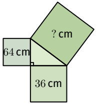
5.



Hypotenuse square: area and side length?

6. A student checks $9^2 + 40^2 = 41^2$ and says that proves the triangle is right-angled. What assumption did they make about the longest side?

7. Which is closer to being right-angled: $(8, 15, 16)$ or $(8, 15, 18)$? Justify using $a^2 + b^2 - c^2$.

8. Which is closer to being right-angled: $(10, 24, 25)$ or $(10, 24, 27)$? Justify using $a^2 + b^2 - c^2$.

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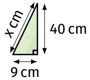
9. A triangle has sides $x, 35, 37$. Find x if the triangle is right-angled.

10.



Right-angled. Find x, and explain how you knew the hypotenuse before calculating.

11. A student says every triangle with sides in the ratio $5 : 12 : 13$ is right-angled. Are they correct? Explain using the scaling property.

12. Create a whole-number triangle close to $(9, 40, 41)$ that is not right-angled, and explain why it fails the check.