Why the theorem works

6 questions | 15 marks

Equivalent correct methods earn the corresponding marks.

1. Squares on two legs have areas 25 and 144 square centimetres. Find the hypotenuse-square area and the hypotenuse length. [3 marks]

Add $25 + 144 = 169$.

Take the positive square root.

Answer: 169 square centimetres; 13 cm.

2. A square of side 9 cm is drawn on a hypotenuse. One leg-square has area 32 square centimetres. Find the other leg-square area. [2 marks]

The hypotenuse-square area is $9^2 = 81$.

Subtract $81 - 32 = 49$.

Answer: 49 square centimetres.

3. In the dissection, $a = 5$ and $b = 12$. Find the total area of the four triangles. [2 marks]

Each area is $\frac{5(12)}{2} = 30$.

Four copies give 120.

Answer: 120 square units.

4. For $a = 5$ and $b = 12$, find the outer square area and central square area. [3 marks]

The outer side is 17, so its area is 289.

Subtract the four triangles' area 120.

Answer: 289 and 169 square units.

5. Explain why the 6-8-10 relationship is $36 + 64 = 100$, not $6 + 8 = 10$. [2 marks]

Those areas are the squared side lengths.

The lengths themselves are not added.

Answer: The theorem relates the areas of squares on the sides.

6. Expand $(a + b)^2$ and subtract $2ab$. Explain what remains. [3 marks]

Expansion gives $a^2 + 2ab + b^2$.

Removing $2ab$ leaves the two square terms.

Answer: $a^2 + b^2$.