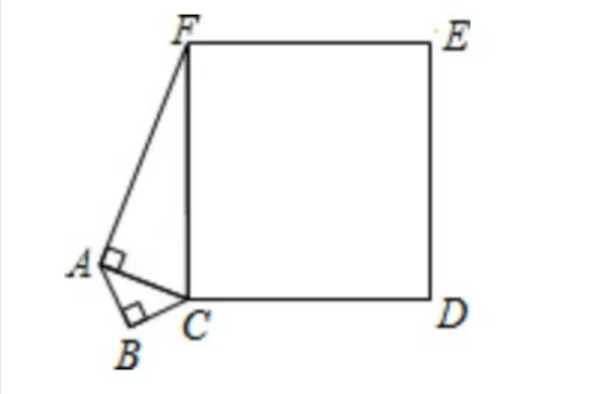
Question 1

As shown in the figure, the length of BC is 3 cm, the length of AB is 4 cm, and the length of AF is 12 cm. Find the area of square CDEF.



According to imformation given in the figure, we can find the length of AC:

$$AC^2 = AB^2 + BC^2$$
$$AC^2 = 4^2 + 3^2$$
$$AC^2 = 16 + 9$$

Thus we have:

$$AC = \sqrt{25}$$
$$AC = 5$$

Then we can find the length of EF:

$$EF = CF$$
$$= \sqrt{AC^2 + AF^2}$$
$$= 13$$

Then we can find the area of square CDEF:

$$Area = EF^2$$
$$Area = 169$$

Question 2

Xiao Ming starts from home and walks 150 m due north. Then he walks due east until he is 250 m away from home. How far did Xiao Ming walk in the eastward direction?

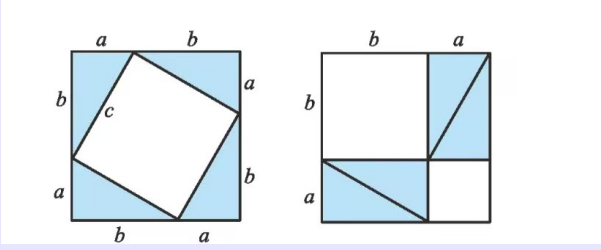
According to the information given in the question, we know that the distance from Xiao Ming's home to the point where he is 250 m away from home is 250 m. We can use the Pythagorean theorem to find the distance he walked in the eastward direction. Let the distance Xiao Ming walked in the eastward direction be x m. According to the Pythagorean theorem, we have:

$$\begin{aligned} x^2 + 150^2 &= 250^2 \\ x^2 + 22500 &= 62500 \\ x^2 &= 62500 - 22500 \\ x^2 &= 40000 \\ x &= \sqrt{40000} \\ x &= 200 \end{aligned}$$

Thus, Xiao Ming walked 200 m in the eastward direction.

Question 3

According to legend, Pythagoras used the two diagrams shown in the figure to verify the Pythagorean Theorem. Can you explain the reasoning behind this?



As shown in the figure, for the first diagram, the aree of the square can be expressed as both $(a+b)^2$ and $c^2 + \frac{1}{2} \times 4ab$, so we have:

$$\begin{aligned} (a+b)^2 &= c^2 + \frac{1}{2} \times 4ab \\ a^2 + 2ab + b^2 &= c^2 + 2ab \\ a^2 + b^2 &= c^2 \end{aligned}$$

Thus, we have proved the Pythagorean theorem.

For the second diagram, we can also express the area of the square as both $(a+b)^2$ and $2 \times ab + b^2 + a^2$, so we have:

$$(a+b)^2 = 2 \times ab + b^2 + a^2$$

Thus, we have proved Perfect Square Formula (完全平方公式).