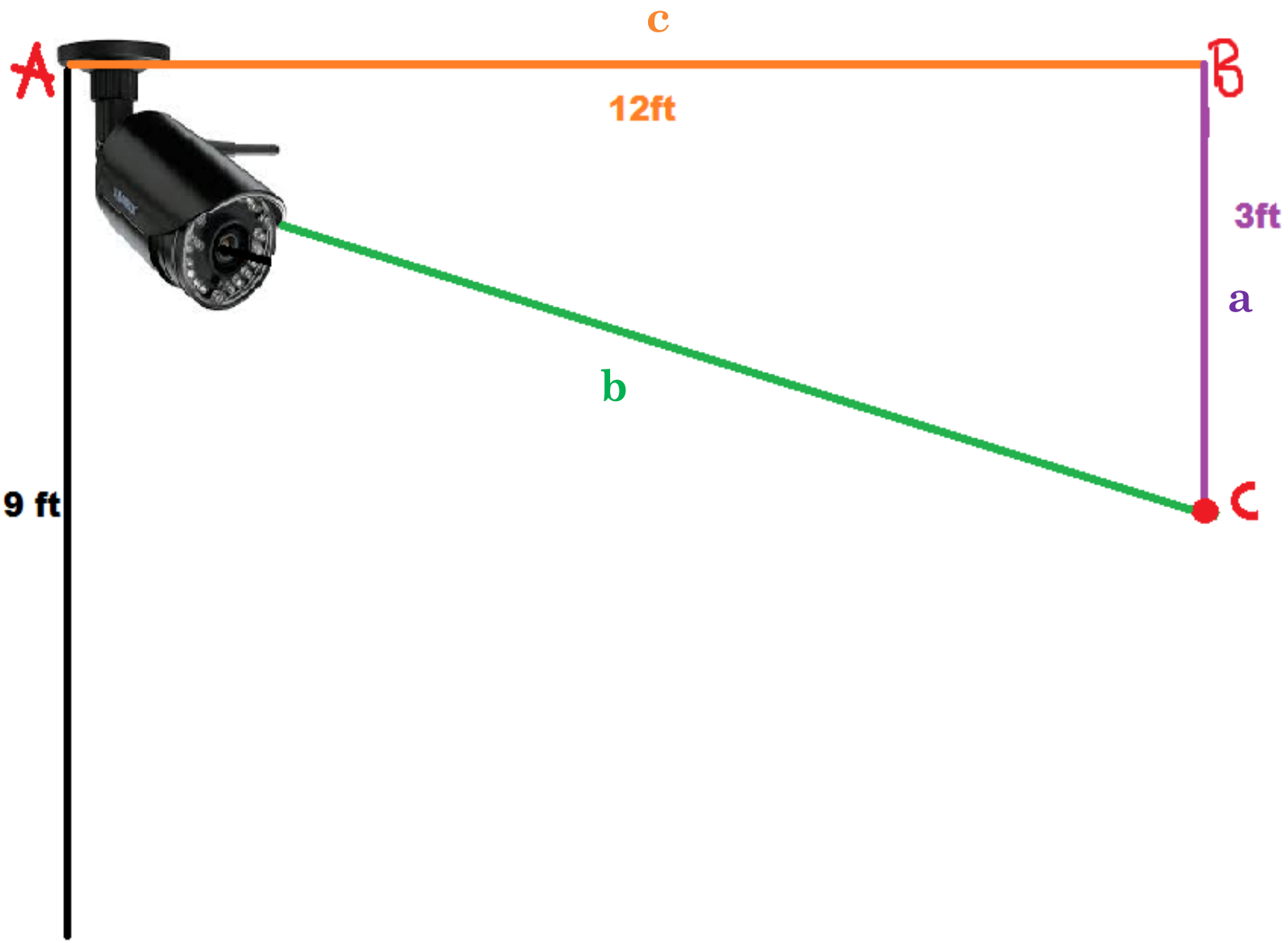
Trigonometry with right triangles

Security

A security camera in a neighborhood bank is mounted on a wall 9 feet above the foor. What angle of the depression should be used if the camera is to be directed to a spot 6 feet above the floor and 12 feet from the wall?


c
A
B
12ft
3ft
a
b
9 ft
C

1. Let's find the hypotenuse b with the **Pythagorean theorem:**

$$b^2 = a^2 + c^2 = 12^2 + 3^2 = 144 + 9 = 153$$

$$b = 12.37$$

2. Use the **Second theorem on Right triangles** to find the angle of depression:

$$a = c * \tan\gamma \quad \Rightarrow \quad \tan\gamma = \frac{a}{c} = \frac{3}{12} = \frac{1}{4}$$

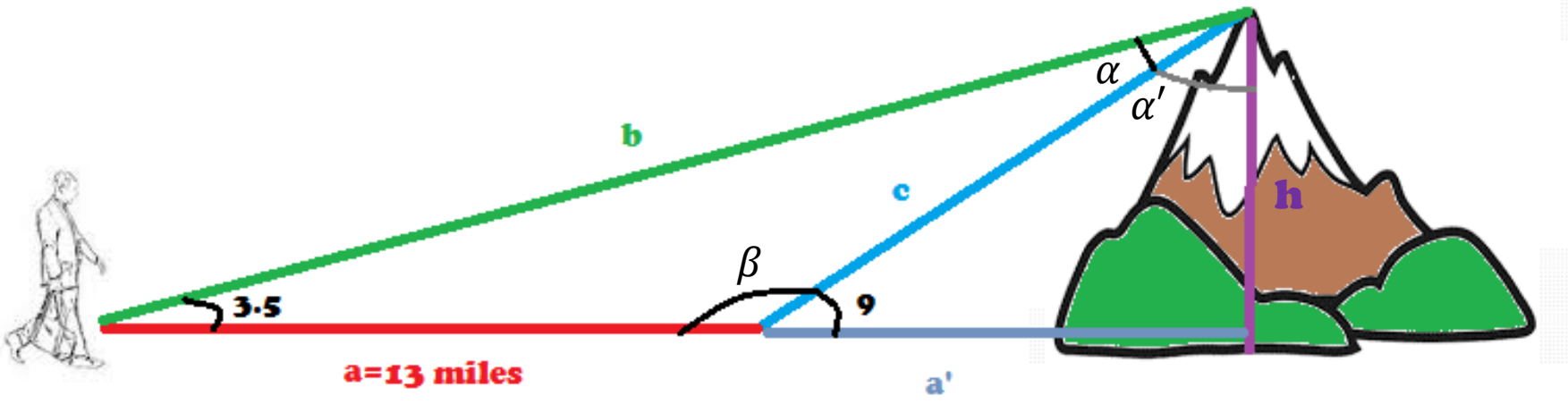
Angle of depression

$$\tan^{-1}\frac{1}{4}$$

$$\gamma = 14°$$

Height of a Mountain

In travelling across flat land, you notice a mountain directly in front of you. Its angle of elevation (to the peak) is 3.5° miles closer to the mountain. The angle of elevation is 9°. Approximate the height of the mountain.


b
c
α
α′
h
β
3.5
9
a=13 miles
a'

1. $\beta = 180° - 9° = 171°$

$\alpha = 180° - 171° - 3{,}5° = 5{,}5°$

2. Let's use the **Law of Sines** to find the side c

$$c = \frac{a}{\sin \alpha} * \sin \gamma = \frac{13}{\sin 5{,}5} * \sin 3{,}5 = 8.28\ mi$$

3. Let's consider the **right triangle with hypotenuse c**

$\alpha' = 180° - 90° - 9° = 81°$

4. With the First Theorem on Right Triangles we can find the height of the mountain (h)

$$h = c * \cos \alpha' = 1.295\ mi$$

The height of the mountain is 1.295 miles

Classe II F

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