

Quiz:

How many men who had served as U.S. president died on the Fourth of July?

- a. 1
- b. 2
- c. 3
- d. 4

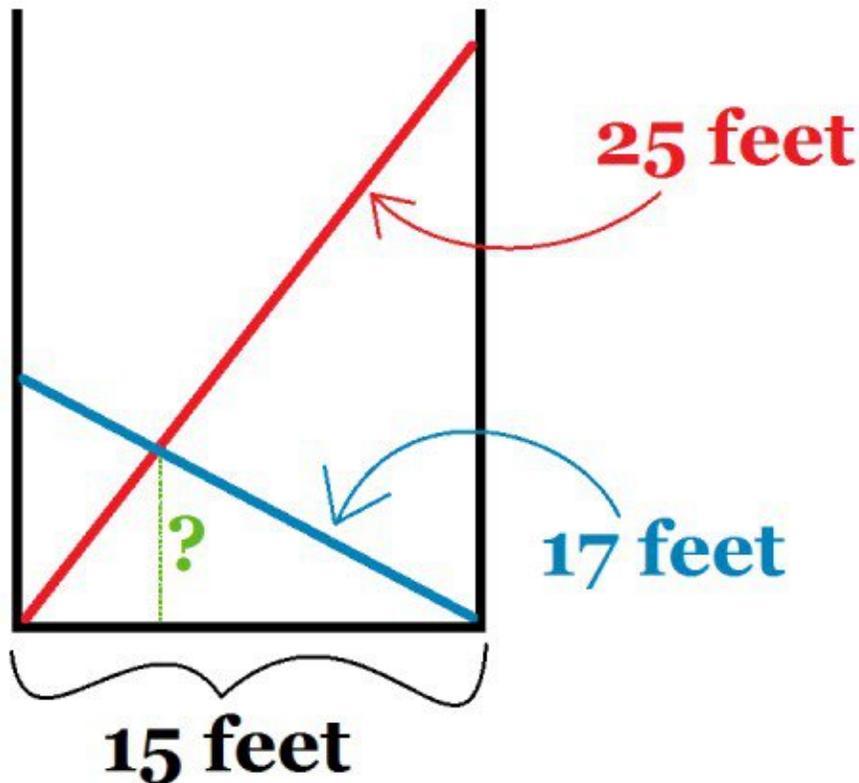
5) c. 3. A lot of people know that Thomas Jefferson and John Adams both died on July 4, 1826, but it is less well known that James Monroe died on July 4, 1831.

Problem:

(1) Crossing Ladders Problem

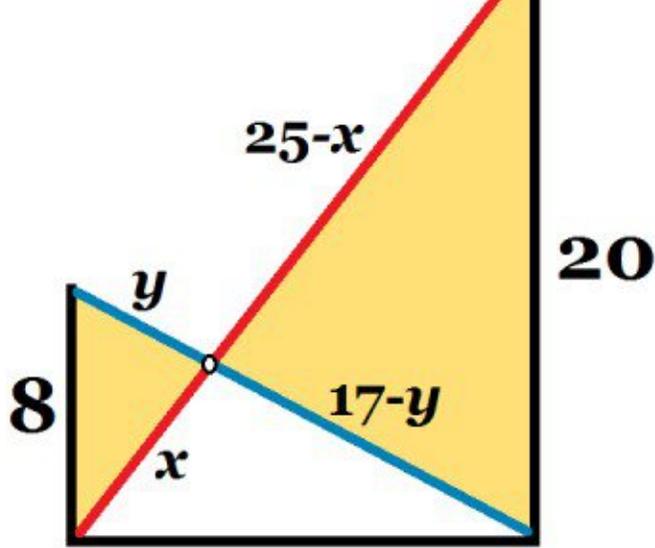
Two buildings are 15 feet apart. A 17-foot ladder is leaning against the right building with its base situated at the base of the left building. A 25-foot ladder is leaning against the left building with its base situated at the base of the right building. How high is the point where the ladders cross?

SOLUTION: This problem is solved using both the [Pythagorean Theorem](#) and properties of similar triangles. The diagram below shows how the ladders are arranged between the two buildings. The length or distance that we want to solve for is shown in green with question mark.



Each ladder is the hypotenuse of a right triangle. Using the Pythagorean Theorem, we can see that the longer ladder reaches a height of $\sqrt{25^2 - 15^2} = 20$ feet, and the shorter ladder reaches a height of $\sqrt{17^2 - 15^2} = 8$ feet. In the following diagram, we can also see that the two ladders form two similar triangles, colored in yellow.



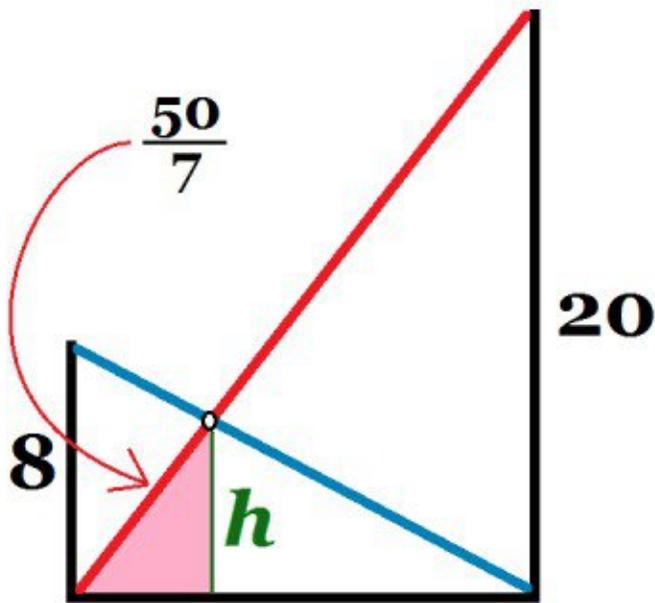


The crossing point of the two ladders creates four line segments. Using properties of similar triangles we can obtain the [ratio equalities](#) to find the lengths of these segments..

$$y/8 = (17-y)/20$$

$$x/8 = (25-x)/20$$

Solving for x and y we get $x = 50/7$ and $y = 34/7$, as well as $25-x = 125/7$ and $17-y = 85/7$. With the lengths of these segments, we can now use similar triangles once more to find the height of the bottom triangle.



The small pink triangle has a hypotenuse of $50/7$ and a height of h . This triangle is similar to the large right triangle on the right, which has a hypotenuse of 25 and a height of 20. This gives us the ratio equation

$$h/(50/7) = 20/25$$

which gives us $h = 40/7$ feet, or approximately 5 feet and 8.5 inches.