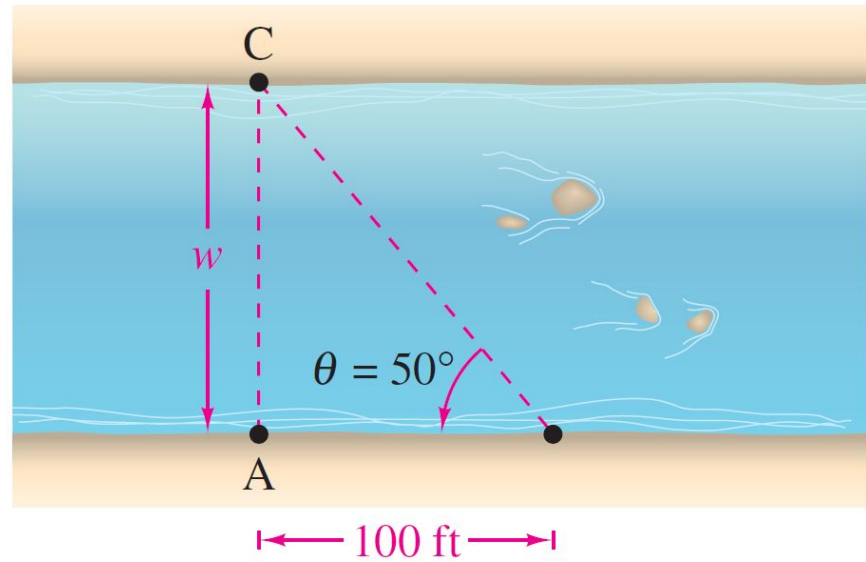


Width of a river

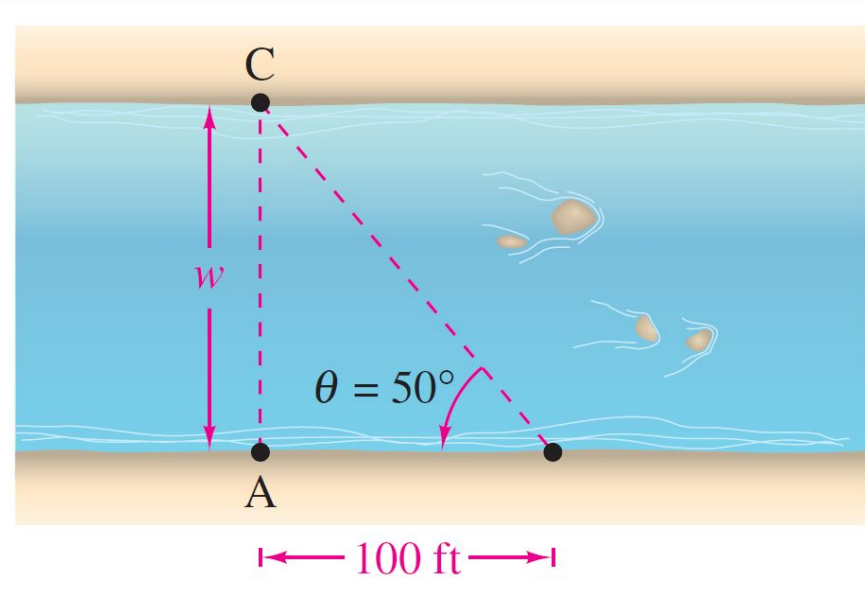
A biologist wants to know the width (w) of a river in order to set instruments to study the pollutants in the water. From point A the biologist walks downstream 100 feet and sights to point C. From this sighting it is determined that $\theta = 50^\circ$ (see figure). How wide is the river?

Resolution



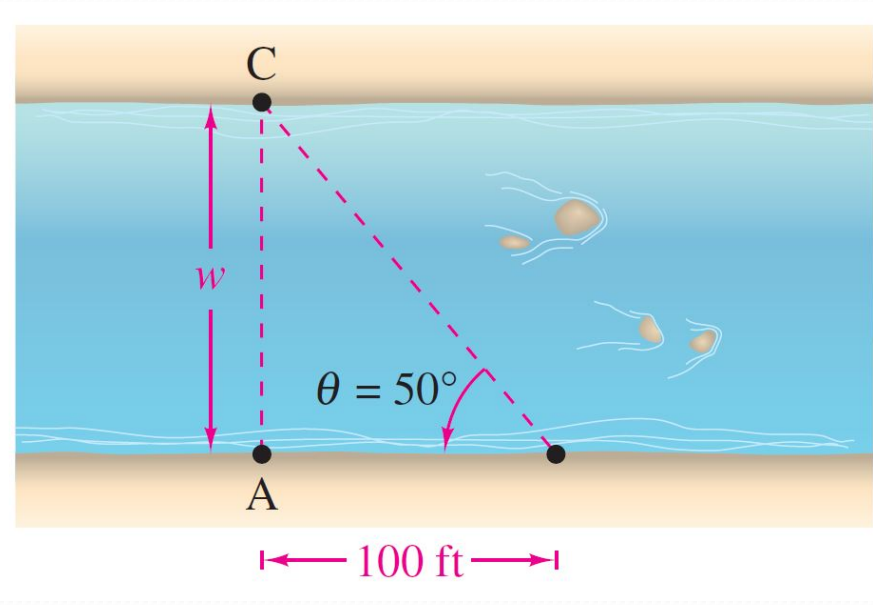
- We notice that we are dealing with a right triangle so we can apply the right triangle theorems.

Resolution



- We can use the second right triangle theorem:
“In a right triangle the length of a side is equal to the length of the other side, multiplied by the tangent of the angle opposite the first side, or by the cotangent of the angle adjacent to the first side”.

Resolution



- In this case...

$$AC = 100 \text{ ft} \cdot \tan \theta = 100 \text{ ft} \cdot \tan 50^\circ$$

$$AC = 100 \cdot 1.19 = 119.2 \text{ ft}$$

Revising a flight plan

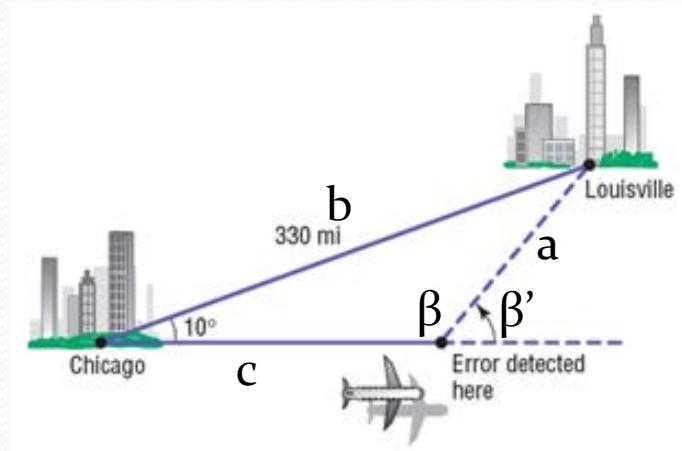
In attempting to fly from Chicago to Louisville, a distance of 330 miles, a pilot inadvertently took a course that was 10° in error, as indicated in the figure.

- a) If the aircraft maintains an average speed of 250 miles per hour and if the error in direction is discovered after 15 minutes, through what angle should the pilot turn to head toward Louisville?
- b) What new average speed should the pilot maintain so that the total time of the trip is 90 minutes?

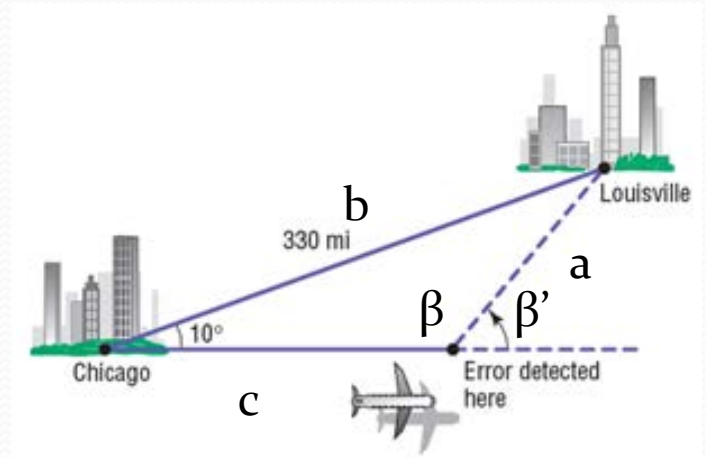
Resolution

- At first we can find how much distance is trodden by the plane until the pilot realises the error with the formula:

$$c = \Delta s = v \cdot \Delta t = 220 \frac{\text{mi}}{\text{h}} \cdot \frac{1}{4} \text{h} = 55 \text{mi}$$



Resolution



- Let's use the Law of Cosines , so:

$$a = \sqrt{b^2 + c^2 - 2bc \cos \alpha} = \sqrt{108900 + 3025 - 35574} = 276,0 \text{ miles}$$

- And then ,we can find the sine of β using the Law of sines:

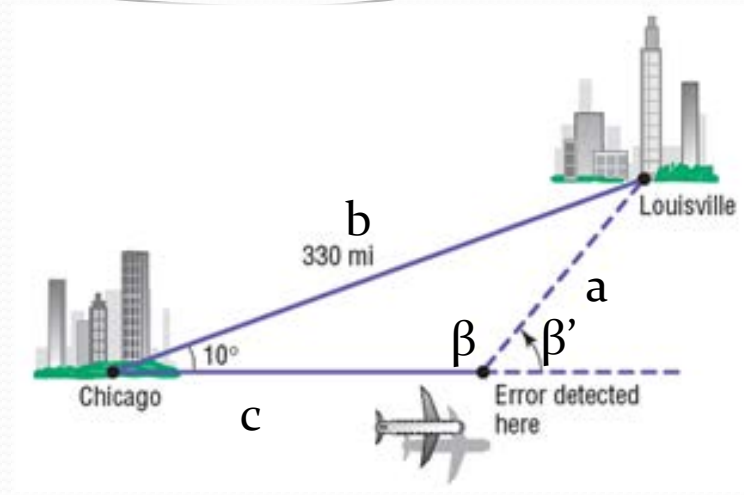
$$\frac{a}{\sin 10^\circ} = \frac{b}{\sin \beta} \Rightarrow \sin \beta = \frac{b}{a} \cdot \sin 10^\circ = 0,20$$

Resolution

- Now β must be obtuse, so:

$$\beta = 180^\circ - \arcsin 0.20 = 168.5^\circ$$

$$\beta' = \arcsin 0.20 = 11.5^\circ$$



By:
Matteo Zazzini
Marco D'Isidoro
Barbara Schirato
Francesco Buzzelli