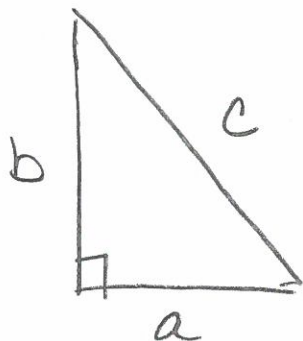


SECTION 4-1: RELATED RATES INTRO

Set up: A right triangle has a base that is getting longer at a rate of 5 m/s and a height that is getting shorter at a rate of 2 m/s.



$$\frac{da}{dt} = 5 \text{ m/s}$$

$$\frac{db}{dt} = -2 \text{ m/s}$$

Question 1: How fast is the length of hypotenuse changing when the base is 10 m and the height is 40 m?

want $\frac{dc}{dt}$. $a^2 + b^2 = c^2$ ← want

$$2a \frac{da}{dt} + 2b \frac{db}{dt} = 2c \boxed{\frac{dc}{dt}}$$

$$\frac{dc}{dt} = \frac{a \frac{da}{dt} + b \frac{db}{dt}}{c} = \frac{10(5) + 40(-2)}{\sqrt{1700}} = -0.7276 \text{ m/s}$$

Question 2: How fast is the area of the triangle changing when the base is 10 m and the height is 40 m?

$$A = \frac{1}{2} ab$$

$$\frac{dA}{dt} = \frac{1}{2} \left[a \cdot \frac{db}{dt} + \frac{da}{dt} \cdot b \right]$$

$$= \frac{1}{2} [10(-2) + 40(5)] = \frac{1}{2} (180) = 90 \text{ m}^2/\text{s}$$