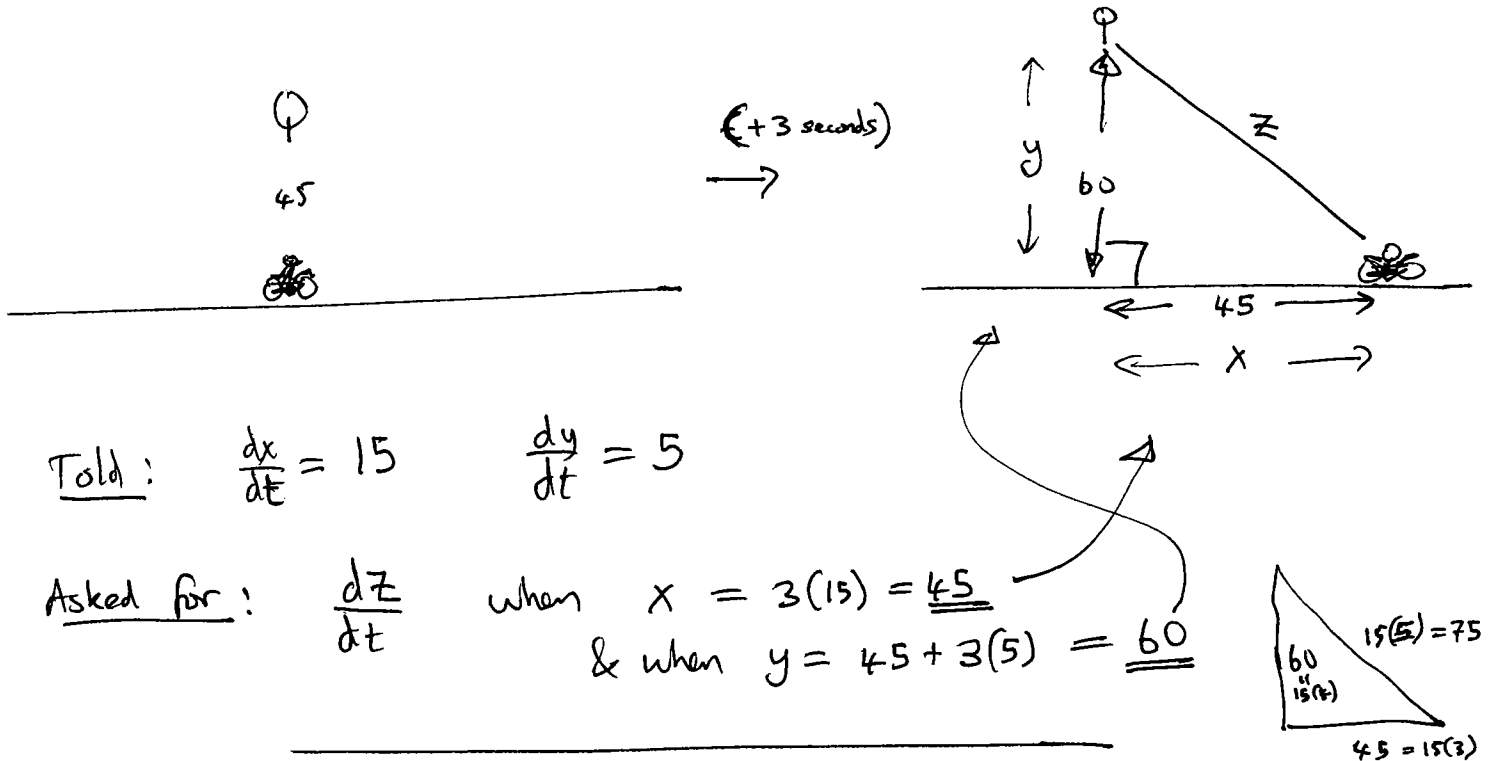


Q1].. A balloon is rising at a constant speed of 5 ft/s. A boy is cycling along a straight, horizontal road at a constant speed of 15 ft/s. When the boy passes under the balloon, it is 45 ft vertically above him. How fast is the distance between the boy and the balloon increasing 3 seconds later?



Told: $\frac{dx}{dt} = 15$ $\frac{dy}{dt} = 5$

Asked for: $\frac{dz}{dt}$ when $x = 3(15) = \underline{45}$
& when $y = 45 + 3(5) = \underline{60}$

Pythagoras \Rightarrow $z^2 = x^2 + y^2$

$$\frac{d}{dt} \Rightarrow z \frac{dz}{dt} = x \frac{dx}{dt} + y \frac{dy}{dt}$$

$$\Rightarrow (75) \frac{dz}{dt} = 45(15) + 60(5)$$

$$\begin{aligned} \underline{\text{Ans}} \quad \frac{dz}{dt} &= \frac{45(15) + 5(60)}{75} \text{ ft/sec.} \\ &= \frac{45 + 20}{5} = \frac{65}{5} = \boxed{13} \text{ ft/sec} \end{aligned}$$