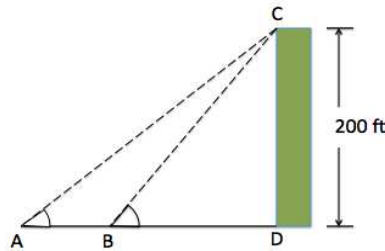


8. [9 points]

- a. [5 points] Arvin and Beatrice are standing on the side of a building that is 200 feet tall at the points A and B , respectively. They are separated by a distance of 100 feet. The angle between the ground and the line BC is equal to 0.6 radians.



Note: The picture is not drawn to scale.

Your answers must be exact or rounded to the nearest 0.1.

- i) Find the horizontal distance between Beatrice and the building. Show all your work.

Solution: Since $\tan(0.6) = \frac{200}{BD}$, then $BD = \frac{200}{\tan(0.6)} \approx 292.34$ feet.

- ii) Let α be the angle made by the line AC and the ground. Find the value of α (in radians). Show all your work.

Solution: Since $\tan(\alpha) = \frac{200}{BD+100} \approx \frac{200}{392.34} \approx 0.509$, then $\alpha = \tan^{-1}\left(\frac{200}{392.34}\right) \approx 0.471$ radians.

- b. [4 points] Let $R(t)$ be the number of employees working at a local store that specializes on selling arts and crafts t weeks after they opened for business. In their annual report, they recorded having 60 employees working for them the day they opened for business. The company had 170 and 60 employees during weeks 35 and 70 after they opened for business. Suppose that the function $R(t)$ is a quadratic function. Find a formula for $R(t)$.

Solution: The vertex of the quadratic function $R(t)$ is at $(35, 170)$. Hence $R(t) = a(t - 35)^2 + 170$. Using the fact that $60 = a(-35)^2 + 170$. Then $a = -\frac{110}{(-35)^2} \approx -0.089$. Therefore $R(t) = -\frac{110}{(-35)^2}(t - 35)^2 + 170$.