

Math 26 Section 1

Quiz 9

1. (2 points) In triangle ABC , $a = 1$, $b = 3$, and $C = 60^\circ$. Find c .

$$c^2 = a^2 + b^2 - 2ab \cos C = 1^2 + 3^2 - 2(1)(3) \cos 60^\circ = 10 - 6 \cdot \frac{1}{2} = 7$$

$$\text{Thus, } c = \sqrt{7}$$

2. (4 points) Find **all** possible values of B in triangle ABC if $A = 45^\circ$, $b = \frac{\sqrt{6}}{2}$, and $a = 1$.

$$\frac{\sin A}{a} = \frac{\sin B}{b}$$

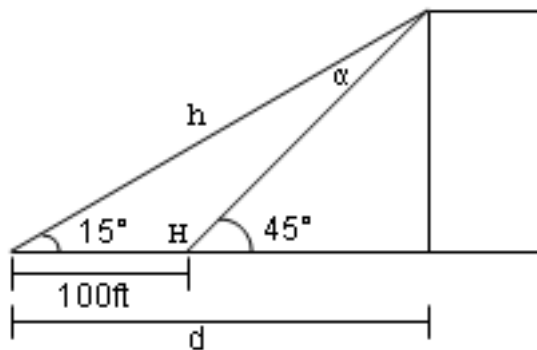
$$\frac{\sin 45^\circ}{1} = \frac{\sin B}{\frac{\sqrt{6}}{2}}$$

$$\sin B = \frac{\sqrt{6}}{2} \cdot \frac{\sqrt{2}}{2} = \frac{\sqrt{12}}{4} = \frac{\sqrt{3}}{2}$$

$$\text{so } B = 60^\circ, 120^\circ$$

3. (4 points) A person standing on the street looks up to the top of a building and finds that the angle of elevation is 45° . She then walks 100ft further away and finds that the angle of elevation to the top of the building is now 15° . How far is she from the building when she makes her second observation? Give an exact answer.

Hint: Use the law of sines and right triangle trigonometry. You will need the half-angle formula $\cos \frac{A}{2} = \pm \sqrt{\frac{1+\cos A}{2}}$ to evaluate $\cos 15^\circ$.



$$H = 180^\circ - 45^\circ = 135^\circ \quad \alpha = 180^\circ - 135^\circ - 15^\circ = 30^\circ$$

$$\frac{\sin H}{h} = \frac{\sin \alpha}{100}$$

$$\frac{\sin 135^\circ}{h} = \frac{\sin 30^\circ}{100}$$

$$\text{Note that } \sin 135^\circ = \sin 45^\circ = \frac{\sqrt{2}}{2}$$

$$\text{Thus, } h = 100\sqrt{2} \text{ and}$$

$$\begin{aligned} d &= h \cos 15^\circ = h \sqrt{\frac{1+\cos 30^\circ}{2}} = h \sqrt{\frac{1+\frac{\sqrt{3}}{2}}{2}} = h \sqrt{\frac{2+\sqrt{3}}{4}} = \\ &= h \frac{\sqrt{2+\sqrt{3}}}{2} = 100\sqrt{2} \frac{\sqrt{2+\sqrt{3}}}{2} = 50\sqrt{4+2\sqrt{3}} \end{aligned}$$