

# Math 130 - Quiz 8

November 11, 2020

Name key

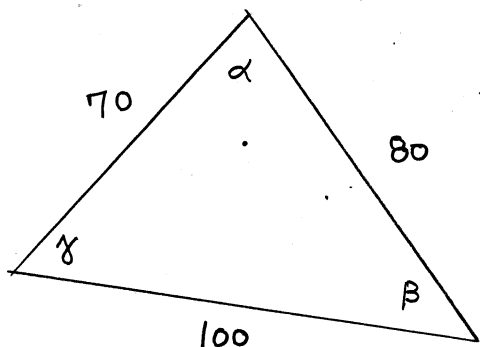
Score \_\_\_\_\_

Show all work to receive full credit. Supply explanations when necessary. You must work individually on this quiz. For each triangle described below,  $a$  is opposite  $\alpha$ ,  $b$  is opposite  $\beta$ , and  $c$  is opposite  $\gamma$ . This quiz is due November 16.

1. (4 points) A triangular plot of land is bounded on each side by a busy street. The lengths of the sides of the plot of land are 70.00 m, 80.00 m, and 100.00 m. Determine the angles that the streets make with one another. Give your answers in degrees, rounded to the nearest hundredth.

LAW OF COSINES  $\rightarrow$   $100^2 = 70^2 + 80^2 - 2(70)(80) \cos \alpha$   
 $\cos \alpha = \frac{100^2 - 70^2 - 80^2}{-2(70)(80)}$

$\Rightarrow \alpha \approx 83.33^\circ$



$70^2 = 100^2 + 80^2 - 2(100)(80) \cos \beta$

$\cos \beta = \frac{70^2 - 100^2 - 80^2}{-2(100)(80)}$

$\Rightarrow \beta \approx 44.05^\circ$

$80^2 = 100^2 + 70^2 - 2(100)(70) \cos \gamma$

$\cos \gamma = \frac{80^2 - 100^2 - 70^2}{-2(100)(70)}$

$\Rightarrow \gamma \approx 52.62^\circ$

2. (1 point) Use the Law of Sines to show that there is no triangle for which  $a = 4$  feet,  $b = 14$  feet, and  $\alpha = 60^\circ$ .

$\frac{\sin \alpha}{a} = \frac{\sin \beta}{b} \Rightarrow \frac{\sin 60^\circ}{4} = \frac{\sin \beta}{14}$

$\sin \beta \approx 3.031$

No such angle.

$-1 \leq \sin \beta \leq 1$

$\frac{14 \sin 60^\circ}{4} = \sin \beta$

$\frac{7\sqrt{3}}{4} = \sin \beta$

Turn over.

3. (5 points) Solve the triangle. If two solutions exist, find both.

$$\alpha = 58^\circ, \quad a = 11.4, \quad b = 12.8$$

LAW OF SINES  $\longrightarrow$   $\frac{\sin 58^\circ}{11.4} = \frac{\sin \beta}{12.8}$

$$\sin \beta = \frac{12.8 \sin 58^\circ}{11.4}$$

$$\beta \approx \underbrace{72.2122^\circ}_{\text{CASE 1}} \quad \text{or} \quad \underbrace{107.7878^\circ}_{\text{CASE 2}}$$

CASE 1

$$\beta \approx 72.2122^\circ$$

$$\gamma = 180^\circ - (\alpha + \beta) \\ \approx 49.7878$$

$$\frac{\sin 58^\circ}{11.4} = \frac{\sin 49.7878^\circ}{c}$$

$$\Rightarrow c \approx 10.3$$

CASE 2

$$\beta \approx 107.7878^\circ$$

$$\gamma = 180^\circ - (\alpha + \beta) \\ \approx 14.2122^\circ$$

$$\frac{\sin 58^\circ}{11.4} = \frac{\sin 14.2122^\circ}{c}$$

$$\Rightarrow c \approx 3.3$$

$$\beta \approx 72.2^\circ$$

$$\gamma \approx 49.8^\circ$$

$$c \approx 10.3$$

$$\beta \approx 107.8^\circ$$

$$\gamma \approx 14.2^\circ$$

$$c \approx 3.3$$