Precalculus Honors
Review for Test §§ 4.1, 4.2, 4.8, 5.5, 5.6

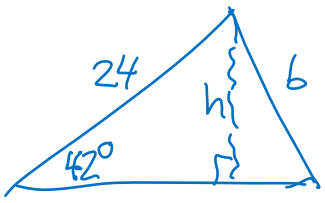
1. In ΔABC, if $a = 24$ and $B = 42^\circ$, determine the values of b that will produce the indicated number of triangles:

$h = 24 \sin 42^\circ \approx 16.06$

(a) Zero $b < 16.06$

(b) One $b = 16.06$ or $b \geq 24$

(c) Two $16.06 < b < 24$



2. Siegfried and Roy are driving towards each other along a straight highway. When they are exactly two miles apart, they simultaneously spot a UFO in the sky between them. If Siegfried's angle of elevation to the object is 36° and Roy's angle of elevation to the object is 48°, then

$180 - (36 + 48) = 96^\circ$

(a) How high is the UFO?

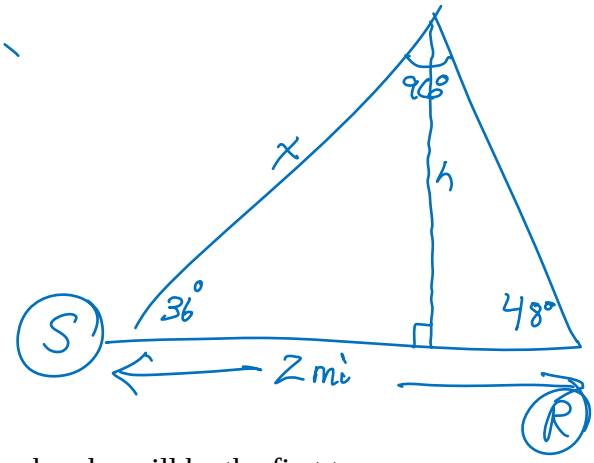
$\frac{\sin 96^\circ}{2} = \frac{\sin 48^\circ}{x}$

$x = \frac{2 \sin 48^\circ}{\sin 96^\circ} \approx 1.49447$ mi

$\sin 36^\circ = \frac{h}{1.49447}$

$h = 1.49447 \sin 36^\circ$

≈ 0.878 mi



(b) If Siegfried is driving 60 mph and Roy is driving 50 mph, who will be the first to arrive at the spot directly under the UFO?

Roy

y = Siegfried's dist

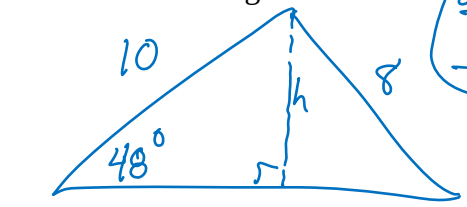
$\cos 36^\circ = \frac{y}{1.49447} \rightarrow y \approx 1.209$ miles

$\text{Time}_S = \frac{1.209}{60} \approx 0.02015$ hrs

Roy's Distance $= 2 - 1.209 \approx 0.791$ mi

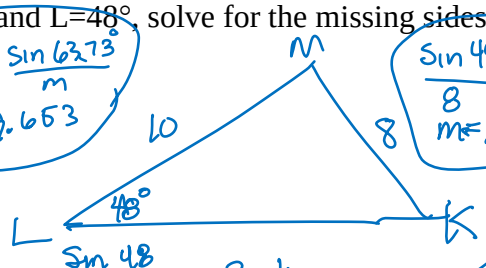
$\text{Time}_R = \frac{0.791}{50} \approx 0.01582$

3. Given $\triangle KLM$ with k=~~10~~, l=8, and L=48°, solve for the missing ~~sides/angles~~ of the triangle.



$h = 10 \sin 48^\circ \approx 7.43$

$7.43 < 8 < 10 \rightarrow$ 2 Δs!



$\frac{\sin 48^\circ}{8} = \frac{\sin 63.73^\circ}{m}$

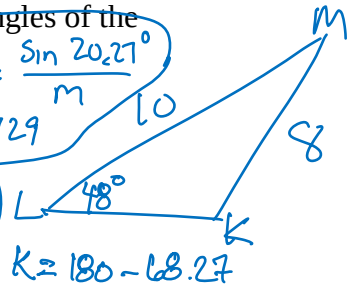
$\rightarrow m = 9.653$

$\frac{\sin 48^\circ}{8} = \frac{\sin k}{10}$

$k \approx 68.27^\circ$

$m \approx 63.73^\circ$ (by subtr)

$m = 9.653$



$\frac{\sin 48^\circ}{8} = \frac{\sin 20.27^\circ}{m}$

$m = 3.729$

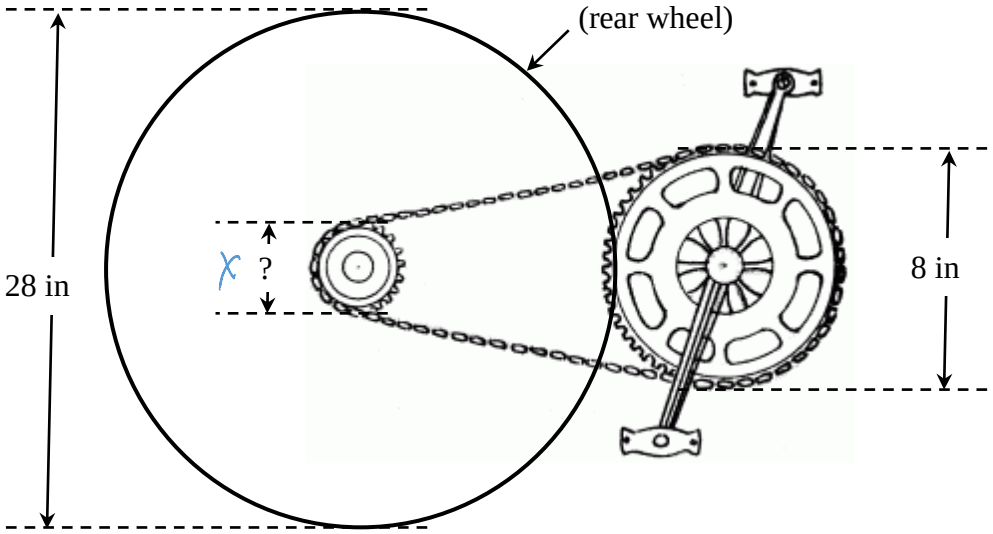
$K \approx 180 - 68.27$

$K \approx 111.73^\circ$

$M = 20.27^\circ$ (by subtr)

$m = 3.729$

4. Sandra is designing a new bike; she wants to use tires that are 28 inches in diameter, and she has already committed to have the pedal sprocket be 8 inches in diameter. What would the diameter of the rear wheel sprocket need to be if she wanted to have a pedal speed of 40 rpms produce a forward speed of 10 miles per hour?



Method ONE

$$\frac{10 \text{ miles}}{1 \text{ hr}} \cdot \frac{5280 \text{ ft}}{1 \text{ mile}} \cdot \frac{12 \text{ in}}{1 \text{ ft}} \cdot \frac{1 \text{ rev}}{28\pi \text{ in}} \cdot \frac{1 \text{ hr}}{60 \text{ min}} = 120.048 \frac{\text{revs}}{\text{min}}$$

(REAR WHEEL & REAR WHEEL SPROCKET SPEED)

$$\frac{X}{8} = \frac{40}{120.048} \longrightarrow \approx 2.666 \text{ inches diameter}$$

Method 2

$\frac{40 \text{ revs}}{1 \text{ min}}$ (pedal sprocket speed)

$$\frac{40 \text{ revs}}{1 \text{ min}} \cdot \frac{8\pi \text{ in}}{1 \text{ rev}} = 320\pi \frac{\text{in}}{\text{min}} \quad \text{(chain speed)}$$

$$\frac{320\pi \text{ in}}{\text{min}} \cdot \frac{1 \text{ rev}}{X\pi \text{ in}} = \frac{320}{X} \frac{\text{revs}}{\text{min}} \quad \text{(rear wheel / rear wheel sprocket speed)}$$

$$\frac{320}{X} \frac{\text{revs}}{\text{min}} \cdot \frac{60 \text{ min}}{1 \text{ hr}} \cdot \frac{28\pi \text{ in}}{1 \text{ rev}} \cdot \frac{1 \text{ ft}}{12 \text{ in}} \cdot \frac{1 \text{ mi}}{5280 \text{ ft}} = \frac{10 \text{ mi}}{1 \text{ hr}}$$