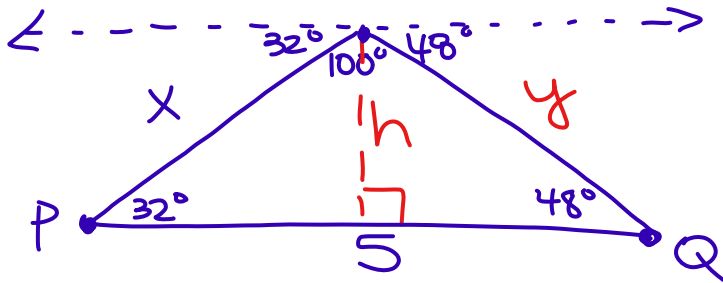


Intro to Law of Cosines and Word Problem Notes

Flight of a Plane

- 1) A pilot is flying over a straight highway. He determines the angles of depression to two mileposts, P and Q, 5 miles apart, to be 32° and 48° , respectively. (a) Find the distance of the plane from milepost P. (b) Find the distance of the plane from milepost Q. (c) What is the elevation of the plane?



$$\sin 48^\circ = \frac{h}{y}$$

$$h = 269 \sin 48^\circ$$

$$h = 2$$

$$\frac{5}{\sin 100^\circ} = \frac{x}{\sin 48^\circ}$$

$$\frac{5}{\sin 100^\circ} = \frac{y}{\sin 32^\circ}$$

$$\frac{5 \sin 48^\circ}{\sin 100^\circ} = x$$

$$\frac{5 \sin 32^\circ}{\sin 100^\circ} = y$$

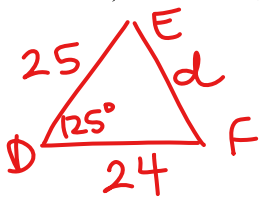
$$x = 3.77$$

$$y = 2.69$$

Solve each triangle. Round your answers to the nearest tenth.

- 2) In $\triangle DEF$, $e = 24$, $m\angle D = 125^\circ$, $f = 25$

- 3) In $\triangle KHP$, $p = 13$, $h = 21$, $k = 29$



$$c^2 = a^2 + b^2 - 2ab \cos C$$

$$d^2 = 24^2 + 25^2 - 2(24)(25) \cos 125^\circ$$

$$d^2 = 1889.292$$

$$d = 43.466$$

$$\angle F = 28.11^\circ$$

$$29^2 = 13^2 + 21^2 - 2(13)(21) \cos K$$

$$231 = -2(13)(21) \cos K$$

$$-423 = \cos K$$

$$K = 115.029^\circ$$

$$\frac{\sin 115.029}{29} = \frac{\sin H}{21}$$

$$\angle H = 41.006^\circ$$

$$\angle P = 23.965^\circ$$

$\angle E$ using L.O.C

$$e^2 = d^2 + f^2 - 2df \cos E$$

$$24^2 = 43.466^2 + 25^2 - 2(43.466)(25) \cos E$$

$$\angle E = 26.89^\circ$$

4) In $\triangle EFD$, $e = 19.9$, $d = 24$, $f = 22.7$

5) In $\triangle RST$, $m\angle R = 92^\circ$, $s = 29$, $t = 28$

$$24^2 = 19.9^2 + 22.7^2 - 2(19.9)(22.7)\cos D$$

$$-3353 = -2(19.9)(22.7)\cos D$$

$$3711 = \cos D$$

$$\cos^{-1}(3711) = D$$

$$\angle D = 68\ 215^\circ$$

$$\angle E = 50\ 349^\circ$$

$$\frac{\sin 68\ 215^\circ}{24} = \frac{\sin F}{22.7}$$

$$\frac{22.7 \sin 68\ 215^\circ}{24} = \sin F$$

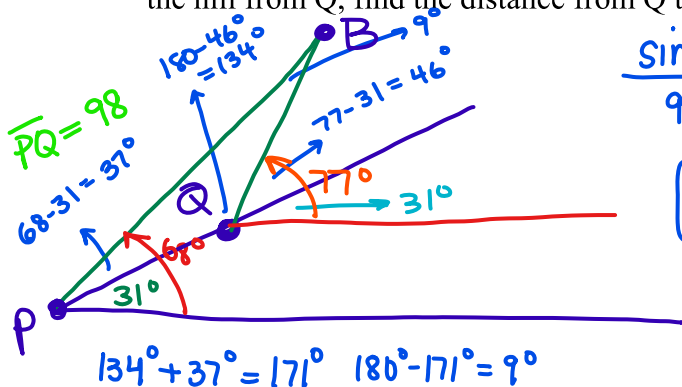
$$\angle F = 61\ 436^\circ$$

$$\angle S = 44\ 97^\circ$$

$$\angle T = 43\ 03^\circ$$

$$r = 41\ 008$$

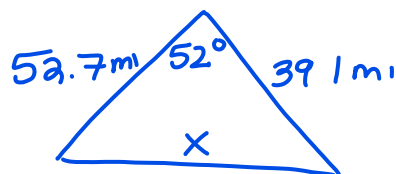
6) Observers at P and Q are located on the side of the hill that is inclined 31° to the horizontal. The observer at P determines the angle of elevation to the hot-air balloon, B, to be 68° . At the same instant, the observer at Q measures the angle of elevation to the balloon to be 77° . If P is 98 m down the hill from Q, find the distance from Q to the balloon.



$$\frac{\sin 9^\circ}{98} = \frac{\sin 37^\circ}{QB}$$

$$QB = 377\text{ m}$$

7) Two straight roads diverge at an angle of 52° . Two cars leave the intersection at 12:15 P.M., one traveling at 46 mi/hr and the other at 62 mi/hr. How far apart are the cars at 1:06 P.M.?



$$\frac{46\text{ mi}}{\text{hr}} \times 85\text{ hr} = 39.1\text{ mi}$$

$$\frac{62\text{ mi}}{\text{hr}} \times 85\text{ hr} = 52.7\text{ mi}$$

which Law do I use?

Cosine

$$X^2 = (52.7)^2 + (39.1)^2 - 2(52.7)(39.1)\cos 52^\circ$$

$$X = 42\ 058\text{ mi}$$

How long is this?
51 minutes $\times \frac{1\text{ hr}}{60\text{ min}} = 85\text{ hr}$