

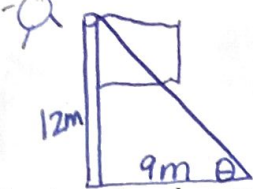
Name

Key

Triangle Applications of Trigonometry Review

Use what you know about SOH-CAH-TO & Law of Sines, and Law of Cosines to solve each of the following. Round to the nearest tenth (one decimal place) unless otherwise indicated.

1. A 12 meter flagpole casts a 9 meter shadow. Determine the angle of elevation of the sun.

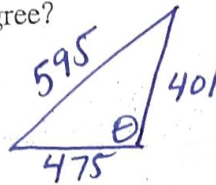


$$\tan \theta = \frac{12}{9}$$

$$\theta = \tan^{-1}\left(\frac{12}{9}\right)$$

$$\theta \approx 53.1^\circ$$

2. A triangular playground has sides of lengths 475 feet, 595 feet, and 401 feet. What is the measure of the largest angle between the sides, to the nearest tenth of a degree?

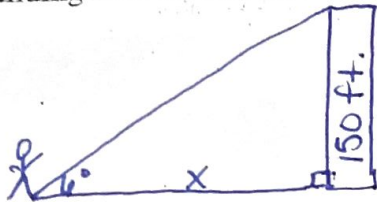


$$595^2 = 475^2 + 401^2 - 2(475)(401)\cos \theta$$

$$\frac{595^2 - 475^2 - 401^2}{-2(475)(401)} = \cos \theta$$

$$\theta \approx 85.1^\circ$$

3. Max Power is walking to his office building which he knows is 150 feet high. The angle to the top of the building from his current location is 6° . How much further does he have to walk?



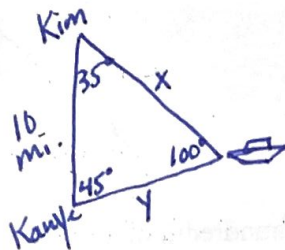
$$\tan 6^\circ = \frac{150}{x}$$

$$x = \frac{150}{\tan 6^\circ}$$

$$x \approx 1427.1$$

He is 1427.1 ft. away.

4. Kanye and Kim are standing at the seashore 10 miles apart. The coastline is a straight line between them. Both can see the same ship in the water. The angle between the coastline and the line between the ship and Kanye is 35° . The angle between the coastline and the line between the ship and Kim is 45° . How far are Kanye and Kim from the ship?

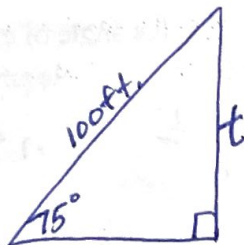


$$\frac{\sin 100^\circ}{10} = \frac{\sin 45^\circ}{x} = \frac{\sin 35^\circ}{y}$$

$$x \approx 7.18 \text{ miles, Kim is 7.2 miles away.}$$

$$y \approx 5.82 \text{ miles, Kanye is 5.8 miles away.}$$

5. Suppose you're flying a kite and it gets caught at the top of a tree. You've let out all 100 feet of string for the kite, and the angle the string makes with the ground is 75° . Due to your inquisitive nature, you wonder, "How tall is that tree?" Using your vast precalculus know-how, determine the answer to that question.

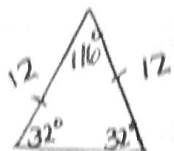


$$\sin 75^\circ = \frac{t}{100}$$

$$100 \sin 75^\circ = t$$

$$t \approx 96.6 \text{ ft.}$$

6. An isosceles triangle has legs of length 12 inches and base angles that measure 32° each. Find the area of triangle to the nearest tenth of a square inch.



$$\text{Area} = \frac{1}{2}(12)(12)\sin(116^\circ)$$

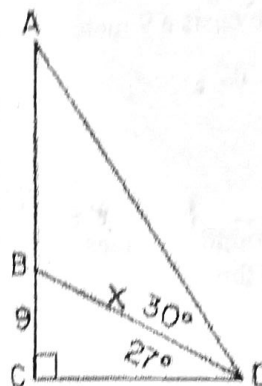
$$= \boxed{64.7 \text{ in.}^2}$$

7. Using the accompanying diagram, determine the length of \overline{BD} .

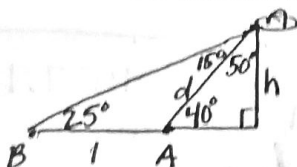
$$\sin 27^\circ = \frac{9}{x}$$

$$x = \frac{9}{\sin 27^\circ}$$

$$\boxed{\overline{BD} = 19.8}$$



8. A person at point A looks due east and sees a UFO with an angle of elevation of 40° . At the same instant, another person, 1 mile due west of point A, looks due east and sights the same UFO with an angle of elevation of 25° . Determine the distance between point A and the UFO. How far is the UFO above the ground?



$$\frac{\sin 15^\circ}{1} = \frac{\sin 25^\circ}{d}$$

$$\sin 40^\circ = \frac{h}{d}$$

$$d \approx 1.63 \text{ mi}$$

$$d \sin 40^\circ = h$$

$$h \approx \boxed{1.04 \text{ miles}}$$

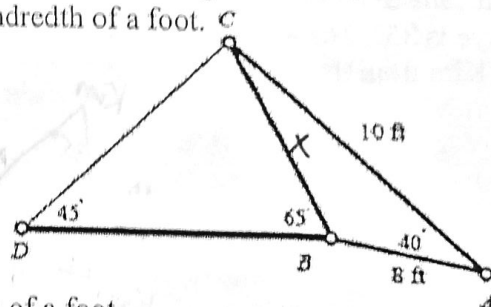
9. A crane is being created by four steel members (bold) and a cable, as shown in the diagram below.

- a. Determine the length of support member \overline{BC} to the nearest hundredth of a foot.

$$x^2 = 10^2 + 8^2 - 2(10)(8)\cos 40^\circ$$

$$x = \sqrt{10^2 + 8^2 - 2(10)(8)\cos 40^\circ}$$

$$x \approx 6.4 \text{ ft.} \quad \boxed{\overline{BC} = 6.4 \text{ ft.}}$$

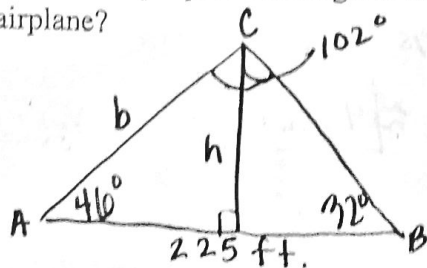


- b. Determine the length of the cable \overline{CD} to the nearest hundredth of a foot.

$$\frac{\sin 45^\circ}{\overline{BC}} = \frac{\sin 65^\circ}{\overline{CD}}$$

$$\boxed{\overline{CD} \approx 8.3 \text{ ft.}}$$

10. An airplane flies directly overhead 2 people at the same time and they measure the angle of elevation. The airplane is between the two people. One angle is 32° and the other measures 46° . If the people are 225 feet apart, how high is the airplane?



$$\frac{\sin 102^\circ}{225} = \frac{\sin 32^\circ}{b}$$

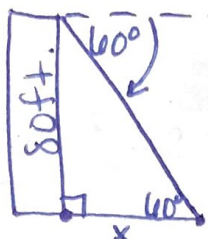
$$\sin 46^\circ = \frac{h}{b}$$

$$b \approx 121.9$$

$$b \sin 46^\circ = h$$

$$h \approx \boxed{87.7 \text{ ft.}}$$

11. From the top of a tower, the angle of depression to a stake on the ground is 60° . The top of the tower is 80 feet above ground. How far is the stake from the foot of the tower?



$$\tan 60^\circ = \frac{80}{x}$$

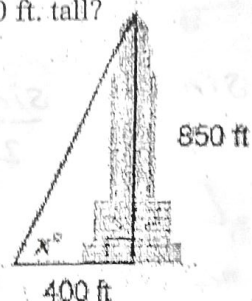
$$x = \frac{80}{\tan 60^\circ} \quad x \approx \boxed{46.2 \text{ ft.}}$$

12. Find the angle of elevation if you are standing 400 ft away and the building is 850 ft. tall?

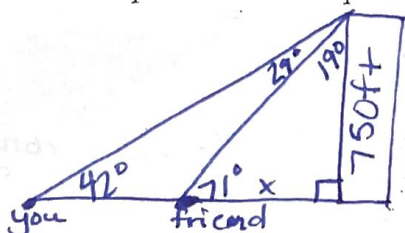
$$\tan x = \frac{850}{400}$$

$$x = \tan^{-1} \left(\frac{850}{400} \right)$$

$$x \approx \boxed{64.8^\circ}$$



13. You are a block away from a skyscraper that is 750 feet tall. Your friend is between the skyscraper and yourself. The angle of elevation from your position to the top of the skyscraper is 42° . The angle of elevation from your friend's position to the top of the skyscraper is 71° . To the nearest foot, how far are you from your friend?



$$\tan 71^\circ = \frac{750}{f}$$

$$f = \frac{750}{\tan 71^\circ}$$

$$f \approx 258.24$$

$$f - y$$

$$\tan 42^\circ = \frac{750}{y}$$

$$y = \frac{750}{\tan 42^\circ}$$

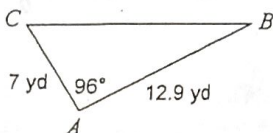
$$559.98$$

$$y \approx 832.959$$

$$\boxed{574.7 \text{ ft.}}$$

Find the area of each triangle to the nearest tenth.

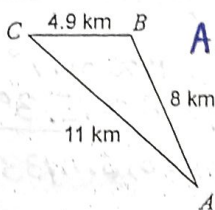
10)



$$\text{Area} = \frac{1}{2}(7)(12.9)\sin 96^\circ$$

$$= \boxed{44.9 \text{ yd}^2}$$

11)



$$S = \frac{11 + 8 + 4.9}{2}$$

$$S = 11.95$$

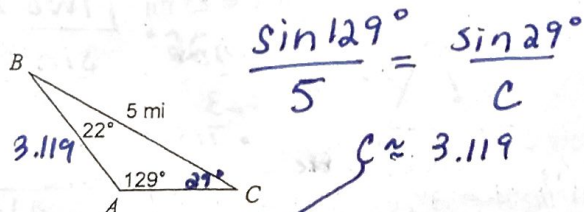
Heron's Formula

$$A = \sqrt{s(s-a)(s-b)(s-c)}$$

$$A = \sqrt{11.95(11.95-11)(11.95-8)(11.95-4.9)}$$

$$\boxed{A \approx 17.7 \text{ km}^2}$$

12)



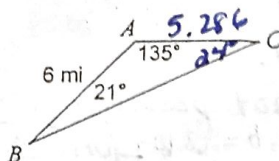
$$\frac{\sin 129^\circ}{5} = \frac{\sin 29^\circ}{c}$$

$$c \approx 3.119$$

$$A = \frac{1}{2}(c)(5)\sin 22^\circ$$

$$\text{Area} \approx \boxed{2.92 \text{ mi}^2}$$

13)



$$\frac{\sin 1^\circ}{b} = \frac{\sin 24^\circ}{6}$$

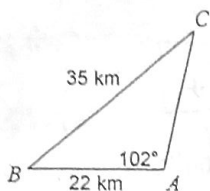
$$b \approx 5.286$$

$$A = \frac{1}{2}(b)(6)\sin(135^\circ)$$

$$A \approx \boxed{11.21 \text{ mi}^2}$$

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

1)



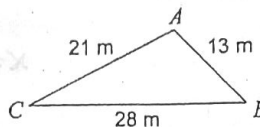
$$\angle C \approx 37.9^\circ$$

$$\angle B \approx 40.1^\circ$$

$$\frac{\sin 102^\circ}{35} = \frac{\sin C}{22} = \frac{\sin B}{b}$$

2)

SSS



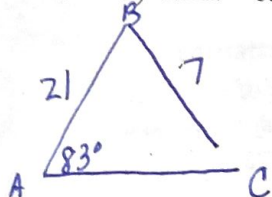
$$28^2 = 21^2 + 13^2 - 2(21)(13) \cos A$$

$$\angle A \approx 108.58^\circ$$

$$21^2 = 13^2 + 28^2 - 2(13)(28) \cos B$$

$$\angle B \approx 45.31^\circ$$

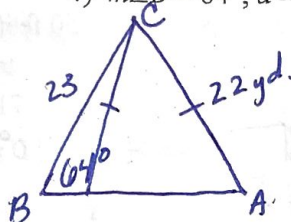
$$\angle C \approx 26.11^\circ$$

3) $m\angle A = 83^\circ$, $c = 21$ km, $a = 7$ km

$$\frac{\sin 83^\circ}{7} = \frac{\sin C}{21}$$

$$2.977 = \sin C$$

Not possible

4) $m\angle B = 64^\circ$, $a = 23$ yd, $b = 22$ yd

$$\frac{\sin 64^\circ}{22} = \frac{\sin A}{23} = \frac{\sin C}{c}$$

If $\angle A$ is acute

$$\angle A \approx 69.99^\circ$$

$$\angle C \approx 46.01^\circ$$

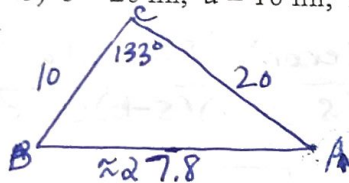
$$c \approx 17.6 \text{ yds.}$$

If $\angle A$ is obtuse

$$\angle A \approx 110.01^\circ$$

$$\angle C \approx 5.99^\circ$$

$$c \approx 2.56 \text{ yds}$$

5) $b = 20$ mi, $a = 10$ mi, $m\angle C = 133^\circ$ 

$$\frac{\sin B}{20} = \frac{\sin 133^\circ}{10}$$

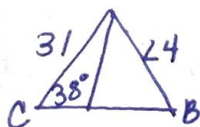
$$\angle B \approx 31.7^\circ$$

$$\angle A \approx 15.3^\circ$$

$$c^2 = 10^2 + 20^2 - 2(10)(20) \cos 133^\circ$$

$$c \approx 27.8 \text{ miles}$$

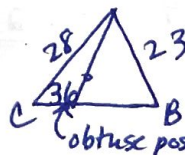
State the number of possible triangles that can be formed using the given measurements.

6) $m\angle C = 38^\circ$, $b = 31$ in, $c = 24$ in

$$\frac{\sin 38^\circ}{24} = \frac{\sin B}{31}$$

$$4.77 = \sin B$$

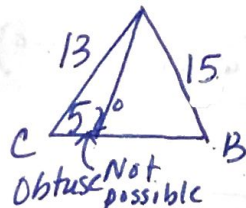
not possible

Zero Δ 's7) $m\angle C = 36^\circ$, $b = 28$ mi, $c = 23$ mi

$$\frac{\sin 36^\circ}{23} = \frac{\sin B}{28}$$

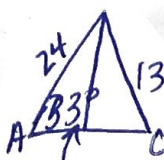
$$0.7155 \approx \sin B$$

possible

Two Δ 's8) $m\angle C = 52^\circ$, $c = 15$ km, $b = 13$ km

$$\frac{\sin 52^\circ}{15} = \frac{\sin B}{13}$$

$$0.6829 = \sin B$$

One Δ 9) $m\angle A = 33^\circ$, $c = 24$ ft, $a = 13$ ft

$$\frac{\sin 33^\circ}{13} = \frac{\sin C}{24}$$

$$0.0966 \approx \sin C$$

possible

Two Δ 's

obtuse possible