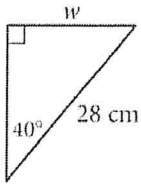
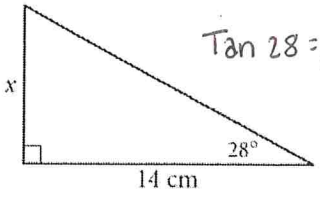
For Exercises 15–17, write a trigonometric equation you can use to solve for the unknown value. Then find the value to the nearest 0.1. SOH CAH TOA

**15.** $w \approx$ 18cm



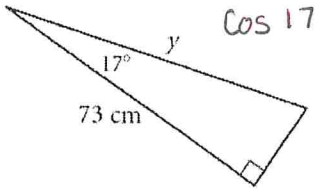

Sin 40 = $\frac{w}{28}$

**16.** $x \approx$ 7.4cm




Tan 28 = $\frac{x}{14}$

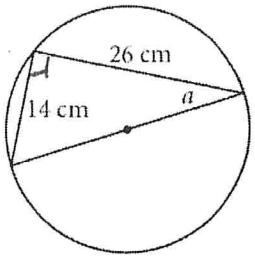
**17.** $y \approx$ 76.3cm




Cos 17 = $\frac{73}{y}$

For Exercises 18–20, find the value of each unknown to the nearest degree.

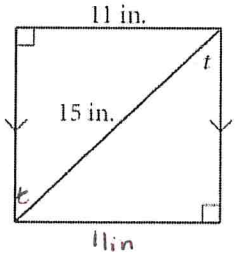
**18.** $a \approx$ 28°




Tan A = $\frac{14}{26}$

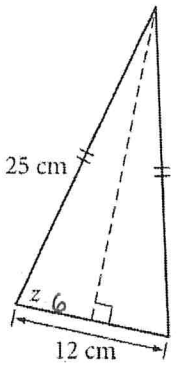
$\tan^{-1}(\frac{14}{26})$

**19.** $t \approx$ 47°




Sin t = $\frac{11}{15}$

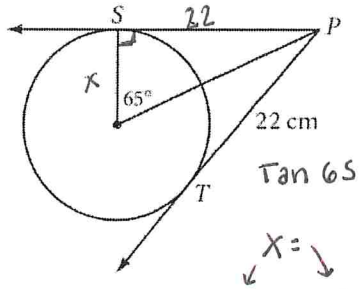
**20.** $z \approx$ 76°




Cos z = $\frac{6}{25}$

**7.** $\overline{PS}$ and $\overline{PT}$ are tangents.

Diameter ≈ 20.6cm



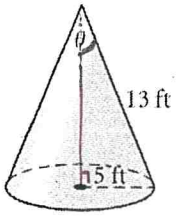

Tan 65 = $\frac{22}{X}$

X = ↘

radius = 10.3

**8.** Right cone

$\theta \approx$ 46°

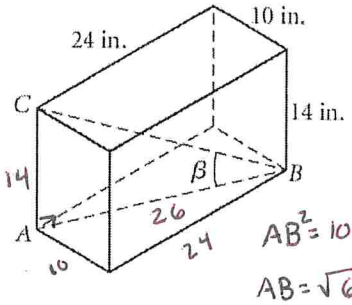



Sin X = $\frac{5}{13}$

X = 23°

**9.** Right rectangular prism

$m\angle ABC = \beta \approx$ 28°




$AB^2 = 10^2 + 24^2$

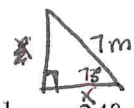
$AB = \sqrt{676}$

26

tan B = $\frac{14}{26}$

In Exercises 10–12, give each answer to the nearest tenth of a unit.

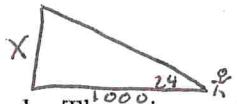
**10.** A ladder 7 m long stands on level ground and makes a 73° angle with the ground as it rests against a wall. How far from the wall is the base of the ladder?




Cos 73 = $\frac{x}{7}$

2m

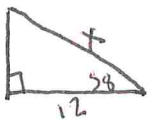
**11.** To see the top of a building 1000 feet away, you look up 24° from the horizontal. What is the height of the building?




Tan 24 = $\frac{x}{1000}$

445.2 ft

**12.** A guy wire is anchored 12 feet from the base of a pole. The wire makes a 58° angle with the ground. How long is the wire?

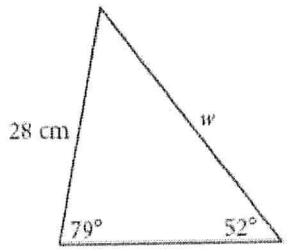



Cos 58 = $\frac{12}{x}$

22.6 ft

In Exercises 5–7, find each length to the nearest centimeter.

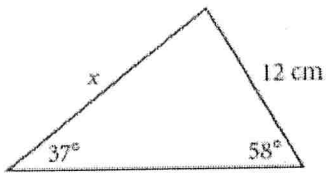
**5.** $w \approx$ ?




$\frac{w}{\sin 79} = \frac{28}{\sin 52}$

$w \approx 35\text{cm}$

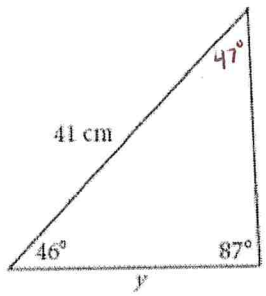
**6.** $x \approx$ ?




$\frac{x}{\sin 58} = \frac{12}{\sin 37}$

$x \approx 17\text{cm}$

**7.** $y \approx$ ?

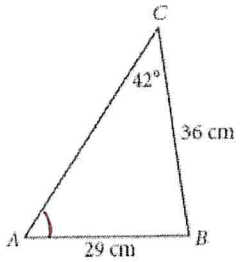



$\frac{y}{\sin 47} = \frac{41}{\sin 87}$

$y \approx 30\text{cm}$

For Exercises 8–10, each triangle is an acute triangle. Find each angle measure to the nearest degree.

**8.** $m\angle A \approx$ ?

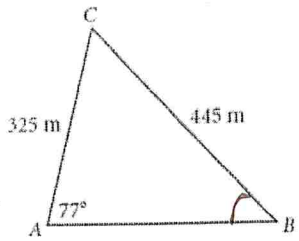



$\frac{\sin A}{36} = \frac{\sin 42}{29}$

$\sin^{-1}(.8306)$

$m\angle A \approx 56°$

**9.** $m\angle B \approx$ ?

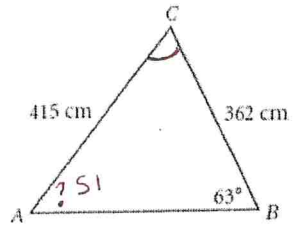



$\frac{\sin B}{325} = \frac{\sin 77}{445}$

$\sin^{-1}(.7116)$

$m\angle B \approx 45°$

**10.** $m\angle C \approx$ ?




$\frac{\sin A}{362} = \frac{\sin 63}{415}$

$\sin^{-1}(.7772)$

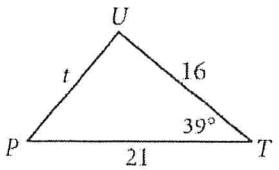
$m\angle A \approx 51°$

$m\angle C = 180 - 63 - 51$

$m\angle C \approx 66°$

In Exercises 1–3, find each length to the nearest centimeter. All lengths are in centimeters.

**1.** $t \approx$ 13cm

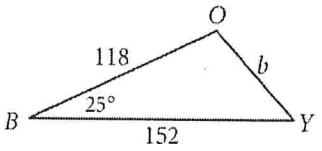



$t^2 = 21^2 + 16^2 - 2(21)(16)\cos 39$

$t^2 = 697 - 522.2$

$t = \sqrt{174.8}$

**2.** $b \approx$ 67cm

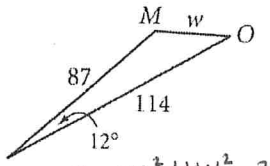



$b^2 = 118^2 + 152^2 - 2(118)(152)\cos 25$ W

$b^2 = 37028 - 32511.1$

$b = \sqrt{4516.9}$

**3.** $w \approx$ 34cm




$w^2 = 87^2 + 114^2 - 2(87)(114)\cos 12$

$w^2 = 20565 - 1162.5$

$w = \sqrt{1162.5}$

In Exercises 4–6, find each angle measure to the nearest degree.

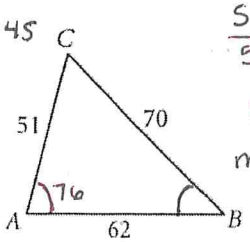
**4.** $m\angle A \approx$ 76°

$m\angle B \approx$ 45°

$m\angle C \approx$ 59°

③ $m\angle C = 180 - 76 - 45$

$m\angle C = 59°$




② $\frac{\sin B}{51} = \frac{\sin 76}{70}$

$\sin^{-1}(.7069)$

$m\angle B = 45°$

① $70^2 = 51^2 + 62^2 - 2(51)(62)\cos A$

$4900 = 6445 - 6324\cos A$

$-1545 = -6324\cos A$

$\cos^{-1}\left(\frac{-1545}{-6324}\right)$

$m\angle A = 76°$

**5.** $m\angle A \approx$ 77°

$m\angle P \approx$ 66°

$m\angle S \approx$ 37°

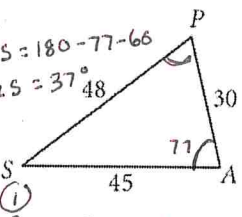
② $\frac{\sin P}{45} = \frac{\sin 77}{48}$

$\sin^{-1}(.9135)$

$m\angle P = 66°$

③ $m\angle S = 180 - 77 - 66$

$m\angle S = 37°$




① $48^2 = 45^2 + 30^2 - 2(45)(30)\cos A$

$2304 = 2925 - 2700\cos A$

$-621 = -2700\cos A$

$\cos^{-1}\left(\frac{-621}{-2700}\right)$ $m\angle A = 77°$

**6.** $m\angle S \approx$ 46°

$m\angle U \approx$ 83°

$m\angle V \approx$ 51°

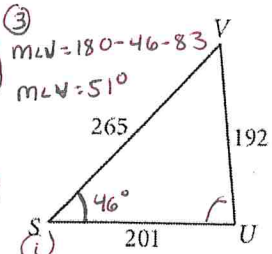
② $\frac{\sin U}{265} = \frac{\sin 46}{192}$

$\sin^{-1}(.9928)$

$m\angle U = 83°$

③ $m\angle V = 180 - 46 - 83$

$m\angle V = 51°$




① $192^2 = 265^2 + 201^2 - 2(201)(265)\cos S$

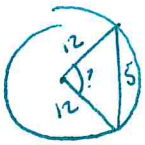
$36864 = 110626 - 106530\cos S$

$-73762 = -106530\cos S$

$\cos^{-1}\left(\frac{-73762}{-106530}\right)$

$m\angle S = 46°$

**7.** A circle with radius 12 in. has radii drawn to the endpoints of a 5 in. chord. What is the measure of the central angle?




$5^2 = 12^2 + 12^2 - 2(12)(12)\cos C$

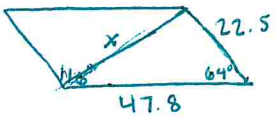
$25 = 288 - 288\cos C$

$-263 = -288\cos C$

$\cos^{-1}(-263/-288)$

24°

**8.** A parallelogram has side lengths 22.5 cm and 47.8 cm. One angle measures 116°. What is the length of the shorter diagonal?



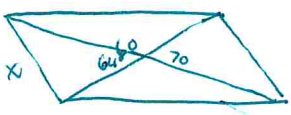

$x^2 = 22.5^2 + 47.8^2 - 2(22.5)(47.8)\cos 64$

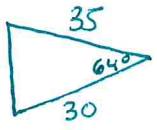
$x^2 = 2791.09 - 942.9$

$x = \sqrt{1848.2}$

43cm

**9.** The diagonals of a parallelogram are 60 in. and 70 in. and intersect at an angle measuring 64°. Find the length of the shorter side of the parallelogram.



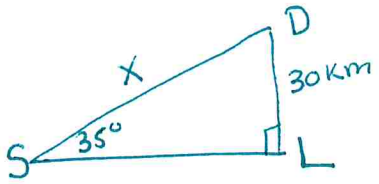

$x^2 = 35^2 + 30^2 - 2(35)(30)\cos 64$

$x^2 = 2125 - 920.6$

$x = \sqrt{1204.4}$

34.7in

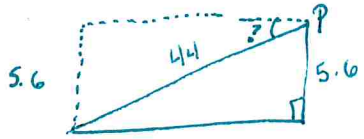
**15.** A lighthouse is east of a sailboat. The sailboat's dock is 30 km north of the lighthouse. The captain measures the angle between the lighthouse and the dock and finds it to be 35°. How far is the sailboat from the dock?




$\sin 35 = \frac{30}{x}$

$x \approx 52.3$ km

**16.** An air traffic controller must calculate the angle of descent (the angle of depression) for an incoming jet. The jet's crew reports that their land distance is 44 km from the base of the control tower and that the plane is flying at an altitude of 5.6 km. Find the measure of the angle of descent.

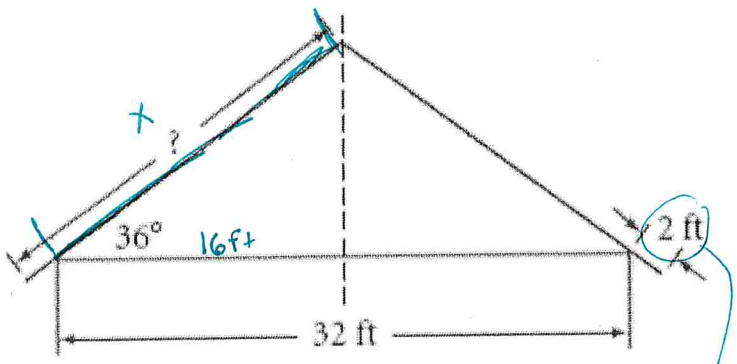



$\sin x = \frac{5.6}{44}$

$\sin^{-1}\left(\frac{5.6}{44}\right)$

7.3°

**17.** A new house is 32 feet wide. The rafters will rise at a 36° angle and meet above the center line of the house. Each rafter also needs to overhang the side of the house by 2 feet. How long should the carpenter make each rafter?




$\cos 36 = \frac{16}{x}$

$x = 20$ ft

$+2$

22ft