

Warm up

Find the exact ratio of the following without a calculator:

1.  $\sin \frac{2\pi}{3}$
2.  $\tan \frac{\pi}{2}$
3.  $\sec 225^\circ$
4.  $\cot 0$
5.  $\cos \frac{\pi}{6}$
6.  $\csc \left( -\frac{5\pi}{6} \right)$
7.  $\sin 240^\circ$
8.  $\cot \frac{7\pi}{4}$
9.  $\sec \frac{2\pi}{3}$
10.  $\tan \frac{7\pi}{6}$
11.  $\csc 330^\circ$
12.  $\cos(-270^\circ)$

Find the values of  $\theta$  without a calculator ( $0 \leq \theta < 2\pi$ )

13.  $\sin \theta = -\frac{\sqrt{3}}{2}$
14.  $\cot \theta = \text{und}$

Find the values of  $\theta$  using a calculator ( $0 \leq \theta < 2\pi$ )

15.  $\tan \theta = -1.3517$

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**GO COUGARS!**

p 294 **Homework Questions**

*In Exercises 37-44, find the reference angle  $\theta'$  for the special angle  $\theta$ . Then sketch  $\theta$  and  $\theta'$  in standard position.*

37.  $\theta = 120^\circ$       38.  $\theta = 225^\circ$   
 39.  $\theta = -135^\circ$       40.  $\theta = -230^\circ$   
 41.  $\theta = \frac{5\pi}{3}$       42.  $\theta = \frac{7\pi}{6}$   
 43.  $\theta = -\frac{5\pi}{4}$       44.  $\theta = -\frac{2\pi}{3}$

*In Exercises 45-48, evaluate the sine, cosine, and tangent of the angle without using a calculator.*

45.  $225^\circ$       46.  $300^\circ$   
 47.  $-150^\circ$       48.  $180^\circ$   
 49.  $\frac{5\pi}{3}$       50.  $\frac{7\pi}{6}$   
 51.  $-\frac{5\pi}{4}$       52.  $-\frac{2\pi}{3}$   
 53.  $\frac{11\pi}{6}$       54.  $\frac{13\pi}{6}$

*In Exercises 55-64, find two solutions of the equation. Give these answers in degrees. (If  $\theta = 0$ ,  $360^\circ$ , and radians.)*

55.  $\sin \theta = \frac{1}{2}$       56.  $\cos \theta = \frac{1}{2}$   
 57.  $\cos \theta = 1$       58.  $\tan \theta = -\frac{1}{2}$   
 59.  $\cos \theta = \frac{\sqrt{2}}{2}$       60.  $\sin \theta = -\frac{\sqrt{2}}{2}$   
 61.  $\cos \theta = \frac{\sqrt{3}}{2}$       62.  $\sin \theta = -\frac{1}{2}$   
 63.  $\cos \theta = -\frac{\sqrt{2}}{2}$       64.  $\sin \theta = -\frac{1}{2}$

*Use a calculator to approximate the values of  $\theta$  ( $0 \leq \theta < 360^\circ$ ) that satisfy the equation. Round the values to two decimal places.*

1.  $\sin \theta = 0.8551$       2.  $\cos \theta = 0.8146$       3.  $\tan \theta = 1.2501$   
 4.  $\cot \theta = -1.5947$       5.  $\sec \theta = 1.3612$       6.  $\csc \theta = 1.1922$

*Use a calculator to approximate two values of  $\theta$  ( $0 \leq \theta < 2\pi$ ) that satisfy the equation. Round the values to three decimal places.*

7.  $\sin \theta = 0.0155$       8.  $\cos \theta = 0.5771$

9.  $\tan \theta = \frac{2.1417}{1.0000}$       10.  $\cot \theta = -1.2214$

**Why do so many students study Trigonometry?**

1.  $\csc \frac{\pi}{2} =$       2.  $\sec \frac{\pi}{2} =$   
 3.  $\tan \frac{\pi}{2} =$       4.  $\cot \frac{\pi}{2} =$   
 5.  $\sin \frac{\pi}{2} =$       6.  $\cos \frac{\pi}{2} =$   
 7.  $\csc \frac{\pi}{3} =$       8.  $\sec \frac{\pi}{3} =$   
 9.  $\tan \frac{\pi}{3} =$       10.  $\cot \frac{\pi}{3} =$

**Did you hear about the girl who backed into a fan?**

1.  $\sin 240^\circ =$       2.  $\cos 315^\circ =$   
 3.  $\tan 135^\circ =$       4.  $\cot 225^\circ =$   
 5.  $\sin 315^\circ =$       6.  $\sec 210^\circ =$   
 7.  $\sin 150^\circ =$       8.  $\csc 120^\circ =$

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**GO COUGARS!**

### Homework Questions

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**Exercises 1-10, solve the right triangle shown in the figure.**

1.  $A = 30^\circ, b = 10$       2.  $\theta = 60^\circ, c = 15$   
 3.  $\theta = 71^\circ, b = 14$       4.  $a = 7.4', u = 20.5$   
 5.  $a = 6, b = 12$       6.  $a = 25, c = 45$   
 7.  $b = 16, c = 54$       8.  $b = 1.32, c = 18.9$   
 9.  $A = 12^\circ 15', c = 430.5$       10.  $\theta = 65^\circ 12', u = 145.5$

**Exercises 11-14, find the altitude of the isosceles triangle shown in the figure.**

11.  $\theta = 52^\circ, b = 8$  inches  
 12.  $\theta = 18^\circ, b = 12$  meters  
 13.  $\theta = 41^\circ, b = 18.5$  feet  
 14.  $\theta = 72.94^\circ, b = 3.26$  centimeters

**15. Length** A shadow of length  $L$  is created by a 60-foot silo when the sun is  $\theta^\circ$  above the horizon.

- Draw a right triangle that gives a visual representation of the problem. Label the known and unknown quantities.
- Write  $L$  as a function of  $\theta$ .
- Use a graphing utility to complete the table.

$\theta$	$10^\circ$	$20^\circ$	$30^\circ$	$40^\circ$	$50^\circ$
$L$					

(d) The angle measure increases in equal increments in the table. Does the length of the shadow change in equal increments? Explain.

**17. Height** A ladder 20 feet long leans against the side of a house. The angle of elevation of the ladder is  $87^\circ$ . Find the height from the top of the ladder to the ground.

**18. Depth** The center of a navy cruise detects a submarine that is 4000 feet from the cruise. The angle between the water level and the submarine is  $31.5^\circ$ . How deep is the submarine?

**22. Height** From a point 100 feet in front of a public library, the angle of elevation to the base of the flagpole and the top of the flagpole are  $28^\circ$  and  $39^\circ 45'$ , respectively. The flagpole is mounted on the front of the library's roof. Find the height of the flagpole.

**28. Angle of Depression** Find the angle of depression from the top of a lighthouse 250 feet above water level to the water line of a ship 2.1 miles offshore.

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### Homework Questions

**Change each degree measure to radian measure in terms of  $\pi$ . Do not use your calculator and reduce your answer.**

1.  $140^\circ \rightarrow \frac{7\pi}{9}$       2.  $860^\circ \rightarrow \frac{43\pi}{9}$       3.  $1200^\circ \rightarrow \frac{20\pi}{3}$   
 4.  $-300^\circ \rightarrow -\frac{5\pi}{3}$       5.  $-405^\circ \rightarrow -\frac{9\pi}{4}$       6.  $280^\circ \rightarrow \frac{14\pi}{9}$

**Change each radian measure to degree measure without using a calculator.**

7.  $-\frac{2\pi}{5} \rightarrow -108^\circ$       8.  $\frac{11\pi}{3} \rightarrow 660^\circ$       9.  $\frac{2\pi}{7} \rightarrow \frac{360^\circ}{7}$   
 10.  $-4\frac{1}{2}\pi \rightarrow -810^\circ$       11.  $-\frac{12\pi}{5} \rightarrow -432^\circ$       12.  $\frac{8\pi}{5} \rightarrow 288^\circ$   
 13.  $\frac{3\pi}{5} \rightarrow 108^\circ$       14.  $\frac{\pi}{5} \rightarrow 36^\circ$       15.  $-\frac{\pi}{3} \rightarrow -60^\circ$

**Find the exact value of each trigonometric function.**

1.  $\tan(510^\circ) \rightarrow -\frac{1}{\sqrt{3}}$       2.  $\csc \frac{11\pi}{4} \rightarrow \sqrt{2}$       3.  $\sin(-90^\circ) \rightarrow -1$   
 4.  $\cot 1665^\circ \rightarrow 1$       5.  $\cot 30^\circ \rightarrow \sqrt{3}$       6.  $\tan 315^\circ \rightarrow -1$   
 7.  $\csc \frac{\pi}{4} \rightarrow \sqrt{2}$       8.  $\tan \frac{4\pi}{3} \rightarrow \sqrt{3}$       9.  $\cot 1110^\circ \rightarrow \sqrt{3}$   
 10.  $\cos 270^\circ \rightarrow 0$       11.  $\csc(-45^\circ) \rightarrow -\sqrt{2}$       12.  $\sin 30^\circ \rightarrow \frac{1}{2}$   
 13.  $\sec 2\pi \rightarrow 1$       14.  $\cot(-30^\circ) \rightarrow -\sqrt{3}$       15.  $\csc 3\pi \rightarrow \text{und}$

**4.4 extra problems**

Find the value of  $\theta$  in radians and in degrees.

①  $\sin \theta = 0.4565 \rightarrow 27.16^\circ, 154.84^\circ$       ③  $\cot \theta = 2.3545 \rightarrow 23.01^\circ, 203.01^\circ$   
 ②  $\cos \theta = 0.8746 \rightarrow .47, 2.67$       ④  $\sec \theta = 1.3746 \rightarrow .40, 3.54$   
 ⑤  $29^\circ, 331^\circ, .51, 5.78$       ⑥  $43.32^\circ, 316.68^\circ, .76, 5.53$

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## 4.8 Applications and Models

Solving Right Triangles

AOE/AOD

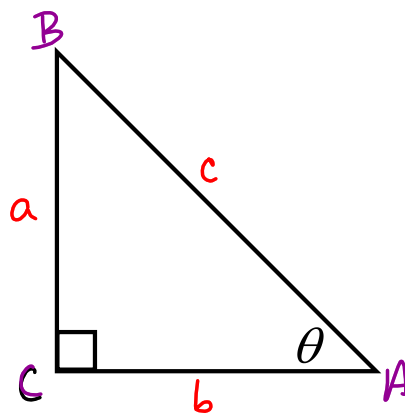
Word Problems

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### Solving a Right Triangle

Standard Lettering

Angle C is  
always  $90^\circ$



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Solve the Triangle.

$A = 36$

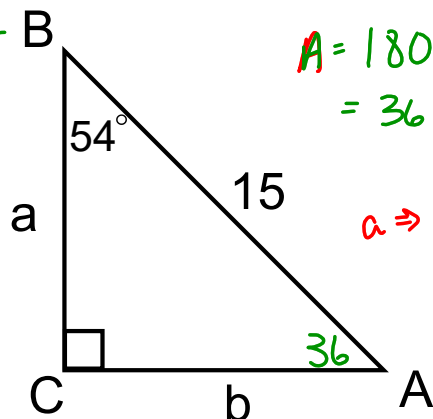
$a = 8.82$

$B = 54$

$b = 12.14$

$C = 90$

$c = 15$



$$A = 180 - 54 - 90 = 36$$

$$a \Rightarrow \cos 54 = \frac{a}{15}$$

$$15 \cos 54 = a$$

$$b \Rightarrow \sin 54 = \frac{b}{15}$$

$$15 \sin 54 = b$$

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Solve the triangle.

$a = 9.36$

$b = 1.32$

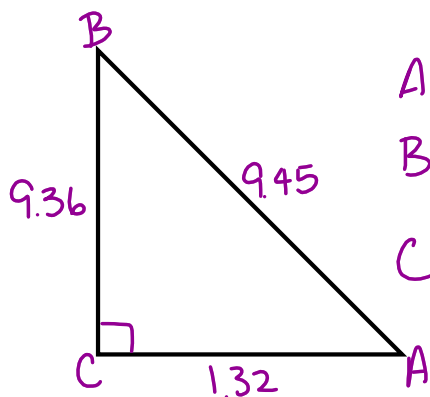
$c = 9.45$

$$A \Rightarrow \cos A = \frac{1.32}{9.45}$$

$$\cos^{-1}\left(\frac{1.32}{9.45}\right)$$

$$B \Rightarrow \sin B = \frac{1.32}{9.45}$$

$$\sin^{-1}\left(\frac{1.32}{9.45}\right)$$



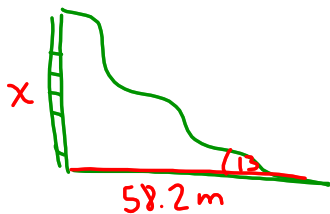
$A = 81.97$

$B = 8.03$

$C = 90$

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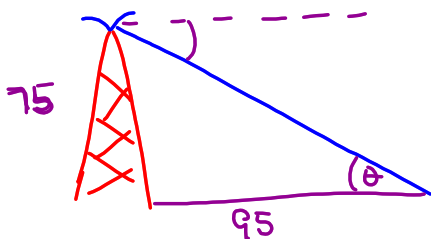
The angle of elevation from the base to the top of a water slide is  $13^\circ$ . The slide extends horizontally 58.2 meters. Approximate the height of the water slide.



$$\tan 13 = \frac{x}{58.2 \text{ m}}$$
$$58.2 \tan 13 = x$$
$$13.44 \text{ m}$$

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An engineer builds a 75-foot vertical cellular phone tower. A bird on the top of the tower flies to a point on the ground 95 feet away from the base of the tower. What is the angle of depression from the tower?



$$\tan \theta = \frac{75}{95}$$
$$\tan^{-1} \left( \frac{75}{95} \right) = \theta$$
$$38.29^\circ$$

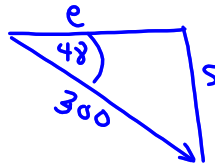
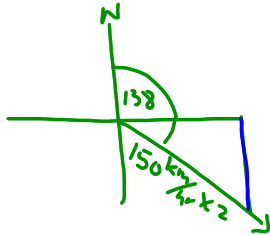
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Section 4-8 Notes WB p 104

bearing

1. An airplane travels at 150km/h for 2 hours in a direction of  $138^\circ$  from Omaha. At the end of this time, how far south of Omaha is the plane? How far east?

direction or bearing is measured from North moving clockwise



$$\cos 48 = \frac{e}{300}$$

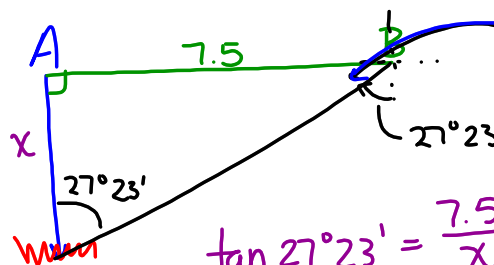
$$300 \cos 48 = e = 200.74 \text{ km}$$

$$\sin 48 = \frac{s}{300}$$

$$300 \sin 48 = s = 222.94 \text{ km}$$

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2. A forest ranger at a point A sights a fire directly south. A second ranger at a point B, 7.5 miles east, sights the same fire at a bearing of  $S27^\circ 23' W$ . How far from point A is the fire?



$$90 - 27^\circ 23' = 62.62$$

$$\tan 27^\circ 23' = \frac{7.5}{x}$$

$$x = \frac{7.5}{\tan 27^\circ 23'}$$

$$= 14.48 \text{ miles}$$

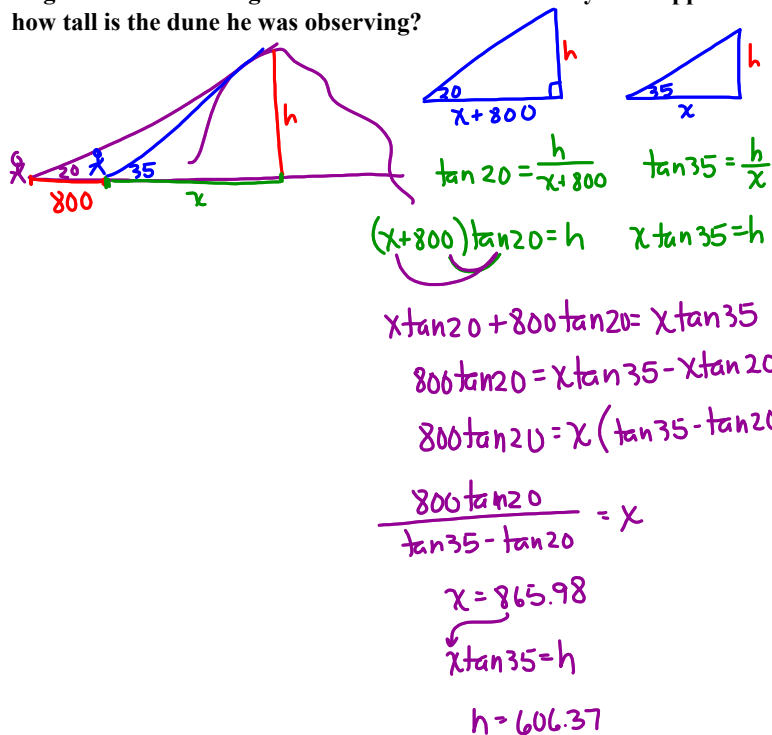
$$\tan 62.62 = \frac{x}{7.5}$$

$$7.5 \tan 62.62 = x$$

$$14.48 = x$$

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3. While visiting Sand Dunes National Park, Ian approximated the angle of elevation to the top of a sand dune to be  $20^\circ$ . After walking 800 feet closer, he guessed that the angle of elevation had increased by  $15^\circ$ . Approximately how tall is the dune he was observing?



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## HOMWORK



pg 337  
 1-17 odd, 20, 22,  
 28, 29, 31, 33, 34,  
 36, 37, 39, 41, 43

Aug 29-6:38 AM



Jan 26-7:35 AM