Chapter 6

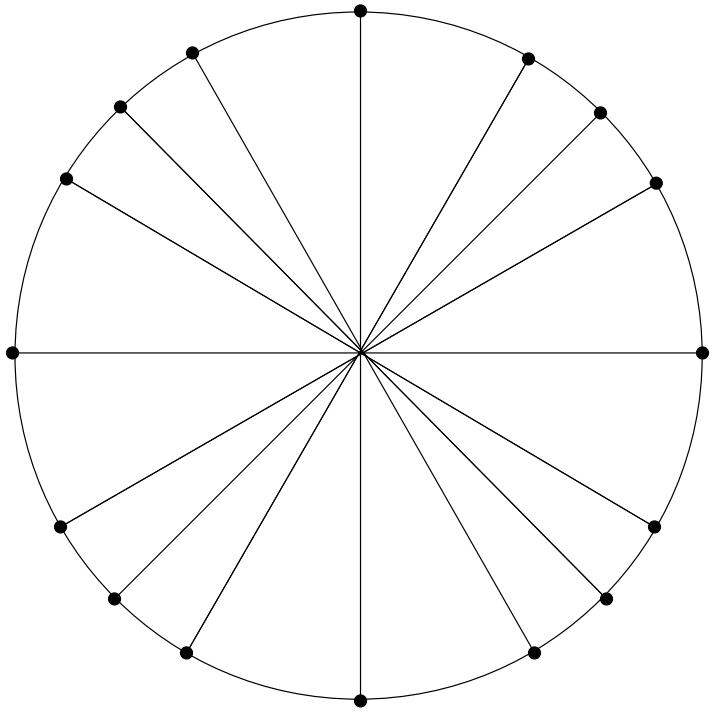
Trigonometric Functions of Angles

Review sections as needed from Chapter 0, Basic Techniques, page 8.

6.1 Angle Measure

Exercises

1. Label the terminal points indicated around the unit circle from 0 to 2π, inclusive, using both degree measure and radian measure.



6.2 Trigonometry of Right Triangles

The purpose of problems 1 and 2 is to be sure you are comfortable with finding the function values and angles on your calculator.

The calculator must be in degree mode for these problems. Refer to section 0.8.3 (Mode Settings, page 118).

Exercises

1. Find the function value specified, rounding to four decimal places.

   (a) $\sin 51°$ (b) $\tan 69°$ (c) $\cos 74°$

   (d) $\cot 35°$ (e) $\csc 21°$ (f) $\sec 81°$

2. Find θ in each of the following, rounding to the nearest degree.

   (a) $\sin\theta = 0.6691306$ (b) $\cos\theta = 0.6691306$ (c) $\tan\theta = 0.6691306$

3. Given $\sin 35° = 0.5736$, $\cos 35° = 0.8192$, $\tan 35° = 0.7002$,
   $\cot 35° = 1.4281$, $\sec 35° = 1.2208$, $\csc 35° = 1.7434$

   find $\sin 55°$, $\cos 55°$, $\tan 55°$, $\cot 55°$, $\sec 55°$, $\csc 55°$, without using a calculator.

4. Given $\sin 8° = a$, $\cos 8° = b$, $\tan 8° = c$

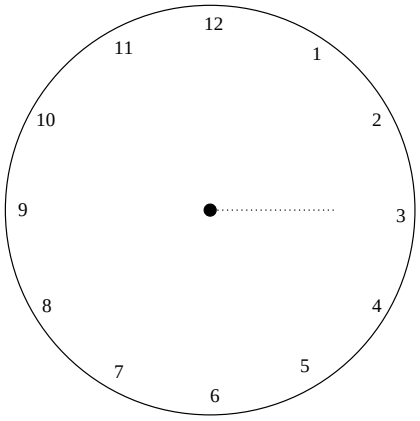
   a) Find $\cot 8°$, $\sec 8°$, $\csc 8°$ in terms of the values a, b, c. Don't use two letters if one will work.

   b) Find $\sin 82°$, $\cos 82°$, $\tan 82°$, $\cot 82°$, $\sec 82°$, $\csc 82°$, in terms of the values a, b, c. Don't use two letters if one will work.

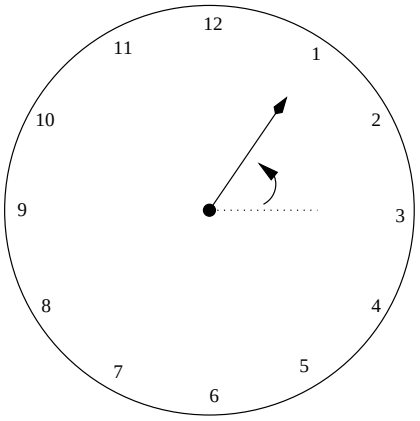
6.3 Trigonometric Functions of Angles

Exercises

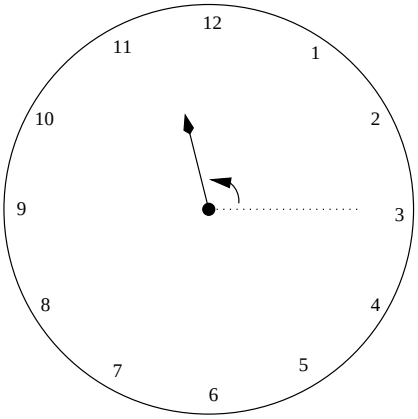
Consider a clock face superimposed on the unit circle. Place angle θ in standard position, rotating upward from the horizontal dotted line shown. Let the terminal side of θ be the **hour** hand of the clock. We need to convert each time given to the appropriate angle on the unit circle. [1]



By dividing the circle into 12 hours, we have $\frac{360^\circ}{12}$ which is 30°, or $\frac{\pi}{6}$, between each set of numbers on the clock face. The hour hand at 1 o'clock, for example, points exactly to the 1, so the angle is 60°, or $\frac{\pi}{3}$.



Similarly, at 11:30, the hour hand is halfway between the 11 and 12. Since it is 30°, or $\frac{\pi}{6}$, between each number on the clock, halfway between 11 and 12 would represent 15°, or $\frac{\pi}{12}$. Thus, the angle desired is 105°, or $\frac{7\pi}{12}$.



[1] Idea contributed by Dr. Charles Kerr, Boise State University

1. Fill in the table using appropriate exact values as indicated.

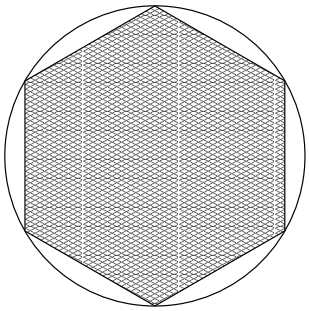
Hour	$0 \leq \theta < 2\pi$	$0^\circ \leq \theta < 360^\circ$	$\sin(\theta)$	$\cos(\theta)$	$\tan(\theta)$
2:00 a.m.					
1:30 p.m.					
9:00 p.m.					
10:30 a.m.					
5:00 p.m.					
4:30 a.m.					

2. Fill in the table using appropriate exact values as indicated.

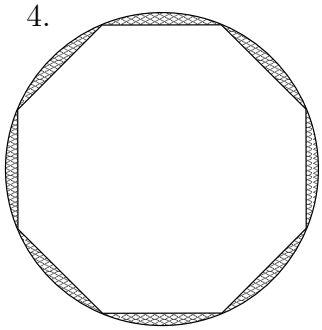
Hour	$0 \leq \theta < 2\pi$	$0^\circ \leq \theta < 360^\circ$	$\sin(\theta)$	$\cos(\theta)$	$\tan(\theta)$
10:00 a.m.					
7:30 p.m.					
4:00 p.m.					

Suppose we inscribe regular polygons in the unit circle. Recall, that in a regular polygon, all the sides have the same length and all angles have the same measure. Find the area of the shaded regions shown below, using exact values.

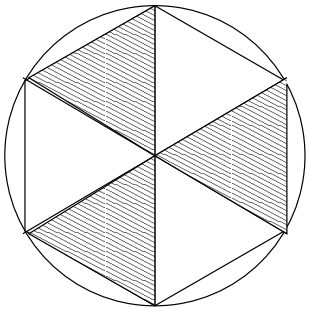
3.



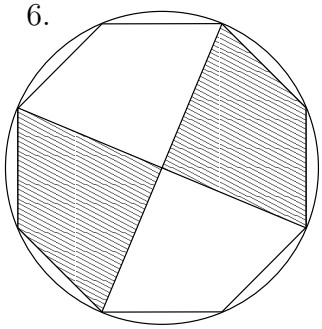
4.



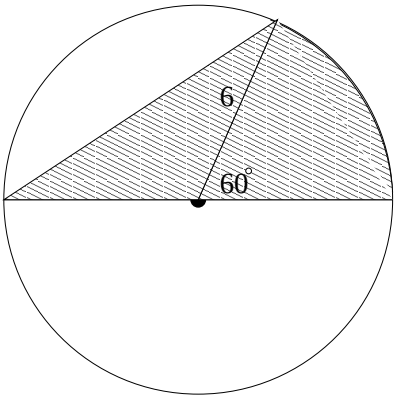
5.



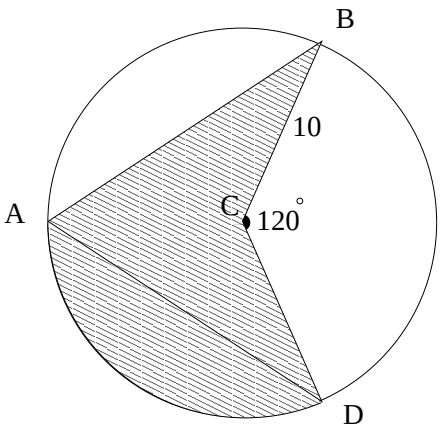
6.



7. Find the area of the shaded region, using exact values. The circle has radius 6 inches, and the central angle is 60°.



8. Find the area of the shaded region, using exact values. The circle has radius 10 inches, and the central angle shown is 120°. Line segments AB and AD are the same length.



Think about these carefully, and explain how you arrived at your answer.

9. Without a calculator, find the exact value of

$$\sin 1° + \sin 2° + \sin 3° + \sin 4° + \ldots + \sin 358° + \sin 359°.$$

10. Without a calculator, find the exact value of

$$\cos 1° + \cos 2° + \cos 3° + \cos 4° + \ldots + \cos 358° + \cos 359°.$$

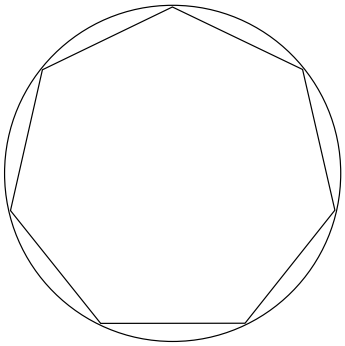
6.4 The Law of Sines

See textbook for exercises.

6.5 The Law of Cosines

Exercises

1. A seven-sided regular polygon is inscribed in a circle of radius 24.8 inches. Find the perimeter of the polygon, accurate to one decimal place.



2. Find the total area of the shaded regions. The semicircle has a diameter of 20 inches, and one leg of the right triangle is 8 inches. Round final answer to a whole number.