

## Exercises

1. What are the radian and degree measures for each of the following fractional parts of a circle?  
(Remember a complete circle measures  $2\pi$  radians.)

a.  $1/2$

b.  $1/3$

c.  $1/4$

d.  $1/6$

e.  $1/8$

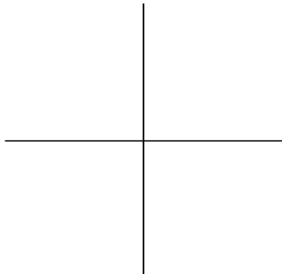
f.  $1/9$

g.  $1/12$

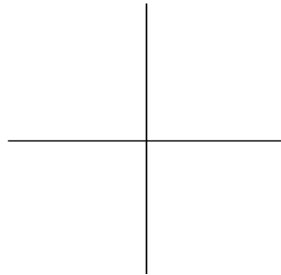
h.  $1/24$

2. On the graphs below indicate the given radian measures:

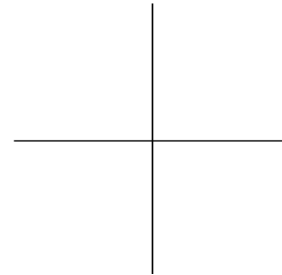
a.  $2/3 \pi$



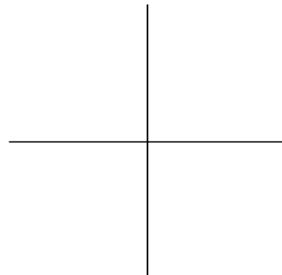
b.  $\pi/2$



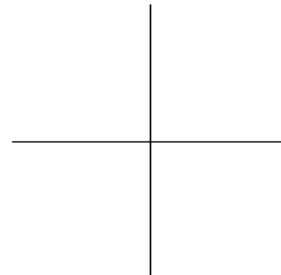
c.  $3/4 \pi$



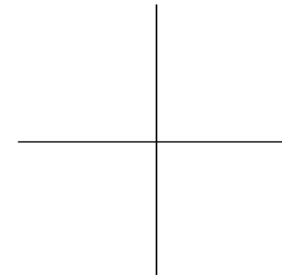
d.  $11/12 \pi$



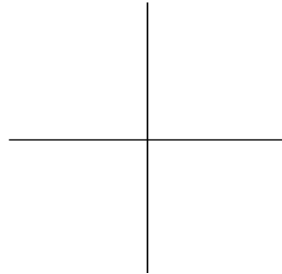
e.  $-\pi/6$



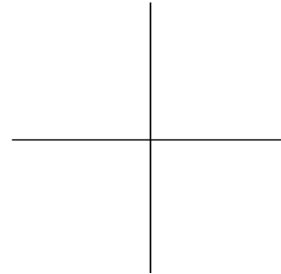
f.  $5/4 \pi$



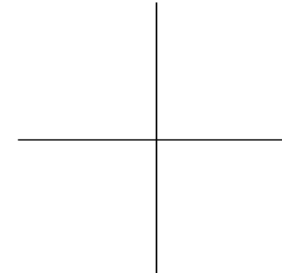
g.  $-\pi$

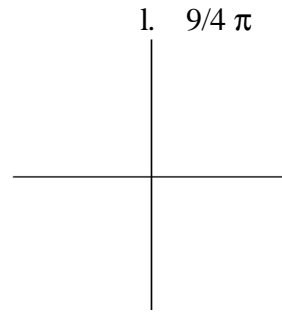
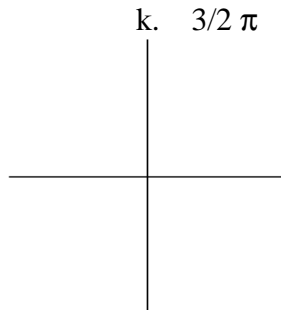
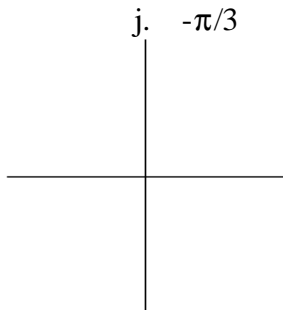


h.  $7/4 \pi$



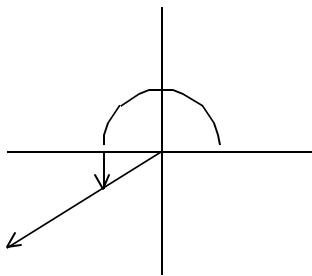
i.  $5/6 \pi$



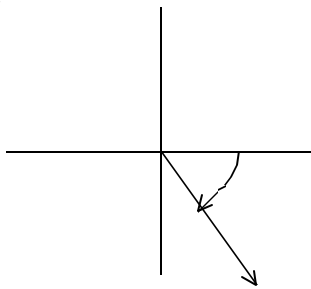


3. Determine the radian measure (in  $\pi$  radians) of each of the following angles. Use a protractor.

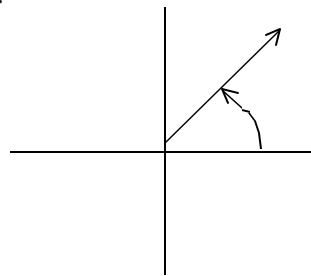
a.



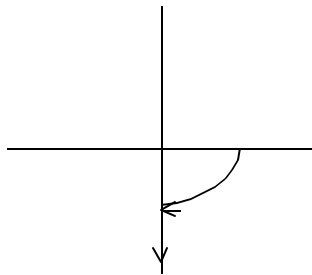
b.



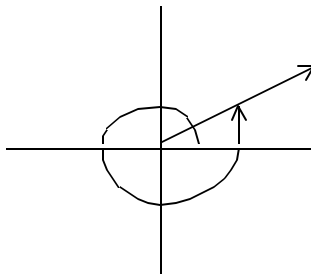
c.



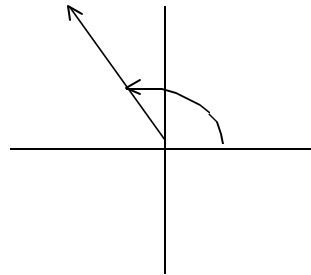
d.



e.



f.



4. a. How many degrees are in 1 radian?  
 b. How many degrees are in 2 radians?  
 c. How many degrees are in  $\pi$  radians?  
 d. How many degrees are in  $2\pi$  radians?

5. Convert the following angles from degrees to radians: (State your answer to the nearest hundredth.)

- |                 |                |                  |                    |
|-----------------|----------------|------------------|--------------------|
| a. $72^\circ$   | b. $110^\circ$ | c. $-208^\circ$  | d. $315^\circ$     |
| e. $-225^\circ$ | f. $270^\circ$ | g. $135.5^\circ$ | h. $-78.956^\circ$ |

6. Convert the following angles from radians to degrees: State your answers to the nearest hundredth.

- |         |          |             |          |
|---------|----------|-------------|----------|
| a. 3.8  | b. $2/3$ | c. -2       | d. 3.14  |
| e. 1.57 | f. 6.28  | g. $.52\pi$ | h. -9.15 |

7. Which of the angles in #6 are decimal approximations to the basic rational  $\pi$  radian measures? (i.e.  $.78 \approx \pi/4$ ) What are the equivalent radian measures?

Match the following radian measures with the appropriate degree measures. Do **not** use a calculator for these.

- |              |                   |
|--------------|-------------------|
| a. $\pi/2$   | i. $260^\circ$    |
| b. $11/6\pi$ | ii. $-345^\circ$  |
| c. $\pi/8$   | iii. $275^\circ$  |
| d. $7/6\pi$  | iv. $-120^\circ$  |
| e. $-2/3\pi$ | v. $90^\circ$     |
| f. $5\pi/6$  | vi. $22.5^\circ$  |
| g. $-7/4\pi$ | vii. $75^\circ$   |
| h. $3/4\pi$  | viii. $125^\circ$ |
| i. $5/12\pi$ | ix. $-125^\circ$  |
|              | x. $210^\circ$    |
|              | xi. $-35^\circ$   |
|              | xii. $150^\circ$  |
|              | xiii. $330^\circ$ |
|              | xiv. $-315^\circ$ |

9. How did you reason through your answers?

10. a. What is the arc length of a  $45^\circ$  sector of a circle which has a radius of 5 cm.?

b. What is the arc length of a  $2/3\pi$  radian sector of a circle which has a diameter of  $1/2$  cm.?

11. How quickly can you convert the following from radians to degrees or degrees to radians **without** a calculator? Time yourself!

- |                 |                |                |                |                |                |
|-----------------|----------------|----------------|----------------|----------------|----------------|
| a. $\pi/3$      | b. $135^\circ$ | c. $270^\circ$ | d. $-3/4 \pi$  | e. $5/6 \pi$   | f. $225^\circ$ |
| g. $-330^\circ$ | h. $-\pi/2$    | i. $5/12 \pi$  | j. $3/2 \pi$   | k. $210^\circ$ | l. $60^\circ$  |
| m. $\pi/4$      | n. $-7/6 \pi$  | o. $2/3 \pi$   | p. $315^\circ$ | q. $150^\circ$ | r. $4/3 \pi$   |
| n. $-\pi$       | t. $11/6 \pi$  |                |                |                |                |

12. By now you should have developed patterns for your conversions. Please explain them.

13. Eratosthenes determined the circumference of the earth to within 15% of the actual circumference using the length of the arc and the determined angular measurement between two cities. Below, the distances between two cities are given. Using today's accepted value of the earth's radius of 7,926 miles, determine the angular distance between the two cities listed below. Assume the angles vertex is the center of the earth.

- Washington, D. C. to Albuquerque, N MX is 2047 miles.
- Los Angeles, CA to Spokane, WA is 502 miles.
- Cleveland, OH to Salt Lake City, UT is 1854 miles.