Convert each degree measure to radians. Leave answers in terms of π.

A 1. a. 315°　　b. 225°　　c. 15°　　d. −45°

2. a. −90°　　b. 135°　　c. −180°　　d. −225°

3. a. −120°　　b. −240°　　c. 300°　　d. 360°

4. a. 210°　　b. −135°　　c. −210°　　d. −315°

Convert each radian measure to degrees.

5. a. $-\dfrac{\pi}{2}$　　b. $\dfrac{4\pi}{3}$　　c. $-\dfrac{3\pi}{4}$　　d. $-\dfrac{\pi}{6}$

6. a. $-\dfrac{5\pi}{6}$　　b. -2π　　c. $\dfrac{5\pi}{4}$　　d. $-\dfrac{\pi}{3}$

7. a. π　　b. $-\dfrac{3\pi}{2}$　　c. $\dfrac{2\pi}{3}$　　d. $\dfrac{7\pi}{6}$

8. a. $-\dfrac{\pi}{4}$　　b. $\dfrac{7\pi}{4}$　　c. 4π　　d. $\dfrac{11\pi}{6}$

9. Give the radian measure of θ if:
   a. $r = 5$ and $s = 6$
   b. $r = 8$ and $s = 6$

10. Give the radian measure of θ if:
   a. $r = 4$ and $s = 5$
   b. $r = 6$ and $s = 15$
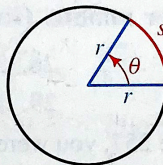
Exs. 9, 10

Convert each degree measure to radians. Give answers to the nearest hundredth of a radian.

11. a. 95°　　b. 110°　　c. 95°10′　　d. 119.2°

12. a. 212°　　b. 365°　　c. 200°40′　　d. 240.8°

Convert each radian measure to degrees. Give answers to the nearest ten minutes or tenth of a degree.

13. a. 1.6　　b. 1.7　　c. 1.21　　d. 1.32
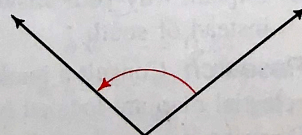
14. a. 2.2　　b. 3.7　　c. 2.82　　d. 3.41

Visual Thinking Estimate (by sight) the size in radians of each angle shown below. Then measure each angle with a protractor and convert from degrees to radians to find its actual size.

15.
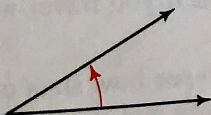
16.

Find two angles, one positive and one negative, that are coterminal with each given angle.

17. a. $500°$ b. $-60°$ c. $\dfrac{\pi}{4}$ d. $-\dfrac{2\pi}{3}$

18. a. $1000°$ b. $-100°$ c. $\dfrac{4\pi}{3}$ d. $-\dfrac{\pi}{6}$

B 19. a. $28.5°$ b. $116.3°$ c. $-60.4°$ d. $-315.3°$

20. a. $38.4°$ b. $127.6°$ c. $-50.8°$ d. $-320.7°$

21. a. $360°30'$ b. $-90°40'$ c. $3°21'$ d. $115°15'$

22. a. $180°20'$ b. $-270°30'$ c. $11°44'$ d. $172°11'$

23. Give an expression in terms of the integer n for the measure of all angles that are coterminal with an angle of $29.7°$.

24. Give an expression in terms of the integer n for the measure of all angles that are coterminal with an angle of $-116°10'$.

Each of Exercises 25–30 gives the speed of a revolving gear. Find (a) the number of degrees per minute through which each gear turns and (b) the number of radians per minute. Give answers to the nearest hundredth.

25. 35 rpm   26. 27 rpm   27. 2.5 rpm

28. 6.5 rpm   29. 14.6 rpm   30. 19.8 rpm

31. *Reading* On page 257, you were told that when a car with wheels of radius 14 in. is driven at 35 mi/h, the wheels turn at an approximate rate of 420 rpm. Show how to obtain this rate of turn.

32. *Recreation* Suppose you can ride a bicycle a distance of 5 mi in 15 min. If you ride at a constant speed and if the bicycle's wheels have diameter 27 in., find the wheels' approximate rate of turn (in rpm).

33. *Research* Consult an encyclopedia or an atlas to see how points on a world map are located by using *latitude* and *longitude* coordinates given in degrees, minutes, and seconds.
    a. If you travel south from a given point on Earth, about how many miles do you have to go to traverse an angle of $1°$?
    b. Explain why your answer to part (a) might be different if you travel west instead of south.

34. *Research* Consult a book of astronomy or a star atlas to see how stars on a celestial map are located by using angles of *right ascension* and *declination*. Describe how each of these angles is measured, and give examples.