

6.3: Radian Measures

“I WILL...

...convert radian measure to degrees.

...convert degree measure to radians.”

I. Radian Measure

- A. Degree measure is a unit of application such as surveying and navigation
- B. Radian measure is a unit of measure for theoretical work in mathematics
- C. One radian is the measure of an angle in standard position whose terminal side intercepts an arc of length r .

II. Conversions

- A. $180^\circ = \pi$ Radian
- B. $1^\circ = \frac{\pi}{180}$ Radian
- C. $\frac{180}{\pi} = 1$ Radian
- D. Conversions between Degrees and Radians:
- E. Rewrite degrees as radians, multiply $\frac{\pi}{180}$
- F. Rewrite radians as degrees, multiply $\frac{180}{\pi}$

Ex 1: Convert 240° to radian measure	Ex 2: Convert 2° to radian measure	Your Turn: Convert -90° to radian measure
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Ex 3: Convert $9\pi/2$ to degree measure	Your Turn: Convert $-\pi/2$ to degree measure
Ex 4: Convert 1 radian to degree measure	Your Turn: Convert $1/4$ radian to degree measure

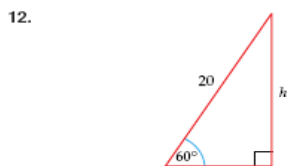
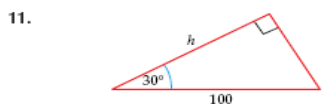
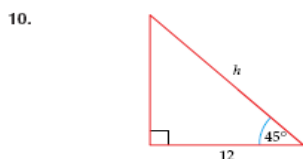
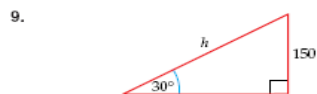
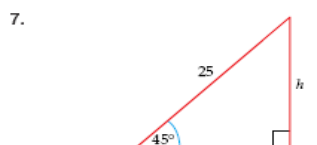
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In Exercises 11–22, convert the given radian measure to degrees.

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|------------------------|-----------------------|-----------------------|------------------------|
| 11. $\frac{\pi}{5}$ | 12. $-\frac{\pi}{6}$ | 13. $-\frac{\pi}{10}$ | 14. $\frac{2\pi}{5}$ |
| 15. $\frac{3\pi}{4}$ | 16. $-\frac{5\pi}{3}$ | 17. $\frac{\pi}{45}$ | 18. $-\frac{\pi}{60}$ |
| 19. $-\frac{5\pi}{12}$ | 20. $\frac{7\pi}{15}$ | 21. $\frac{27\pi}{5}$ | 22. $-\frac{41\pi}{6}$ |

In Exercises 23–34, convert the given degree measure to radians. Write your answer in terms of π .

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|------------------|------------------|-----------------|------------------|
| 23. 6° | 24. -10° | 25. -12° | 26. 36° |
| 27. 75° | 28. -105° | 29. 135° | 30. -165° |
| 31. -225° | 32. 252° | 33. 930° | 34. -585° |



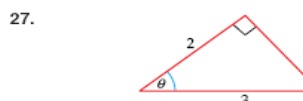
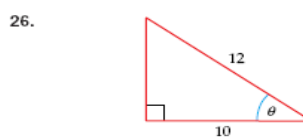
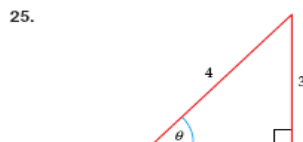
In Exercises 13–16, find the indicated value without using a calculator.

13. $a = 4$ $m\angle A = 60^\circ$ Find c .
 14. $c = 5$ $m\angle A = 60^\circ$ Find a .
 15. $c = 10$ $m\angle A = 30^\circ$ Find a .
 16. $a = 12$ $m\angle A = 30^\circ$ Find c .

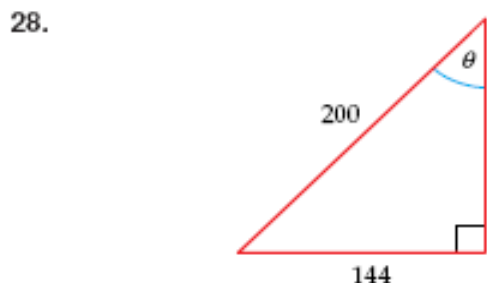
In Exercises 17–24, solve the triangle with the given conditions.

17. $b = 10$ $m\angle C = 50^\circ$
 18. $c = 12$ $m\angle C = 37^\circ$
 19. $a = 6$ $m\angle A = 14^\circ$
 20. $a = 8$ $m\angle A = 40^\circ$
 21. $c = 5$ $m\angle A = 65^\circ$
 22. $c = 4$ $m\angle C = 28^\circ$
 23. $b = 3.5$ $m\angle A = 72^\circ$
 24. $a = 4.2$ $m\angle C = 33^\circ$

In Exercises 25–28, find angle θ .



Use the figure below for Exercises 13–24.



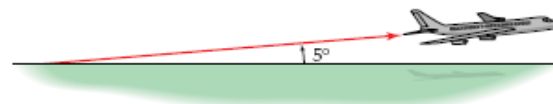
In Exercises 29–36, use the figure for Exercises 13–24 to find angles A and C under the given conditions.

29. $a = 4$ and $c = 6$ 30. $b = 14$ and $c = 5$
 31. $a = 7$ and $b = 10$ 32. $a = 5$ and $c = 3$
 33. $b = 18$ and $c = 12$ 34. $a = 4$ and $b = 9$
 35. $a = 2.5$ and $c = 1.4$

37. A 24-ft ladder positioned against a wall forms an angle of 75° with the ground.
 a. How high up the wall does the ladder reach?
 b. How far is the base of the ladder from the wall?

38. A guy wire stretches from the top of an antenna tower to a point on level ground 18 feet from the base of the tower. The angle between the wire and the ground is 63° . How high is the tower?

39. A plane takes off at an angle of 5° . After traveling 1 mile along this flight path, how high (in feet) is the plane above the ground? (1 mi = 5280 ft)



40. A plane takes off at an angle of 6° traveling at the rate of 200 feet/second. If it continues on this flight path at the same speed, how many minutes will it take to reach an altitude of 8000 feet?

41. The Ohio Turnpike has a maximum uphill slope of 3° . How long must a straight uphill segment of the road be in order to allow a vertical rise of 450 feet?

47. A buoy in the ocean is observed from the top of a 40-meter-high radar tower on shore. The angle of depression from the top of the tower to the base of the buoy is 6.5° . How far is the buoy from the base of the radar tower?

51. A rocket shoots straight up from the launch pad. Five seconds after lift-off, an observer 2 miles away notes that the rocket's angle of elevation is 3.5° . Four seconds after that, the angle of elevation is 41° . How far did the rocket rise during those 4 seconds?