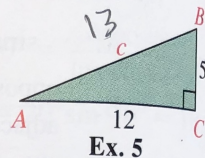


WRITTEN EXERCISES

Throughout the exercises, give angle measures to the nearest tenth of a degree and lengths to three significant digits.

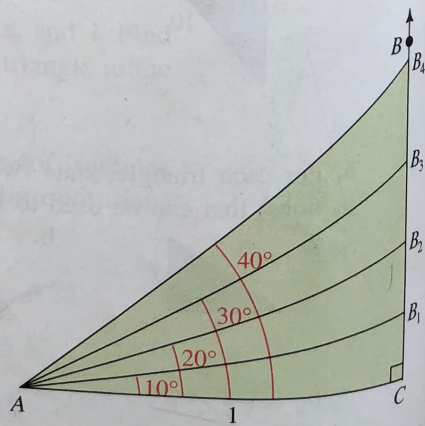
- A**
- In $\triangle ABC$, $\angle A = 90^\circ$, $\angle B = 25^\circ$, and $a = 18$. Find b and c .
 - In $\triangle PQR$, $\angle P = 90^\circ$, $\angle Q = 64^\circ$, and $p = 27$. Find q and r .
 - In $\triangle DEF$, $\angle D = 90^\circ$, $\angle E = 12^\circ$, and $e = 9$. Find d and f .
 - In $\triangle XYZ$, $\angle X = 90^\circ$, $\angle Y = 37^\circ$, and $z = 25$. Find x and y .



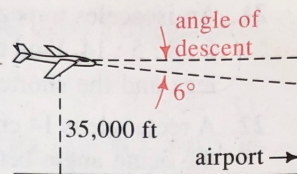
- $\sin A$
 - $\cos B$
 - $\tan A$
 - $\cot B$
 - $\sec A$
 - $\csc B$
- Sketch $\triangle ABC$ with $\angle C = 90^\circ$. What is the relationship between:
 - $\sin A$ and $\cos B$?
 - $\tan A$ and $\cot B$?
 - $\sec A$ and $\csc B$?
 - Find the measures of the acute angles of a 3-4-5 right triangle.
 - Find the measures of the acute angles of a right triangle whose legs are 9 cm and 16 cm long.
 - The legs of an isosceles right triangle are 1 unit long.
 - Find the length of the hypotenuse in simplest radical form.
 - Use part (a) to find the exact value of each of the following.
 - $\tan 45^\circ$
 - $\sin 45^\circ$
 - $\cos 45^\circ$
 - Use a calculator to convert the answers in part (b) to decimal form. Compare these with the values of $\tan 45^\circ$, $\sin 45^\circ$, and $\cos 45^\circ$ obtained directly from the calculator.
 - The hypotenuse of a 30° - 60° - 90° triangle is 2 units long.
 - Find the lengths of the legs in simplest radical form.
 - Use part (a) to find the exact value of each of the following.
 - $\sin 30^\circ$
 - $\sin 60^\circ$
 - $\tan 30^\circ$
 - $\tan 60^\circ$
 - Use a calculator to convert the answers in part (b) to decimal form. Compare these with the values of $\sin 30^\circ$, $\sin 60^\circ$, $\tan 30^\circ$, and $\tan 60^\circ$ obtained directly from the calculator.

11. Using graph paper, draw a horizontal segment AC of length 1 unit and a vertical ray CB , as shown. Then use a protractor to draw segments that make angles of $10^\circ, 20^\circ, \dots, 80^\circ$ with \overline{AC} . Find CB_1, CB_2, \dots, CB_8 by direct measurement. What is the significance of these lengths?

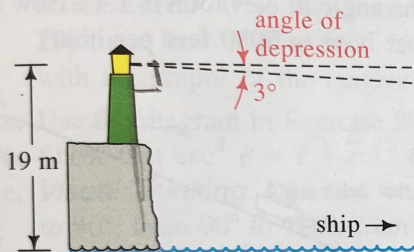
12. Refer to the diagram that you drew for Exercise 11. Note that $\angle CAB_2 = 20^\circ$ is twice as large as $\angle CAB_1 = 10^\circ$. Is $\overline{CB_2}$ twice as long as $\overline{CB_1}$? Is $\overline{CB_4}$ four times as long as $\overline{CB_1}$?



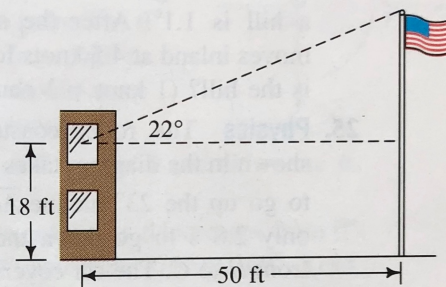
13. **Aviation** An airplane is at an elevation of 35,000 ft when it begins its approach to an airport. Its *angle of descent* is 6° .



- What is the distance between the airport and the point on the ground directly below the airplane?
 - What is the approximate air distance between the plane and the airport? What assumptions did you make in finding this distance?
14. **Navigation** A lighthouse keeper observes that there is a 3° *angle of depression* between the horizontal and the line of sight to a ship. If the keeper is 19 m above the water, how far is the ship from shore?

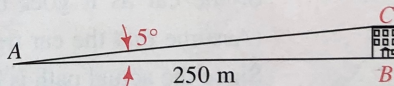


Ex. 14



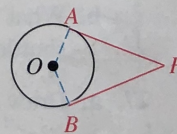
Ex. 15

15. A student looks out of a second-story school window and sees the top of the school flagpole at an angle of elevation of 22° . The student is 18 ft above the ground and 50 ft from the flagpole. Find the height of the flagpole.
16. For an observer at point A, 250 m from a building, the angle of elevation of the top of the building is 5° . In Chapter 7, we said that $\triangle ABC$ is about the same as a sector with central angle A.
- Use the arc length formula $s = r\theta$ to approximate BC. (Remember to express θ in radians.)
 - Use right-triangle trigonometry to find BC more accurately. Compare your answers.



17. Find the measures of the angles of an isosceles triangle whose sides are 6, 6, and 8. Also find the area of the triangle.
18. The legs of an isosceles triangle are each 21 cm long and the angle between them has measure 52° . What is the length of the third side?

- B** 19. In the figure at the right, \overline{PA} and \overline{PB} are tangents to a circle with radius $OA = 6$. If the measure of $\angle APB$ is 42° , find PA and PB .



Ex. 19

20. Sketch the circle $(x - 6)^2 + (y - 8)^2 = 9$ and the two tangents to the circle from the origin. Find the measure of the angle between the tangents.