Exercises

GUIDED PRACTICE

Vocabulary Apply the vocabulary from this lesson to answer each question.
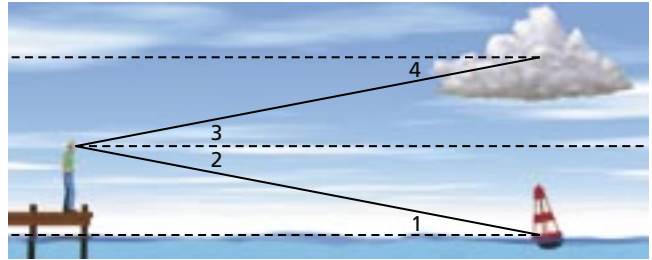
1. An angle of ___?___ is measured from a horizontal line to a point above that line. (*elevation* or *depression*)

2. An angle of ___?___ is measured from a horizontal line to a point below that line. (*elevation* or *depression*)

SEE EXAMPLE 1
p. 544

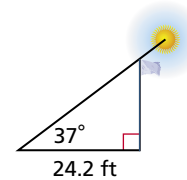**Classify each angle as an angle of elevation or angle of depression.**

3. ∠1

4. ∠2

5. ∠3

6. ∠4

SEE EXAMPLE 2
p. 545

7. **Measurement** When the angle of elevation to the sun is 37°, a flagpole casts a shadow that is 24.2 ft long. What is the height of the flagpole to the nearest foot?

37°
24.2 ft

SEE EXAMPLE 3
p. 545

8. **Aviation** The pilot of a traffic helicopter sights an accident at an angle of depression of 18°. The helicopter's altitude is 1560 ft. What is the horizontal distance from the helicopter to the accident? Round to the nearest foot.

SEE EXAMPLE 4
p. 546

9. **Surveying** From the top of a canyon, the angle of depression to the far side of the river is 58°, and the angle of depression to the near side of the river is 74°. The depth of the canyon is 191 m. What is the width of the river at the bottom of the canyon? Round to the nearest tenth of a meter.

58°
74°
191 m
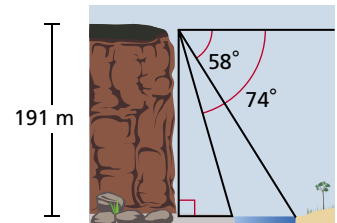
PRACTICE AND PROBLEM SOLVING

Independent Practice

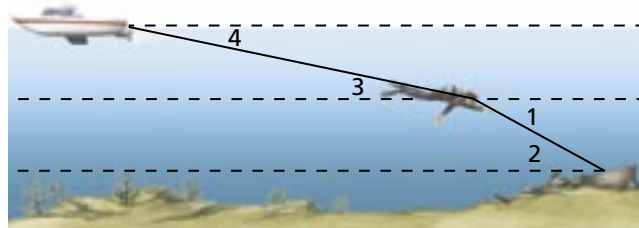| For Exercises	See Example
10–13	1
14	2
15	3
16	4

Extra Practice

Skills Practice p. S19

Application Practice p. S35

Classify each angle as an angle of elevation or angle of depression.

10. ∠1

11. ∠2

12. ∠3

13. ∠4

14. **Geology** To measure the height of a rock formation, a surveyor places her transit 100 m from its base and focuses the transit on the top of the formation. The angle of elevation is 67°. The transit is 1.5 m above the ground. What is the height of the rock formation? Round to the nearest meter.

15. Forestry A forest ranger in a 120 ft observation tower sees a fire. The angle of depression to the fire is 3.5°. What is the horizontal distance between the tower and the fire? Round to the nearest foot.

16. Space Shuttle Marion is observing the launch of a space shuttle from the command center. When she first sees the shuttle, the angle of elevation to it is 16°. Later, the angle of elevation is 74°. If the command center is 1 mi from the launch pad, how far did the shuttle travel while Marion was watching? Round to the nearest tenth of a mile.
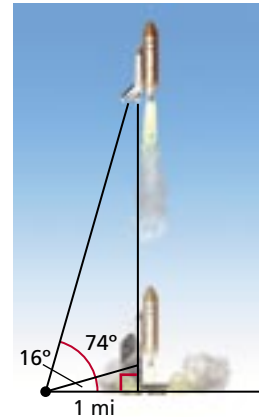
**Tell whether each statement is true or false. If false, explain why.**

17. The angle of elevation from your eye to the top of a tree increases as you walk toward the tree.

18. If you stand at street level, the angle of elevation to a building's tenth-story window is greater than the angle of elevation to one of its ninth-story windows.

19. As you watch a plane fly above you, the angle of elevation to the plane gets closer to 0° as the plane approaches the point directly overhead.

20. An angle of depression can never be more than 90°.

Use the diagram for Exercises 21 and 22.

21. Which angles are not angles of elevation or angles of depression?

22. The angle of depression from the helicopter to the car is 30°. Find m∠1, m∠2, m∠3, and m∠4.
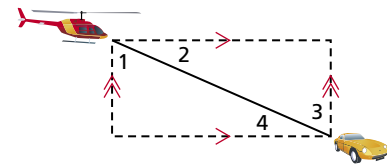
23. Critical Thinking Describe a situation in which the angle of depression to an object is decreasing.

24. An observer in a hot-air balloon sights a building that is 50 m from the balloon's launch point. The balloon has risen 165 m. What is the angle of depression from the balloon to the building? Round to the nearest degree.

25. Multi-Step A surveyor finds that the angle of elevation to the top of a 1000 ft tower is 67°.
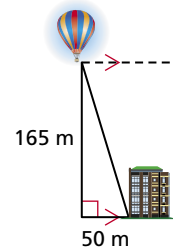
    a. To the nearest foot, how far is the surveyor from the base of the tower?

    b. How far back would the surveyor have to move so that the angle of elevation to the top of the tower is 55°? Round to the nearest foot.

26. Write About It Two students are using shadows to calculate the height of a pole. One says that it will be easier if they wait until the angle of elevation to the sun is exactly 45°. Explain why the student made this suggestion.

MULTI-STEP TEST PREP

27. This problem will prepare you for the Multi-Step Test Prep on page 568.

The pilot of a rescue helicopter is flying over the ocean at an altitude of 1250 ft. The pilot sees a life raft at an angle of depression of 31°.

    a. What is the horizontal distance from the helicopter to the life raft, rounded to the nearest foot?

    b. The helicopter travels at 150 ft/s. To the nearest second, how long will it take until the helicopter is directly over the raft?

28. Mai is flying a plane at an altitude of 1600 ft. She sights a stadium at an angle of depression of 35°. What is Mai's approximate horizontal distance from the stadium?
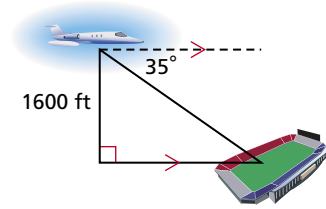

Ⓐ 676 feet   Ⓒ 1450 feet

Ⓑ 1120 feet   Ⓓ 2285 feet

29. Jeff finds that an office building casts a shadow that is 93 ft long when the angle of elevation to the sun is 60°. What is the height of the building?

Ⓕ 54 feet   Ⓖ 81 feet   Ⓗ 107 feet   Ⓙ 161 feet

30. Short Response Jim is rafting down a river that runs through a canyon. He sees a trail marker ahead at the top of the canyon and estimates the angle of elevation from the raft to the marker as 45°. Draw a sketch to represent the situation. Explain what happens to the angle of elevation as Jim moves closer to the marker.

CHALLENGE AND EXTEND

31. Susan and Jorge stand 38 m apart. From Susan's position, the angle of elevation to the top of Big Ben is 65°. From Jorge's position, the angle of elevation to the top of Big Ben is 49.5°. To the nearest meter, how tall is Big Ben?
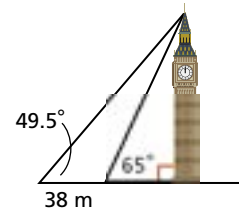
32. A plane is flying at a constant altitude of 14,000 ft and a constant speed of 500 mi/h. The angle of depression from the plane to a lake is 6°. To the nearest minute, how much time will pass before the plane is directly over the lake?

33. A skyscraper stands between two school buildings. The two schools are 10 mi apart. From school *A*, the angle of elevation to the top of the skyscraper is 5°. From school *B*, the angle of elevation is 2°. What is the height of the skyscraper to the nearest foot?

34. Katie and Kim are attending a theater performance. Katie's seat is at floor level. She looks down at an angle of 18° to see the orchestra pit. Kim's seat is in the balcony directly above Katie. Kim looks down at an angle of 42° to see the pit. The horizontal distance from Katie's seat to the pit is 46 ft. What is the vertical distance between Katie's seat and Kim's seat? Round to the nearest inch.

SPIRAL REVIEW

35. Emma and her mother jog along a mile-long circular path in opposite directions. They begin at the same place and time. Emma jogs at a pace of 4 mi/h, and her mother runs at 6 mi/h. In how many minutes will they meet? *(Previous course)*

36. Greg bought a shirt that was discounted 30%. He used a coupon for an additional 15% discount. What was the original price of the shirt if Greg paid $17.85? *(Previous course)*

Tell which special parallelograms have each given property. *(Lesson 6-5)*

37. The diagonals are perpendicular.

38. The diagonals are congruent.

39. The diagonals bisect each other.

40. Opposite angles are congruent.

Find each length. *(Lesson 8-1)*

41. x **42.** y **43.** z