

Vocabulary and Concept Check

- This alphabetical list of vocabulary terms in Chapter 13 includes a page reference where each term was introduced.
- Assessment** A vocabulary test/review for Chapter 13 is available on p. 766 of the Chapter 13 Resource Masters.

Lesson-by-Lesson Review

- For each lesson,
- the main ideas are summarized,
  - additional examples review concepts, and
  - practice exercises are provided.

Vocabulary PuzzleMaker

**ELL** The Vocabulary PuzzleMaker software improves students' mathematics vocabulary using four puzzle formats—crossword, scramble, word search using a word list, and word search using clues. Students can work on a computer screen or from a printed handout.

MindJogger Videoquizzes

**ELL** MindJogger Videoquizzes provide an alternative review of concepts presented in this chapter. Students work in teams in a game show format to gain points for correct answers. The questions are presented in three rounds.

- Round 1 Concepts (5 questions)
- Round 2 Skills (4 questions)
- Round 3 Problem Solving (4 questions)

FOLDABLES™ Study Organizer

For more information about Foldables, see Teaching Mathematics with Foldables.

Have students look through the chapter to make sure they have included notes and examples in their Foldables for each lesson of Chapter 13.

Encourage students to refer to their Foldables while completing the Study Guide and Review and to use them in preparing for the Chapter Test.

Vocabulary and Concept Check

congruent solids (p. 707) ordered triple (p. 714) similar solids (p. 707) volume (p. 688)

A complete list of postulates and theorems can be found on pages R1–R8.

**Exercises** Complete each sentence with the correct italicized term.

- You can use  $V = \frac{1}{3}Bh$  to find the volume of a (*prism, pyramid*).
- (*Similar, Congruent*) solids always have the same volume.
- Every point in space can be represented by (*an ordered triple, an ordered pair*).
- $V = \pi r^2h$  is the formula for the volume of a (*sphere, cylinder*).
- In (*similar, congruent*) solids, if  $a \neq b$  and  $a : b$  is the ratio of the lengths of corresponding edges, then  $a^3 : b^3$  is the ratio of the volumes.
- The formula  $V = Bh$  is used to find the volume of a (*prism, pyramid*).
- To find the length of an edge of a pyramid, you can use (*the Distance Formula in Space, Cavalieri's Principle*).
- You can use  $V = \frac{4}{3}\pi r^3$  to find the volume of a (*cylinder, sphere*).
- To find the volume of an oblique pyramid, you can use (*Cavalieri's Principle, the Distance Formula in Space*).
- The formula  $V = \frac{1}{3}Bh$  is used to find the volume of a (*cylinder, cone*).

Lesson-by-Lesson Review

13-1 Volumes of Prisms and Cylinders

See pages 688–694.

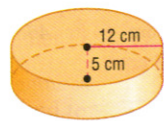
Concept Summary

- The volumes of prisms and cylinders are given by the formula  $V = Bh$ .

Example

Find the volume of the cylinder.

$$\begin{aligned} V &= \pi r^2h && \text{Volume of a cylinder} \\ &= \pi(12^2)(5) && r = 12 \text{ and } h = 5 \\ &\approx 2261.9 && \text{Use a calculator.} \end{aligned}$$



The volume is approximately 2261.9 cubic centimeters.

**Exercises** Find the volume of each prism or cylinder. Round to the nearest tenth if necessary. See Examples 1 and 3 on pages 689 and 690.

- $504 \text{ in}^3$
- $311.0 \text{ m}^3$
- $749.5 \text{ ft}^3$

13-2 Volumes of Pyramids and Cones

See pages 696–701.

Concept Summary

- The volume of a pyramid is given by the formula  $V = \frac{1}{3}Bh$ .
- The volume of a cone is given by the formula  $V = \frac{1}{3}\pi r^2h$ .

Example

Find the volume of the square pyramid.

$$\begin{aligned} V &= \frac{1}{3}Bh && \text{Volume of a pyramid} \\ &= \frac{1}{3}(21^2)(19) && B = 21^2 \text{ and } h = 19 \\ &= 2793 && \text{Simplify.} \end{aligned}$$



The volume of the pyramid is 2793 cubic inches.

**Exercises** Find the volume of each pyramid or cone. Round to the nearest tenth. See Examples 1 and 2 on pages 697 and 698.

- $109.1 \text{ cm}^3$
- $1466.4 \text{ ft}^3$
- $368.3 \text{ m}^3$

13-3 Volume of Spheres

See pages 702–706.

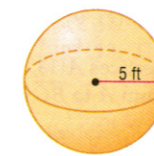
Concept Summary

- The volume of a sphere is given by the formula  $V = \frac{4}{3}\pi r^3$ .

Example

Find the volume of the sphere.

$$\begin{aligned} V &= \frac{4}{3}\pi r^3 && \text{Volume of a sphere} \\ &= \frac{4}{3}\pi(5^3) && r = 5 \\ &\approx 523.6 && \text{Use a calculator.} \end{aligned}$$



The volume of the sphere is about 523.6 cubic feet.

**Exercises** Find the volume of each sphere. Round to the nearest tenth. See Example 1 on page 703.

- The radius of the sphere is 2 feet.  $33.5 \text{ ft}^3$
- The diameter of the sphere is 4 feet.  $33.5 \text{ ft}^3$
- The circumference of the sphere is 65 millimeters.  $4637.6 \text{ mm}^3$
- The surface area of the sphere is 126 square centimeters.  $133.0 \text{ cm}^3$
- The area of a great circle of the sphere is  $25\pi$  square units.  $523.6 \text{ units}^3$

Answers

- 24.  $AB = 10$ ;  $(-1, -8, 1)$
- 25.  $CD = \sqrt{58}$ ;  $(-9, 5.5, 5.5)$
- 26.  $EO = \sqrt{66}$ ;  $(-2, 2.5, 2.5)$
- 27.  $FG = \sqrt{422}$ ;  $(1.5\sqrt{2}, 3\sqrt{7}, -3)$

Answers (page 723)

- 19.  $\sqrt{34}$ ;  $(0, -1.5, 2.5)$
- 20.  $\sqrt{126}$ ;  $(-0.5, 5, -2.5)$
- 21.  $\sqrt{155}$ ;  $(4.5, 2.5, -3.5)$
- 22.  $\sqrt{86}$ ;  $(-2.5, -1.5, -1)$
- 23.  $2\sqrt{107}$ ;  $(0, -2, 5)$
- 24.  $\sqrt{323}$ ;  $(2.5, -0.5, 5.5)$

13-4 Congruent and Similar Solids

See pages 707-713.

Concept Summary

- Similar solids have the same shape, but not necessarily the same size.
- Congruent solids are similar solids with a scale factor of 1.

Example

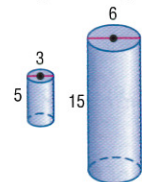
Determine whether the two cylinders are congruent, similar, or neither.

$$\frac{\text{diameter of larger cylinder}}{\text{diameter of smaller cylinder}} = \frac{6}{3} \quad \text{Substitution}$$

$$= 2 \quad \text{Simplify.}$$

$$\frac{\text{height of larger cylinder}}{\text{height of smaller cylinder}} = \frac{15}{5} \quad \text{Substitution}$$

$$= 3 \quad \text{Simplify.}$$



The ratios of the measures are not equal, so the cylinders are not similar.

**Exercises** Determine whether the two solids are congruent, similar, or neither.

See Example 1 on page 708.

22.  $T = 232 \text{ cm}^2$   $T = 232 \text{ cm}^2$  **congruent** 23. **similar**

13-5 Coordinates in Space

See pages 714-719.

Concept Summary

- The Distance Formula in Space is  $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$ .
- Given  $A(x_1, y_1, z_1)$  and  $B(x_2, y_2, z_2)$ , the midpoint of  $\overline{AB}$  is at  $(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}, \frac{z_1 + z_2}{2})$ .

Example

Consider  $\triangle ABC$  with vertices  $A(13, 7, 10)$ ,  $B(17, 18, 6)$ , and  $C(15, 10, 10)$ . Find the length of the median from  $A$  to  $\overline{BC}$  of  $ABC$ .

$$M = (\frac{17 + 15}{2}, \frac{18 + 10}{2}, \frac{6 + 10}{2}) \quad \text{Formula for the midpoint of } \overline{BC}$$

$$= (16, 14, 8) \quad \text{Simplify.}$$

$\overline{AM}$  is the desired median, so  $AM$  is the length of the median.

$$AM = \sqrt{(16 - 13)^2 + (14 - 7)^2 + (8 - 10)^2} \text{ or } \sqrt{62} \quad \text{Distance Formula in Space}$$

**Exercises** Determine the distance between each pair of points. Then determine the coordinates of the midpoint  $M$  of the segment joining the pair of points. See Example 2 on page 715. 24-27. See margin.

- 24.  $A(-5, -8, -2)$  and  $B(3, -8, 4)$
- 25.  $C(-9, 2, 4)$  and  $D(-9, 9, 7)$
- 26.  $E(-4, 5, 5)$  and the origin
- 27.  $F(5\sqrt{2}, 3\sqrt{7}, 6)$  and  $G(-2\sqrt{2}, 3\sqrt{7}, -12)$

Chapter 13 Practice Test

Vocabulary and Concepts

Write the letter of the formula used to find the volume of each of the following figures.

- 1. right cylinder **b**
- 2. right pyramid **c**
- 3. sphere **a**

$$\text{a. } V = \frac{4}{3}\pi r^3$$

$$\text{b. } V = \pi r^2 h$$

$$\text{c. } V = \frac{1}{3}Bh$$

Skills and Applications

Find the volume of each solid. Round to the nearest tenth if necessary.

4. **226.2 yd<sup>3</sup>**

5. **840 mm<sup>3</sup>**

6. **70 km<sup>3</sup>**

7. **25 ft<sup>3</sup>**

8. **259.8 m<sup>3</sup>**

9. **119.7 cm<sup>3</sup>**

10.  $C = 22\pi$  **1140.4 in<sup>3</sup>**

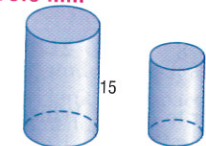
11. **SPORTS** The diving pool at the Georgia Tech Aquatic Center was used for the springboard and platform diving competitions of the 1996 Olympic Games. The pool is 78 feet long and 17 feet deep, and it is 110.3 feet from one corner on the surface of the pool to the opposite corner on the surface. If it takes about 7.5 gallons of water to fill one cubic foot of space, approximately how many gallons of water are needed to fill the diving pool? **775,588 gal**

Find the volume of each sphere. Round to the nearest tenth.

- 12. The radius has a length of 3 cm. **113.1 cm<sup>3</sup>**
- 13. The circumference of the sphere is 34 ft. **663.7 ft<sup>3</sup>**
- 14. The surface area of the sphere is 184 in<sup>2</sup>. **234.7 in<sup>3</sup>**
- 15. The area of a great circle is 157 mm<sup>2</sup>. **1479.8 mm<sup>3</sup>**

The two cylinders at the right are similar.

- 16. Find the ratio of the radii of the bases of the cylinders. **3:2**
- 17. What is the ratio of the surface areas? **9:4**
- 18. What is the ratio of the volumes? **27:8**



Determine the distance between each pair of points in space. Then determine the coordinates of the midpoint  $M$  of the segment joining the pair of points. 19-24. See margin.

- 19. the origin and  $(0, -3, 5)$
- 20. the origin and  $(-1, 10, -5)$
- 21. the origin and  $(9, 5, -7)$
- 22.  $(-2, 2, 2)$  and  $(-3, -5, -4)$
- 23.  $(9, 3, 4)$  and  $(-9, -7, 6)$
- 24.  $(8, -6, 1)$  and  $(-3, 5, 10)$

25. **STANDARDIZED TEST PRACTICE** A rectangular prism has a volume of 360 cubic feet. If the prism has a length of 15 feet and a height of 2 feet, what is the width? **C**

- A** 30 ft
- B** 24 ft
- C** 12 ft
- D** 7.5 ft

[www.geometryonline.com/chapter\\_test](http://www.geometryonline.com/chapter_test)

Chapter 13 Practice Test

Assessment Options

**Vocabulary Test** A vocabulary test/review for Chapter 13 can be found on p. 766 of the Chapter 13 Resource Masters.

**Chapter Tests** There are six Chapter 13 Tests and an Open-Ended Assessment task available in the Chapter 13 Resource Masters.

Chapter 13 Tests			
Form	Type	Level	Pages
1	MC	basic	753-754
2A	MC	average	755-756
2B	MC	average	757-758
2C	FR	average	759-760
2D	FR	average	761-762
3	FR	advanced	763-764

MC = multiple-choice questions  
FR = free-response questions

Open-Ended Assessment

Performance tasks for Chapter 13 can be found on p. 765 of the Chapter 13 Resource Masters. A sample scoring rubric for these tasks appears on p. A22.

**Unit 4 Test** A unit test/review can be found on pp. 773-774 of the Chapter 13 Resource Masters.

**End-of-Year Tests** A Second Semester Test for Chapters 8-13 and a Final Test for Chapters 1-13 can be found on pp. 775-784 of the Chapter 13 Resource Masters.



ExamView® Pro

Use the networkable ExamView® Pro to:

- Create multiple versions of tests.
- Create modified tests for Inclusion students.
- Edit existing questions and add your own questions.
- Use built-in state curriculum correlations to create tests aligned with state standards.

Portfolio Suggestion

**Introduction** A greenhouse is a closed structure that has air, temperature, and humidity control.

**Ask Students** Ask students to design a greenhouse that is a right rectangular prism with a pyramid for a roof. They should make the base of the pyramid the same shape as the base of the prism and include all dimensions. Ask them to find the volume of the greenhouse.