Chapter 12: Study Guide and Review

Vocabulary and Concept Check

- **acute angle (p. 57)**
- **base (p. 57)**
- **circumference (p. 56)**
- **cross section (p. 56)**
- **cylinder (p. 58)**
- **edge (p. 57)**
- **face (p. 57)**
- **great circle (p. 47)**
- **hypothesis (p. 57)**
- **lateral area (p. 56)**
- **lateral edges (p. 56)**
- **lateral faces (p. 55)**
- **net (p. 55)**
- **oblique cone (p. 56)**
- **oblique cylinder (p. 55)**
- **orthographic drawing (p. 56)**
- **perspective view (p. 56)**
- **pyramid (p. 57)**
- **polyhedron (p. 57)**
- **regular prism (p. 57)**
- **regular pyramid (p. 57)**
- **right prism (p. 57)**
- **right pyramid (p. 57)**
- **spherical triangle (p. 57)**
- **surface area (p. 57)**

A complete list of vocabulary and theorems can be found on pages 81-88.

Exercises

**12-1 Three-Dimensional Figures**

**Concept Summary**
- A solid can be determined from its orthographic drawing.
- Solids can be classified by bases, faces, edges, and vertices.

**Examples**

A solid can be determined from its orthographic drawing. Solids can be classified by bases, faces, edges, and vertices.

**Exercises**

Identify each solid. Name the bases, faces, edges, and vertices.

See Example 2 on page 638: 11-13. See margin.

- **11.**
- **12.**
- **13.**

**12-2 Nets and Surface Area**

**Concept Summary**
- Every three-dimensional solid can be represented by one or more two-dimensional nets.
- The area of the net of a solid is the same as the surface area of the solid.

**Exercises**

For each solid, draw a net and find the surface area.


- **14.**
- **15.**
- **16.**
- **17.**
- **18.**
- **19.**

- **220 units²**

- **133.71 units²**

**Chapter 12 Study Guide and Review 679**
12-3 **Surface Areas of Prisms**

**Concept Summary**
- The lateral faces of a prism are the faces that are not bases of the prism.
- The lateral surface area of a right prism is the perimeter of a base of the prism times the height of the prism.

**Example**
The bases are regular hexagons. So the perimeter of one base is 6(3) or 18. Substitute this value into the formula.

\[ L = Ph \]
\[ = (18)(6) \]
\[ = 108 \]

The lateral area is 108 square units.

**Exercises**
Find the lateral area of each prism. See Example 1 on page 650.

20. 1000 units²  21.  22. 72 units²  23. 92 units²

12-4 **Surface Areas of Cylinders**

**Concept Summary**
- The lateral surface area of a cylinder is \(2\pi r\) multiplied by the product of the radius of a base of the cylinder and the height of the cylinder.
- The surface area of a cylinder is the lateral surface area plus the area of both circular bases.

**Example**
Find the surface area of a cylinder with a radius of 36 centimeters and a height of 123 centimeters.

\[ T = 2\pi r + 2\pi h^2 \]
\[ = 2\pi(36)(123) + 2\pi(36)^2 \]
\[ = 38,440.5 \]

The surface area of the cylinder is approximately 38,440.5 square centimeters.

**Exercises**
Find the surface area of a cylinder with the given dimensions. Round to the nearest tenth. See Example 2 on page 650.

23. \( d = 4\) in, \( h = 12\) in, 175.9 in² 
24. \( r = 5\) ft, \( h = 6\) ft, 527.8 ft² 
25. \( r = 4\) mm, \( h = 56\) mm, 1558.2 mm² 
26. \( d = 4\) km, \( h = 8\) km, 129.1 km²

12-5 **Surface Areas of Pyramids**

**Concept Summary**
- The slant height \( l\) of a regular pyramid is the length of an altitude of a lateral face.
- The lateral area of a pyramid is \( \frac{1}{2}Pl\), where \( P\) is the perimeter of the base of the pyramid.

**Example**
Find the surface area of the regular pyramid.

The perimeter of the base is 40 units, and the area of the base is 25 square units. Substitute these values into the formula for the surface area of a pyramid.

\[ T = \frac{1}{2}Ph \]
\[ = \frac{1}{2}(40)(25) \]
\[ = 145 \]

The surface area is 145 square units.

**Exercises**
Find the surface area of each regular pyramid. Round to the nearest tenth if necessary. See Example 2 on pages 663 and 665.

27. 304 units² 
28. 476.0 units² 
29. 33.3 units²

12-6 **Surface Areas of Cones**

**Concept Summary**
- A cone is a solid with a circular base and a single vertex.
- The lateral area of a right cone is \( \tau r\), where \( r\) is the slant height of the cone and \( r\) is the radius of the circular base.

**Example**
Find the surface area of the cone.

Substitute the known values into the formula for the surface area of a right cylinder.

\[ T = \tau r + \tau h^2 \]
\[ = \tau(12)(5) \]
\[ = 181.4 \]

The surface area is approximately 181.4 square meters.
12-7 Surface Areas of Spheres

**Concept Summary**

- The set of all points in space a given distance from one point is a sphere.
- The surface area of a sphere is $4\pi r^2$, where $r$ is the radius of the sphere.

**Examples**

a. Find the surface area of a sphere with a diameter of 10 centimeters.

$$T = 4\pi r^2$$

Surface area of a sphere

$$= 4\pi (5)^2$$

$$= 25\pi$$

Use a calculator.

The surface area is approximately 78.54 square centimeters.

b. Find the surface area of a hemisphere with radius 6.3 inches.

To find the surface area of the hemisphere, add the area of the great circle to half of the surface area of the sphere.

$$\text{surface area} = \frac{4\pi r^2}{2} + \pi r^2$$

Surface area of a hemisphere

$$= \frac{1}{2}(4\pi (6.3)^2) + \pi (6.3)^2$$

$$= 37.4$$

Use a calculator.

The surface area is approximately 37.4 square inches.

**Exercises**

Find the surface area of each sphere or hemisphere. Round to the nearest tenth if necessary. See Example 2 on page 673.

33. $34. \quad 35. \quad 36. \quad 37. \quad 38. \quad 39. \quad 40.$

- a hemisphere with radius 16
- a sphere with diameter 5
- a sphere with radius 9
- a sphere that has a great circle with an area of 220
- a hemisphere that has a great circle with an area of 30
- a sphere with radius 16
- a sphere with diameter 5
- a sphere with radius 9
- a sphere that has a great circle with an area of 220
- a hemisphere that has a great circle with an area of 30

**Vocabulary and Concepts**

Each expression to the correct formula.

1. area of a prism $c$
2. area of a cylinder $b$
3. area of a regular pyramid $a$

- $T = 2\pi rh + 2\pi r^2$
- $T = \pi r^2 + h$
- $T = \pi r^2 + 2\pi r l$

**Skills and Applications**

Identify each solid. Name the bases, faces, edges, and vertices. 4–6. See margin.

4. a. $T = 2\pi r^2 + 2\pi rh$
   - b. $T = \pi r^2 + h$
   - c. $T = \pi r^2 + 2\pi rl$

**Assessment Options**

**Vocabulary Test**

A vocabulary test/review for Chapter 12 can be found on p. 716 of the Chapter 12 Resource Masters.

**Chapter Tests**

There are six Chapter 12 Tests and an Open-Ended Assessment test available in the Chapter 12 Resource Masters.

**Open-Ended Assessment Performance tasks for Chapter 12 can be found on p. 715 of the Chapter 12 Resource Masters. A sample scoring rubric for these tasks appears on p. A28.

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