RLP-GEOB · RLP Geometry B — Solids, Coordinates, Circles and Probability

Unit 1: Solid Geometry and Modeling

Practice Workbook. The same problems, in the same order, as the Practice sections of the online lessons.

Name _____ Period _____

Lesson 1.1 — Cross-Sections and Solids of Revolution

FLUENCY

1. Name the cross-section of a cube cut by a plane parallel to one face.

2. Name the cross-section of a cylinder cut by a plane through its axis.

3. Name the cross-section of a cone cut by a plane parallel to its base.

4. Name the cross-section of a square pyramid cut by a vertical plane through the apex and the midpoints of two opposite base edges.

5. What solid is formed by rotating a rectangle 360° about one of its sides?

6. What solid is formed by rotating a semicircle 360° about its diameter?

7. What is the greatest number of sides a plane section of a triangular prism can have? Explain.

8. Every plane section of a sphere is what shape, and where is the largest one?

APPLICATION

9. A log is modeled as a cylinder of radius 0.3 m and length 4 m. What cross-section would a sawmill measure to estimate its volume, what is its area, and what is the volume?

10. A 3 cm by 5 cm rectangle is rotated about its 5 cm side. Name the solid and find its volume.

11. A right triangle with legs 6 cm and 4 cm is rotated about the 6 cm leg. Name the solid and find its volume.

CHALLENGE

12. A cube has edge 4. Find the exact area of (a) the triangular cross-section through the three vertices adjacent to one corner and (b) the hexagonal cross-section through the midpoints of six edges.

REVIEW

13. In a right triangle, an acute angle is 28° and the hypotenuse is 35. Find the side opposite the angle. Round to the nearest tenth.

14. A 30°-60°-90° triangle has shorter leg 10. Find the longer leg and the hypotenuse.

15. Triangle ABC is similar to triangle DEF. $AB = 9$ and the corresponding side $DE = 27$. If $BC = 12$, find EF, and the ratio of the triangles' areas.

Lesson 1.2 — Why the Volume Formulas Work

FLUENCY

1. Find the volume of a sphere with radius 4 cm. Give an exact answer and, if it involves π, a decimal to the nearest tenth.

2. Find the volume of a cone with radius 4 cm and height 9 cm. Give an exact answer and, if it involves π, a decimal to the nearest tenth.

3. Find the volume of a sphere with radius 7 cm. Give an exact answer and, if it involves π, a decimal to the nearest tenth.

4. Find the volume of a cylinder with radius 9 cm and height 8 cm. Give an exact answer and, if it involves π, a decimal to the nearest tenth.

5. Find the volume of a cone with radius 5 cm and height 17 cm. Give an exact answer and, if it involves π, a decimal to the nearest tenth.

6. Find the volume of a cylinder with radius 12 cm and height 20 cm. Give an exact answer and, if it involves π, a decimal to the nearest tenth.

7. Find the volume of a rectangular prism 9 cm by 9 cm by 15 cm. Give an exact answer and, if it involves π, a decimal to the nearest tenth.

8. Find the volume of a rectangular prism 6 cm by 15 cm by 13 cm. Give an exact answer and, if it involves π, a decimal to the nearest tenth.

9. A cube with edge 6 is cut into three congruent square pyramids that share a corner as their apex. Find the volume of one pyramid and check it with $V = \frac{1}{3}Bh$.

10. An upright cylinder and an oblique cylinder both have radius 4 and height 9. Compare their volumes and name the principle.

APPLICATION

11. A grain silo is a cylinder of radius 3 m and height 10 m topped by a hemisphere of the same radius. Find its volume.

12. An ice-cream cone is modeled as a cone of radius 2.5 cm and height 11 cm with a hemisphere of ice cream on top. Find the total volume to the nearest tenth.

13. A basketball has a diameter of about 24 cm. Find its volume to the nearest cubic centimeter.

14. A cone and a cylinder have the same radius and height. How many full cones of water fill the cylinder, and which argument explains it?

CHALLENGE

15. For a hemisphere of radius 5, and for a cylinder of radius 5 and height 5 with a cone removed (apex at the base center, base at the top), compare the cross-section areas at height 3 above the base. What does Cavalieri's principle then give for the hemisphere's volume?

REVIEW

16. In a right triangle, an acute angle is 18° and the hypotenuse is 34. Find the side opposite the angle. Round to the nearest tenth.

17. A 30°-60°-90° triangle has hypotenuse 8. Find both legs.

18. Triangle ABC is similar to triangle DEF. $AB = 14$ and the corresponding side $DE = 7$. If $BC = 12$, find EF, and the ratio of the triangles' areas.

Lesson 1.3 — Scaling Lengths, Areas and Volumes

FLUENCY

1. Triangle ABC is similar to triangle DEF. $AB = 4$ and the corresponding side $DE = 2$. If $BC = 24$, find EF, and the ratio of the triangles' areas.

2. Triangle ABC is similar to triangle DEF. $AB = 12$ and the corresponding side $DE = 6$. If $BC = 6$, find EF, and the ratio of the triangles' areas.

3. Triangle ABC is similar to triangle DEF. $AB = 10$ and the corresponding side $DE = 5$. If $BC = 14$, find EF, and the ratio of the triangles' areas.

4. Two similar solids have scale factor 3. By what factors do their surface areas and volumes differ?

5. A 1:50 model is 30 cm tall. How tall is the real object?

6. The same model has a floor area of 40 cm^2. Find the real floor area in m^2.

7. The model's volume is 600 cm^3. Find the real volume in m^3.

8. Two similar containers have volumes in the ratio 64 : 1. Find the ratio of their heights and of their surface areas.

APPLICATION

9. A 14-inch pizza and a 10-inch pizza have the same thickness. How many times as much pizza is the larger one?

10. A statue is scaled up by a factor of 2.5. The original needed 3 L of paint and weighed 40 kg. Estimate the paint and weight for the copy (same material).

11. Compare surface area to volume for cubes with edge 1 cm and 10 cm. Use the result to explain why small animals lose heat faster.

CHALLENGE

12. A film shows a person scaled up 10 times. If the original weighs 60 kg and the cross-section of each thigh bone is 6 cm^2, find the giant's weight and bone cross-section, and the load per cm^2 compared with the original.

REVIEW

13. In a right triangle, an acute angle is 18° and the side opposite it is 10. Find the hypotenuse. Round to the nearest tenth.

14. A 30°-60°-90° triangle has longer leg $7\sqrt{3}$. Find the shorter leg and the hypotenuse.

15. Triangle ABC is similar to triangle DEF. $AB = 6$ and the corresponding side $DE = 9$. If $BC = 18$, find EF, and the ratio of the triangles' areas.

Lesson 1.4 — Density and Design with Solids

FLUENCY

1. Find the volume of a rectangular prism 5 cm by 7 cm by 20 cm. Give an exact answer and, if it involves π, a decimal to the nearest tenth.

2. Find the volume of a cone with radius 6 cm and height 13 cm. Give an exact answer and, if it involves π, a decimal to the nearest tenth.

3. Find the volume of a cylinder with radius 3 cm and height 7 cm. Give an exact answer and, if it involves π, a decimal to the nearest tenth.

4. An iron ball (density 7.87 g/cm^3) has radius 3 cm. Find its mass to the nearest gram.

5. *(Illustrative.)* A town of 48,000 people covers 12.5 square miles. Find its population density.

6. A 250 cm^3 block has mass 675 g. Find its density and say which material in the lesson it matches.

APPLICATION

7. *(Illustrative forest survey.)* A circular plot of radius 10 m contains 23 trees. Estimate the tree density per hectare (10,000 m^2).

8. A closed box with a square base must hold 1,000 cm^3. Compute the surface area for base edges 8, 10 and 12 cm and say which is least.

9. A solid aluminum cylinder (2.70 g/cm^3) of radius 2 cm must weigh 500 g. How tall must it be?

CHALLENGE

10. An *open-top* box with a square base must hold 1,000 cm^3. Build a table in a spreadsheet or Desmos and find the base edge that uses the least material, to the nearest tenth. How does it compare with the closed box?

REVIEW

11. In a right triangle, an acute angle is 31° and the adjacent leg is 34. Find the opposite leg. Round to the nearest tenth.

12. A 30°-60°-90° triangle has shorter leg 7. Find the longer leg and the hypotenuse.

13. Triangle *ABC* is similar to triangle *DEF*. *AB* = 10 and the corresponding side *DE* = 15. If *BC* = 22, find *EF*, and the ratio of the triangles' areas.

Unit 1 checkpoint

1. A plane cuts a cylinder parallel to its base. The cross-section is:
   A. A rectangle
   B. A circle
   C. An ellipse
   D. A triangle

2. Rotating a right triangle about one leg produces a:
   A. Cylinder
   B. Cone
   C. Sphere
   D. Pyramid
3. True or false: A cube can have a regular hexagonal cross-section.
4. A cylinder with radius 5 and height 4 has volume _____π.
5. A cone with radius 3 and height 7 has volume _____π.
6. A sphere with radius 6 has volume _____π.
7. True or false: An oblique prism has a larger volume than an upright prism with the same base and height.
8. Why is the cone formula one-third of Bh?
   A. Because cones are round
   B. A cube splits into three congruent pyramids, and Cavalieri extends this to cones
   C. Because $\pi \approx 3$
   D. It is a definition
9. Two similar solids have scale factor 4. The volume ratio is:
   A. 4
   B. 8
   C. 16
   D. 64
10. A 1:20 model has a surface area of 30 cm^2. The real surface area is _____ cm^2.
11. A 400 cm^3 block has mass 1,080 g. Its density is:
   A. 2.7 g/cm^3
   B. 0.37 g/cm^3
   C. 3.7 g/cm^3
   D. 432 g/cm^3
12. True or false: For a closed cylinder holding a fixed volume, the least surface area occurs when the height equals the diameter.

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