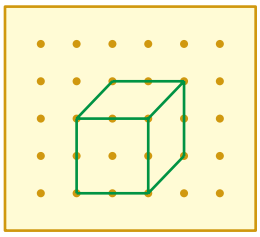
English Spanish

6.1 Drawing 3-Dimensional Figures

Essential Question How can you draw three-dimensional figures?

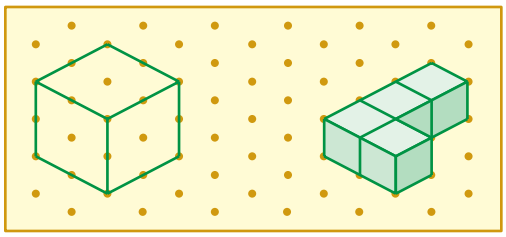
Dot paper can help you draw three-dimensional figures, or solids. Shading parallel sides the same color helps create a three-dimensional illusion.

Square Dot Paper



Face-On View

Isometric Dot Paper



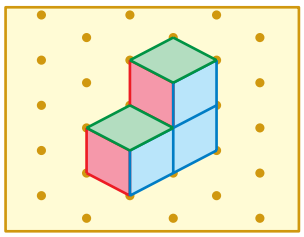
Corner View

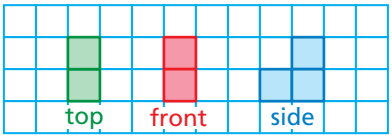
1 ACTIVITY: Finding Surface Areas and Volumes

Work with a partner.

Draw the front, side, and top views of each stack of cubes. Then find the surface area and volume. Each small cube has side lengths of 1 unit.

a. Sample:

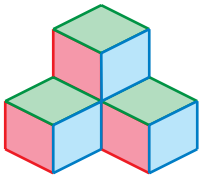




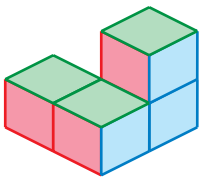
Volume: 3 cubic units

Surface Area: 14 square units

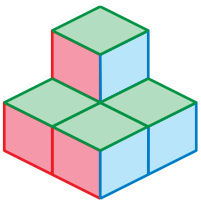
b.



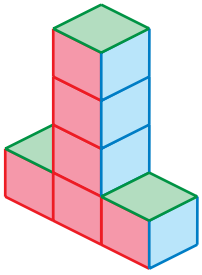
c.



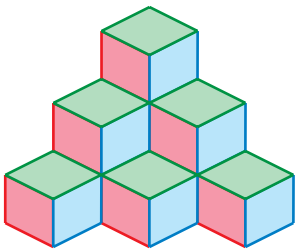
d.



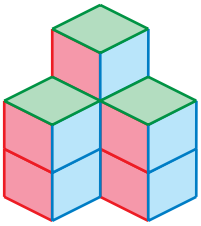
e.



f.



g.



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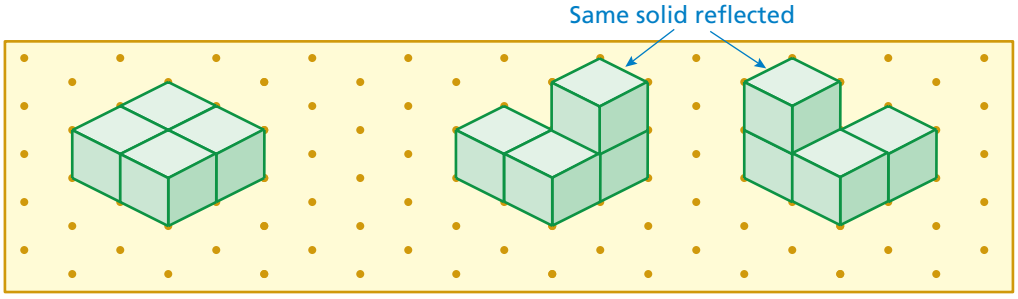
2 ACTIVITY: Drawing Solids

Work with a partner.

a. Draw all the different solids you can make by joining four cubes. (Two have been drawn.) Cubes must be joined on faces, not on edges only. Translations, reflections, and rotations do not count as different solids.



b. Do all the solids have the same surface area? Do all the solids have the same volume? Explain your reasoning.

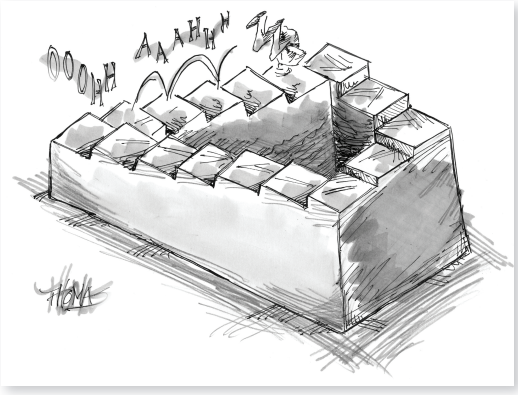
What Is Your Answer?

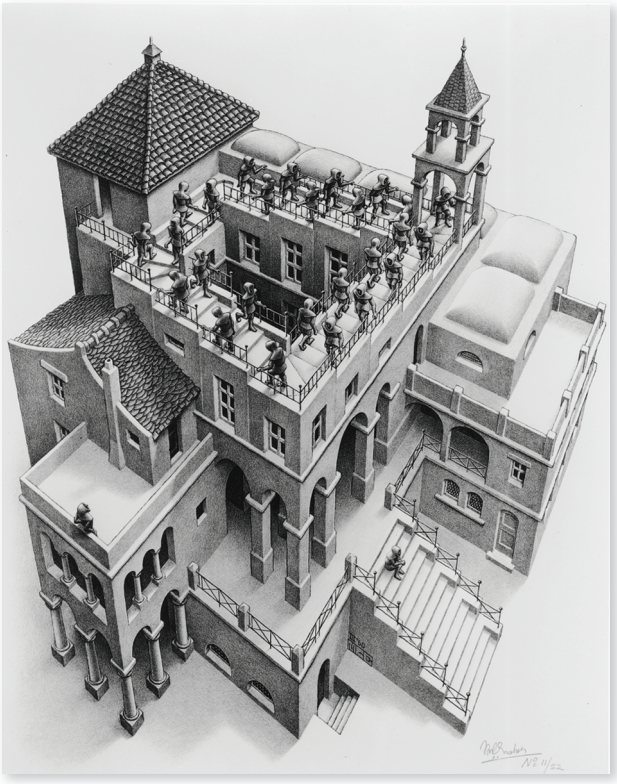
3. IN YOUR OWN WORDS How can you draw three-dimensional figures? Draw and shade two prisms that have the same volume but different surface areas.

4. Maurits Escher (1898–1972) was a popular artist who drew optical illusions.

a. What is the illusion in Escher's drawing?

b. Why is the cartoon funny? What is the illusion in the cartoon?





©2010 M.C. Escher's "Ascending and Descending"

Practice Use what you learned about three-dimensional figures to complete Exercises 7–9 on page 254.

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6.1 Lesson

Check It Out
Lesson Tutorials
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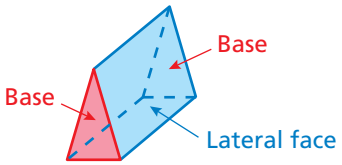
Key Vocabulary
three-dimensional figure, *p. 252*
polyhedron, *p. 252*
lateral face, *p. 252*

A **three-dimensional figure**, or *solid*, has length, width, and depth.
A **polyhedron** is a three-dimensional figure whose faces are all polygons.

Key Ideas

Prisms

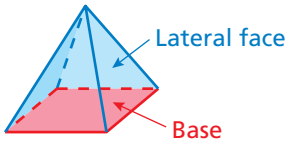
A prism is a polyhedron that has two parallel, identical bases. The **lateral faces** are parallelograms.



Triangular Prism

Pyramids

A pyramid is a polyhedron that has one base. The lateral faces are triangles.

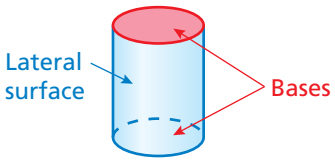


Rectangular Pyramid

The shape of the base tells the name of the prism or the pyramid.

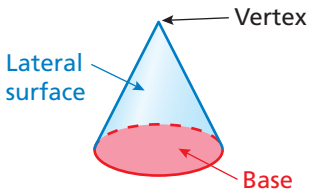
Cylinders

A cylinder is a solid that has two parallel, identical circular bases.



Cones

A cone is a solid that has one circular base and one vertex.

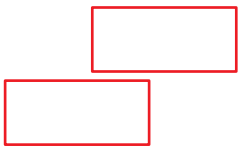


EXAMPLE 1 Drawing a Prism

Draw a rectangular prism.

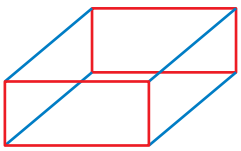
Step 1

Draw identical rectangular bases.



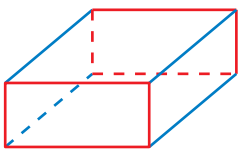
Step 2

Connect corresponding vertices.



Step 3

Change any *hidden* lines to dashed lines.



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EXAMPLE 2 Drawing a Pyramid

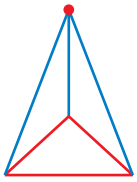
Draw a triangular pyramid.

Step 1

Draw a triangular base and a point.

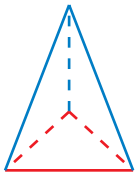
Step 2

Connect the vertices of the triangle to the point.



Step 3

Change any *hidden* lines to dashed lines.



On Your Own

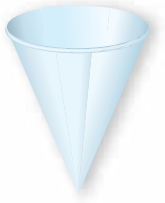
Now You're Ready
Exercises 10–15

Draw the solid.

1. Square prism
2. Pentagonal pyramid

EXAMPLE 3 Drawing Views of a Solid

Draw the front, side, and top views of the paper cup.



The front view is a triangle.

The side view is a triangle.

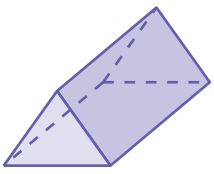
The top view is a circle.

On Your Own

Now You're Ready
Exercises 16–21

Draw the front, side, and top views of the solid.

3.



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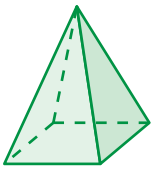

5.

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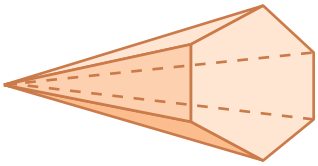
6.1 Exercises

Check It Out
Help with Homework
BigIdeasMath.com

Vocabulary and Concept Check

1. **VOCABULARY** Compare and contrast prisms and cylinders.
2. **VOCABULARY** Compare and contrast pyramids and cones.
3. **WRITING** Give examples of prisms, pyramids, cylinders, and cones in real life.

Identify the shape of the base. Then name the solid.

4. 
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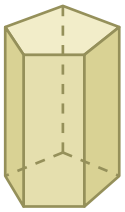
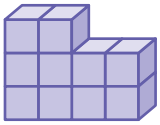
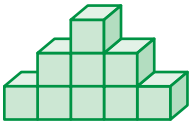
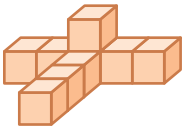
6. 

Practice and Problem Solving

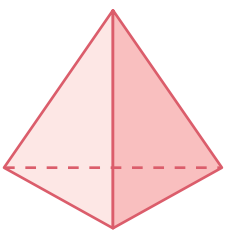
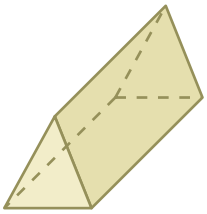
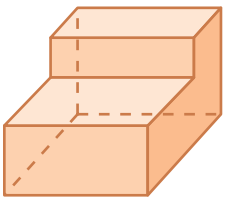
Draw the front, side, and top views of the stack of cubes. Then find the surface area and volume.

7. 
8. 
9. 

Draw the solid.

10. Triangular prism
11. Pentagonal prism
12. Rectangular pyramid
13. Hexagonal pyramid
14. Cone
15. Cylinder

Draw the front, side, and top views of the solid.

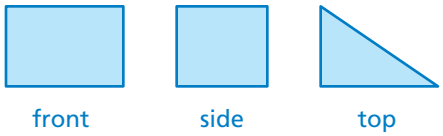
16. 
17. 
18. 
19. 
20. 
21. 

22. **PYRAMID ARENA** The Pyramid of Caius Cestius in Rome is in the shape of a square pyramid. Draw a sketch of the pyramid.

23. **RESEARCH** Use the Internet to find a picture of the Washington Monument. Describe its shape.

Draw a solid with the following front, side, and top views.

24.



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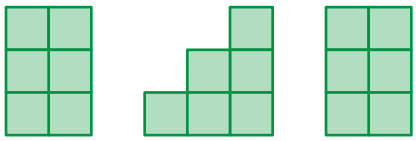
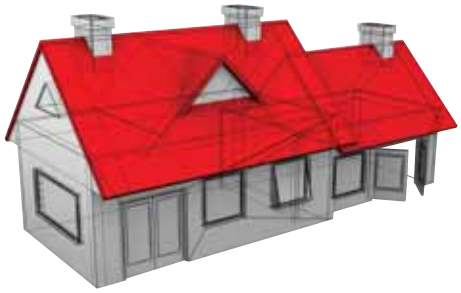


26. **PROJECT** Design and draw a house. Name the different solids that can be used to make a model of the house.

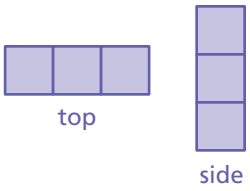


27. **REASONING** Two of the three views of a solid are shown.

a. What is the greatest number of unit cubes in the solid?

b. What is the least number of unit cubes in the solid?

c. Draw the front views of both solids in parts (a) and (b).



28. Reasoning Draw two different solids with five faces.

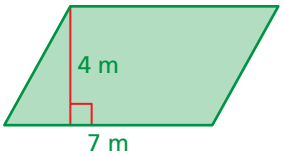
a. Write the number of vertices and edges for each solid.

b. Explain how knowing the numbers of edges and vertices helps you draw a three-dimensional figure.

Fair Game Review What you learned in previous grades & lessons

Find the area. SKILLS REVIEW HANDBOOK

29.



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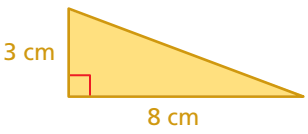

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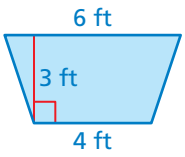

32. **MULTIPLE CHOICE** You borrow $200 and agree to repay $240 at the end of 2 years. What is the simple interest rate per year? SECTION 4.4

Ⓐ 5% Ⓑ 10% Ⓒ 15% Ⓓ 20%