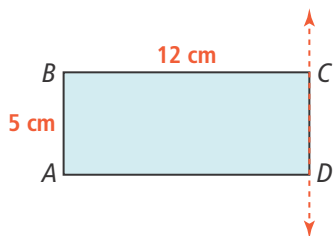




UNDERSTAND

10. **Mathematical Connections** If you rotate rectangle $ABCD$ about $\overleftrightarrow{CD}$, what is the volume of the resulting three-dimensional figure?

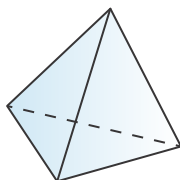


11. **Error Analysis** Philip was asked to find the number of vertices of a polyhedron with 32 faces and 60 edges. What is his error?

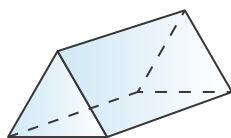
$$\begin{aligned} F + E &= V + 2 \\ 32 + 60 &= V + 2 \\ 90 &= V \end{aligned}$$



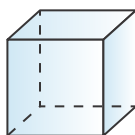
12. **Make Sense and Persevere** A tetrahedron is a polyhedron with four triangular faces. Can a plane intersect the tetrahedron shown to form a cross section with four sides? Explain.



13. **Use Appropriate Tools** Can the intersection of a plane and a triangular prism produce a rectangular cross section? Draw a diagram to explain.

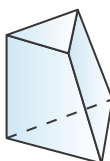


14. **Higher Order Thinking** Is it possible to rotate a polygon to form a cube? Explain.



15. **Make Sense and Persevere** Use the polyhedron shown.

- a. Does the figure have a cross section with five sides? Copy the figure and draw the cross section or explain why not.



- b. What is the maximum number of sides that a cross section of this figure can have?

PRACTICE

For Exercises 16–20, find the missing number for each polyhedron. SEE EXAMPLES 1 AND 2

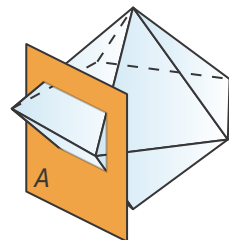
16. A polyhedron has 24 edges and 12 vertices. How many faces does it have?

17. A polyhedron has 20 faces and 12 vertices. How many edges does it have?

18. A polyhedron has 8 faces and 15 edges. How many vertices does it have?

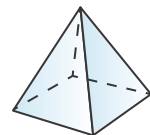
19. A polyhedron has 16 edges and 10 vertices. How many faces does it have?

20. Draw the cross section formed by the intersection of plane A and the polyhedron shown. What type of polygon is the cross section? SEE EXAMPLE 3



For Exercises 20 and 21, use the square pyramid shown. SEE EXAMPLE 4

21. Visualize a plane intersecting the square pyramid parallel to the base. Describe the cross section.



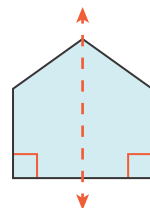
22. Visualize a plane intersecting the square pyramid through the vertex and perpendicular to opposite edges of the base. Describe the cross section.

23. Describe the three-dimensional figure that is formed from by rotating the rectangle about the side.

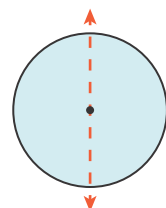
SEE EXAMPLE 5



24. Describe the three-dimensional figure that is formed by rotating the pentagon about the line shown. SEE EXAMPLE 5



25. Describe the three-dimensional figure that is formed by rotating the circle about a diameter.



APPLY

26. **Model With Mathematics** Parker cuts 12 pentagons and 20 hexagons out of fabric to make the pillow shown. The pillow has 60 vertices. If it takes 20 inches of thread per seam to connect the edges of the polygons, how many inches of thread does Parker need to make the pillow?



27. **Reason** A gem cutter cuts a polyhedral crystal from a garnet gemstone. The crystal has 10 fewer vertices than edges and twice as many edges as faces. How many faces, vertices, and edges does the crystal have?



28. **Communicate Precisely** Rebecca wants to install a safety mat under the path of a revolving door. What shape should she make the mat? Explain.

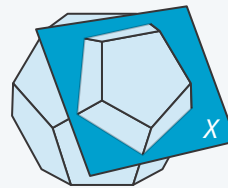


ASSESSMENT PRACTICE

29. Complete the table for each polyhedron.

Polyhedron	Faces (F)	Vertices (V)	Edges (E)
regular dodecahedron	12		30
heptagonal pyramid	8	9	
octahedron	8		12
rhombohedron		8	12

30. **SAT/ACT** Which best describes the cross section of plane X and the polyhedron shown?



- Ⓐ hexagon
 Ⓑ pentagon
 Ⓒ rectangle
 Ⓓ trapezoid
 Ⓔ triangle
31. **Performance Task** Draw a polyhedron with the fewest possible faces, vertices, and edges. Choose the faces from the polygons shown. You may use a polygon more than once.



Part A Explain why the polygon or polygons you chose minimize the number of vertices and edges.

Part B How do you know that there is no polyhedron with fewer faces, vertices, or edges than the one you drew?