

Slices and Spins

Connect flat shapes to the solids they create or reveal.

HIGH SCHOOL • HSG-GMD.B

CCSS.Math.Content.HSG-GMD.B "Visualize relationships between two-dimensional and three-dimensional objects"

NAME _____

DATE _____

SEE THE SOLID

Imagine a plane passing through a solid, or imagine a flat figure turning around a side. A slice parallel to a prism's base has the same shape as the base, and a side used as an axis of rotation becomes a dimension of the new solid.

WORKED EXAMPLE

A 3 cm by 7 cm rectangle is rotated around its 7 cm side. What solid forms, and what are its radius and height?

1. The 7 cm side is the axis of rotation, so it becomes the height.
2. The 3 cm side sweeps a circle, so it becomes the radius.
3. Rotating a rectangle around one side forms a cylinder.

Answer: Cylinder with radius 3 cm and height 7 cm.

PRACTICE 6 problems

- 1** A rectangular prism has a base that is 8 cm by 11 cm. It is sliced by a plane parallel to its base. What is the shape and dimensions of the cross-section?

ANSWER _____

- 2** A cylinder has radius 4 cm and height 14 cm. A plane passes through its central axis. What is the shape and dimensions of the cross-section?

ANSWER _____

- 3** A square pyramid is sliced by a plane parallel to its base. What shape is the cross-section?

ANSWER _____

- 4** A sphere is sliced by a plane through its center. What shape is the cross-section?

ANSWER _____

- 5** A right triangle has legs 5 cm and 12 cm. It is rotated around the 12 cm leg. What solid forms, and what are its radius and height?

ANSWER _____

- 6** A semicircle has radius 9 cm. It is rotated around its diameter. What solid forms, and what is its radius?

ANSWER _____

APPLY IT Show your work

- 1** For an esports club trophy, Lina spins a right triangle with legs 6 cm and 8 cm around the 8 cm leg. What solid does the design create, and what are its radius and height?

WORK SPACE

ANSWER _____

- 2** A cylindrical snack container for the school media club has radius 11 cm and height 18 cm. A virtual cutting plane passes through the container's central axis. What shape appears, and what dimensions does it have?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A 6 cm by 10 cm rectangle is rotated once around its 10 cm side and once around its 6 cm side. For each rotation, name the cylinder's radius and height. Then find each volume and explain why the volumes are different.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A rectangular prism has a base that is 8 cm by 11 cm. It is sliced by a plane parallel to its base. What is the shape and dimensions of the cross-section?	A rectangle that is 8 cm by 11 cm.
2	A cylinder has radius 4 cm and height 14 cm. A plane passes through its central axis. What is the shape and dimensions of the cross-section?	A rectangle that is 8 cm by 14 cm.
3	A square pyramid is sliced by a plane parallel to its base. What shape is the cross-section?	A square.
4	A sphere is sliced by a plane through its center. What shape is the cross-section?	A circle.
5	A right triangle has legs 5 cm and 12 cm. It is rotated around the 12 cm leg. What solid forms, and what are its radius and height?	A cone with radius 5 cm and height 12 cm.
6	A semicircle has radius 9 cm. It is rotated around its diameter. What solid forms, and what is its radius?	A sphere with radius 9 cm.

PART 2 • APPLY IT

1. **A cone with radius 6 cm and height 8 cm.** The leg used as the axis becomes the cone's height. The other leg becomes the radius of the circular base.
2. **A rectangle that is 22 cm by 18 cm.** A plane through a cylinder's axis makes a rectangle. Its width is the diameter, $2 \times 11 = 22$ cm, and its height is 18 cm.

CHALLENGE

Around the 10 cm side: radius 6 cm, height 10 cm, volume $360\pi \text{ cm}^3$. Around the 6 cm side: radius 10 cm, height 6 cm, volume $600\pi \text{ cm}^3$. The second volume is larger because the radius is squared in $V = \pi r^2 h$.

Accept dimensions in either order for rectangular cross-sections. Accept $V = 360\pi$ and $V = 600\pi$ when cubic centimeters are understood.