

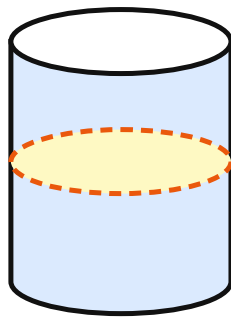
Geometry - Cross Sections and Solids of Revolution - Answer Key

Common Core G-GMD.B.4 · maths-pdf.fr/en/

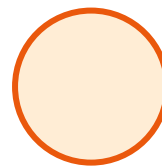
Use this answer key to check the 20 problems on cross sections. Every solution shows the formula or theorem used, each step of the work, and the final answer in bold. If an answer differs from yours, compare the steps line by line to find where the work changed.

Geometry · Common Core State Standards: **G-GMD.B.4**

Exercise 1 - Cylinder, parallel cut



cross section



circle

A plane parallel to the base cuts a cylinder in a circle.

Every point of the cut is the same distance from the axis.

A circle

Exercise 2 - Cylinder through the axis

The cross section is a rectangle with width $2 \cdot 5 = 10$ and height 12.

$$10 \cdot 12 = 120$$

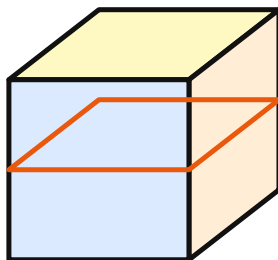
Rectangle; area 120

Exercise 3 - Slanted cut

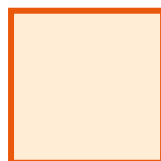
A slanted plane section of a cylinder is an ellipse.

An ellipse

Exercise 4 - Cube, parallel cut



cross section



square

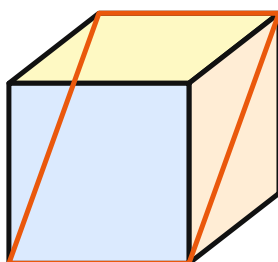
A plane parallel to a face cuts a cube in a square.

A square with side 6.

$$6^2 = 36$$

Square; area 36

Exercise 5 - Cube, diagonal cut



cross section



rectangle

A plane through opposite edges cuts a cube in a rectangle.

The rectangle has one side 6 and the other side is a face diagonal: $6\sqrt{2}$.

$$6 \cdot 6\sqrt{2} = 36\sqrt{2} = 50.9$$

Rectangle; area $36\sqrt{2}$, about 50.9

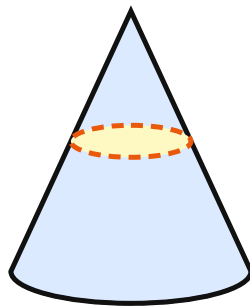
Exercise 6 - Cube, corner cut

Each side is a face diagonal: $6\sqrt{2}$. The triangle is equilateral.

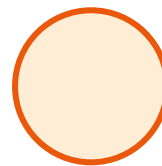
$$\frac{\sqrt{3}}{4} \cdot (6\sqrt{2})^2 = \frac{\sqrt{3}}{4} \cdot 72 = 18\sqrt{3} = 31.2$$

Equilateral triangle; area $18\sqrt{3}$, about 31.2

Exercise 7 - Cone, parallel cut



cross section



circle

A plane parallel to the base cuts a cone in a circle.

Halfway up, the radius is half: 2 (similar triangles).

$$\pi \cdot 2^2 = 4\pi = 12.6$$

Radius 2; area 4π , about 12.6

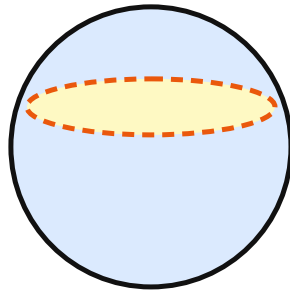
Exercise 8 - Cone, through the apex

The cross section is a triangle with base $2 \cdot 4 = 8$ and height 10.

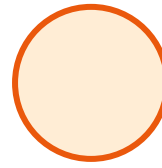
$$\frac{1}{2} \cdot 8 \cdot 10 = 40$$

Triangle; area 40

Exercise 9 - Sphere cross section



cross section



circle

Every plane cut of a sphere is a circle.

$$r = \sqrt{13^2 - 5^2} = \sqrt{144} = 12.$$

$$\pi \cdot 12^2 = 144\pi = 452.4$$

Circle of radius 12; area 144π , about 452.4

Exercise 10 - Great circle

The cross section is a great circle with radius 13.

$$2\pi \cdot 13 = 26\pi.$$

26π

Exercise 11 - Rectangular prism

The cross section is congruent to the 4 by 6 face.

$$4 \cdot 6 = 24$$

Rectangle; area 24

Exercise 12 - Square pyramid

The cross section is a square similar to the base with scale factor $\frac{1}{2}$: side 4.

$$4^2 = 16$$

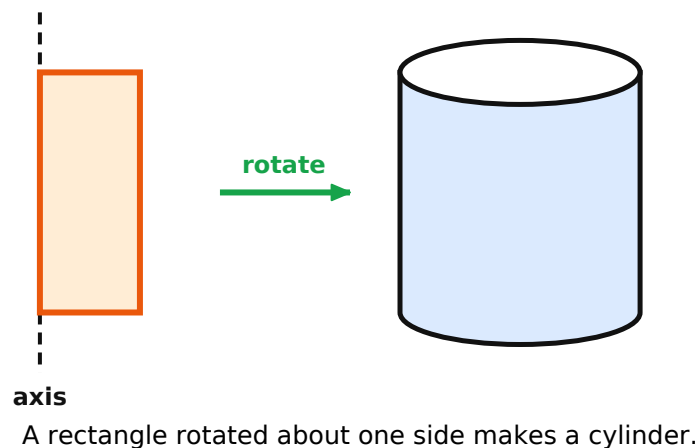
Square; area 16

Exercise 13 - Cube cross sections

For example: a square (cut parallel to a face), a rectangle (cut through two opposite edges), and a triangle (cut through three vertices). A hexagon is also possible.

Square, rectangle, triangle (also pentagon, hexagon)

Exercise 14 - Rotate a rectangle

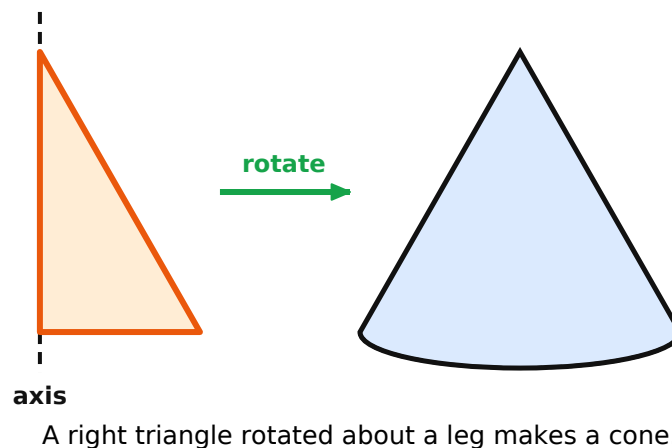


The solid is a cylinder with radius 3 and height 8.

$$V = \pi \cdot 3^2 \cdot 8 = 72\pi = 226.2$$

Cylinder; 72π , about 226.2

Exercise 15 - Rotate a triangle about the long leg



The solid is a cone with radius 6 and height 8.

$$V = \frac{1}{3}\pi \cdot 6^2 \cdot 8 = 96\pi = 301.6$$

Cone; 96π , about 301.6

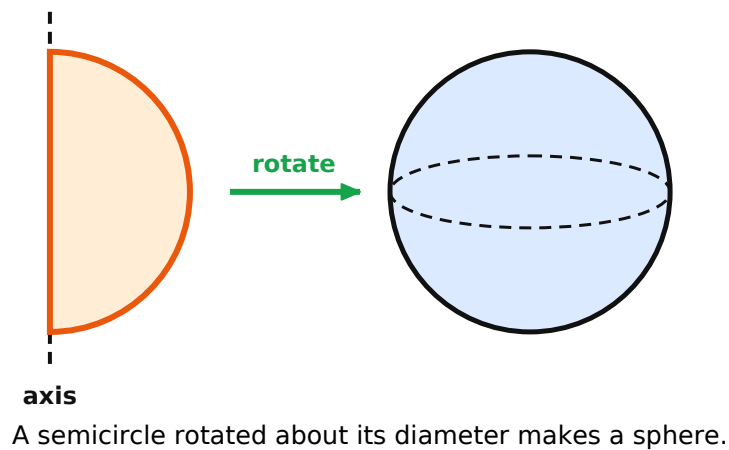
Exercise 16 - Rotate a triangle about the short leg

Now the radius is 8 and the height is 6.

$$V = \frac{1}{3}\pi \cdot 8^2 \cdot 6 = 128\pi = 402.1$$

128π , about 402.1

Exercise 17 - Rotate a semicircle

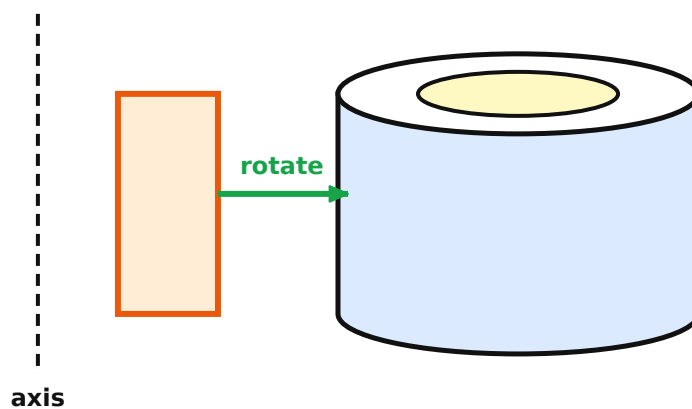


The solid is a sphere of radius 5.

$$V = \frac{4}{3}\pi \cdot 5^3 = \frac{500}{3}\pi = 523.6$$

Sphere; $500\pi/3$, about 523.6

Exercise 18 - Hollow cylinder



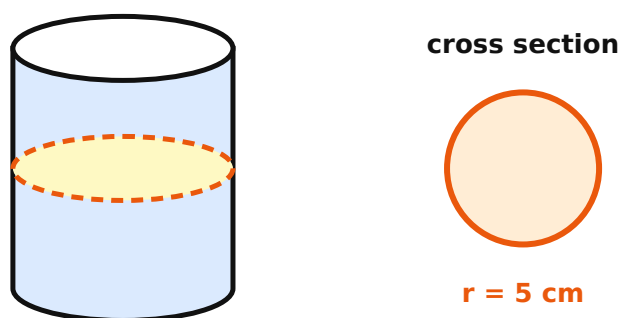
A rectangle that does not touch the axis makes a hollow cylinder.

The rotation makes a hollow cylinder with inner radius 3, outer radius 5 and height 5.

$$V = \pi(5^2 - 3^2) \cdot 5 = 80\pi = 251.3$$

Hollow cylinder; 80π , about 251.3

Exercise 19 - Slicing a loaf



The slice face is a circle of radius 5 cm.

The face is a circle with radius 5.

$$\pi \cdot 5^2 = 25\pi = 78.5$$

Circle; 78.5 square centimeters

Exercise 20 - Pottery cone

Radius 9, height 12.

$$V = \frac{1}{3}\pi \cdot 81 \cdot 12 = 324\pi = 1017.9$$

1017.9 cubic units