

Solids and Their Nets

Name: _____

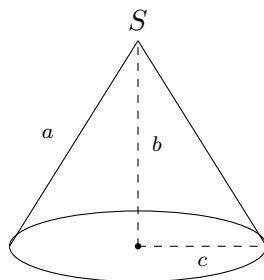
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Cones

1. A traffic cone on a Montréal work site is a right circular cone. The drawing below marks three of its measurements: $a = 10$ cm, $b = 8$ cm and $c = 6$ cm.



- Name each of a , b and c using the proper term for a cone.
- How many flat faces, curved surfaces, edges and vertices does the cone have?
- What is the diameter of its base?

Congruent and Similar Solids

2. A dépanneur sells iced tea in two similar cylindrical cans. The small can has a base radius of 4 cm and a height of 10 cm; the large can has a base radius of 6 cm.

- a) Find the ratio of similarity k from the small can to the large one.
- b) Find the height of the large can.
- c) The small can holds $160\pi \text{ cm}^3$ of iced tea, which is about 503 mL. How much does the large one hold? Leave your answer in terms of π .

Constructing the Nets of Cones

3. A cone-shaped party hat has a base radius of 5 cm and a slant height of 12 cm. Its net is a disc together with a sector of a circle.

- a) Give the radius of the disc and the radius of the sector.
- b) Find the length of the sector's arc, to the nearest tenth of a centimetre.
- c) Find the central angle of the sector.

Constructing the Nets of Cylinders

4. A tin of maple butter is a right circular cylinder with a base radius of 5 cm and a height of 18 cm. Its net is made of one rectangle and two circles.

- a) Give the radius of each circle.
- b) Give the two dimensions of the rectangle, rounding any length to the nearest tenth of a centimetre.
- c) Which dimension of the rectangle would change if the tin were made taller but no wider?

Cylinders

5. The salt tank at a snow-clearing depot is a right circular cylinder standing on one of its bases.

- a) How many flat faces, curved surfaces, edges and vertices does it have?
- b) The tank is sliced by a horizontal plane, parallel to its base. What shape is the cut surface, and does its size depend on how high up the cut is made?
- c) Which two measurements are enough to describe the tank completely?

Decomposable and Truncated Solids

6. A water tank at an arena is made of a cylinder of radius 40 cm and height 90 cm, with a hemisphere of the same radius closing it at the top. It rests flat on the floor.

- a) Name the two simple solids the tank decomposes into.
- b) List the surfaces that make up the *outside* of the tank, and name one surface of the two simple solids that is *not* part of the outside.
- c) Find the total height of the tank.

Geometry

7. Match each term on the left with the description on the right that fits it. Each description is used exactly once.

Term	Description
1. Face	A. A flat pattern that folds up into a solid
2. Edge	B. The single point where all the lateral faces of a pyramid meet
3. Vertex	C. A flat or curved surface bounding a solid
4. Apex	D. The distance from the apex to a point on the edge of a cone's base
5. Net	E. A line or curve where two surfaces of a solid meet
6. Slant height	F. A corner point where edges of a solid meet

Similarity, Congruence, and Equivalence

8. For each pair of solids, say whether the two solids are **congruent**, **similar but not congruent**, **equivalent but not similar**, or none of these. Justify each answer.

- a) Two cubes, each with edges of 5 cm.
- b) A cylinder with $r = 2$ cm, $h = 9$ cm, and a cylinder with $r = 6$ cm, $h = 27$ cm.
- c) A cube with edges of 6 cm, and a rectangular prism measuring $4 \text{ cm} \times 9 \text{ cm} \times 6 \text{ cm}$.

Solids

9. Consider these seven solids: a cube, a cone, a hexagonal prism, a sphere, a square-based pyramid, a cylinder, a regular tetrahedron.

- a) Sort them into polyhedra and non-polyhedra, and say what decides which group a solid goes into.
- b) Check Euler's relation, $F - E + V = 2$, on the hexagonal prism.

Solids with Curved Surfaces

10. Copy and complete this table for the three solids with curved surfaces.

Solid	Flat faces	Curved surfaces	Edges	Vertices
Cylinder				
Cone				
Sphere				

Then answer: which of the three has no edge at all, and which has exactly one vertex?

Tetrahedrons

11. A wooden puzzle piece is a regular tetrahedron with all its edges 9 cm long.

- Give its number of faces, edges and vertices, and name the shape of each face.
- Check Euler's relation on it.
- A ribbon is glued along every edge. What total length of ribbon is needed?

The Net and Drawing of a Sphere

12. A globe-maker and a mathematics student are discussing spheres.

- a) Explain why a sphere has no exact net, unlike a cylinder or a cone.
- b) Globes are in fact covered with printed paper. Describe what shape those pieces of paper have and why the result is only an approximation.
- c) When a sphere is drawn on paper, the great circle around it is drawn as an oval rather than as a circle. Why?

The Sphere

13. A basketball is a sphere with a diameter of 24 cm.

- a) Give its radius.
- b) What is a great circle of a sphere?
- c) Find the circumference of a great circle of this basketball, to the nearest tenth of a centimetre.

Synthesis — drawing on several sheets in this topic

14. A grain silo on a farm in the Beauce is a decomposable solid: a cylinder of radius 3 m and height 8 m, with a cone of slant height 5 m sitting on top of it. The silo stands on the ground and its whole outside surface, including the disc it stands on, is to be covered in sheet metal.

- a) Name the three pieces that make up the net of the outside surface, and give the radius of each circular piece.
- b) Give the two dimensions of the rectangular piece, to the nearest tenth of a metre.
- c) Find the central angle of the sector.

Want the harder problems and the worked solutions?

The *Challenge Problems* set and the *Answer Keys* for Solids and Their Nets — with the reasoning written out in full — are available at tutorinmontreal.ca.