Grade 7 Mathematics: Geometry and Transformations

Free sample lesson

Ontario curriculum: Mathematics (2020), Strand E: Spatial Sense, E1 Geometric and Spatial Reasoning. 18 days.

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This is Lesson 1 of 12 from the full unit, exactly as it appears in the Teacher Guide, followed by the student worksheet. The full unit is at unitplans.ca.

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Lesson 1: Prisms and cylinders

1 day · about 60 minutes · E1.1

Learning goal

- We are learning to sort prisms and cylinders by their bases, faces, edges and vertices.

Success criteria

- I can name a prism from the shape of its base.
- I can count the faces, edges and vertices of a prism.
- I can tell a right prism from an oblique prism.
- I can explain how a cylinder is like a prism and how it is different.

Materials

- Solid models or nets of prisms and cylinders (or pictures)
- Straws and modelling clay (optional)
- Chart paper

Minds On (10 min)

1. Show a box of tissues, a can of soup and a triangular chocolate box. Ask: "What do all three objects have in common, and what is different about them?"
2. Students share with a partner, then the class builds a list of words on the board (flat, curved, bases, faces).

Action (35 min)

1. Hand out models. Students record the shape of the two bases and the number of faces, edges and vertices for each prism, then look for the pattern when the base has n sides.
2. Introduce the words: a cylinder has two parallel, matching bases joined by parallel lines; a prism is a cylinder whose bases are polygons and whose side faces are parallelograms. A prism is named for its base.
3. Compare a right prism (sides meet the bases at right angles) with an oblique prism (sides lean). Students complete the worksheet.

Consolidation (15 min)

1. Build a class chart: base shape, faces, edges, vertices. Discuss the pattern $F = n + 2$, $E = 3n$, $V = 2n$.
2. Discuss question 6: why is a soup can a cylinder but not a prism?

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3. Exit: "A prism has a base with 7 sides. How many vertices does it have?"

Questions to ask

- What stays the same all the way up a prism?
- How could you find the number of edges without counting every one?
- Can an oblique prism still be a prism? Why?

Watch for

- Students name a prism by its side faces instead of its base. A triangular prism has rectangles on the sides. Always ask: what shape is the base?
- Students count only the edges they can see. Use straws or a model to show the hidden ones.

Differentiation

Support	Extend
Give a table that is partly filled in and let students complete the last rows. Use real objects to count faces by touching each one.	Find a rule for a prism with a base that has 20 sides without drawing it. Is there a prism with exactly 10 vertices? Is there one with exactly 12 edges? Explain.

Answer key: Prisms and cylinders

1. A prism has a pentagon for each base. How many faces does the prism have?

   > **Answer:** 7
   > 5 side faces + 2 bases = 7

2. How many edges does a hexagonal prism have?

   > **Answer:** 18
   > 6 edges on each base × 2 = 12, plus 6 edges joining the bases = 18

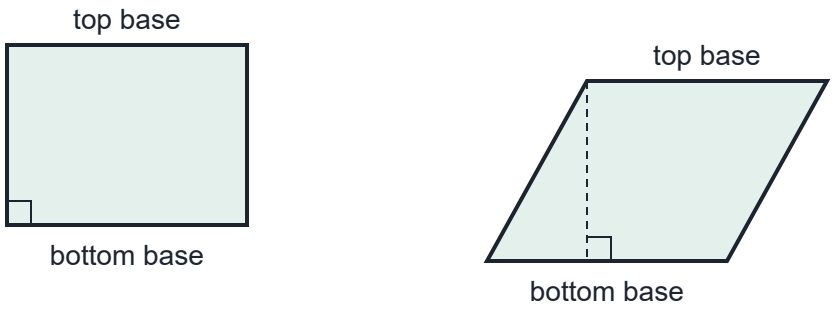
3. How many vertices does an octagonal prism have?

   > **Answer:** 16
   > 8 vertices on each base × 2 = 16

4. A prism has 15 edges. What shape are its bases? Name the prism.

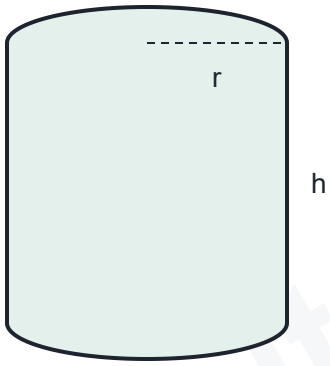
   > **Answer:** 15 ÷ 3 = 5 sides, so the bases are pentagons. It is a pentagonal prism.

5. Look at the side views of the two prisms. Which is a right prism and which is oblique? How can you tell?



> **Answer:** The first (rectangle) is a right prism because its sides meet the bases at right angles. The second leans, so it is an oblique prism.

6. A soup can is a cylinder. Explain why it is not a prism.



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> **Answer:** The bases of a soup can are circles. A prism must have polygon bases (straight sides) and flat side faces. A can has a curved surface.

7. Check Euler's rule on a pentagonal prism: faces + vertices − edges. What do you get?

> **Answer:** 2
> 7 + 10 − 15 = 2

Student worksheet: Prisms and cylinders

Success criteria

- I can name a prism from the shape of its base.
- I can count the faces, edges and vertices of a prism.
- I can tell a right prism from an oblique prism.
- I can explain how a cylinder is like a prism and how it is different.

Show your work. A prism with an n-sided base has n + 2 faces.

1. A prism has a pentagon for each base. How many faces does the prism have?

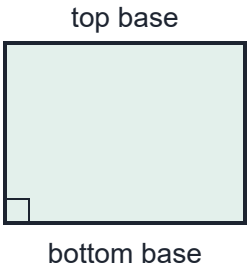
2. How many edges does a hexagonal prism have?

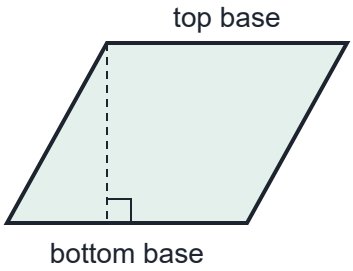
3. How many vertices does an octagonal prism have?

4. A prism has 15 edges. What shape are its bases? Name the prism.

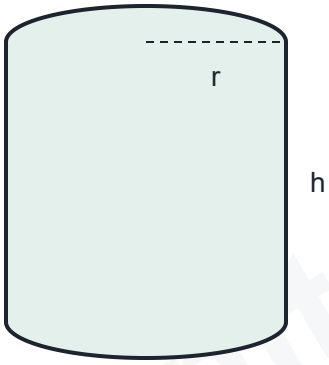
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5. Look at the side views of the two prisms. Which is a right prism and which is oblique? How can you tell?





6. A soup can is a cylinder. Explain why it is not a prism.



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7. Check Euler's rule on a pentagonal prism: faces + vertices − edges. What do you get?