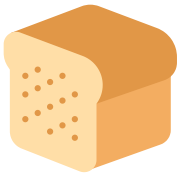
Name & Surname: _____ Class: _____ Date: _____

Volume of Prisms

From cross-section area to 3D volume

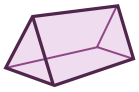
About 50 minutes Level ★★★☆☆



Volume of a prism

A prism has the same **cross-section** all the way through its **length**. Think of a sliced loaf: every slice is the same shape.

- Area of triangle = $\frac{1}{2}$ x base x height
- Area of parallelogram = base x height
- Area of trapezium = $\frac{1}{2}$ x (a + b) x height, where a and b are the parallel sides
- Volume of any prism = area of cross-section x length
- Volume of cuboid = length x width x height. Volume of cylinder = 3.14 x radius x radius x height
- Volume is in cubic units, e.g. cm3 or m3. 1000 cm3 = 1 litre



Task A

/4

Work out each calculation on squared paper. Show your method.

1

		3	6
×			5

2

		1	2
×		1	0

3

		4	2
×		1	8

4

5) 180

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Area First

Practise the cross-section areas you need for volume.

Key words

prism: a 3D shape with the same shape all the way through

volume: the amount of space inside a 3D shape, measured in cubic units

parallelogram: a quadrilateral with opposite sides parallel and equal

cross-section: the 2D shape you get when you slice straight through a prism

trapezium: a quadrilateral with one pair of parallel sides

cylinder: a 3D shape with a circular cross-section

Task B

/12

Find each area or perimeter. Include the correct units.

WARM UP

1 Find the area of a triangle with base 10 cm and perpendicular height 5 cm.

Answer: _____

2 Find the area of a parallelogram with base 9 cm and perpendicular height 4 cm.

Answer: _____

3 Find the area of a trapezium with parallel sides 6 cm and 10 cm and perpendicular height 4 cm.

Answer: _____

4 Find the area of a rectangle 8 cm by 3 cm.

Answer: _____

PRACTISE

5 Find the area of a triangle with base 12 cm and perpendicular height 7 cm.

Answer: _____

6 Find the area of a parallelogram with base 15 cm and perpendicular height 8 cm.

Answer: _____

7 Find the area of a trapezium with parallel sides 8 cm and 12 cm and perpendicular height 5 cm.

Answer: _____

8 Find the perimeter of a triangle with sides 7 cm, 7 cm and 10 cm.

Answer: _____

PROBLEM SOLVING

9 A flower bed is a trapezium with parallel sides 6 m and 10 m and distance between them 4 m. Find its area.

Answer: _____

10 A parallelogram-shaped window has base 1.2 m and perpendicular height 0.9 m. Find its area.

Answer: _____

11 A student says the area of a triangle with base 8 cm and height 3 cm is 24 cm². Explain how you know they are wrong.

Answer: _____

12 A triangle has area 30 cm² and base 10 cm. Find its perpendicular height.

Answer: _____

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Spot the Mistake

Find the wrong step in each solution and correct it.

Task C

/6

Find the wrong step, explain the error and write the correct answer.



Student A

Work out the volume of a triangular prism with triangular base 6 cm, triangular height 4 cm and prism length 10 cm.

1. Area of triangle = $\frac{1}{2} \times 6 \times 4 = 12$ cm²
2. Volume = 12 × 10 = 120
3. So volume = 120 cm²

The mistake is in step: _____

What went wrong?

.....

Correct answer: _____



Student B

Work out the volume of a triangular prism with triangular base 8 cm, triangular height 5 cm and prism length 12 cm.

1. Area of cross-section = 8 × 5 = 40 cm²
2. Volume = 40 × 12 = 480 cm³

The mistake is in step: _____

What went wrong?

.....

Correct answer: _____



Student C

Work out the volume of a cuboid 8 cm by 5 cm by 3 cm.

1. Cross-section area = 8 × 5 = 40 cm²
2. Volume = 40 + 3 = 43 cm³

The mistake is in step: _____

What went wrong?

.....

Correct answer: _____

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Volume Practice

Use cross-section area × length for every prism.

Task D

/12

Show the cross-section area first, then multiply by the length.

WARM UP

1 Find the volume of a cuboid 8 cm by 5 cm by 3 cm.

Answer: _____

2 A prism has cross-section area 8 cm² and length 20 cm. Find its volume.

Answer: _____

3 A prism has cross-section area 20 cm² and length 15 cm. Find its volume.

Answer: _____

4 Find the volume of a triangular prism with triangular base 6 cm, triangular height 4 cm and prism length 10 cm.

Answer: _____

PRACTISE

5 A prism has a parallelogram cross-section with base 9 cm and height 4 cm. The prism length is 5 cm. Find its volume.

Answer: _____

6 A prism has a pentagonal cross-section with area 42 cm². The prism length is 18 cm. Find its volume.

Answer: _____

7 A prism has a trapezoidal cross-section with parallel sides 6 cm and 10 cm and height 4 cm. The prism length is 15 cm. Find its volume.

Answer: _____

8 Find the volume of a cylinder with radius 5 cm and height 12 cm. Use π as 3.14.

Answer: _____

PROBLEM SOLVING

9 A tent has a triangular cross-section with base 2.4 m and height 1.8 m. The tent is 3 m long. Find its volume.

Answer: _____

10 A cuboid-shaped pool has volume 120 m³. Its length is 10 m and its width is 4 m. Find its depth.

Answer: _____

11 A gift box is a cuboid 20 cm by 10 cm by 5 cm. Find its volume in litres. 1000 cm³ = 1 litre.

Answer: _____

12 Explain how you know that volume is measured in cubic units such as cm³, not cm².

Answer: _____

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Reason and Measure

Correct the reasoning, then find cross-section areas.

Task E

/2

Read each statement. Explain the mistake and give the correct fact.



Student A

Volume is measured in cm² because you only find the area of the end.

What mistake did Student A make? Write the correct fact.

.....

.....



Student B

To find the volume of a triangular prism you just multiply all three numbers together.

What mistake did Student B make? Write the correct fact.

.....

.....

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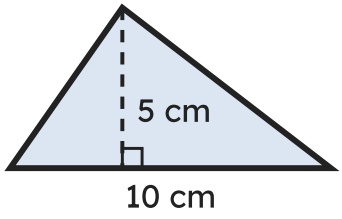
Volume of Prisms

Task F

/5

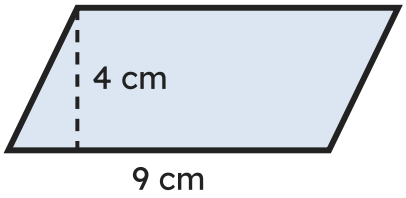
Find the area of each cross-section. Write the correct units.

1



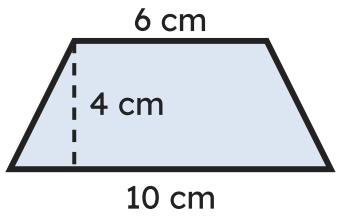
Area: _____ **cm²**

2



Area: _____ **cm²**

3



Area: _____ **cm²**

4



Area: _____ **cm²**

Perimeter: _____ **cm**

How did I do?

Circle a face for each line.

I can find the area of triangles, parallelograms and trapezia.	☹	😐	☺
I can find the volume of cuboids and other prisms.	☹	😐	☺
I can solve volume problems and explain my method.	☹	😐	☺

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Answer sheet: Volume of Prisms

Task A

1. $36 \times 5 = 180$
2. $12 \times 10 = 120$
3. $42 \times 18 = 756$
4. $180 \div 5 = 36$

Task B

1. 25 cm^2
2. 36 cm^2
3. 32 cm^2
4. 24 cm^2
5. 42 cm^2
6. 120 cm^2
7. 50 cm^2
8. 24 cm
9. 32 m^2
10. 1.08 m^2
11. They forgot to halve. Area = $\frac{1}{2} \times 8 \times 3 = 12$ cm^2.
12. 6 cm

Task C

1. Step 3 is wrong: Volume needs cubic units, not square units, because three lengths are multiplied. Correct answer: 120 cm^3
2. Step 1 is wrong: They forgot to halve for a triangle. Area of triangle = $\frac{1}{2}$ × base × height. Correct answer: 240 cm^3
3. Step 2 is wrong: They added the length instead of multiplying. Volume = area of cross-section × length. Correct answer: 120 cm^3

Task D

1. 120 cm^3
2. 160 cm^3
3. 300 cm^3
4. 120 cm^3
5. 180 cm^3
6. 756 cm^3
7. 480 cm^3
8. 942 cm^3
9. 6.48 m^3
10. 3 m
11. 1 litre
12. Volume multiplies three perpendicular lengths, e.g. cross-section area (cm^2) × length (cm), so the units are cm × cm × cm = cm^3.

Task E

1. Student A: Wrong units and method stopped too early. You must also multiply by the length, so volume is in cm^3.
2. Student B: Misses halving the triangle. Do $\frac{1}{2}$ × base × height first to get the cross-section area, then × length.

Task F

1. area = 25 cm^2
2. area = 36 cm^2
3. area = 32 cm^2
4. area = 24 cm^2, perimeter = 22 cm

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