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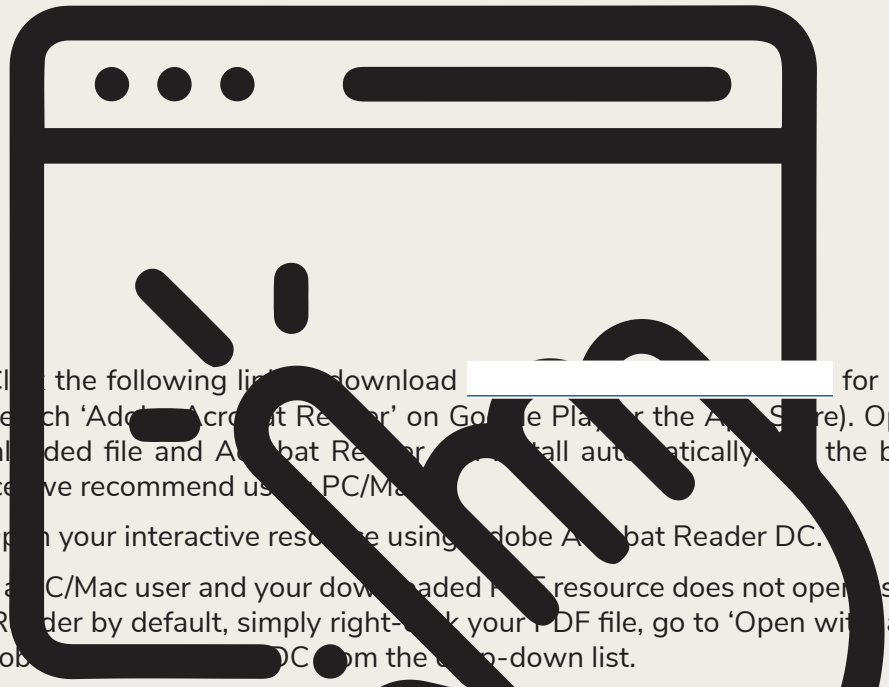

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For PC/Mac users: To fill in the resou click the text fields and type you swers as needed. Check boxes and radio bu can simply be clicked on t ake the selection of your choice and for anything else ill see the ques mark icon which, upon being clicked, will reveal specific instruct you respond to the corresponding question or activity. When you are finished with the resource, go to File > Save As... and save your file in a memorable location.

For smart device users: To fill in the resource, follow the same process as described above. When you are finished, simply press the back button in the top left of the appscreen and your PDF will save automatically.

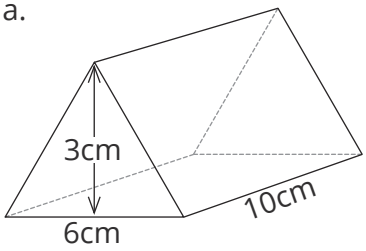
Remember: Saving your PDF will overwrite the original file, so be sure to create a copy before starting if you wish to keep a blank copy of the resource on your device.

We hope you have found this information useful. If you experience any problems in following the instructions above, please contact the Beyond team at and we will do our best to help with your query.

Your turn

1. Calculate the volume of each shape, giving your answers correct to the nearest whole number where necessary.

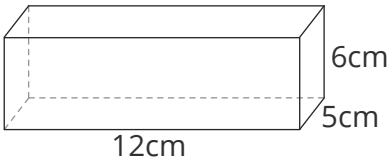
a.



$\frac{1}{2} \times 6 \times 3 = 9cm^2$

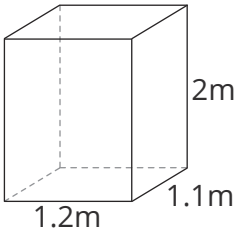
$9 \times 10 = 90cm^3$

b.



$5 \times 6 \times 12 = 360cm^3$

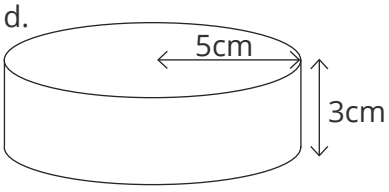
c.



$2 \times 1.1 \times 1.2 = 2.64$

$3m^3$

d.

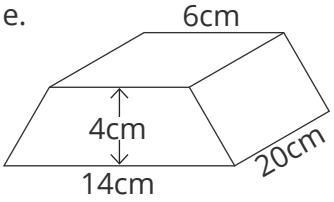


$\pi \times 5^2 = 78.53981634...cm^2$

$78.53981634... \times 3 = 235.619449...cm^2$

$236cm^3$

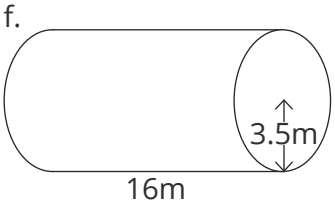
e.



$\frac{1}{2} \times (6 + 14) \times 4 = 40cm^2$

$40 \times 20 = 800cm^3$

f.

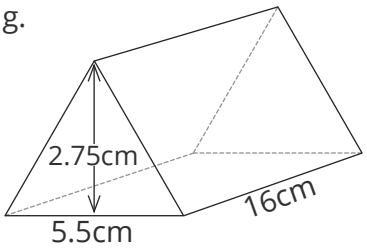


$\pi \times 3.5^2 = 38.48451001...m^2$

$38.48451001... \times 16 = 615.7521601...$

$616m^3$

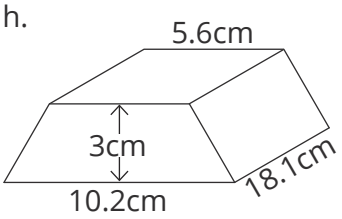
g.



$\frac{1}{2} \times 5.5 \times 2.75 = 7.5625cm^2$

$7.5625 \times 16 = 121cm^3$

h.

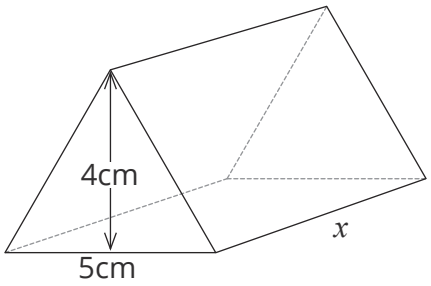


$\frac{1}{2} \times (5.6 + 10.2) \times 3 = 23.7cm^2$

$23.7 \times 18.1 = 428.97$

$429cm^3$

2. The volume of the triangular prism is 106cm^3. Calculate the measurement of the missing length marked x.

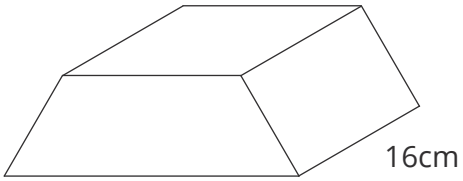


$\frac{1}{2}$ × 4 × 5 = 10cm^2

106 ÷ 10 = 10.6

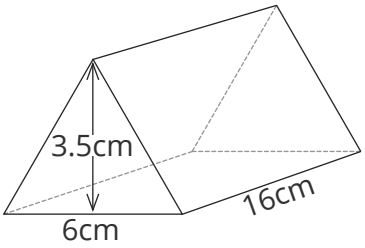
x = 10.6cm

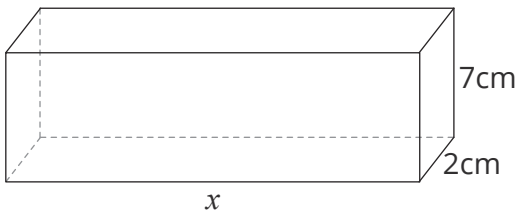
3. The volume of the prism shown below is 216cm^3. Calculate the cross-sectional area of the prism.



216 ÷ 16 = 13.5cm^2

4. The cuboid and the triangular prism have the same volume. Calculate the measurement of the missing length marked x.





$\frac{1}{2}$ × 6 × 3.5 = 10.5cm^2

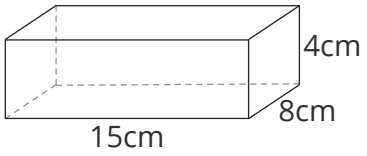
10.5 × 16 = 168cm^3

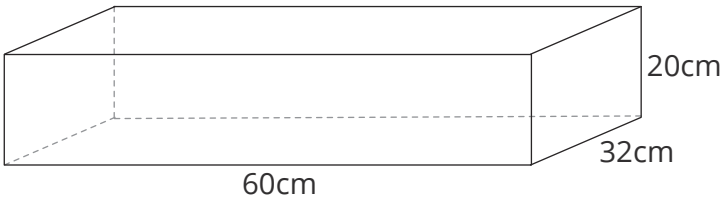
7 × 2 = 14cm^2

168 ÷ 14 = 12

x = 12cm

5. Boxes of chocolate are placed into a crate. Each box of chocolate is a cuboid and the crate is also a cuboid. Calculate the number of boxes of chocolate which will fit inside the crate.





60 ÷ 15 = 4cm

32 ÷ 8 = 4cm

20 ÷ 4 = 5cm

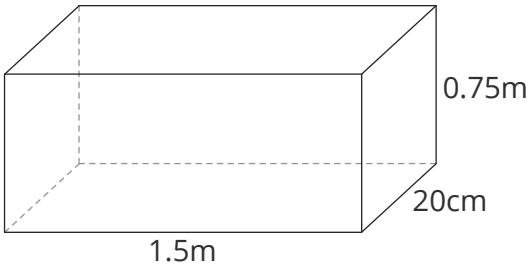
4 x 4 x 5 = 80

80 boxes of chocolate will fit inside of the crate.

Challenge

A fish tank is filled $\frac{3}{4}$ full of water. Joshua pours 1500ml more water into the fish tank. How many **litres** of water does the fish tank now contain?

Hint: 1ml = $1cm^3$



1.5m = 150cm

0.75m = 75cm

150 × 20 × 75 = 225 000cm^3

225 000cm^3 = 225 000ml

$\frac{3}{4}$ × 225 000 = 168 750ml

168 750 + 1500 = 170 250ml

170 250ml = 170.25 litres

Volume of Prisms

Prior Knowledge:

Before attempting this sheet, students should be able to:

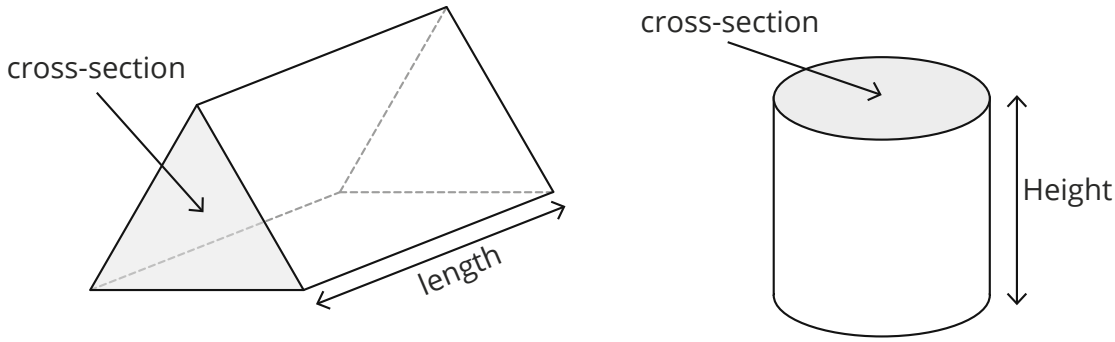
- calculate the area of a circle (πr^2)
- round numbers to whole numbers
- calculate the area of:
- triangles ($\frac{1}{2}$ × base × height)
- rectangles (length × width)
- squares (length × width)
- trapeziums ($\frac{1}{2} \times (a + b) \times$ height)

The volume of a shape is the measure of the **three-dimensional** space it covers. The units of measurement for volume are cubic units, for example cm^3 or m^3.

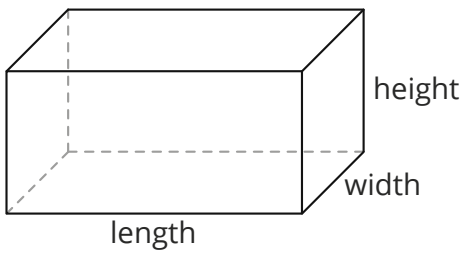
A **prism** is a solid (3D) object which is the same shape all the way through; it has a constant cross-section.

To calculate the volume of a prism, including a circular prism, learn this formula by heart:

Volume = area of cross-section × length or height



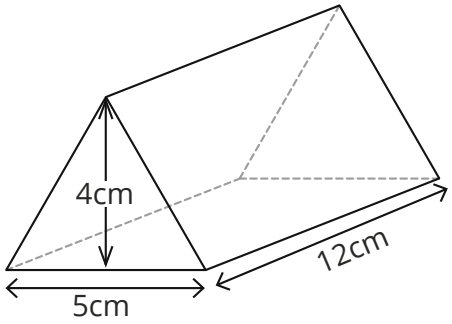
For example, the cross-section of this cuboid is a rectangle.



To calculate the area of the cross-section, it would be length × width. You would then multiply this by the height, hence the formula: length × width × height.

Example 1

Calculate the volume of the prism shown below.



The first step is to calculate the **area of** the **cross-section**. In other words, you need to calculate the area of the **base** of the shape. (The **base** is always the face which is the same as the cross-section).

This shape is a triangular prism; its base is a triangle. Therefore, you need to calculate the area of the triangle. Remember that the formula for calculating the area of a triangle is $\frac{1}{2}$ × base × height.

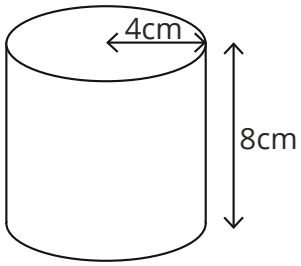
$\frac{1}{2} \times 5 \times 4 = 10\text{cm}^2$

Now that you have the area of the cross-section, multiply it by its length to calculate the volume.

$10 \times 12 = 120\text{cm}^3$ (Don't forget the units!)

Example 2

Calculate the volume of the cylinder, giving your answer correct to the nearest whole number.



Start by calculating the area of the cross section. In other words - the area of the circle. Remember that the formula for calculating the area of a circle is πr^2.

$\pi \times 4^2$

$\pi \times 16 = 50.26548246...\text{cm}^2$

(It's important that you don't round your answer at this stage – you could also leave your answer in terms of π, e.g. 16π.)

Now, multiply the area of the circle by the height.

$50.26548246... \times 8 = 402.1238597...$

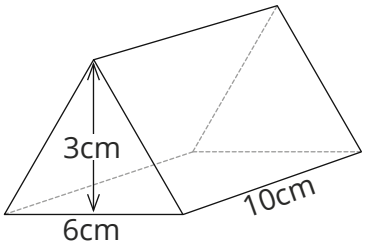
As you don't have any further calculations to do, you should now round the answer to the degree which the question has asked for. In this case, the nearest **whole** number.

Therefore, the answer is **402cm^3**. (Don't forget the units!)

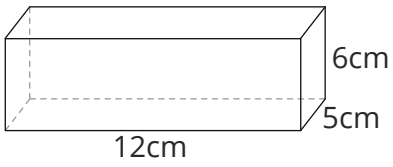
Your turn

1. Calculate the volume of each shape, giving your answers correct to the nearest whole number where necessary.

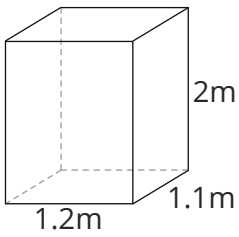
a.



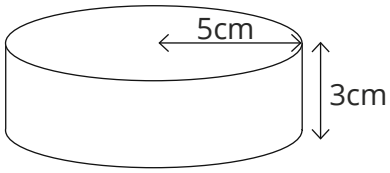
b.



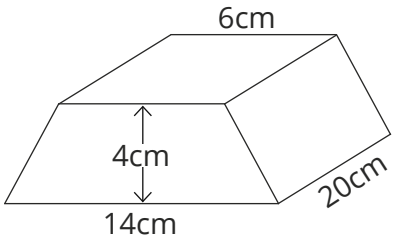
c.



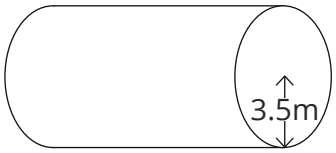
d.



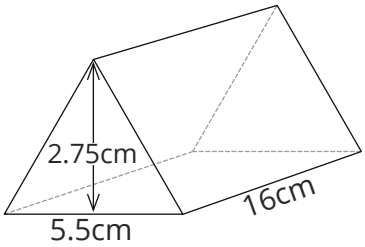
e.



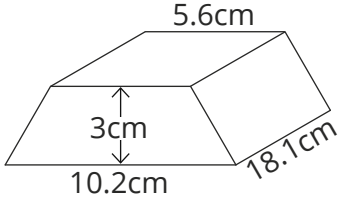
f.



g.



h.



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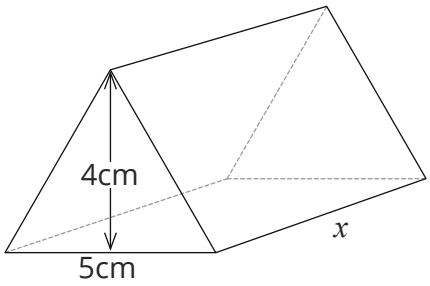

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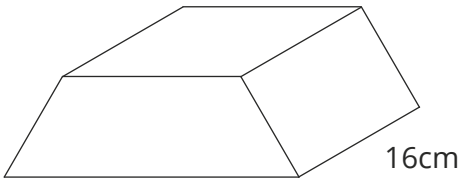

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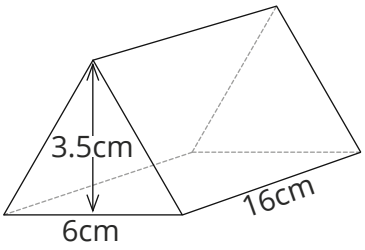

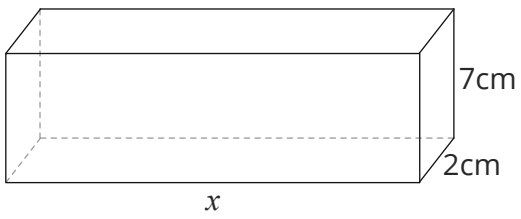

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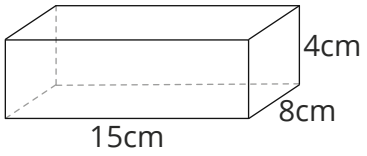

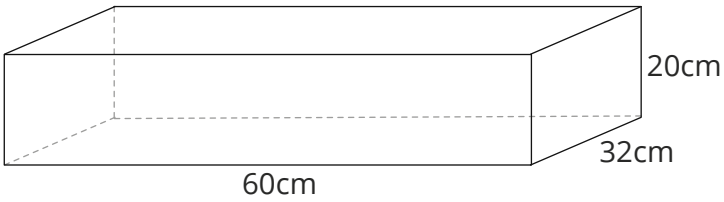

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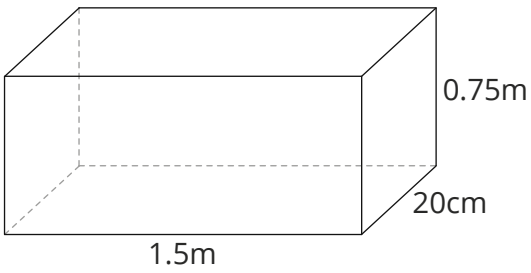

Volume of Prisms

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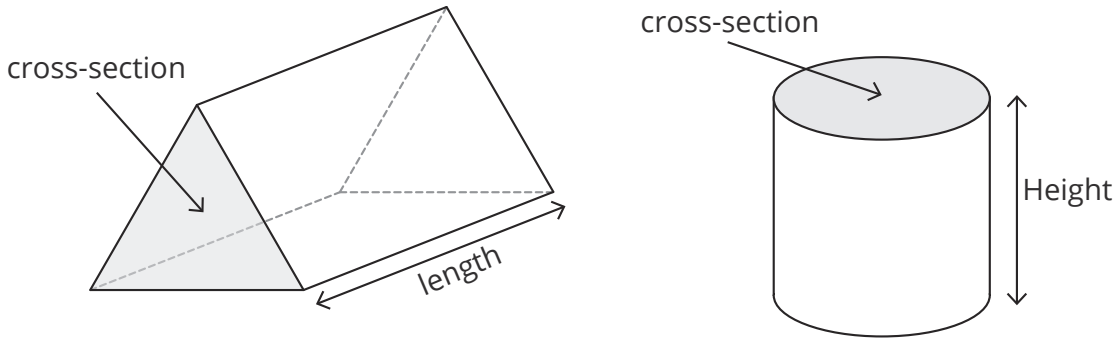
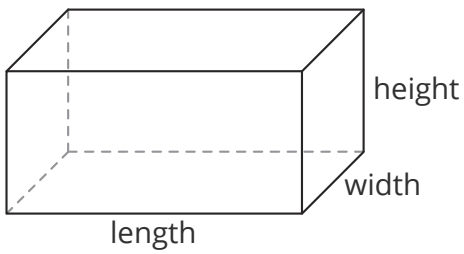


For example, the cross-section of this cuboid is a rectangle.



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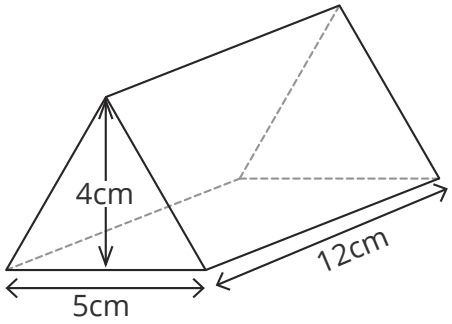
Calculate the volume of the prism shown below.



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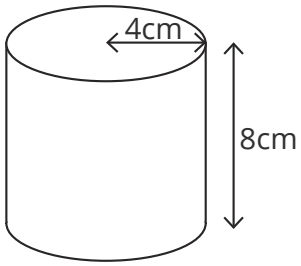
$\frac{1}{2} \times 5 \times 4 = 10\text{cm}^2$

Now that you have the area of the cross-section, multiply it by its length to calculate the volume.

$10 \times 12 = 120\text{cm}^3$ (Don't forget the units!)

Example 2

Calculate the volume of the cylinder, giving your answer correct to the nearest whole number.



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$\pi \times 4^2$

$\pi \times 16 = 50.26548246...\text{cm}^2$

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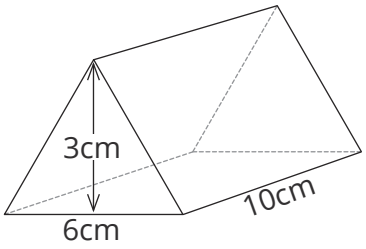
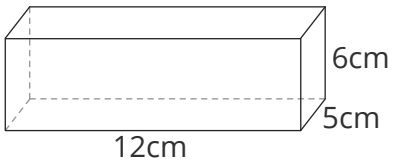


b.



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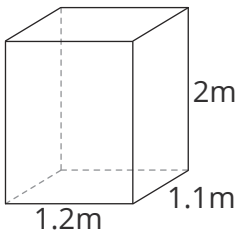
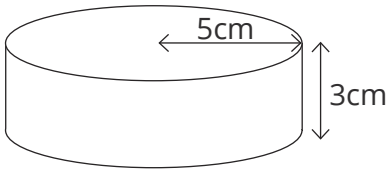
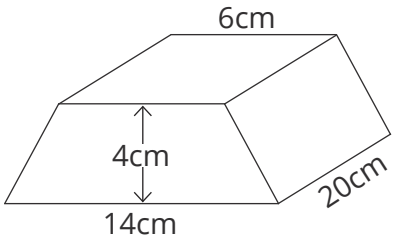


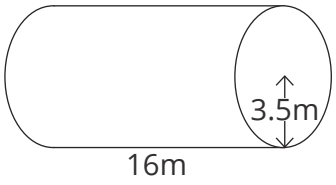
d.



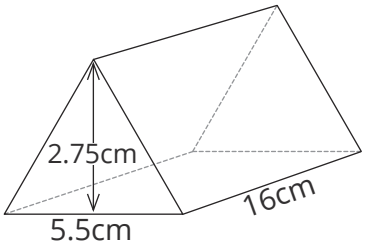
e.



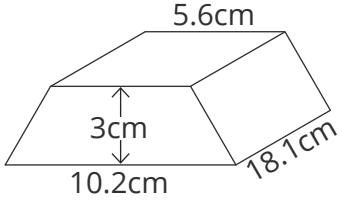
f.



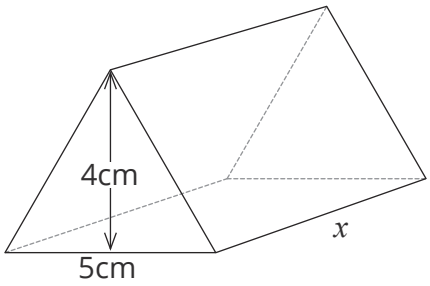
g.



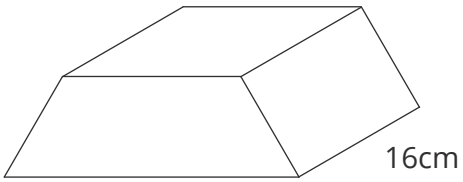
h.



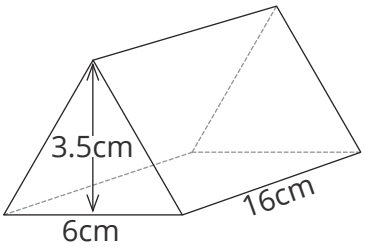
2. The volume of the triangular prism is $106cm^3$. Calculate the measurement of the missing length marked x.

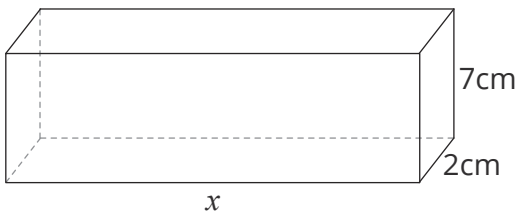


3. The volume of the prism shown below is $216cm^3$. Calculate the cross-sectional area of the prism.

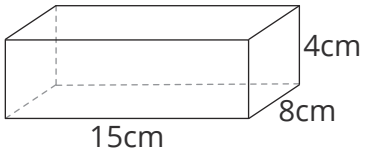


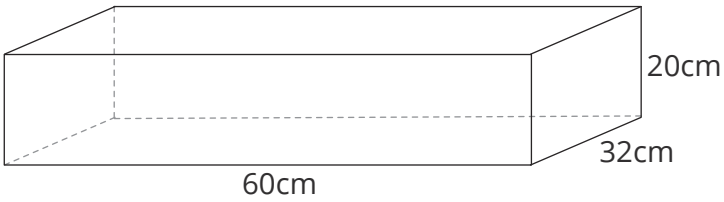
4. The cuboid and the triangular prism have the same volume. Calculate the measurement of the missing length marked x.





5. Boxes of chocolate are placed into a crate. Each box of chocolate is a cuboid and the crate is also a cuboid. Calculate the number of boxes of chocolate which will fit inside the crate.





Challenge

A fish tank is filled $\frac{3}{4}$ full of water. Joshua pours 1500ml more water into the fish tank. How many **litres** of water does the fish tank now contain?

Hint: 1ml = $1cm^3$