

Finding the volume and surface area of cylinders

Lesson Map: <http://esriaustralia.com.au/education/SpatialActivity85>

Engage

Finding the volume of a cylinder

- Click on the URL above to open the lesson map. Satellite imagery of a 3D world will be displayed. Move your mouse cursor along the bottom of the scene and you will notice that there are four (4) scenes that have been prepared for this activity. Throughout the activity, you will be directed to navigate to these scenes in a specific order.
- Throughout this activity, you will be calculating the volume and surface area of cylinders. You will have to perform measurements, display your knowledge of formulas, and demonstrate your working.
- On the scene pane at the bottom of the page click on the second scene, which is titled *Linz, Austria*.



- A 3D model of the buildings and structures of Linz, Austria will appear in white. Please note, as the modelling is 3D, it may take a few moments to buffer.
- ? Record the formula for finding the volume of a cylinder. Record your response below this question or in your subject book. [*Volume of cylinder = $\pi r^2 h$* .]
- Zoom in tight on the structure marked by the orange pin on the **west side (left side)** of the scene. A compass is in the top-left for orientation purposes. The Black arrow marks the direction of North. You can zoom in using the + and – symbols or by using the scroll wheel on your mouse.



Download student worksheet [here](#).

Time
35 minutes

Activity

Calculate the volume and surface area of cylinders

Learning Outcome

Students will be able to:

- Find the volume of cylinders
- Find the surface area of cylinders
- Engage with ICTs and locate cylindrical structures in cities on Earth

ACARA Curriculum Link

[Year 9 Mathematics: Geometry and measurement](#)

[ACMMG217](#)

Teacher Feedback:

To share your feedback on this, or any Spatial Activity, please contact education@esriaustralia.com.au

- You can rotate the scene by holding down the right-click button on your mouse and dragging the scene in the way you want to view it. You can drag the scene up, down, left and right. Release the right-click button to stop rotating the scene. You can also do this by selecting the **pan** tool on the left-hand toolbar.

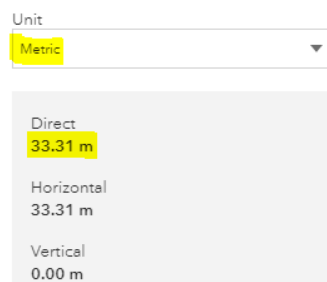
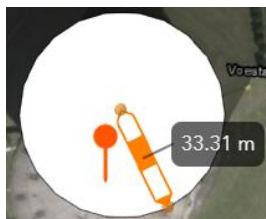


- This cylindrical structure appears to be a part of a factory or refinery. You will find the volume of this structure. To do this, you will need to measure key distances of the structure, like radius and height.

- Click on the **Analyse** button on the toolbar on the right-hand side of the scene.



- View the cylinder from a bird's eye view (top-down; from above). Select the **Measure distance** option. Ensure that the **Metric** unit is selected. Then click on the centre of the circle to begin the measurement. Drag your mouse to the side of the circle and click the mouse again to complete the measurement. Your measurement should look like the image below:



- ? You have now found the radius the circle-side of the cylinder. Now find the height of the structure. Once you have completed your measurements of the structure, find the volume of the cylinder. Show your working in your subject book or in the space provided below this question. Round your answer to two decimal places. *[Note to educators: measurements may vary slightly depending on the accuracy of student measurement.]*

Working	$\text{Volume of cylinder} = \pi r^2 h$ $\text{Volume of cylinder} = \pi \times 33.31\text{m}^2 \times 96.32\text{m}$ $\text{Volume of cylinder} = 335,749.68\text{m}^3$
Final answer	<i>The volume of the cylindrical structure is 335,749.68m³.</i>

Explore

Finding the volume of cylinders

- Close the measurement tool. Zoom out from this cylindrical structure until you can see the other cylinder marked by an orange pin. This cylinder is closer to the river and is one of 3 identical cylinders. Zoom in on this set of three cylinders so that you can clearly see it.
- ? Calculate the volume of these three identical cylindrical structures. Use the **analyse** tool to assist you once again in finding key measurements. Show your working in your subject book or in the space provided below this question. Round your answer to two decimal places. *[Note to educators: measurements may vary slightly depending on the accuracy of student measurement.]*

Working	$\text{Volume of cylinder} = \pi r^2 h$ $\text{Volume of cylinder} = \pi \times 21.79\text{m}^2 \times 25.15\text{m}$ $\text{Volume of cylinder} = 37,514.77\text{m}^3$ $\text{Volume of all 3 cylinders} = 3 \times 37,514.77\text{m}^3$ $\text{Volume of all 3 cylinders} = 3 \times 112,544.31\text{m}^3$
Final answer	The volume of the building is 112,544.31m ³ .

Explain

Finding the surface area of a cylinder


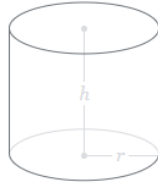
- On the scene pane at the bottom of the page click on the third scene, which is titled *Sydney, Australia*.
- 
- A 3D model of the buildings and structures of Sydney will appear. Please note, as the modelling is 3D, it may take a few moments to buffer.
 - You will notice that an orange pin is located over a tall building near the centre of the city. Zoom in tight on the structure. As you zoom in closer, you will notice that the building is cylindrical.
 - ? Record the formula for finding the surface area of a cylinder. Record your response below this question or in your subject book. *[Surface area of cylinder = $2\pi rh + 2\pi r^2$.]*
 - The formula for finding the surface area is as follows: **Surface area of cylinder = $2\pi rh + 2\pi r^2$** . In this formula, **r** represents **radius** and **h** represents **height**. See the

image below for reference:



- ? To calculate the surface area of this cylindrical building, find the appropriate measurements needed for the formula. Use the **analyse** tool to assist you with this. Show your working in your subject book or in the space provided below this question. Round your answer to two decimal places.

Working	$\text{Surface area of cylinder} = 2\pi rh + 2\pi r^2$ $\text{Surface area of cylinder} = 2\pi \times 20.99\text{m} \times 166.38\text{m} + 2\pi \times 20.99\text{m}^2$ $\text{Surface area of cylinder} = 21,942.87\text{m}^2 + 2,768.25\text{m}^2$ $\text{Surface area of cylinder} = 24,711.12\text{m}^2$
Final answer	<i>The surface area of the building is 24,711.12m².</i>

Extend

Finding the volume and surface area of a cylinder

- On the scene pane at the bottom of the page click on the final scene, which is titled *New York, USA*.



- A 3D model of the buildings and structures of New York will appear. Please note, as the modelling is 3D, it may take a few moments to buffer.
- You will notice that an orange pin is located over a building close to the Hudson River. Zoom in tight on the structure marked by the orange pin. As you zoom in closer, an octagonal building with a cylinder on top will appear.
- ? Calculate the volume of the cylinder component of the building. To assist you in finding key measurements, use the **analyse** tool. Show your working in your subject book or in the space provided below this question. Round your answer to two decimal places.

Working	$\text{Volume of cylinder} = \pi r^2 h$ $\text{Volume of cylinder} = \pi \times 15.59^2 \times 10.74$ $\text{Volume of cylinder} = 8,200.61\text{m}^3$
Final answer	<i>The volume of the building is 8,200.61m³.</i>

- ? Calculate the surface area of the cylinder component of the building. To assist you in finding key measurements, use the **analyse** tool. Show your working in your subject book or in the space provided below this question. Round your answer to two decimal places.

Working	$\text{Surface area of cylinder} = 2\pi rh + \pi r^2 \text{ (as one of the circle ends is not counted)}$ $\text{Surface area of cylinder} = 2 \times \pi \times 15.59 \times 10.74 + \pi \times 15.59^2$ $\text{Surface area of cylinder} = 1,052.04\text{m}^2 + 763.56\text{m}^2$ $\text{Surface area of cylinder} = 1,815.60\text{m}^2$
Final answer	<i>The surface area of the cylinder is 1,815.60m².</i>

- **You have completed the worksheet.** If you would like to practice more, you can revisit any of the scenes and look for other structures that are cylindrical in nature.

Next Steps:

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