

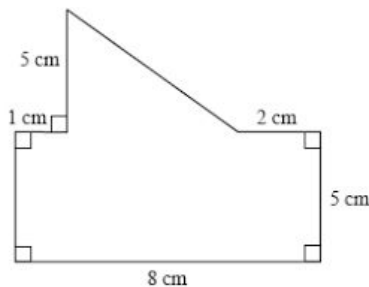
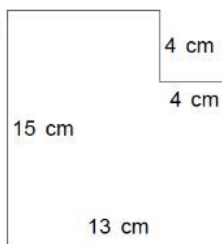
Decomposition of complex shapes

Lesson Map: <http://esriaustralia.com.au/education/SpatialActivity83>

Engage

What is decomposition of a complex shape?

- The term **complex shape** is used to describe a combination of simple shapes that have been joined together. This term is also interchangeable with **compound shape**. Write this definition in your subject book if required. Consider the two complex shapes below:



- ? What two simple shapes have been joined in the left complex shape? [*2 rectangles.*]
- ? What two simple shapes have been joined in the right complex shape? [*A triangle and a rectangle.*]
- In order to determine the total area of a complex shape – like the ones above – we are required to **decompose** the complex shape into recognisable and non-overlapping shapes, such as rectangles, squares, triangles, parallelograms, and trapezoids. This process is called **decomposition**. Write this definition in your subject book if required.
- ? Revisit the **left** complex shape above. Find the total area of this shape by decomposing it into recognisable and non-overlapping shapes. Record your working in your subject book or below this question.

Working	<p><i>Total area = Area of rectangle 1 + Area of rectangle 2</i></p> <p><i>Area of rectangle 1 = $L \times W$</i></p> <p><i>Area of rectangle 1 = $13\text{cm} \times 11\text{cm}$</i></p> <p><i>Area of rectangle 1 = 143cm^2</i></p> <p><i>Area of rectangle 2 = $L \times W$</i></p>
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Download student worksheet [here](#).

Time
30 minutes

Activity

Decompose complex shapes to calculate area.

Learning Outcome

Students will be able to:

- Define terms: 'complex/compound/composite shape' and 'decomposition'
- Decompose shapes into recognisable and non-overlapping shapes
- Calculate areas of composite shapes
- Engage with ICTs

ACARA Curriculum Link

[Year 9: Measurement and Geometry](#)
[ACMMG216](#)

Teacher Feedback:

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

	<p>Area of rectangle 2 = $9\text{cm} \times 4\text{cm}$ Area of rectangle 2 = 36cm^2</p> <p>Total area of complex shape = Area of rec. 1 + Area of rec. 2 Total area of complex shape = $143\text{cm}^2 + 36\text{cm}^2$ Total area of complex shape = 179cm^2</p>
Final answer	The total area of the left complex shape is 179cm^2 .

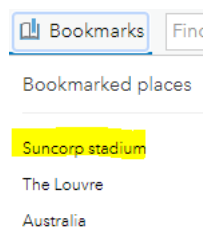
- ? Revisit the **right** complex shape above. Find the total area of this shape by decomposing it into recognisable and non-overlapping shapes. Record your working in your subject book or below this question.

Working	<p>Total area = Area of rectangle + Area of triangle</p> <p>Area of rectangle = $L \times W$ Area of rectangle = $8\text{cm} \times 5\text{cm}$ Area of rectangle = 40cm^2</p> <p>Area of triangle = $H_b \times B \div 2$ Area of triangle = $5\text{cm} \times 5\text{cm} \div 2$ Area of triangle = 12.5cm^2</p> <p>Total area of complex shape = Area of rectangle + Area of triangle Total area of complex shape = $40\text{cm}^2 + 12.5\text{cm}^2$ Total area of complex shape = 52.5cm^2</p>
Final answer	The total area of the right complex shape is 52.5cm^2 .

Explore

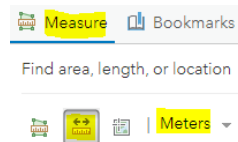
Decomposing the total surface area of Suncorp Stadium

- Click on the map URL at the top of this worksheet to open up an activity map. Alternatively, click [here](#). Satellite imagery of Australia is displayed. Under the 'Bookmarks' tab, select *Suncorp Stadium*. The map extent will refocus on Suncorp Stadium. You can use the bookmarks to quickly jump to different locations specified in this worksheet.



- Suncorp Stadium is the home sporting ground of the NRL's Brisbane Broncos. A-League football is also played at the stadium.
- Under the 'Details' tab, click 'Content'. Turn on the *Suncorp Stadium* layer. The complex shape of Suncorp Stadium has been decomposed for you already.

- You will be required to calculate the total area of Suncorp Stadium. Before beginning, you will need to measure the appropriate lengths of the decomposed shapes to assist you in your working. Use the **Measure** tool on the map to assist you in finding key measurements. Set the measurement tool to **Distance** and select **Metres** for the unit of measurement.



- ? Calculate the total area of Suncorp stadium. Display all working in your subject book or in the space below this question. Round your answer to two decimal places.

[Note to teacher: student answers may differ depending on accuracy of measurements.]

Working	<p><i>Total surface area of Suncorp Stadium = $A_1 + A_2 + A_3 + A_4 + A_5$</i></p> <p><i>Area of $A_1 = L \times W$</i> <i>Area of $A_1 = 144.5m \times 7.5m$</i> <i>Area of $A_1 = 1083.75m^2$</i></p> <p><i>Area of $A_2 = L \times W$</i> <i>Area of $A_2 = 76.3m \times 13.8m$</i> <i>Area of $A_2 = 1052.94m^2$</i></p> <p><i>Area of $A_3 = L \times W$</i> <i>Area of $A_3 = 144.5m \times 12.8m$</i> <i>Area of $A_3 = 1849.6m^2$</i></p> <p><i>Area of $A_4 = L \times W$</i> <i>Area of $A_4 = 76.5m \times 12.7m$</i> <i>Area of $A_4 = 971.55m^2$</i></p> <p><i>Area of $A_5 = L \times W$</i> <i>Area of $A_5 = 212m \times 159.3m$</i> <i>Area of $A_5 = 33771.6m^2$</i></p> <p><i>Total surface area of Suncorp Stadium = $A_1 + A_2 + A_3 + A_4 + A_5$</i> <i>Total surface area of Suncorp Stadium = $1083.75m^2 + 1052.94m^2 + 1849.6m^2 + 971.55m^2 + 33771.6m^2$</i> <i>Total surface area of Suncorp Stadium = $38729.44m^2$</i></p>
Final answer	<i>The total surface area of Suncorp Stadium is $38,729.44m^2$.</i>

Explain

Decomposing the surface area of the Louvre

- Click the 'Bookmarks' tab and select *the Louvre*. The map extent will refocus on the Louvre in Paris, France.


- Under the 'Details' tab, click 'Content'. Turn on the *The Louvre* layer. Unlike the Suncorp Stadium layer, this layer has not been decomposed for you.
- The Louvre is the world's largest art museum and is also a historic monument in Paris, France.
- ? Decompose the complex shape and calculate the total area of the lined area.
Display all working in your subject book or in the space below this question. Round your answer to two decimal places. *[Note to teacher: student answers may differ depending on accuracy of measurements.]*


Working	<p><i>Decomposition = one square, three triangles</i></p> <p><i>Total surface area = Square + Triangle 1 + Triangle 2 + Triangle 3</i></p> <p><i>Area of square = $S \times S$</i></p> <p><i>Area of square = $35m \times 35m$</i></p> <p><i>Area of square = $1225m^2$</i></p> <p><i>Area of triangle 1 = $H_b \times B \div 2$</i></p> <p><i>Area of triangle 1 = $16.8m \times 35m \div 2$</i></p> <p><i>Area of triangle 1 = $294m^2$</i></p> <p><i>Area of triangle 2 = $H_b \times B \div 2$</i></p> <p><i>Area of triangle 2 = $16.5m \times 35m \div 2$</i></p> <p><i>Area of triangle 2 = $288.75m^2$</i></p> <p><i>Area of triangle 3 = $H_b \times B \div 2$</i></p> <p><i>Area of triangle 3 = $18.4m \times 35m \div 2$</i></p> <p><i>Area of triangle 3 = $322m^2$</i></p> <p><i>Total surface area = Square + Triangle 1 + Triangle 2 + Triangle 3</i></p> <p><i>Total surface area = $1225m^2 + 294m^2 + 288.75m^2 + 322m^2$</i></p> <p><i>Total surface area = $2129.75m^2$</i></p>
Final answer	<p><i>The total surface area of the lined area surrounding the Louvre is $2129.75m^2$.</i></p>

Extend

Locate your own complex shape to decompose

- Click the 'Bookmarks' tab and select *Australia*. The map extent will refocus to Australia.
- In the search bar, search for either your school, a local suburb or your city.

 Bookmarks



- ➔ Search the local area for a complex or a compound shape that you can use to find the area of.
- ? Once you have located a complex shape, decompose the shape and calculate the total area of the lined area. Display all working in your subject book. *[Note to teacher: student answers may differ depending on accuracy of measurements.]*

Next Steps:

Request a free ArcGIS Online Account for your school:

Australian schools can request a free ArcGIS Online account as part of Esri Australia's Classroom GIS Initiative. A school subscription provides additional map layers, content, features and privacy.

Learn more about ArcGIS Online, and apply for your ArcGIS Online School subscription at <http://esriaustralia.com.au/education>