**Activity 1 Worksheet: Using integration to calculate the area under a curve**

# Practice question 1A large, arched opening in the wall of a building

As part of some renovation work, a contractor needs to fill in an old arched opening to create an internal room. You have been asked to use integration to check the overall area so that eventually it will be possible to determine the number of stone blocks that will be needed.

The arched part of the graph can be represented by a quadratic equation in the form and is shown below.

**Image © Shutterstock/Olena Kozachuk**

A graph plotting the curve of the opening area underneath an arch.
The x-axis goes from 0 to 10, split into 2 metre intervals. It is labelled: horizontal position (m).
The y-axis goes from 0 to 7. It is labelled: height (m).
The graph consists of a line graph in purple representing the arch, starting at point 0, 2. It follows an inverted u-shape across points 1.5, 4.78, then 3, 6.44 then 4.5, 7 then 6, 6.44 then 7.5, 4.78 and finally 9, 2.
The area underneath the curved is shaded in light purple to represent the opening area. 

**Figure 1**

The area under the curve between = 0 m and = 9 m is to be determined. So:

Remember to work through the steps in turn:

**Step 1:** Integrate each term.

**Step 2:** Apply definite limits.

**Step 3:** Evaluate at highest value of x.

**Step 4:** Evaluate at lowest value of x.

**Step 5:** Calculate the final area.

# Practice question 2

You are tasked with cladding the back elevation of a metal hangar. The back elevation of the hangar has a curved shape, and its dimensions are provided in the graph below. The total width of the hangar’s side is 36 metres. The arched part of the graph can be represented by a quadratic equation in the form:

A graph plotting the curve of the cladding area of a Hangar roof.
The x-axis goes from 0 to 35, split into 5 metre intervals. It is labelled: horizontal position (m).
The y-axis goes from 0 to 10. It is labelled: height (m).
The graph consists of a line graph in purple representing the arch, starting at point 0, 3. It follows a wide inverted u-shape with the highest point at 18, 9, returning to 36, 3.
The area underneath the curved is shaded in light purple to represent the cladding area. 

**Figure 2**

The area under the curve between = 0 m and = 36 m is to be determined. So: