**Using Simpson’s rule to calculate the area under a curve**

# Worked example

You are constructing a curved roof and wish to calculate the area of bricks that will be needed to complete the area under the roof.

The roof line of the building can be represented by a quadratic equation in the form:

**Step 1: Plot the curve on graph paper.**

This has been done for you.

A graph of the function y equals minus 0.2 x squared add 4 x.
The x-axis goes from 0 to 20 and is labelled distance across width of building, m.
The y axis goes from 0 to 25 and is labelled height from base of roof, m.

The graph is a curve that looks like a smooth n shape. The bases of the n are at 0, 0 and 20, 0. The height of the curve is 20 metres.

**Step 2: Divide the base width of the cross-section into equal intervals.**

Remember: Simpson’s rule requires an **odd number of ordinates**. This means you need an **even number of intervals**.

The base width is 20 metres.

10 intervals give 11 ordinates.

interval width = 20 ÷ 10 = 2 m

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There are 11 vertical lines from the x-axis to the curve. The first is at x = 0, and they are at 2 metre intervals from 0 to 20.

**Step 3: Label the points where you will measure the ordinates.**

A graph of the function y equals minus 0.2 x squared add 4 x.
The x-axis goes from 0 to 20 and is labelled distance across width of building, m.

The point where each vertical line meets the curve there is a cross. The crosses are labelled as y1 to y11 from left to right.
The y axis goes from 0 to 25 and is labelled height from base of roof, m.

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**Step 4: Find the height of each ordinate.**

**Step 5: Calculate the area under the curve using Simpson’s rule.**

interval width = 2

first ordinate = 0

sum of middle even ordinates = 7 + 17 + 20 + 17 + 7 = 68

sum of middle odd ordinates = 13 + 19 + 19 + 13 = 64

last ordinate = 0

m2

**So, enough bricks will need to be purchased to cover an area of 267 m2.**