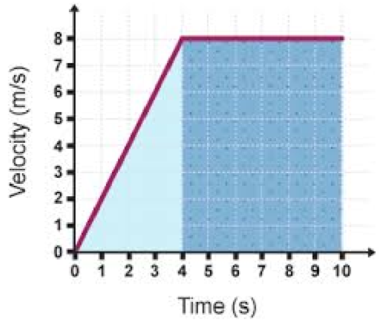
GCSE - Numeracy and Mathematics **Topic:** Area under the graph including the trapezium rule.	**Tier:** Higher	**Grade:** A*/A

Top Tips!



Finding the area under a graph can be relatively easy when there are straight lines. Here, we can find the area of the triangle and the rectangle and add them together to calculate the total area under the graph.

It is more difficult with a curve. We need to use the trapezium rule. This works by cutting up the area under the curve into a number of trapezia (trapeziums!) and adding their areas to give an estimate of the area under the curve.

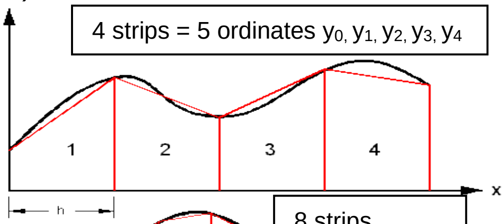
$$Area \approx \frac{h}{2}(y_0 + y_n + 2(y_1 + y_2 + y_3 \ldots . + y_{n-1}))$$

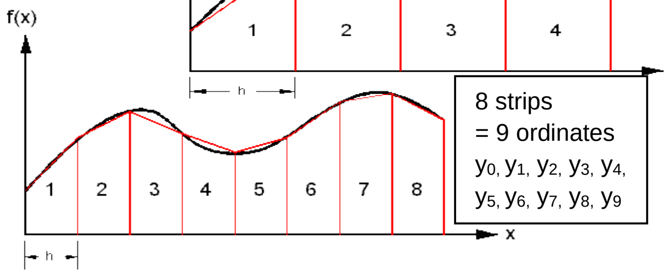
where h is the width of the bars

and each y is the y coordinate of the ordinates (the lines).

y_0 *is the first line's length*

y_n *is the last line's length*





Remember -> More strips = More accurate estimation

Starter:

Practise your substitution.

Find S and V when r = 3.5

$$S = 4\pi r^2$$

$$V = \frac{4}{3}\pi r^3$$

Skills:

1) Draw the graph of $y = x^2 + 2$ by first completing this table:

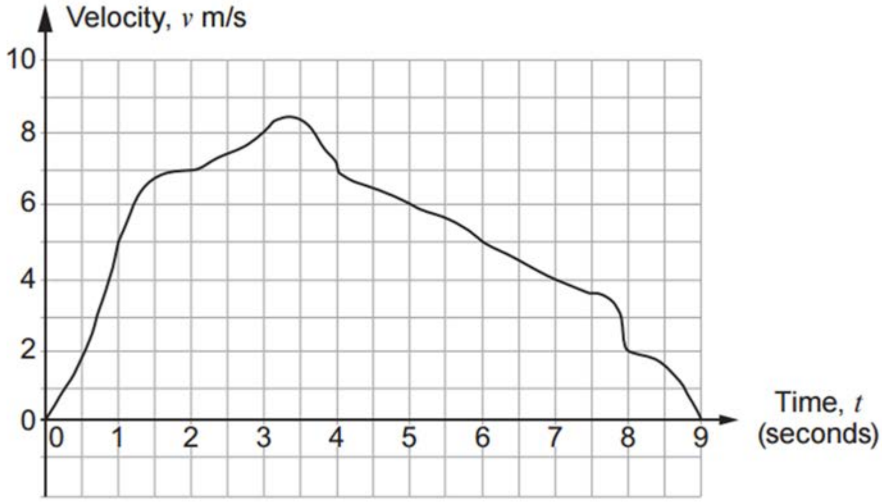
x	0	1	2	3	4	5
y	2		6			27

Find an estimate for the area under the curve by using the trapezium rule with 5 strips between x=0 and x=5.

Examination Question:

2015 Summer Linear P1 Higher Q18b

A scientist records the velocity, v m/s, of a particle from time t = 0 to t = 9 seconds. His results are shown in the graph below.



(b) (i) Use the trapezium rule, with the ordinates t = 0, t = 3, t = 6 and t = 9 to estimate the distance the particle travelled during the experiment.

Assessment for Learning

Video / QR code

GCSE - Numeracy and Mathematics

Topic: Area under the graph including the trapezium rule.

Tier: Higher

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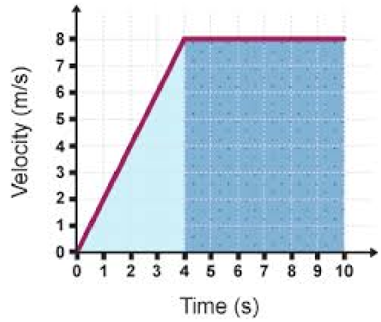

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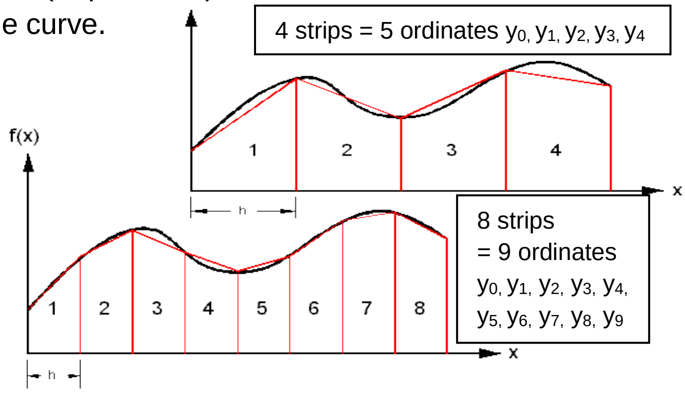

Remember -> More strips = More accurate estimation

Starter:

Practise your substitution.

Find S and V when r = 3.5

$$S = 4\pi r^2 = 49\pi = 153.94\ (2dp)$$

$$V = \frac{4}{3}\pi r^3 = 179.59\ (2dp)$$

Skills:

Draw the graph of $y = x^2 + 2$ by first completing this table:

x	0	1	2	3	4	5
y	2	3	6	11	18	27

Find an estimate for the area under the curve by using the trapezium rule with 5 strips between x=0 and x=5.

$$h = \frac{5}{5} = 1$$

$$A = \frac{1}{2}[2 + 27 + 2(3 + 6 + 11 + 18)]$$

$$= 52.5\ units^2$$

Examination Question:

2015 Summer Linear P1 Higher Q18b

A scientist records the velocity, v m/s, of a particle from time t = 0 to t = 9 seconds. His results are shown in the graph below.

(b) (i) Use the trapezium rule, with the ordinates t = 0, t = 3, t = 6 and t = 9 to estimate the distance the particle travelled during the experiment.

$y_0 = 0, y_1 = 8, y_2 = 7, y_3 = 0, h = 9/3 = 3$

$$A = \frac{3}{2}[0 + 0 + 2(8 + 7)] = \frac{3}{2}[2(15)] = \frac{3}{2}(30) = \frac{90}{2} = 45\ metres$$

Assessment for Learning

Video / QR code