

MATHS



MODEL ANSWERS

TRAPEZIUM RULE

SCORE

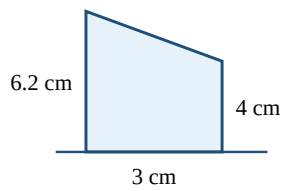
/142

PERCENTAGE

%

STEM UP

- 1 The diagram shows a strip under a curve.
Work out the area of the trapezium.

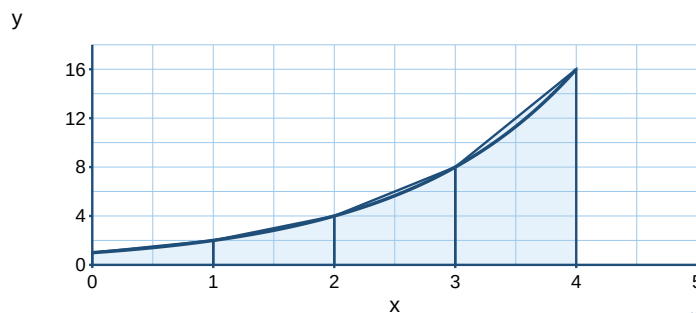


$$\frac{1}{2} \times 3 \times (6.2 + 4) = 15.3$$

$$15.3 \text{ cm}^2$$

1 / 1

- 2 The diagram shows the graph of $y = 2^x$ and the 4 trapezia used to estimate the area under the graph between $x = 0$ and $x = 4$.
Is this estimate an over-estimate or an under-estimate? Give a reason for your answer.

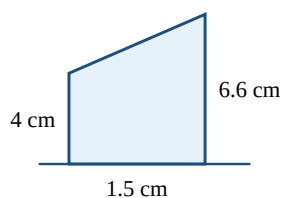


the trapezia replace the curve by straight chords

over-estimate; the curve bends upwards so the trapezia lie above it

2 / 2

- 3 The diagram shows a strip under a curve.
Work out the area of the trapezium.

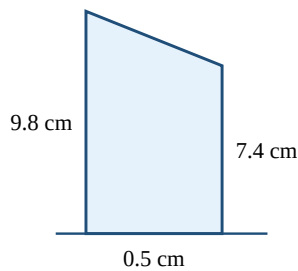


$$\frac{1}{2} \times 1.5 \times (4 + 6.6) = 7.95$$

$$7.95 \text{ cm}^2$$

1 / 1

- 4 The diagram shows a strip under a curve.
Work out the area of the trapezium.

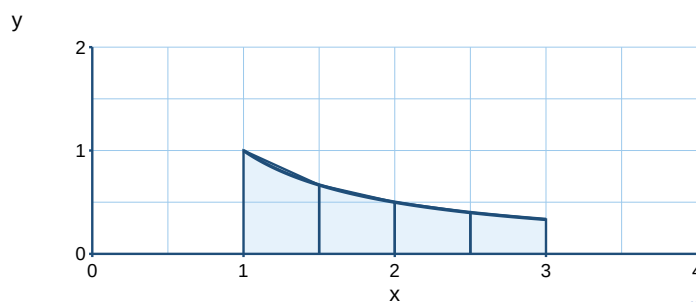


$$\frac{1}{2} \times 0.5 \times (9.8 + 7.4) = 4.3$$

$$4.3 \text{ cm}^2$$

1 / 1

- 5 The diagram shows the graph of $y = \frac{1}{x}$ and the 4 trapezia used to estimate the area under the graph between $x = 1$ and $x = 3$.
Is this estimate an over-estimate or an under-estimate? Give a reason for your answer.



the trapezia replace the curve by straight chords

over-estimate; the curve bends upwards so the trapezia lie above it

2 / 2

- 6 The table shows some values of x and y for a curve.
Use the trapezium rule with 4 strips of equal width to estimate the area between the curve, the x axis and the lines $x = 0$ and $x = 6$.

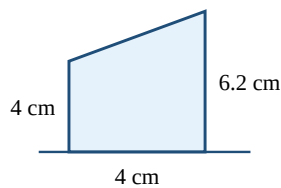
x	0	1.5	3	4.5	6
y	8	11.5	16	21	20

$$\begin{aligned} h &= 1.5 \\ \text{area} &= \frac{1}{2} \times 1.5 \times [8 + 20 + 2(11.5 + 16 + 21)] \\ &= 93.75 \end{aligned}$$

$$93.75$$

2 / 2

- 7 The diagram shows a strip under a curve.
Work out the area of the trapezium.

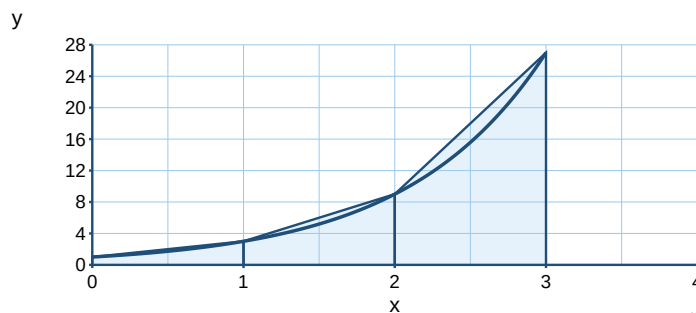


$$\frac{1}{2} \times 4 \times (4 + 6.2) = 20.4$$

$$20.4 \text{ cm}^2$$

1 / 1

- 8 The diagram shows the graph of $y = 3^x$ and the 3 trapezia used to estimate the area under the graph between $x = 0$ and $x = 3$.
Is this estimate an over-estimate or an under-estimate? Give a reason for your answer.



the trapezia replace the curve by straight chords

over-estimate; the curve bends upwards so the trapezia lie above it

2 / 2

- 9 The table shows some values of x and y for a curve.
Use the trapezium rule with 5 strips of equal width to estimate the area between the curve, the x axis and the lines $x = 2$ and $x = 27$.

x	2	7	12	17	22	27
y	9	11	10.5	12	9	12

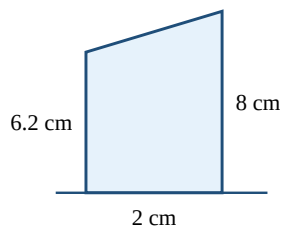
$$h = 5$$

$$\text{area} = \frac{1}{2} \times 5 \times [9 + 12 + 2(11 + 10.5 + 12 + 9)] = 265$$

$$265$$

2 / 2

- 10 The diagram shows a strip under a curve.
Work out the area of the trapezium.

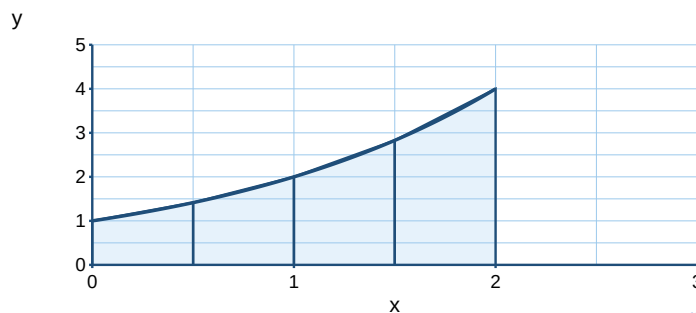


$$\frac{1}{2} \times 2 \times (6.2 + 8) = 14.2$$

14.2 cm²

1 / 1

- 11 The diagram shows the graph of $y = 2^x$ and the 4 trapezia used to estimate the area under the graph between $x = 0$ and $x = 2$.
Is this estimate an over-estimate or an under-estimate? Give a reason for your answer.



the trapezia replace the curve by straight chords

over-estimate; the curve bends upwards so the trapezia lie above it

2 / 2

- 12 The table shows some values of x and y for a curve.
Use the trapezium rule with 3 strips of equal width to estimate the area between the curve, the x axis and the lines $x = 2$ and $x = 5$.
Give your answer correct to 3 significant figures.

x	2	3	4	5
y	4	5	6	5

$$h = 1$$

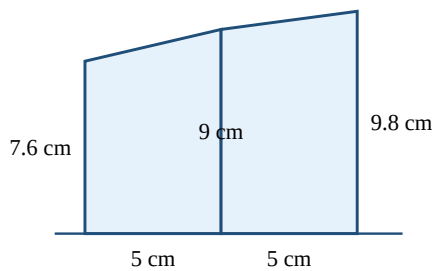
$$\text{area} = \frac{1}{2} \times 1 \times [4 + 5 + 2(5 + 6)] = 15.5$$

$$= 15.5 \text{ to 3 s.f}$$

15.5

2 / 2

- 13 The diagram shows two strips of equal width under a curve. Work out the area of the two trapezia together.



$$h = 5$$

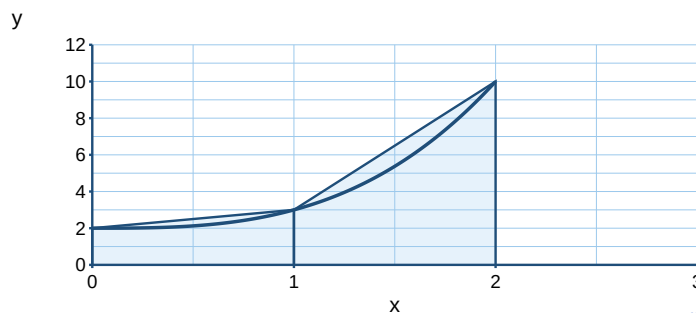
$$\text{area} = \frac{1}{2} \times 5 \times [7.6 + 9.8 + 2 \times 9]$$

$$= 88.5$$

88.5 cm²

1 / 1

- 14 The diagram shows the graph of $y = x^3 + 2$ and the 2 trapezia used to estimate the area under the graph between $x = 0$ and $x = 2$. Is this estimate an over-estimate or an under-estimate? Give a reason for your answer.



the trapezia replace the curve by straight chords

over-estimate; the curve bends upwards so the trapezia lie above it

2 / 2

- 15 The table shows some values of x and y for a curve. Use the trapezium rule with 6 strips of equal width to estimate the area between the curve, the x axis and the lines $x = 0$ and $x = 12$. Give your answer correct to 3 significant figures.

x	0	2	4	6	8	10	12
y	11	15	15	17.5	16.5	32	35

$$h = 2$$

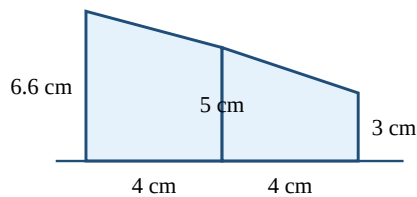
$$\text{area} = \frac{1}{2} \times 2 \times [11 + 35 + 2(15 + 15 + 17.5 + 16.5 + 32)] = 238$$

$$= 238 \text{ to 3 s.f.}$$

238

2 / 2

- 16 The diagram shows two strips of equal width under a curve. Work out the area of the two trapezia together.



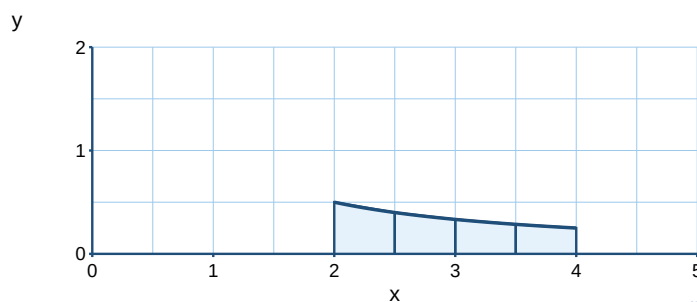
$$h = 4$$

$$\text{area} = \frac{1}{2} \times 4 \times [6.6 + 3 + 2 \times 5] = 39.2$$

$$39.2 \text{ cm}^2$$

1 / 1

- 17 The diagram shows the graph of $y = \frac{1}{x}$ and the 4 trapezia used to estimate the area under the graph between $x = 2$ and $x = 4$. Is this estimate an over-estimate or an under-estimate? Give a reason for your answer.



the trapezia replace the curve by straight chords

over-estimate; the curve bends upwards so the trapezia lie above it

2 / 2

- 18 A car travels for 15 seconds. The table shows its speed at different times.
(a) Use the trapezium rule with 3 strips to estimate the distance travelled in 15 seconds.

Time (s)	0	5	10	15
Speed (m/s)	0	1	5	10

(a) distance = area under the speed-time graph

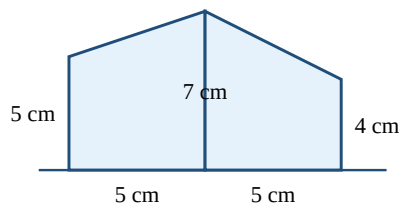
$$h = 5$$

$$\text{area} = \frac{1}{2} \times 5 \times [0 + 10 + 2(1 + 5)] = 55$$

(a) 55 metres

2 / 2

- 19 The diagram shows two strips of equal width under a curve. Work out the area of the two trapezia together.



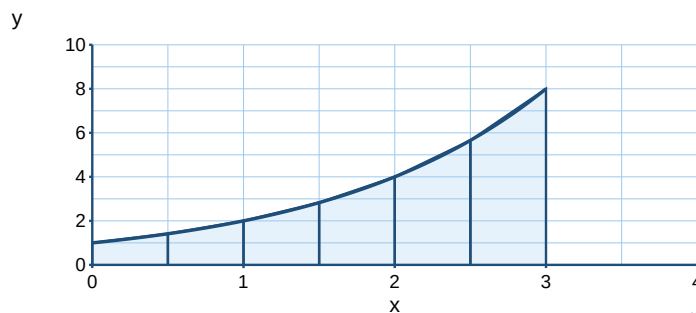
$$h = 5$$

$$\text{area} = \frac{1}{2} \times 5 \times [5 + 4 + 2 \times 7] = 57.5$$

$$57.5 \text{ cm}^2$$

1 / 1

- 20 The diagram shows the graph of $y = 2^x$ and the 6 trapezia used to estimate the area under the graph between $x = 0$ and $x = 3$. Is this estimate an over-estimate or an under-estimate? Give a reason for your answer.



the trapezia replace the curve by straight chords

over-estimate; the curve bends upwards so the trapezia lie above it

2 / 2

- 21 Here is a table of values for $y = x^2 + 1$.
- (a) Complete the table.
- (b) Use the trapezium rule with 3 strips to estimate the area under the graph of $y = x^2 + 1$ between $x = 1$ and $x = 4$. Give your answer correct to 1 decimal place.

x	1	2	3	4
y	2	5	10	17

(a) substitute each x into $x^2 + 1$

(b) $h = 1$

$$\text{area} = \frac{1}{2} \times 1 \times [2 + 17 + 2(5 + 10)] = 24.5$$

$$(b) 24.5$$

3 / 3

- 22 A canal is 6 metres wide. Its depth is measured every 1 metres across the width, as shown in the table.

- (a) Use the trapezium rule to estimate the area of the cross section.
 (b) The water flows at 1 metres per second. Work out an estimate of the volume of water passing a point each second.

Distance from bank (m)	0	1	2	3	4	5	6
Depth (m)	0	2.1	2.4	3.1	1.5	2.2	0

(a) $h = 1$

$$\text{area} = \frac{1}{2} \times 1 \times [0 + 0 + 2(2.1 + 2.4 + 3.1 + 1.5 +$$

$2.2)] = 11.3$

(b) $\text{volume per second} = \text{area} \times \text{speed} = 11.3 \times 1 = 11.3$

(a) 11.3 m^2 ; (b) 11.3 m^3

3 / 3

- 23 A train leaving a station travels for 15 seconds. The table shows its speed at different times.

- (a) Use the trapezium rule with 3 strips to estimate the distance travelled in 15 seconds.
 (b) The speed-time graph is a smooth curve that bends downwards. Is your estimate an over-estimate or an under-estimate? Give a reason.

Time (s)	0	5	10	15
Speed (m/s)	2	8	12	15

(a) $\text{distance} = \text{area under the speed-time graph}$

$h = 5$

$$\text{area} = \frac{1}{2} \times 5 \times [2 + 15 + 2(8 + 12)] = 142.5$$

(b) $\text{the curve bends downwards so the trapezia lie below it}$

(a) 142.5 metres; (b) under-estimate, the curve bends downwards so the trapezia lie below it

3 / 3

- 24 Here is a table of values for $y = \frac{1}{x}$.

- (a) Complete the table. Give the values correct to 2 decimal places.

- (b) Use the trapezium rule with 4 strips to estimate the area under the graph of $y = \frac{1}{x}$ between $x = 1$ and $x = 3$.

Give your answer correct to 3 significant figures.

x	1	1.5	2	2.5	3
y	1.00	0.67	0.50	0.40	0.33

(a) substitute each x into $\frac{1}{x}$

(b) $h = 0.5$

$$\text{area} = \frac{1}{2} \times 0.5 \times [1 + 0.33 + 2(0.67 + 0.5 + 0.4)] =$$

1.1175

$= 1.12$

(b) 1.12

3 / 3

- 25 A river is 12 metres wide. Its depth is measured every 3 metres across the width, as shown in the table.

- (a) Use the trapezium rule to estimate the area of the cross section.
 (b) The water flows at 1.5 metres per second. Work out an estimate of the volume of water passing a point each second.

Distance from bank (m)	0	3	6	9	12
Depth (m)	0	3.2	3.6	3.8	0

(a) $h = 3$

area = $\frac{1}{2} \times 3 \times [0 + 0 + 2(3.2 + 3.6 + 3.8)] = 31.8$

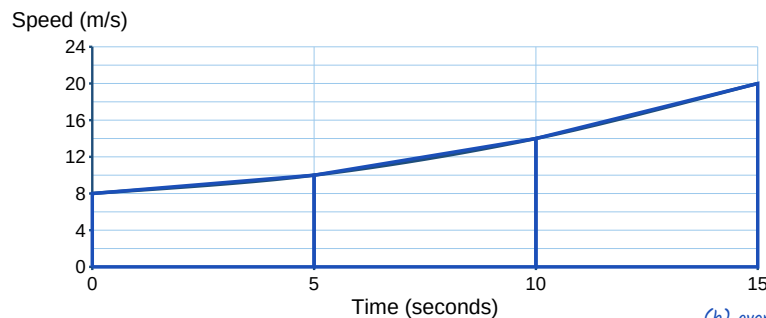
(b) volume per second = area $\times$ speed = $31.8 \times 1.5 = 47.7$

(a) 31.8 m^2 ; (b) 47.7 m^3

3 / 3

- 26 A rocket travels for 15 seconds. The graph shows its speed during this time.

- (a) Use the trapezium rule with 3 strips to estimate the distance travelled.
 (b) Is your estimate an over-estimate or an under-estimate? Give a reason.



(a) read the speeds at each time: 8, 10, 14, 20
 $h = 5$
 area = $\frac{1}{2} \times 5 \times [8 + 20 + 2(10 + 14)] = 190$
 (b) the curve bends upwards so the trapezia lie above it

(b) over-estimate, the curve bends upwards so the trapezia lie above it

3 / 3

- 27 Here is a table of values for $y = \frac{1}{x}$.

- (a) Complete the table. Give the values correct to 2 decimal places.
 (b) Use the trapezium rule with 4 strips to estimate the area under the graph of $y = \frac{1}{x}$ between $x = 1$ and $x = 5$.
 Give your answer correct to 2 decimal places.

x	1	2	3	4	5
y	1.00	0.50	0.33	0.25	0.20

(a) substitute each x into $\frac{1}{x}$

(b) $h = 1$
 area = $\frac{1}{2} \times 1 \times [1 + 0.2 + 2(0.5 + 0.33 + 0.25)] = 1.68$
 $= 1.68$

(b) 1.68

3 / 3

- 28 A canal is 12 metres wide. Its depth is measured every 2 metres across the width, as shown in the table.

- (a) Use the trapezium rule to estimate the area of the cross section.
 (b) The water flows at 2 metres per second. Work out an estimate of the volume of water passing a point each second.

Distance from bank (m)	0	2	4	6	8	10	12
Depth (m)	0	1	1.1	2.6	3.1	2.6	0

(a) $h = 2$

area = $\frac{1}{2} \times 2 \times [0 + 0 + 2(1 + 1.1 + 2.6 + 3.1 + 2.6)] =$

20.8

(b) volume per second = area $\times$ speed = $20.8 \times 2 = 41.6$

(a) 20.8 m^2 ; (b) 41.6 m^3

3 / 3

- 29 A cyclist travels for 40 seconds. The table shows its speed at different times.

- (a) Use the trapezium rule with 4 strips to estimate the distance travelled in 40 seconds.
 (b) The speed-time graph is a smooth curve that bends downwards. Is your estimate an over-estimate or an under-estimate? Give a reason.

Time (s)	0	10	20	30	40
Speed (m/s)	2	11	19	26	31

(a) distance = area under the speed-time graph

$h = 10$

area = $\frac{1}{2} \times 10 \times [2 + 31 + 2(11 + 19 + 26)] = 725$

(b) the curve bends downwards so the trapezia lie below it

(a) 725 metres; (b) under-estimate, the curve bends downwards so the trapezia lie below it

3 / 3

- 30 Here is a table of values for $y = \frac{1}{x}$.

- (a) Complete the table. Give the values correct to 2 decimal places.

- (b) Use the trapezium rule with 4 strips to estimate the area under the graph of $y = \frac{1}{x}$ between $x = 1$ and $x = 3$.

Give your answer correct to 2 decimal places.

x	1	1.5	2	2.5	3
y	1.00	0.67	0.50	0.40	0.33

(a) substitute each x into $\frac{1}{x}$

(b) $h = 0.5$

area = $\frac{1}{2} \times 0.5 \times [1 + 0.33 + 2(0.67 + 0.5 + 0.4)] = 1.1175$
 $= 1.12$

(b) 1.12

3 / 3

- 31 A river is 15 metres wide. Its depth is measured every 3 metres across the width, as shown in the table.

- (a) Use the trapezium rule to estimate the area of the cross section.
 (b) The water flows at 0.5 metres per second. Work out an estimate of the volume of water passing a point each second.

Distance from bank (m)	0	3	6	9	12	15
Depth (m)	0	1	1.6	2.1	3.3	0

(a) $h = 3$

$\text{area} = \frac{1}{2} \times 3 \times [0 + 0 + 2(1 + 1.6 + 2.1 + 3.3)] = 24$

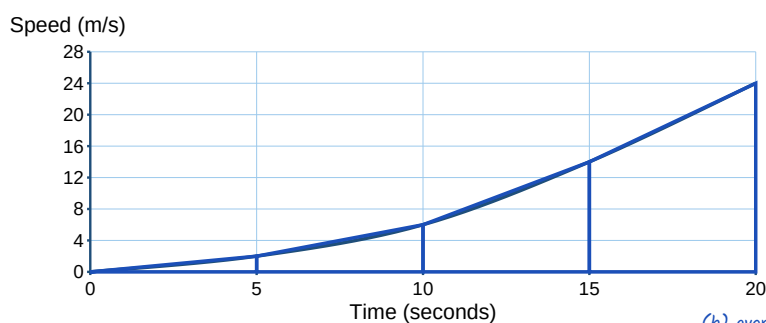
(b) $\text{volume per second} = \text{area} \times \text{speed} = 24 \times 0.5 = 12$

(a) 24 m^2 ; (b) 12 m^3

3 / 3

- 32 A cyclist travels for 20 seconds. The graph shows its speed during this time.

- (a) Use the trapezium rule with 4 strips to estimate the distance travelled.
 (b) Is your estimate an over-estimate or an under-estimate? Give a reason.



(a) read the speeds at each time: 0, 2, 6, 14, 24
 $h = 5$

$\text{area} = \frac{1}{2} \times 5 \times [0 + 24 + 2(2 + 6 + 14)] = 170$

(b) the curve bends upwards so the trapezia lie above it

(b) over-estimate, the curve bends upwards so the trapezia lie above it

4 / 4

- 33 Here is a table of values for $y = \sqrt{x^2 + 4}$.

- (a) Complete the table. Give the values correct to 2 decimal places.
 (b) Use the trapezium rule with 4 strips to estimate the area under the graph of $y = \sqrt{x^2 + 4}$ between $x = 0$ and $x = 2$.

x	0	0.5	1	1.5	2
y	2.00	2.06	2.24	2.50	2.83

(a) substitute each x into $\sqrt{x^2 + 4}$

(b) $h = 0.5$

$\text{area} = \frac{1}{2} \times 0.5 \times [2 + 2.83 + 2(2.06 + 2.24 + 2.5)] = 4.6075$
 $= 4.61$

(b) 4.61

3 / 3

- 34 A river is 10 metres wide. Its depth is measured every 2 metres across the width, as shown in the table.

- (a) Use the trapezium rule to estimate the area of the cross section.
 (b) The water flows at 1 metres per second. Work out an estimate of the volume of water passing a point each second.

Distance from bank (m)	0	2	4	6	8	10
Depth (m)	0	1.4	2.4	2.8	3.6	0

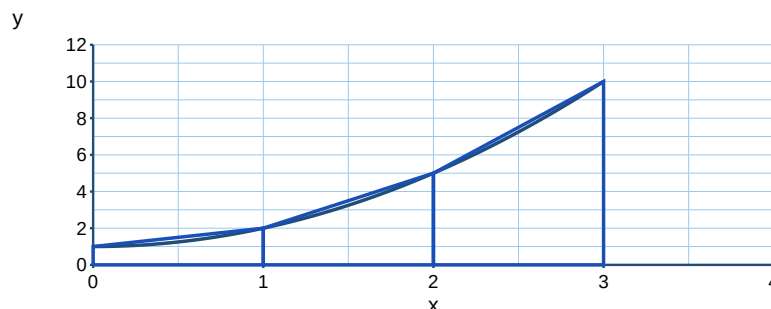
(a) $h = 2$
 $\text{area} = \frac{1}{2} \times 2 \times [0 + 0 + 2(1.4 + 2.4 + 2.8 + 3.6)] = 20.4$
 (b) $\text{volume per second} = \text{area} \times \text{speed} = 20.4 \times 1 = 20.4$

(a) 20.4 m^2 ; (b) 20.4 m^3

3 / 3

- 35 The diagram shows the graph of $y = x^2 + 1$. The table shows some values of x and y .
 (a) Draw the trapezia needed to estimate the area under the graph from $x = 0$ to $x = 3$.
 (b) Use the trapezium rule to estimate this area, correct to 3 significant figures.

x	y
0	1
1	2
2	5
3	10



(b) 12.5

4 / 4

- 36 Here is a table of values for $y = 8 - x^2$.
 (a) Complete the table. Give the values correct to 2 decimal places.
 (b) Use the trapezium rule with 8 strips to estimate the area under the graph of $y = 8 - x^2$ between $x = 0$ and $x = 2$.
 Give your answer correct to 3 significant figures.

x	0	0.25	0.5	0.75	1	1.25	1.5	1.75	2
y	8.00	7.94	7.75	7.44	7.00	6.44	5.75	4.94	4.00

(a) substitute each x into $8 - x^2$
 (b) $h = 0.25$
 $\text{area} = \frac{1}{2} \times 0.25 \times [8 + 4 + 2(7.94 + 7.75 + 7.44 + 7 + 6.44 + 5.75 + 4.94)] = 13.315$
 $= 13.3$

(b) 13.3

3 / 3

- 37 A river is 18 metres wide. Its depth is measured every 3 metres across the width, as shown in the table.

- (a) Use the trapezium rule to estimate the area of the cross section.
 (b) The water flows at 0.75 metres per second. Work out an estimate of the volume of water passing a point each second.

Distance from bank (m)	0	3	6	9	12	15	18
Depth (m)	0	1.7	1.4	1.1	1.9	2.7	0

(a) $h = 3$

area = $\frac{1}{2} \times 3 \times [0 + 0 + 2(1.7 + 1.4 + 1.1 + 1.9 + 2.7)] =$

26.4

(b) volume per second = area $\times$ speed = $26.4 \times 0.75 = 19.8$

(a) 26.4 m^2 ; (b) 19.8 m^3

3 / 3

- 38 The diagram shows the graph of $y = 4x - x^2$. The table shows some values of x and y .

x	y
0	0
2	4
4	0



(b) 8.0

4 / 4

- 39 The table shows values of $y = x^2 + 1$.

- (a) Use the trapezium rule with 2 strips to estimate the area under the graph between $x = 0$ and $x = 2$.
 (b) Use the trapezium rule with 4 strips to estimate the same area.
 (c) Which of your estimates is more accurate? Give a reason. Give areas correct to 3 significant figures.

x	0	0.5	1	1.5	2
y	1	1.25	2	3.25	5

(b) $h = 0.5$

area = $\frac{1}{2} \times 0.5 \times [1 + 5 + 2(1.25 + 2 + 3.25)] = 4.75$

= 4.75

(c) more strips means the tops of the trapezia are closer to the curve

(a) 5.00; (b) 4.75; (c) the estimate with 4 strips, because narrower strips fit the curve more closely

4 / 4

40 The table shows values of $y = x^2 + 1$.

(a) Use the trapezium rule with 3 strips to estimate the area under the graph between $x = 0$ and $x = 3$.

(b) The exact area is 12 square units. Work out the percentage error in your estimate, correct to 1 decimal place.

(c) How could the estimate be made more accurate?

x	0	1	2	3
y	1	2	5	10

$$(a) h = 1$$

$$\text{area} = \frac{1}{2} \times 1 \times [1 + 10 + 2(2 + 5)] = 12.5$$

$$(b) \text{error} = 12.5 - 12 = 0.500$$

$$0.500 \div 12 \times 100 = 4.2\%$$

(c) narrower strips give trapezia closer to the curve

(a) 12.5; (b) 4.2%; (c) use more strips

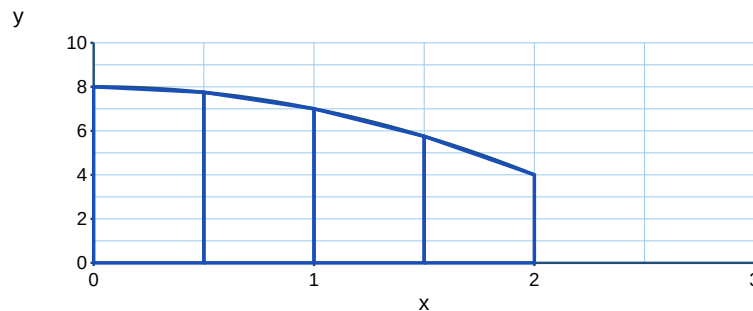
5 / 5

41 The diagram shows the graph of $y = 8 - x^2$. The table shows some values of x and y .

(a) Draw the trapezia needed to estimate the area under the graph from $x = 0$ to $x = 2$.

(b) Use the trapezium rule to estimate this area, correct to 2 decimal places.

x	y
0	8
0.5	7.75
1	7
1.5	5.75
2	4



(b) 13.25

4 / 4

42 The table shows values of $y = 2^x$.

(a) Use the trapezium rule with 2 strips to estimate the area under the graph between $x = 0$ and $x = 4$.

(b) Use the trapezium rule with 4 strips to estimate the same area.

(c) Which of your estimates is more accurate? Give a reason. Give areas correct to 3 significant figures.

x	0	1	2	3	4
y	1	2	4	8	16

$$(b) h = 1$$

$$\text{area} = \frac{1}{2} \times 1 \times [1 + 16 + 2(2 + 4 + 8)] = 22.5$$

$$= 22.5$$

(c) more strips means the tops of the trapezia are closer to the curve

(a) 25.0; (b) 22.5; (c) the estimate with 4 strips, because narrower strips fit the curve more closely

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- 43 The table shows values of $y = x^3 + 2$.

- (a) Use the trapezium rule with 3 strips to estimate the area under the graph between $x = 0$ and $x = 3$.
 (b) The exact area is 26.25 square units. Work out the percentage error in your estimate, correct to 1 decimal place.
 (c) How could the estimate be made more accurate?

x	0	1	2	3
y	2	3	10	29

(a) $h = 1$
 $\text{area} = \frac{1}{2} \times 1 \times [2 + 29 + 2(3 + 10)] = 28.5$

(b) $\text{error} = 28.5 - 26.25 = 2.250$
 $2.250 \div 26.25 \times 100 = 8.6\%$

(c) narrower strips give trapezia closer to the curve

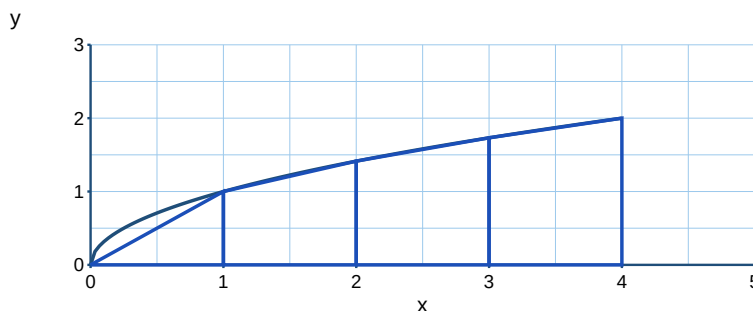
(a) 28.5; (b) 8.6%; (c) use more strips

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- 44 The diagram shows the graph of $y = \sqrt{x}$. The table shows some values of x and y .

- (a) Draw the trapezia needed to estimate the area under the graph from $x = 0$ to $x = 4$.
 (b) Use the trapezium rule to estimate this area, correct to 2 decimal places.

x	y
0	0.00
1	1.00
2	1.41
3	1.73
4	2.00



(b) 5.14

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- 45 The table shows some values of x and y for a curve. One of the values is k .
 The trapezium rule with 4 strips gives an estimate of 108.75 for the area under the curve between $x = 1$ and $x = 13$.
 Work out the value of k .

x	1	4	7	10	13
y	8	10	k	6.5	9.5

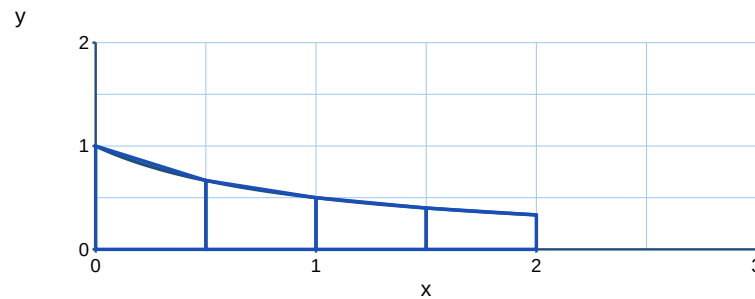
$\frac{1}{2} \times 3 \times [\text{sum}] = 108.75$ so the sum in the brackets = 72.5
 the other values give 50.5
 so $2k = 72.5 - 50.5 = 22$

$k = 11$

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- 46 The diagram shows the graph of $y = \frac{1}{x+1}$. The table shows some values of x and y .
- (a) Draw the trapezia needed to estimate the area under the graph from $x = 0$ to $x = 2$.
- (b) Use the trapezium rule to estimate this area, correct to 1 decimal place.

x	y
0	1.00
0.5	0.67
1	0.50
1.5	0.40
2	0.33

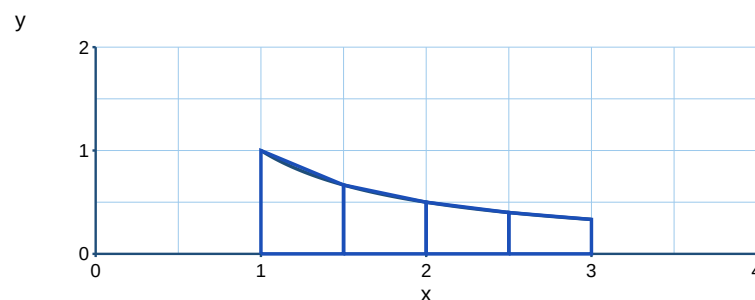


(b) 1.1

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- 47 The diagram shows the graph of $y = \frac{1}{x}$. The table shows some values of x and y .
- (a) Draw the trapezia needed to estimate the area under the graph from $x = 1$ to $x = 3$.
- (b) Use the trapezium rule to estimate this area, correct to 3 significant figures.

x	y
1	1.00
1.5	0.67
2	0.50
2.5	0.40
3	0.33



(b) 1.12

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- 48 The table shows some values of x and y for a curve. One of the values is k .
The trapezium rule with 5 strips gives an estimate of 87.5 for the area under the curve between $x = 2$ and $x = 12$.
Work out the value of k .

x	2	4	6	8	10	12
y	4	k	6	6	13.5	4.5

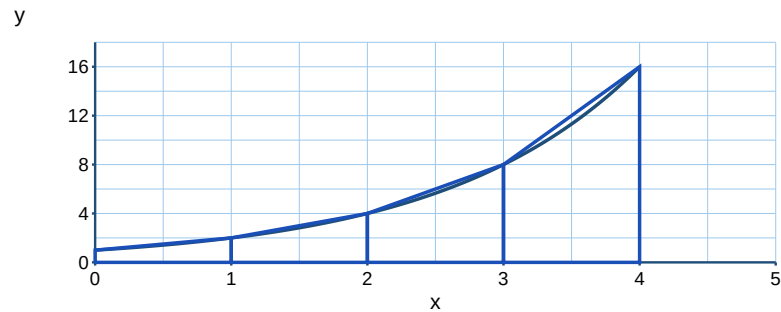
$\frac{1}{2} \times 2 \times [\text{sum}] = 87.5$ so the sum in the brackets = 87.5
the other values give 59.5
so $2k = 87.5 - 59.5 = 28$

 $k = 14$

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- 49 The diagram shows the graph of $y = 2^x$. The table shows some values of x and y .
- (a) Draw the trapezia needed to estimate the area under the graph from $x = 0$ to $x = 4$.
- (b) Use the trapezium rule to estimate this area, correct to 3 significant figures.

x	y
0	1
1	2
2	4
3	8
4	16

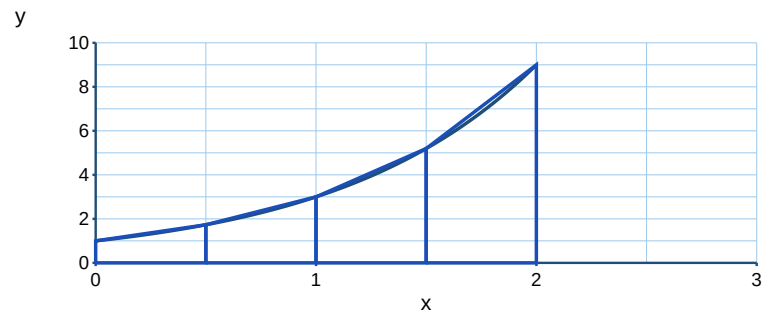


(b) 22.5

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- 50 The diagram shows the graph of $y = 3^x$. The table shows some values of x and y .
- (a) Draw the trapezia needed to estimate the area under the graph from $x = 0$ to $x = 2$.
- (b) Use the trapezium rule to estimate this area, correct to 1 decimal place.

x	y
0	1.00
0.5	1.73
1	3.00
1.5	5.20
2	9.00



(b) 7.5

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