

Maths GCSE Problem Solving Questions Workbook

Area of rectangles

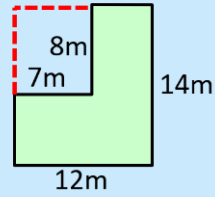
GRADES 1 – 4



Area of rectangles (Splitting shapes)

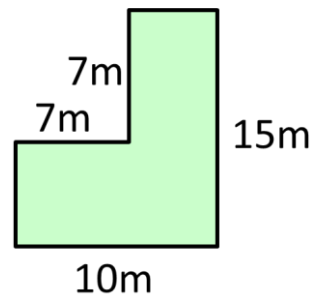
EXAMPLE

The diagram shows the plan view of a floor.
Varnish costs £11 per tin and covers 20m^2 .
Work out the total cost to varnish the whole floor.

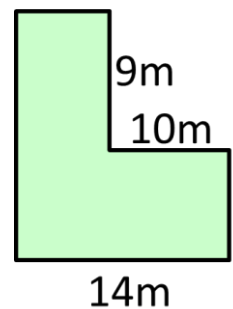


- 1) Create a full rectangle
- 2) Work out area of big rectangle $\rightarrow 14 \times 12 = 168\text{m}^2$
- 3) Work out area of small rectangle $\rightarrow 7 \times 8 = 56\text{m}^2$
- 4) Subtract small from large $\rightarrow 168 - 56 = 112\text{m}^2$
- 5) Work out how many tins are needed
 $112 \div 20 = 5.6 \rightarrow 6 \text{ tins needed} \rightarrow 6 \times £11 = £66$

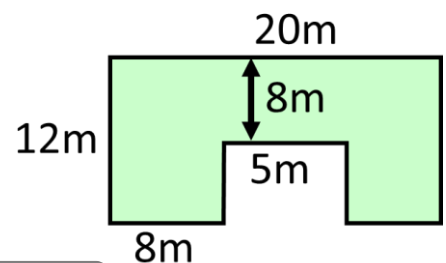
- 1 The diagram shows the plan view of a floor.
Varnish costs £9 per tin of paint and covers 30m^2 .
Work out the total cost to varnish the whole floor.



- 2 The diagram shows the plan view of a floor.
Varnish costs £15 per tin and covers 22m^2 .
Work out the total cost to varnish the whole floor.



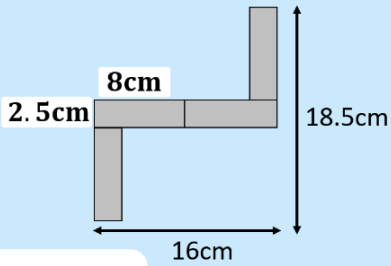
- 3 The diagram shows the plan view of a floor.
Varnish costs £8 per tin and covers 18m^2 .
Work out the total cost to varnish the whole floor.



Area of rectangles (Composite)

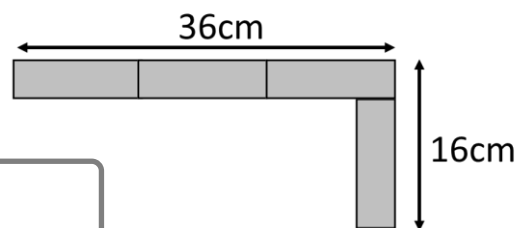
EXAMPLE

A pattern is made using identical rectangular tiles.
Find the total area of the pattern.



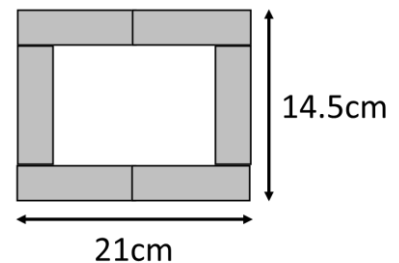
Two tiles are 16cm long so,
one tile must be 8cm long
Width = $18.5 - 8 - 8 = 2.5\text{cm}$
Area of one rectangle = $8 \times 2.5 = 20\text{cm}^2$
Total area = $20 \times 4 = 80\text{cm}^2$

- 1 A pattern is made using identical rectangular tiles.
Find the total area of the pattern.



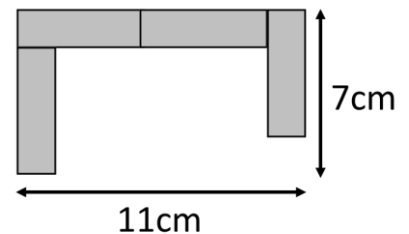
✎

- 2 A pattern is made using identical rectangular tiles.
Find the total area of the pattern.



✎

- 3 A pattern is made using identical rectangular tiles.
Find the total area of the pattern.



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Area of rectangles (Simple algebra)

EXAMPLE

A rectangle has a base twice its height.
If the perimeter is 24cm, what is its area?

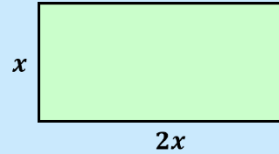
Call the height x and the base $2x$

$$\text{Perimeter} = 2x + x + 2x + x = 24$$

$$6x = 24, \quad x = 4$$

Side lengths are 4 and 8

$$\text{Area} = 4 \times 8 = 32\text{cm}^2$$



- 1 A rectangle has a base four times its height.
If the perimeter is 120cm, what is its area?



- 2 A rectangle has a height 3cm longer than its base.
If the perimeter is 50cm, what is its area?



- 3 A rectangle has a base 5 times its height.
If the area is 45cm^2 , what is its perimeter?



- 4 An isosceles triangle has two sides which are 5cm longer than the other side.
If the perimeter is 52cm, what is the length of the shortest side?



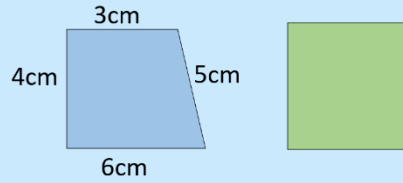
- 5 The 3 lengths of a scalene triangle are 3 consecutive numbers. Find the value of the smallest side if the perimeter is 48cm



Area and perimeter of rectangles (Comparing)

EXAMPLE

The two shapes below have the same perimeter, calculate the area of the square.



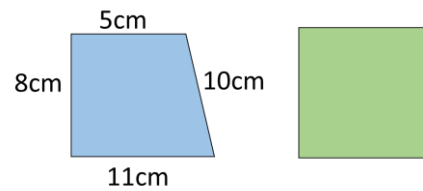
$$\text{Perimeter of trapezium} = 3 + 4 + 6 + 5 = 18\text{cm}$$

$$\text{Perimeter of square} = 18\text{cm}$$

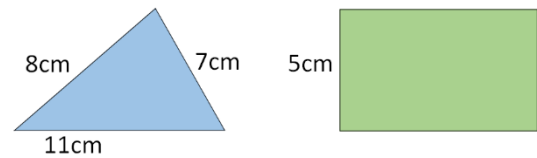
$$\text{Side of square} = 18 \div 4 = 4.5\text{cm}$$

$$\text{Area of square} = 4.5 \times 4.5 = 20.25\text{cm}^2$$

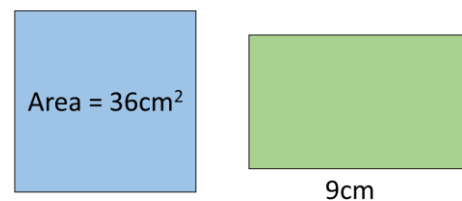
- 1 The two shapes shown have the same perimeter, calculate the area of the square.



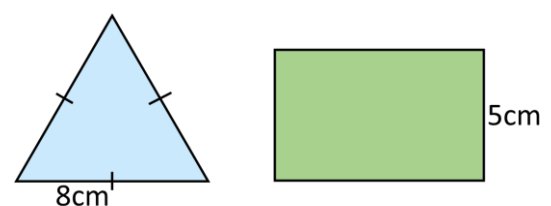
- 2 The two shapes given have the same perimeter, calculate the area of the rectangle.



- 3 The square and rectangle (right) have the same perimeter, calculate the area of the rectangle.



- 4 The equilateral triangle and rectangle shown both have the same perimeter, calculate the area of the rectangle.



Page 1 – Area of rectangles (splitting shapes)

- £36 : Big rectangle $\rightarrow 10 \times 15 = 150\text{m}^2$
 Small rectangle $\rightarrow 7 \times 7 = 49\text{m}^2$
 Total area $= 150 - 49 = 101\text{m}^2$
 $101 \div 30 = 3.366 \dots$ (therefore 3 tins not enough)
 Need 4 tins of paint : $4 \times £9 = £36$
- £75 : Big rectangle $\rightarrow 14 \times 14 = 196\text{m}^2$
 Small rectangle $\rightarrow 9 \times 10 = 90\text{m}^2$
 Total area $= 196 - 90 = 106\text{m}^2$
 $106 \div 22 = 4.81 \dots$ (therefore 4 tins not enough)
 Need 5 tins of paint: $5 \times £15 = £75$
- £104 : Big rectangle $\rightarrow 20 \times 12 = 240\text{m}^2$
 Small rectangle $\rightarrow 5 \times 4 = 20\text{m}^2$
 Total area $= 240 - 20 = 220\text{m}^2$
 $220 \div 18 = 12.22$ (therefore 12 tins not enough).
 Need 13 tins of paint : $13 \times £8 = £104$

Page 2 – Area of rectangles (composite)

- 192cm^2 : Length $= 36 \div 3 = 12\text{cm}$,
 Width $= 16 - 12 = 4\text{cm}$
 Total area $= 4 \times (4 \times 12) = 192\text{cm}^2$
- 126cm^2 : Length $= 21 \div 2 = 10.5\text{cm}$,
 Width $= (14.5 - 10.5) \div 2 = 2\text{cm}$
 Total area $= 6 \times (2 \times 10.5) = 126\text{cm}^2$
- 48cm^2 : Let Length $= l$ and width $= w$
 Horizontal $\rightarrow 2l + w = 11$, Vertical $\rightarrow l + w = 7$
 Length $= 4\text{cm}$, Width $= 3\text{cm}$
 Total area $= 4 \times (4 \times 3) = 48\text{cm}^2$

Page 3 – Area of rectangles (simple algebra)

- 576cm^2 : Perimeter $= 4x + x + 4x + x = 120$
 $10x = 120 \rightarrow x = 12$
 Side lengths are $12(x)$ and $48(4x)$
 Area $= 12 \times 48 = 576\text{cm}^2$
- 154cm^2 :
 Perimeter $= x + x + 3 + x + x + 3 = 50$
 $4x + 6 = 50 \rightarrow 4x = 44, x = 11$
 Side lengths are $11(x)$ and $14(x + 3)$
 Area $= 11 \times 14 = 154\text{cm}^2$
- 36cm : Area $= x \times 5x = 45$
 $5x^2 = 45 \rightarrow x^2 = 9 \rightarrow x = \sqrt{9}, x = 3$
 Side lengths are $3(x)$ and $15(5x)$
 Perimeter $= 2 \times (15 + 3) = 36\text{cm}$
- 14cm : Perimeter $= x + x + 5 + x + 5 = 3x + 10$
 $3x + 10 = 52 \rightarrow 3x = 42 \rightarrow x = 14$
- 15cm : $x + (x + 1) + (x + 2) = 45$
 $3x + 3 = 48 \rightarrow 3x = 45 \rightarrow x = 15$

Page 4 – Area and perimeter of rectangles (comparing)

- 72.25cm^2 : Perimeter $= 34\text{cm}$
 Side of square $= 34 \div 4 = 8.5\text{cm}$
 Area of square $= 8.5 \times 8.5 = 72.25\text{cm}^2$
- 40cm^2 : Perimeter $= 26\text{cm}$
 Missing rectangle side $= (26 - (2 \times 5)) \div 2 = 8\text{cm}$
 Area of rectangle $= 8 \times 5 = 40\text{cm}^2$
- 27cm^2 : Missing side of square $= \sqrt{36} = 6\text{cm}$
 Perimeter $= 4 \times 6 = 24\text{cm}$
 Missing rectangle side $= (24 - (2 \times 9)) \div 2 = 3\text{cm}$
 Area of rectangle $= 9 \times 3 = 27\text{cm}^2$
- 35cm^2 : Perimeter $= 8 \times 3 = 24\text{cm}$
 length $= 24 - (2 \times 5) = 14 \rightarrow 14 \div 2 = 7\text{m}$
 Area of rectangle $= 7 \times 5 = 35\text{cm}^2$