

Student Name

Mathematics Stage 4

AREA

Book 1 Develop and use formulas to find the area of rectangles, triangles, and parallelograms to solve problems

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OVERVIEW

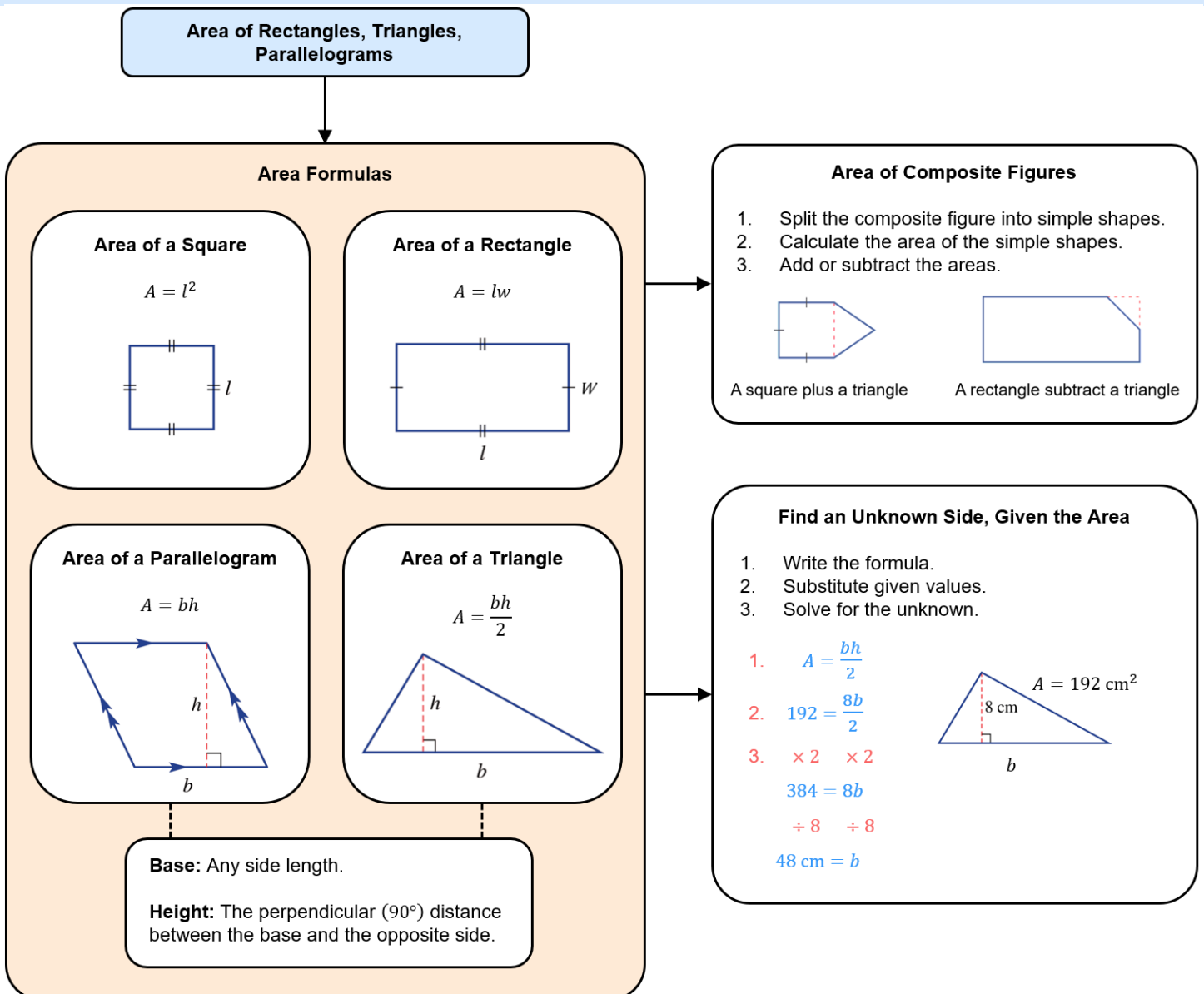
SYLLABUS CONTENT

MA4-ARE-C-01 applies knowledge of area and composite area involving triangles, quadrilaterals and circles to solve problems

Develop and use formulas to find the area of rectangles, triangles and parallelograms to solve problems

- Apply the formula to find the area of a rectangle or square: $A = lb$, where l is the length and b is the breadth (or width) of the rectangle or square
- Develop and apply the formula to find the area of a triangle: $A = \frac{1}{2}bh$, where b is the base length and h is the perpendicular height
- Develop and apply the formula to find the area of a parallelogram: $A = bh$ where b is the base length and h is the perpendicular height
- Calculate the area of composite figures that can be dissected into rectangles, squares, parallelograms or triangles to solve problems

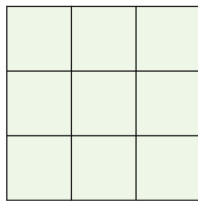
SUMMARY



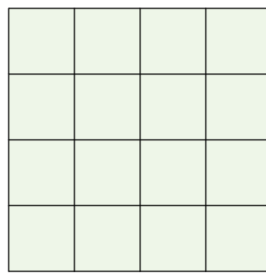
REVIEW OF PRIOR KNOWLEDGE

- 1** Area is the amount of space contained inside a 2D shape.
 Area is measured by counting the number of squares that can fit inside an object.
 Determine the area of these squares and rectangles. Each small square is 1 cm^2 .

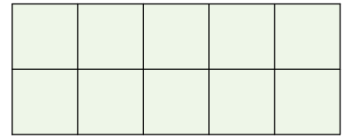
a



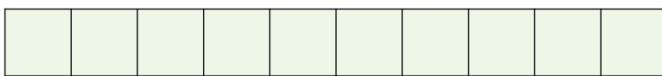
b



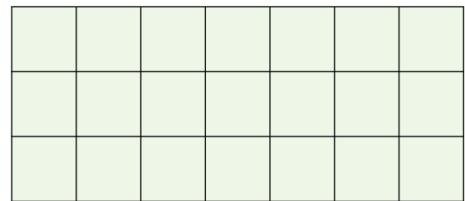
c



d



e



- 2** Convert these units.

a $500 \text{ mm} = \dots\dots\dots \text{ cm}$

b $72 \text{ cm} = \dots\dots\dots \text{ m}$

c $112 \text{ cm} = \dots\dots\dots \text{ m}$

d $15.5 \text{ m} = \dots\dots\dots \text{ cm}$

e $7.2 \text{ cm} = \dots\dots\dots \text{ mm}$

f $72 \text{ m} = \dots\dots\dots \text{ km}$

- 3** Evaluate the following:

a 7^2

b 3^2

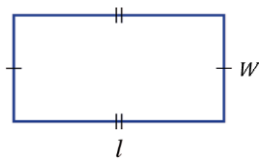
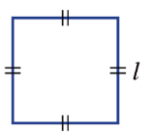
c 12^2

d $\sqrt{9}$

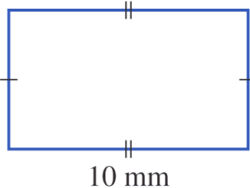
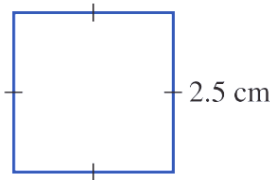
e $\sqrt{16}$

f $\sqrt{49}$

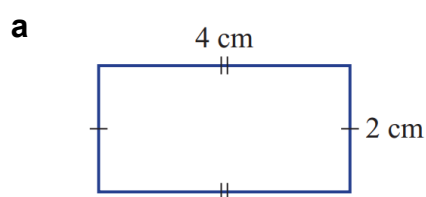
AREA OF SQUARES AND RECTANGLES

Area of a rectangle	Area of a square
 $A = lw$	 $A = l^2$

Example Calculate area of a square and rectangle.

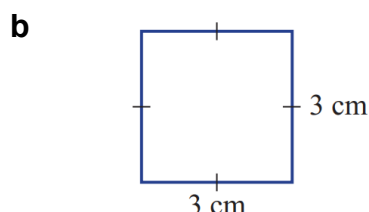
Calculate the area of these squares and rectangles.  $ \begin{aligned} A &= lw \\ &= 10 \times 4 \\ &= 40 \text{ mm}^2 \end{aligned} $	Why does it not matter which side is the length and which is the width? <i>We are length and the width, and we can in any order, so swapping the length and width does not change the answer.</i>
 $ \begin{aligned} A &= l^2 \\ &= 2.5 \times 2.5 \\ &= 6.25 \text{ cm}^2 \end{aligned} $	For a square, the area can also be calculated using $A = l^2$. Explain what this means. <i>A square is a special rectangle with all sides, so the area is the same as multiplying a side length by, which is shown using the power of 2.</i>

Calculate the area of these squares and rectangles.



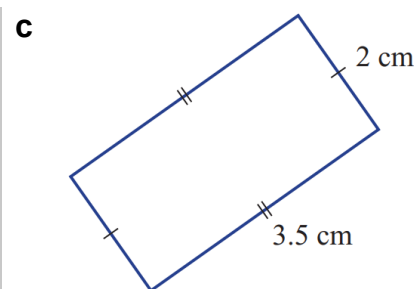
$$\begin{aligned}
 A &= lw \\
 &= \dots \times \dots \\
 &= \dots \text{ cm}^2
 \end{aligned}$$

8 cm²



$$\begin{aligned}
 A &= lw \\
 &= \dots \times \dots \\
 &= \dots
 \end{aligned}$$

9 cm²



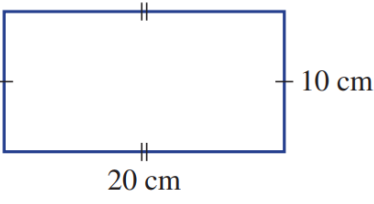
7 cm²

Key ideas

1. Area is the amount of space a shape.
2. We measure area by counting how many a shape covers.
3. The area of a rectangle or square is the of its side lengths.

1 Calculate the area of these rectangles and squares.

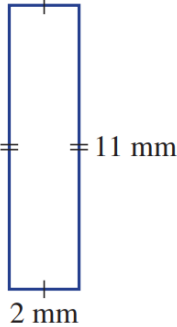
a



$A = lw$
 $= \dots \times \dots$
 $= \dots \text{ cm}^2$

200 cm²

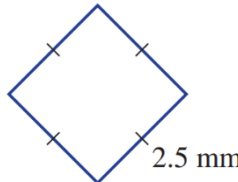
b



$A = lw$
 $= \dots \times \dots$
 $= \dots$

22 mm²

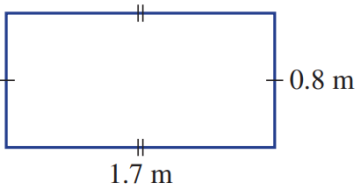
c



$A = \dots$
 $= \dots \times \dots$
 $= \dots$

6.25 mm²

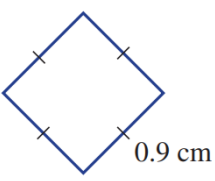
d



$A = lw$
 $= \dots \times \dots$
 $= \dots \text{ m}^2$

1.36 m²

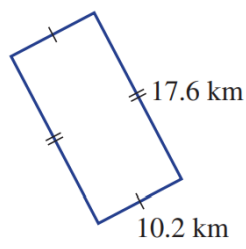
e



$A = lw$
 $= \dots \times \dots$
 $= \dots$

0.81 cm²

f



$A = lw$
 $= \dots \times \dots$
 $= \dots$

179.52 km²

2 A rectangular soccer field needs new grass. The field is 100 m long and 50 m wide. Find the area of grass to be laid down.

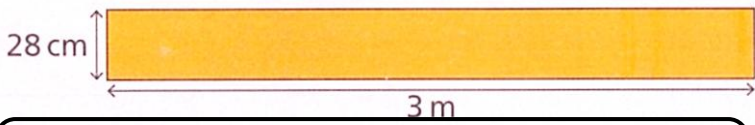
5000 m²

3 Glass is to be cut for a square window of side length 50 cm. Find the area of glass required for the window.

2500 cm²

4

Ava says:



The area of the rectangle is $28 \times 3 = 84 \text{ cm}^2$

Explain why Ava is incorrect.

The units are different

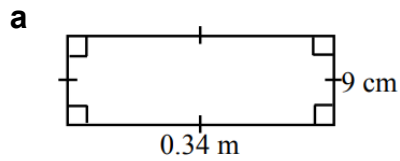
Find the area of the rectangle in cm²

8400 cm²

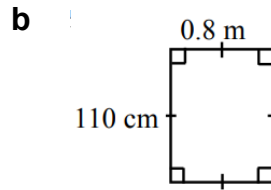
Find the area of the rectangle in m²

0.84 m²

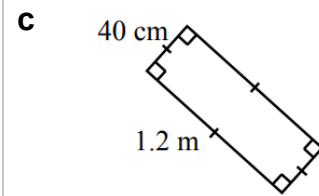
5 Calculate the area of these shapes. Give your answer in the smaller unit.



306 cm²



8800 cm²



4800 cm²

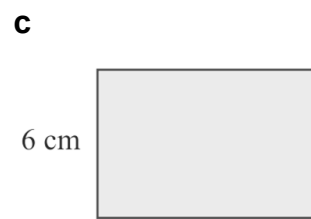
6 These rectangles have the same perimeter of 30 cm.
For each rectangle, calculate the missing side, then calculate the area.



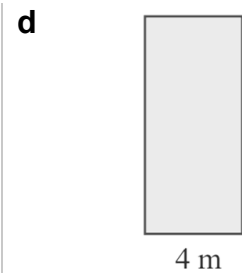
10 cm, 50 cm²



13 m, 26 m²



9 cm, 54 cm²



11 m, 44 m²

Does having the same perimeter mean having the same area?

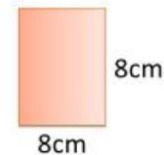
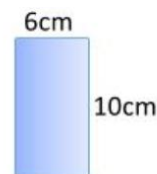
no

7 Which of these rectangles fits all these criteria?

The smallest length is less than 5 cm.

The area is more than 20 cm².

The perimeter is equal to 32 cm.



The left most rectangle

8

- a A square has a perimeter of 20 cm. Find its area.

Each side is 5 cm, Area = 25 cm²

- b A square has an area of 9 square centimetres. Find its perimeter.

Each side is 3 cm, Area = 9 cm²

- c A square's area and perimeter are the same number. How many units is the side length?

4 cm

9

- a A square has all its side lengths doubled. Explain why the area does **NOT** double.
(Hint: Draw a diagram.)

A square with sides x cm has area x^2 cm², a square with $2x$ cm has area $4x^2$ cm²

- b How much as large would the area of a square be if the lengths were tripled?

9 times larger

- c If you want a square to be 16 times as large, how would you need to change the side lengths?

The sides need to be 4 times as long

- 10 A rectangle has area 72 cm². The lengths of the sides are integers,

- a Find the possible lengths of the sides of the rectangle in centimetres,

1 and 72, 2 and 36, 3 and 24, 4 and 18, 6 and 12, 8 and 9 cm

- b What is the connection to the factors of 72?

The possible side lengths are factor pairs of 72.

- 11 The only rectangle with integer side lengths and area 19 cm² measures 1 cm by 19 cm.

- a Explain why this is correct.

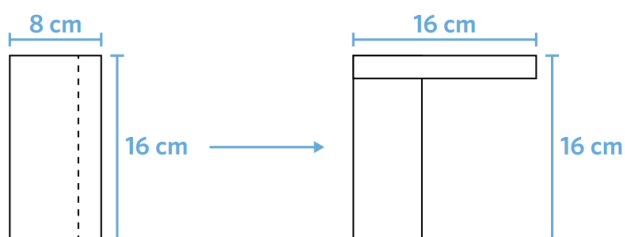
19 is a prime number, so its factor pair that are integers is 1 and 19.

- b If the sides could be any number, give one possible pair of lengths for the sides.

0.5 cm and 38 cm (other answers possible)

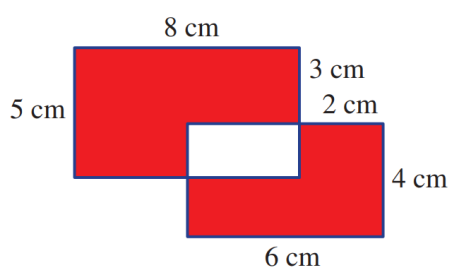
- 12** Vince has a rectangular piece of scrap paper. He decides to cut a quarter of the rectangle off, and places it over the remaining paper to make a new shape, as shown.

What is the perimeter of this new shape?



64 cm

- 13** These two rectangles overlap, as shown. Find the total area of the shaded region.



Area of larger rectangle: 5×8

Area of smaller rectangle: 4×6

Area of overlapping region: 4×2

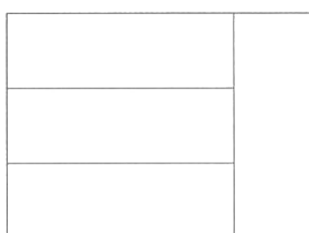
$$A = (5 \times 8) + (4 \times 6) - 2(4 \times 2) \\ = 48 \text{ cm}^2$$

- 14** Four identical rectangles are placed together to make one large rectangle.

The area of the large rectangle is 192 cm^2 .

The length of one of the smaller rectangles is 3 times the width.

Work out the length and width of the large rectangle.



Area of small rectangle is $192 \div 4 = 48 \text{ cm}^2$

The small rectangle has lengths x and $3x$, so the area is $3x^2 = 48$

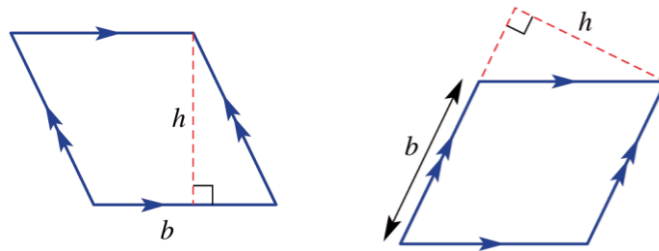
$$x = 4 \text{ cm}$$

The lengths of the larger rectangle is 12 cm and 16 cm

AREA OF PARALLELOGRAMS

PARALLELOGRAMS

- Lines running in the same direction are **parallel**.
- A four-sided shape with **two pairs of parallel sides** is a **parallelogram**.
- A **parallelogram** has opposite sides of equal length.
- The **base** is any side of a parallelogram.
- The **height** is the **perpendicular** (90°) distance from the base to the opposite side.



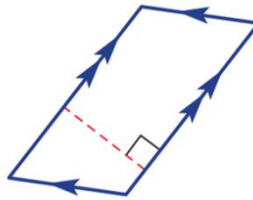
Example Identify base and height of a parallelogram.

On each parallelogram, circle a base and height.

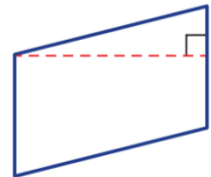
a



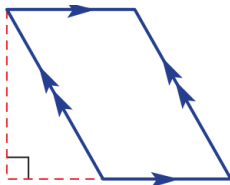
b



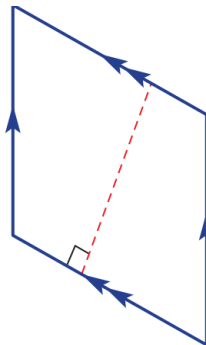
c



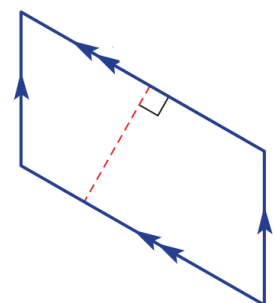
d



e



f



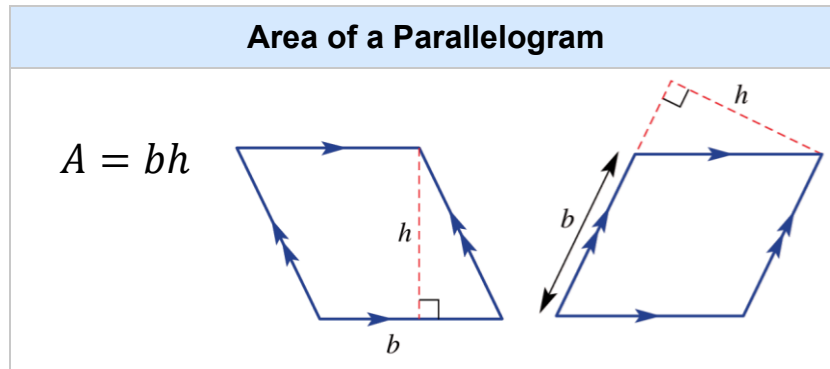
Key ideas

1. The base and height are always (at $^\circ$) to each other.

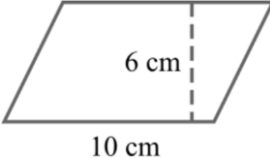
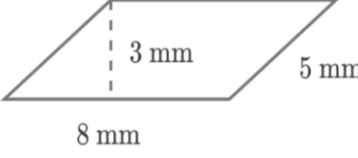
AREA OF PARALLELOGRAMS

 Area of a Parallelogram: <https://www.geogebra.org/m/drzqkwdc>

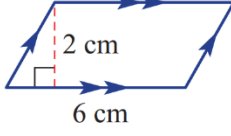
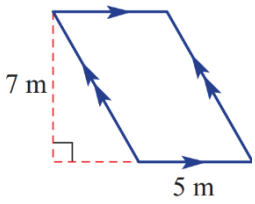
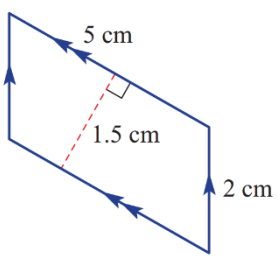
- A parallelogram has the same area as a rectangle with the same base and height.



Example Calculate area of a parallelogram.

Calculate the area of these parallelograms.  $ \begin{aligned} A &= bh \\ &= 10 \times 6 \\ &= 60 \text{ cm}^2 \end{aligned} $	What is the base and height of a parallelogram? The base is side of the parallelogram. The height is the (90°) distance between the base and the opposite side.
 $ \begin{aligned} A &= bh \\ &= 8 \times 3 \\ &= 24 \text{ cm}^2 \end{aligned} $	In this example, why did we not use the 5? In this example, the base and the height are 3 mm and 8 mm because they are to each other. The 5 mm is not used because it is not to the base.

Calculate the area of these parallelograms. Label the base and height first.

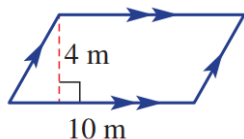
a  $ \begin{aligned} A &= bh \\ &= \dots \times \dots \\ &= \dots \text{ cm}^2 \end{aligned} $ 12 cm²	b  $ \begin{aligned} A &= bh \\ &= \dots \times \dots \\ &= \dots \end{aligned} $ 35 m²	c  $ \begin{aligned} A &= \dots \\ &= \dots \\ &= \dots \end{aligned} $ 7.5 cm²
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Key ideas

- A parallelogram can be made into a
- The area of a parallelogram is the same as a rectangle with the same and

1 Calculate the area of these parallelograms.

a



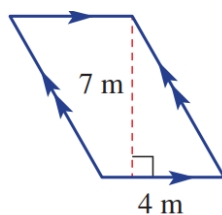
$$A = bh$$

$$= \dots \times \dots$$

$$= \dots \text{ m}^2$$

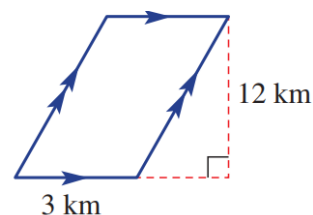
40 m²

b



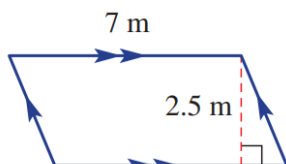
28 m²

c



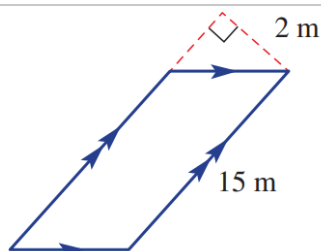
36 km²

d



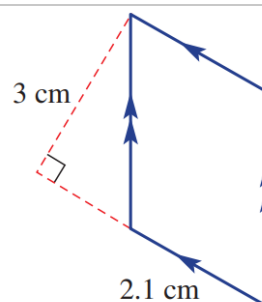
17.5 m²

e



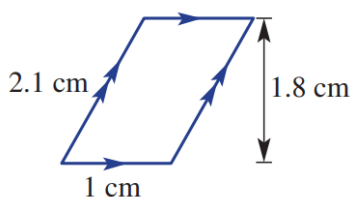
30 m²

f



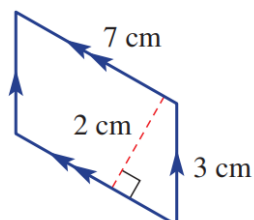
6.3 cm²

g



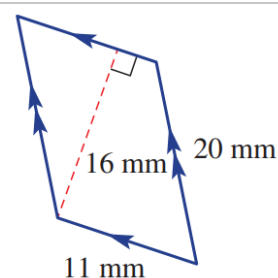
1.8 cm²

h



14 cm²

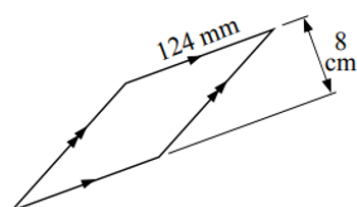
i



176 mm²

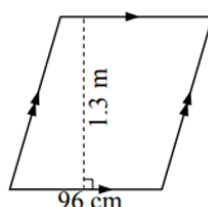
2 Calculate the area of these shapes. Give your answer in the smaller unit.

a



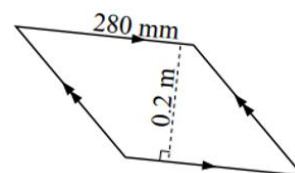
9920 mm²

b



12 480 cm²

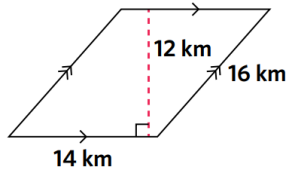
c



56 000 mm²

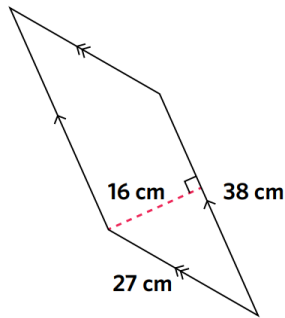
3 Calculate the area of these parallelograms.

a



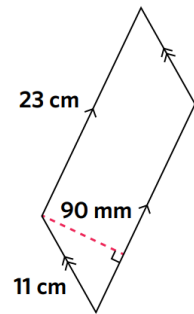
168 km²

b



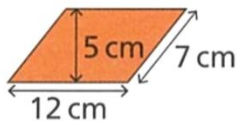
608 cm²

c



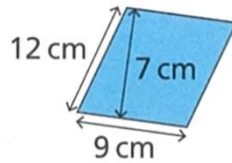
20 700 mm²

d



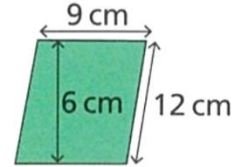
60 cm²

e



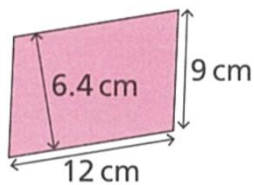
63 cm²

f



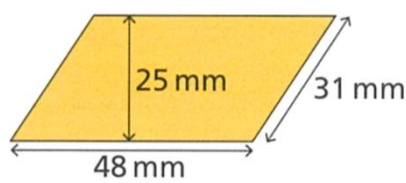
54 cm²

g



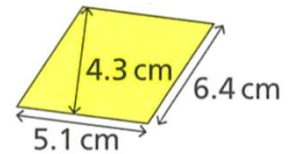
76.8 cm²

h



1200 mm²

i



21.93 cm²

4 A large wall in the shape of a parallelogram is to be painted, which costs \$20 per litre. Each litre of paint covers 5 m². The wall has a base length of 30 m and a height of 10 m. Find the cost of painting the wall.

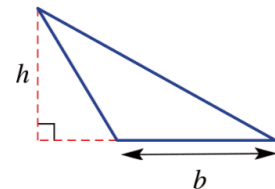
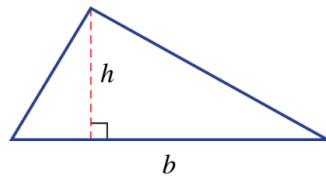
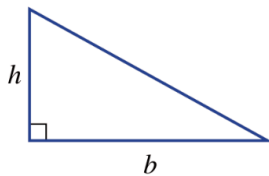
\$1200

AREA OF TRIANGLES

BASE AND HEIGHT

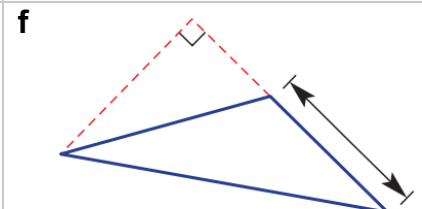
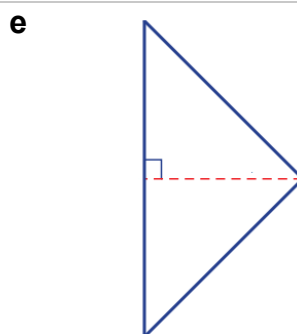
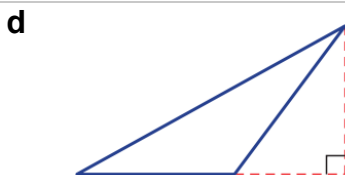
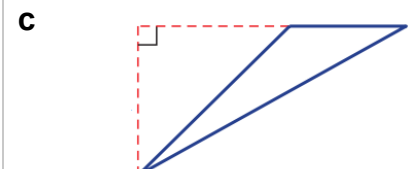
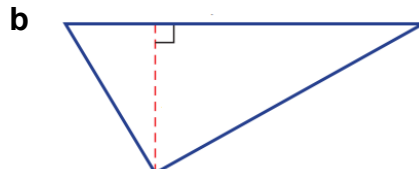
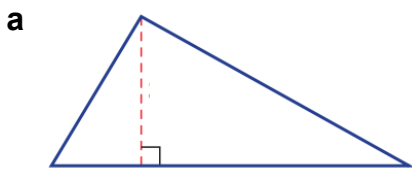
- If a shape has three sides, then it is a triangle.
- The **base** is any side of the triangle.
- The **height** is the **perpendicular** distance from the base to the opposite vertex.

🔗 Base and Height of a Triangle: <https://www.geogebra.org/m/jc4vddy9>



Example Identify base and height of a triangle.

On each triangle, circle a base and height.



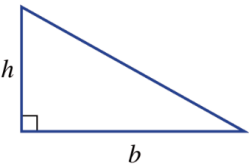
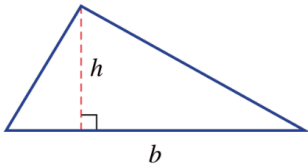
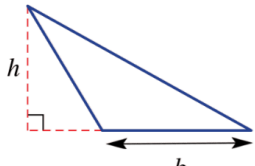
Key ideas

1. The base and height are always to each other.

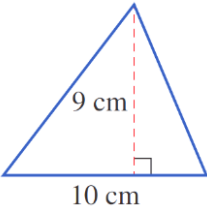
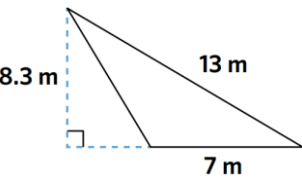
AREA OF A TRIANGLE

🔗 Area of a Triangle: <https://www.geogebra.org/m/uxgykeuz>

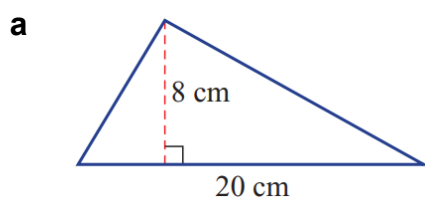
- A triangle has half the area of a rectangle/parallelogram with the same base and height.

Area of a Triangle		
		
$A = \frac{bh}{2}$		

Example Calculate area of a triangle.

Calculate the area of these triangles.  $A = \frac{bh}{2}$ $= \frac{9 \times 10}{2}$ $= 45 \text{ cm}^2$	What is the base and height of a triangle? The base is any of the triangle. The height is the distance from the base to the opposite vertex.
 $A = \frac{bh}{2}$ $= \frac{7 \times 8.3}{2}$ $= 29.05 \text{ m}^2$	In this example, why did we not use the 13? In this example, the base is 7. 13 is not to the base, so it is not the height.

Calculate the area of these triangles.

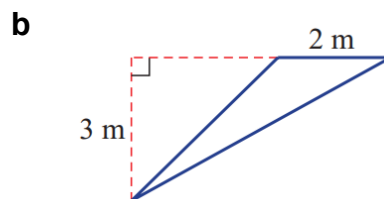


$$A = \frac{bh}{2}$$

$$= \frac{(\quad) \times (\quad)}{(\quad)}$$

$$= \dots\dots\dots \text{ cm}^2$$

80 cm²

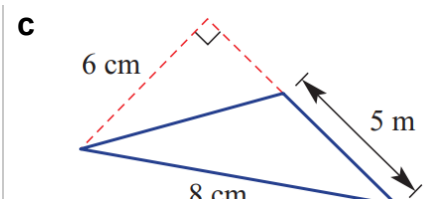


$$A = \frac{bh}{2}$$

$$= \frac{(\quad) \times (\quad)}{(\quad)}$$

$$= \dots\dots\dots$$

3 m²

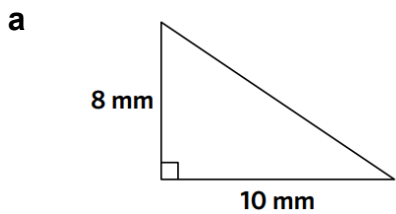


1500 cm²

Key ideas

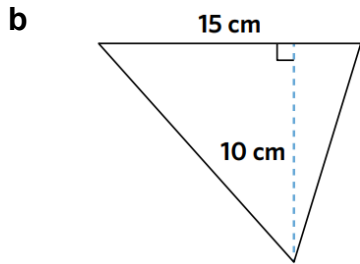
- The area of a triangle is the area of the rectangle or parallelogram with the same and

1 Calculate the area of each of these triangles.



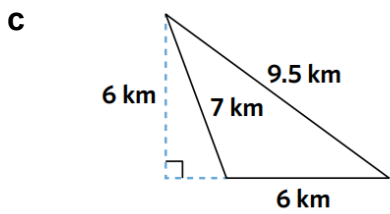
$$A = \frac{bh}{2}$$
$$= \frac{(\quad) \times (\quad)}{(\quad)}$$
$$= \dots\dots\dots \text{ mm}^2$$

40 mm²



$$A = \frac{bh}{2}$$
$$= \frac{(\quad) \times (\quad)}{(\quad)}$$
$$= \dots\dots\dots$$

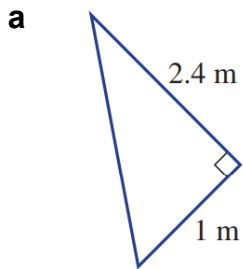
75 cm²



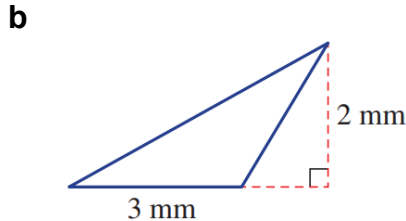
$$A = \frac{bh}{2}$$
$$= \underline{\hspace{2cm}}$$
$$= \dots\dots\dots$$

18 km²

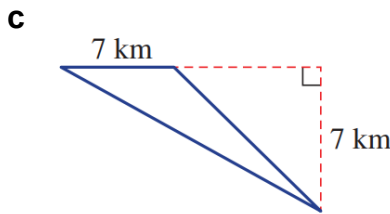
2 Calculate the area of these triangles.



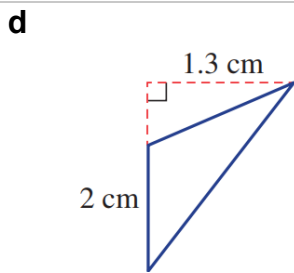
1.2 m²



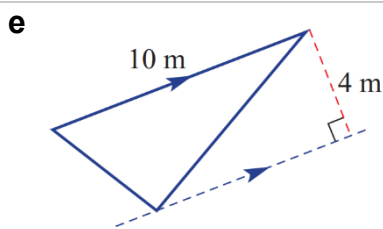
3 mm²



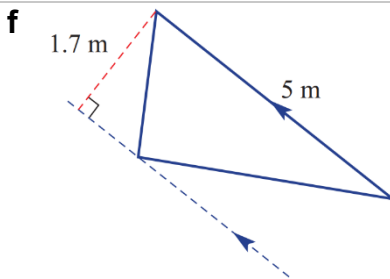
24.5 km²



1.3 cm²

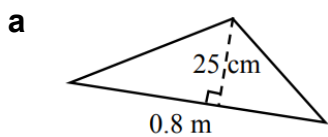


20 m²

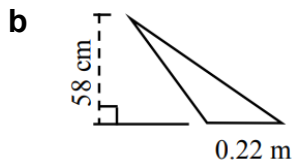


4.25 m²

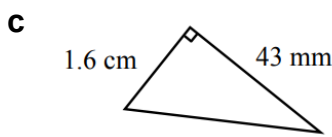
3 Calculate the area of these shapes. Give your answer in the smaller unit.



1000 cm²



638 cm²

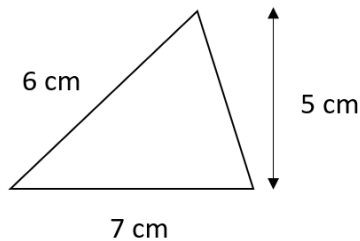


344 mm²

- 4 A rectangular block of land measuring 40 m long by 24 m wide is cut in half along a diagonal. Find the area of each triangular block of land.

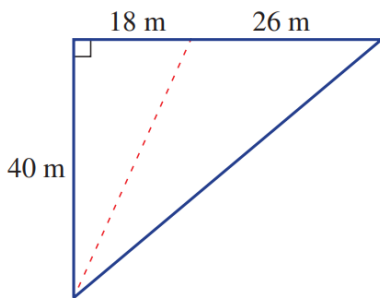
480 m²

- 5 Jimmy calculated the area of this triangle using $\frac{1}{2} \times 6 \times 7 \times 5$. Explain why he is incorrect.



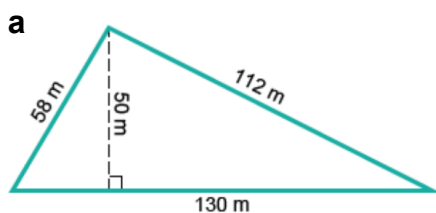
The base and height are 7 and 5. You do not use the 6 cm in the formula.

- 6 A farmer uses fencing to divide a triangular piece of land into two smaller triangles, as shown. What is the difference in the two areas?

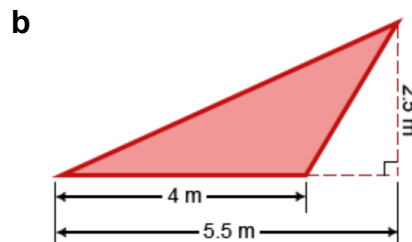


$$\frac{1}{2}(40 \times 44) - \frac{1}{2}(40 \times 18) = 520 \text{ m}^2$$

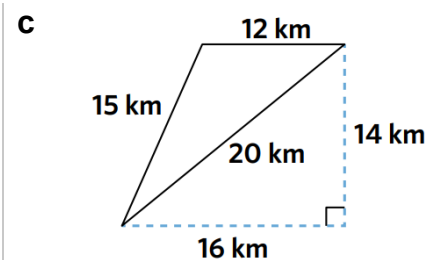
- 7 Find the area of these triangles.



3250 m²

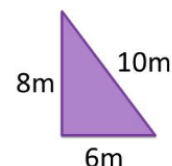
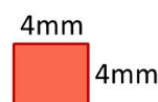


5 m²



84 km²

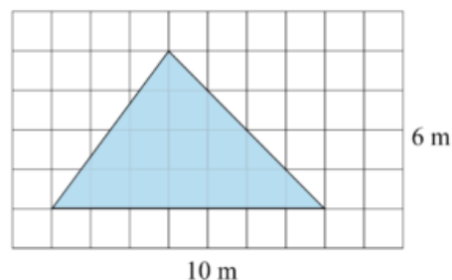
- 8 Which of these shapes does NOT have equal area and perimeter?



The first rectangle.

9 NAPLAN B+

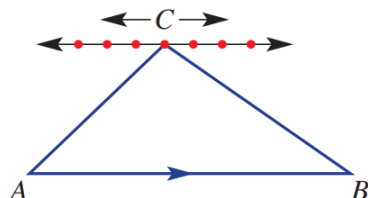
Jill is playing in her parents' rectangular courtyard. The courtyard is measured at 6 m by 10 m. Jill draws a triangle on the courtyard with chalk. What is the area of this triangle?



$$\frac{1}{2} \times 10 \times 6 = 30 \text{ m}^2$$

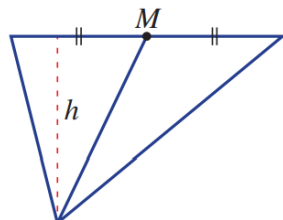
- 10 The vertex, C, for this triangle moves parallel to the base AB. Will the area of the triangle change? Justify your answer.

(Hint: Think about the lengths of the base and the height).



No. The base and height do not change.

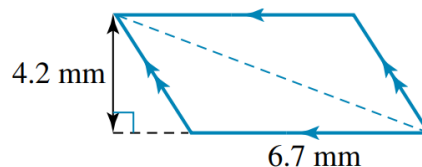
- 11 The midpoint, M, of the base of a triangle joins the opposite vertex. Is the triangle area split in half exactly? Give reasons for your answer.



Yes. The heights of both triangles are the same, but the base of the smaller triangle is exactly half the larger one.

- 12 Treat this parallelogram as two triangles. Calculate the area of the parallelogram by:

a Adding the areas of the triangles.



$$\left(\frac{1}{2} \times 4.2 \times 6.7\right) + \left(\frac{1}{2} \times 4.2 \times 6.7\right) = 28.14 \text{ mm}^2$$

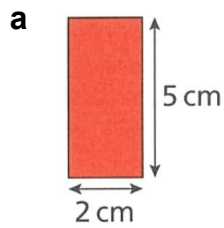
b Using the parallelogram area formula.

$$4.2 \times 6.7 \text{ mm}^2$$

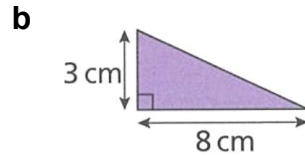
MIXED PRACTICE

FOUNDATION

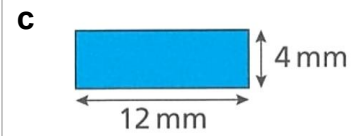
1 Calculate the area of each of these shapes using the appropriate formula.



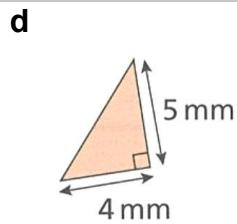
10 cm²



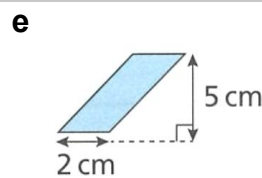
12 cm²



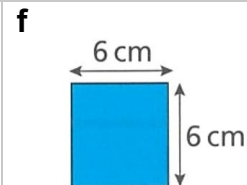
48 mm²



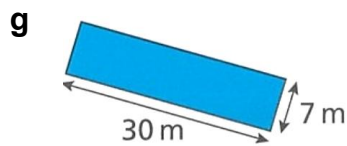
10 mm²



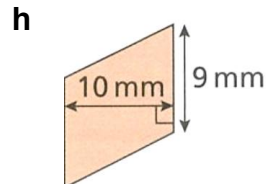
10 cm²



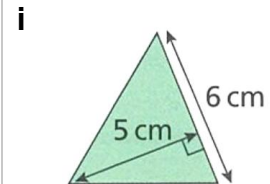
36 cm²



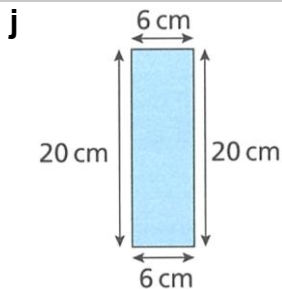
210 m²



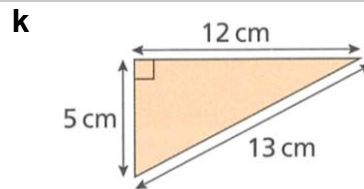
90 mm²



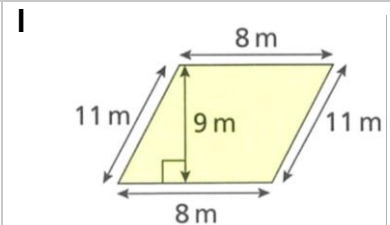
15 cm²



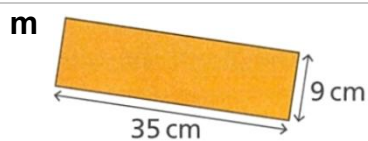
120 cm²



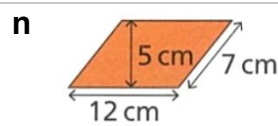
30 cm²



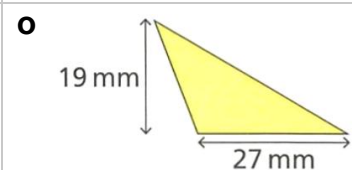
72 m²



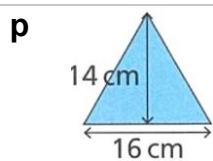
315 cm²



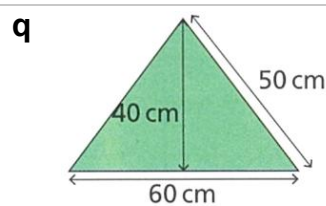
60 cm²



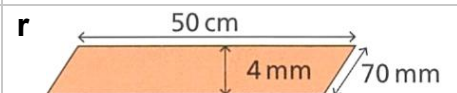
256.5 mm²



112 cm²



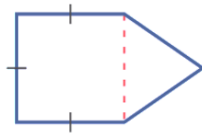
1200 cm²



2000 mm²

AREA OF COMPOSITE FIGURES

- A **composite figure** is made up of multiple simple shapes.



A square plus a triangle



A rectangle subtract a triangle

- To find the area of composite figures, add or subtract the areas of simple shapes.
 - Split the composite figure into squares, rectangles, and triangles.
 - Calculate the area of each simple shape.
 - Add or subtract the areas.

Example Calculate area of composite shapes by addition.

	$A_1 = 1 \times 1$ $= 1 \text{ cm}^2$ $A_2 = 1 \times 3$ $= 3 \text{ cm}^2$ $A_{\text{Total}} = A_1 + A_2$ $= 1 + 3$ $= 4 \text{ cm}^2$	Describe what we did to find the area of the composite shape. First, we the composite shape into two simple shapes, in this case, a and a We the simple shapes A_1 and A_2 to show our thinking. Then, we calculated the area of each shape. Afterwards, we the areas.
--	---	---

Calculate the area of this composite shape by first splitting it up into two shapes.

a

$A_1 =$

$A_2 =$

$A_{\text{Total}} =$

54 m²

b

$A_1 =$

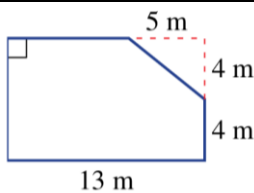
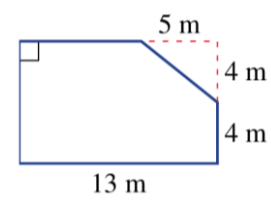
$A_2 =$

$A_{\text{Total}} =$

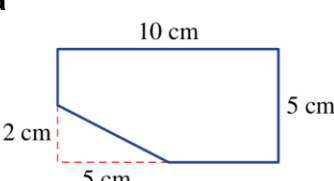
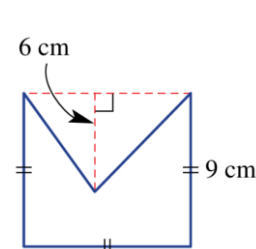
70 m²

- For some composite shapes, it is easier to find the area by subtraction.

Example Calculate area of composite shapes by subtraction.

 $A_1 = 8 \times 13$ $= 104 \text{ m}^2$ $A_2 = \frac{4 \times 5}{2}$ $= 10 \text{ m}^2$ $A_{\text{Total}} = A_1 - A_2$ $= 104 - 10$ $= 94 \text{ cm}^2$	Draw on the diagram how you could have found the area of this composite shape by addition.  Why is subtraction the preferred method for finding area of this composite shape?
---	--

Calculate the area of this composite shape by first splitting it up into two shapes.

a  $A_1 =$ $A_2 =$ $A_{\text{Total}} =$ 45 cm^2	b  $A_1 =$ $A_2 =$ $A_{\text{Total}} =$ 54 cm^2
---	--

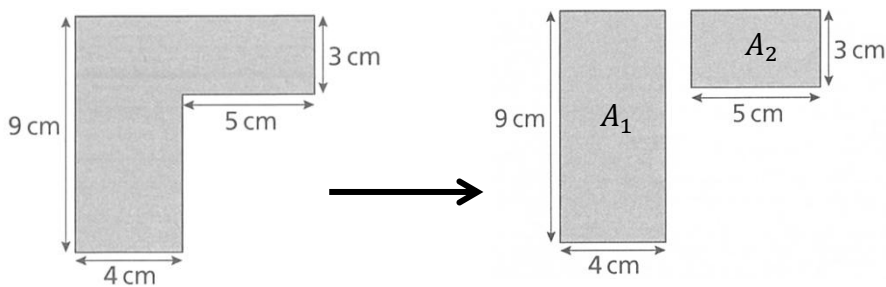
Key ideas

- Composite figures are made up two or more simple shapes, such as r....., s....., p....., and t.....
- First, the composite shape into simple shapes.
- Calculate the area of each of the shapes.
- Add or the areas, depending on what is more efficient.

1 Calculate the area of this shape.

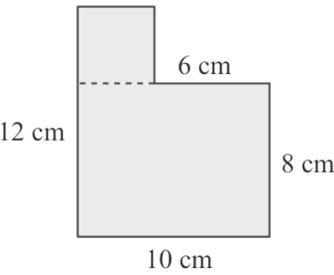
$A = A_1 + A_2$
 $= \dots + \dots$
 $= \dots$

51 cm²



2 Calculate the areas of the following shapes by first splitting each into rectangles.

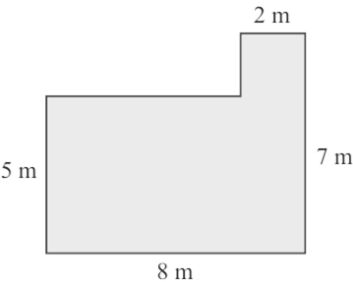
a



Total area = Area 1 + Area 2
 $= \dots + \dots$
 $= \dots$

96 cm²

b

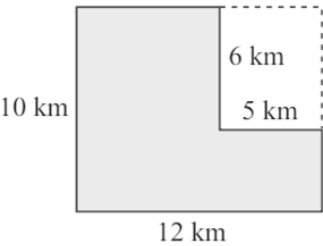


Total area = Area 1 + Area 2
 $= \dots + \dots$
 $= \dots$

44 cm²

3 Calculate the areas of the following shapes by first splitting each into rectangles.

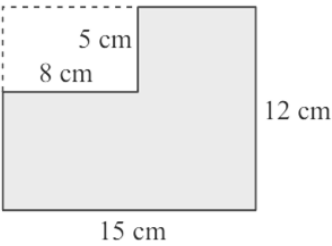
a



Total area = Area 1 – Area 2
 $= \dots - \dots$
 $= \dots$

90 km²

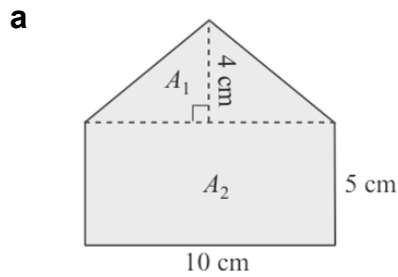
b



Total area = Area 1 – Area 2
 $= \dots - \dots$
 $= \dots$

140 cm²

4 Calculate the areas of these shapes by splitting them into a triangle and a rectangle.

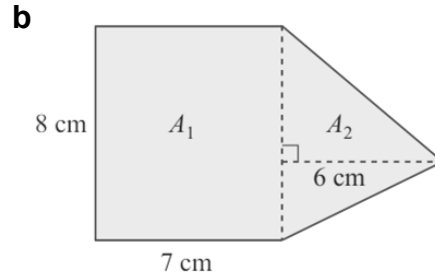


$$A_{\text{total}} = A_1 + A_2$$

$$= \dots + \dots$$

$$= \dots$$

70 cm²

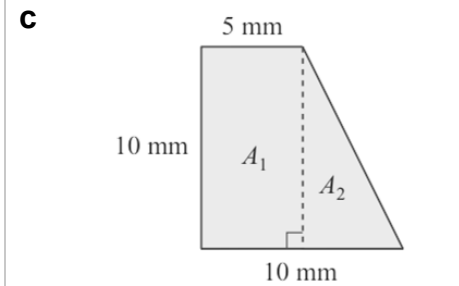


$$A_{\text{total}} = A_1 + A_2$$

$$= \dots + \dots$$

$$= \dots$$

80 cm²



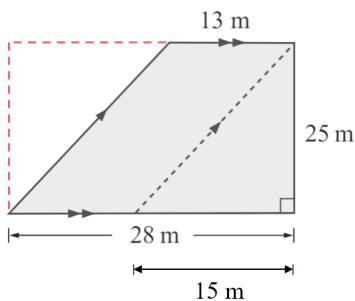
$$A_{\text{total}} = A_1 + A_2$$

$$= \dots + \dots$$

$$= \dots$$

75 mm²

5 Calculate the area of the composite shape by two methods. You should get the same answer.



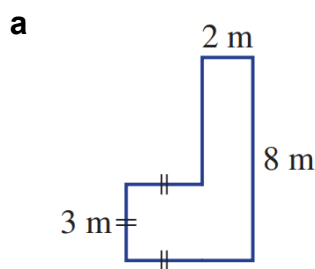
a Subtraction: Large rectangle subtract triangle.

$$(28 \times 25) - \left(\frac{1}{2} \times 15 \times 25\right) = 512.5 \text{ m}^2$$

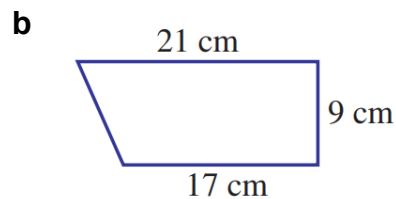
b Addition: Triangle and parallelogram.

$$\left(\frac{1}{2} \times 25 \times 13\right) + (25 \times 13) = 512.5 \text{ m}^2$$

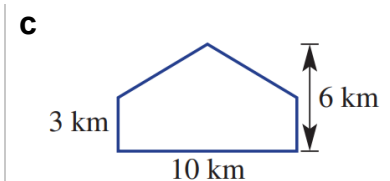
6 Calculate the area of these composite shapes.



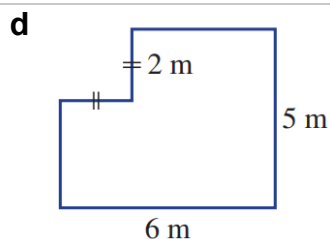
25 m²



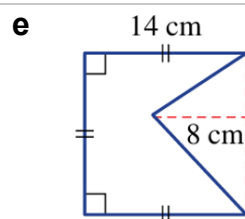
171 cm²



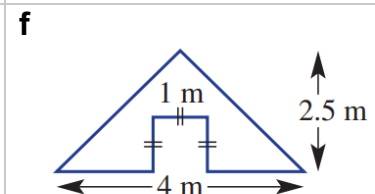
45 km²



26 m²



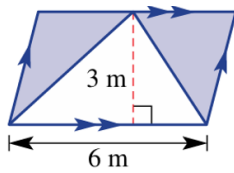
95.5 cm²



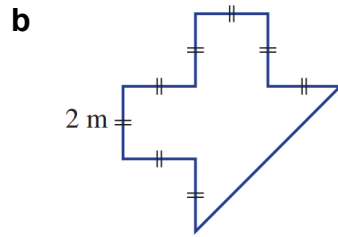
4 m²

7 Calculate the area of these shapes.

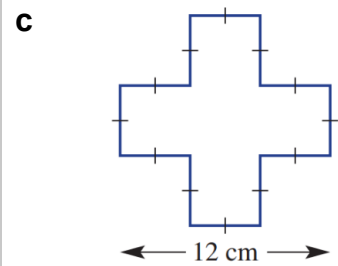
a Find the shaded area



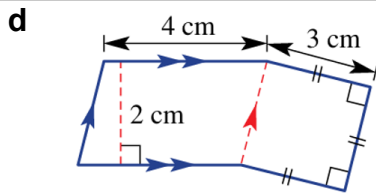
9 m²



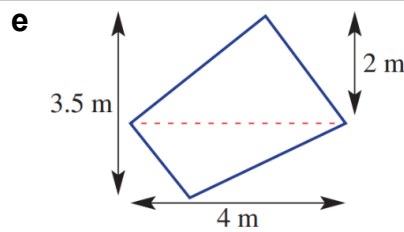
16 m²



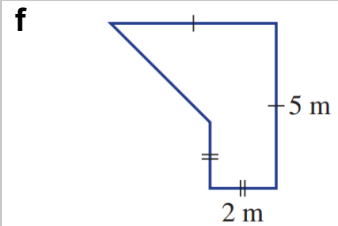
80 cm²



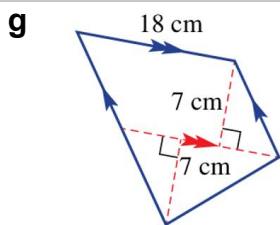
17 cm²



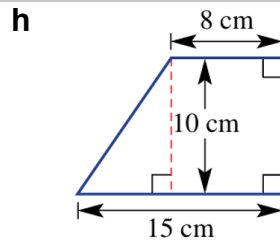
7 m²



14.5 m²

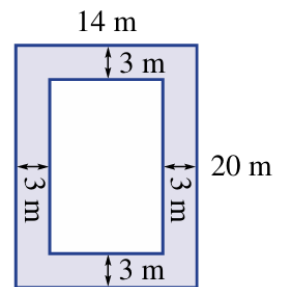


189 cm²



115 cm²

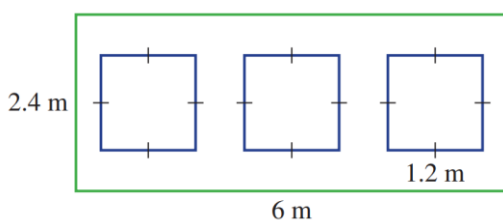
i Find the shaded area



168 m²

8 A wall has three square holes cut into it to allow for windows, as shown.

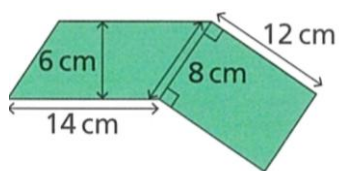
Find the remaining area of the wall.



10.08 m²

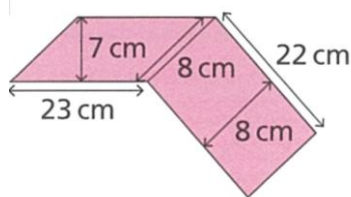
9 Calculate the shaded area.

a



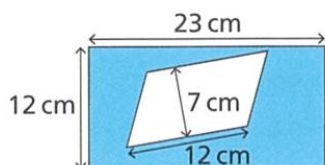
180 cm²

b



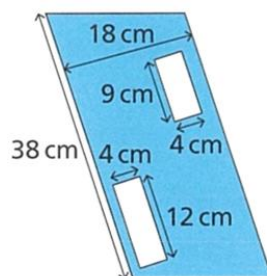
337 cm²

c



192 cm²

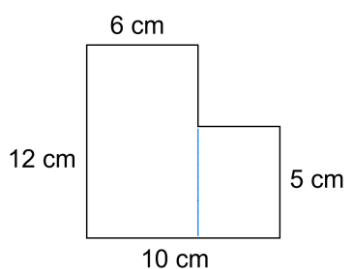
d



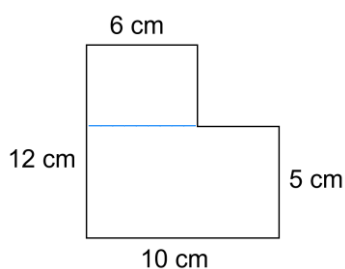
600 cm²

10 These three calculations show three ways to find the area of this shape. Split the shape to represent these calculations.

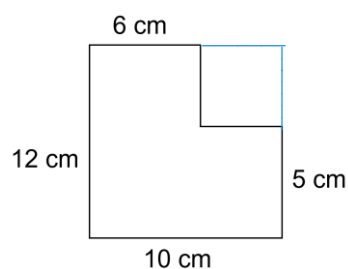
$$A = 12 \times 6 + 5 \times 4$$



$$A = 10 \times 5 + 6 \times 7$$



$$A = 12 \times 10 - 4 \times 7$$



11 NAPLAN B+

Pablo cuts a square out of a rectangular piece of paper, as shown below.

The square Pablo cut out has a side length of 6 cm.

Which of these expressions gives the area of Pablo's piece of paper after cutting out the square?

$$(28 \times 20) - (6 \times 6)$$



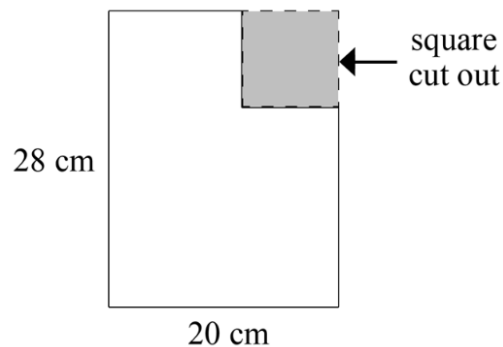
$$(22 \times 14) + (6 \times 6)$$



$$(28 + 20) - (6 + 6)$$



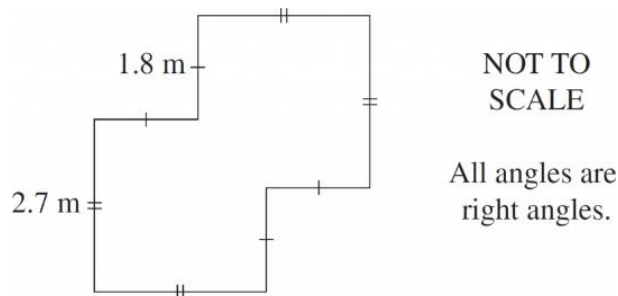
$$(28 + 20) + (6 \times 6)$$



A

12 2009 HSC Standard 2 Band 4

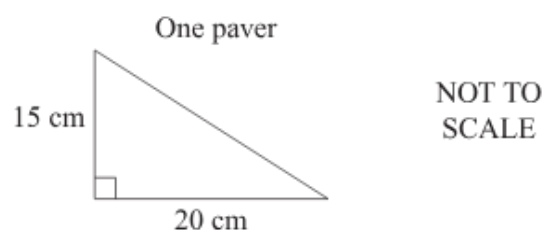
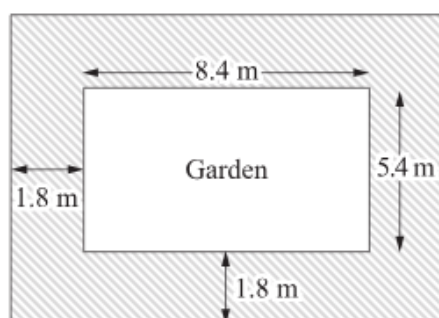
The diagram shows the shape and dimensions of a terrace which is to be tiled.
Find the area of the terrace.



Treat the area as one big square – two small squares
13.77 m²

13 2019 HSC Standard 2 Band 5

A path 1.8 m wide is being built around a rectangular garden.
The garden is 8.4 m long and 5.4 m wide. The path is shaded in the diagram.
The path is to be covered with triangular pavers with side lengths of 15 cm and 20 cm as shown. How many pavers are needed?

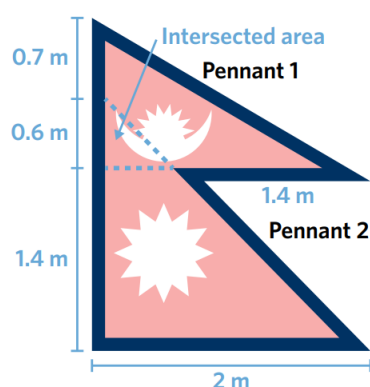


Shaded area is $12 \times 9 - 8.4 \times 5.4 = 62.64 \text{ m}^2 = 626400 \text{ cm}^2$

Each paver is $\frac{1}{2} \times 20 \times 15 = 150 \text{ cm}^2$

$\therefore$ Number of pavers is 4176

14 Nepal is the only country in the world that does not have a rectangular flag.
It is made up of two triangles, with an intersected (shared) area.
Show that the area of the flag is 3.12 m².



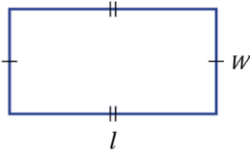
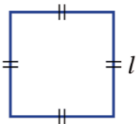
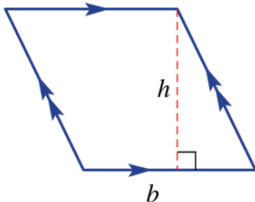
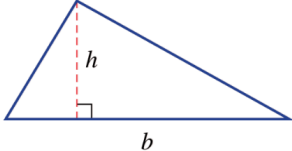
Area of pennant 1: $\frac{1}{2} \times (0.6 + 0.7) \times 2$

Area of pennant 2: $\frac{1}{2} \times (1.4 + 0.6) \times 2$

Overlapping area: $\frac{1}{2} \times (0.6 \times 0.6)$

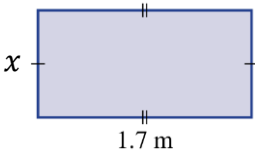
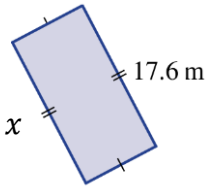
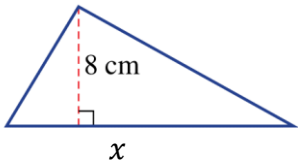
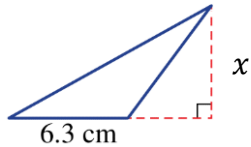
Total area is the two pennants subtract the overlapping area = 3.12 m²

FINDING UNKNOWN SIDES GIVEN THE AREA

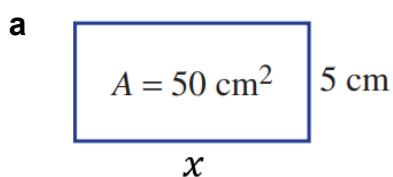
Rectangle	Square	Parallelogram	Triangle
$A = lw$	$A = l^2$	$A = bh$	$A = \frac{bh}{2}$
			

- Steps to using any formula:
 1. Write the formula.
 2. Substitute given values.
 3. Solve for the unknown value using inverse operations.

Example Calculate the side length given the area.

Worked Example	Your Turn
The area of the rectangle is $A = 1.53 \text{ m}^2$ Find the value of x.  1. Write the formula $A = lw$ 2. Substitute $1.53 = 1.7x$ 3. Solve $\div 1.7 \quad \div 1.7$ $0.9 \text{ m} = x$	The area of the rectangle is $A = 140.8 \text{ m}^2$ Find the value of x.  1. 2. 3. 8 m
The area of the triangle is $A = 192 \text{ cm}^2$ Find the value of x.  1. Write the formula $A = \frac{bh}{2}$ 2. Substitute $192 = \frac{8b}{2}$ 3. Solve $\times 2 \quad \times 2$ $384 = 8b$ $\div 8 \quad \div 8$ $48 \text{ cm} = b$	The area of the triangle is $A = 69.3 \text{ cm}^2$ Find the value of x.  1. 2. 3. 22 cm

1 Calculate the missing side length for each of these rectangles, write an equation.



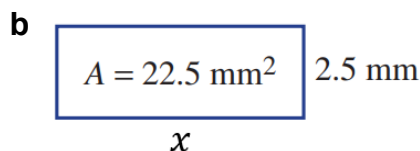
$$A = lw$$

$$50 = 5x$$

$$\div 5 \quad \div 5$$

$$\dots\dots\dots = x$$

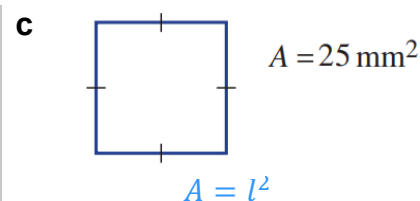
10 cm



$$A = lw$$

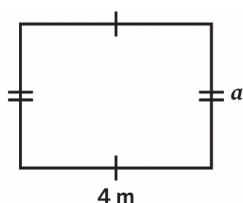
$$22.5 = 2.5x$$

9 cm



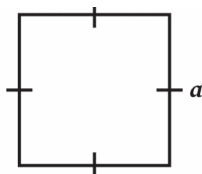
5 cm

d $A = 12.8 \text{ cm}^2$



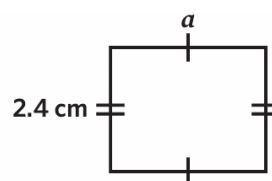
3.2 cm

e $A = 1.44 \text{ cm}^2$



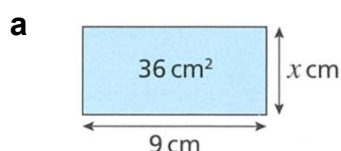
1.2 cm

f $A = 15 \text{ cm}^2$

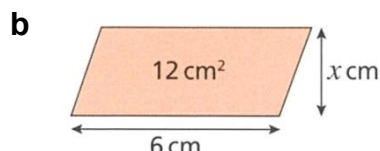


6.25 cm

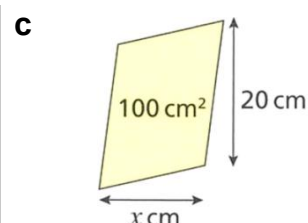
2 Find the missing side lengths in these shapes.



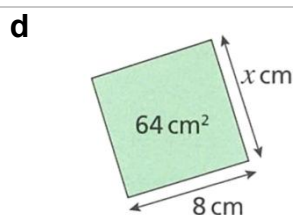
4 cm



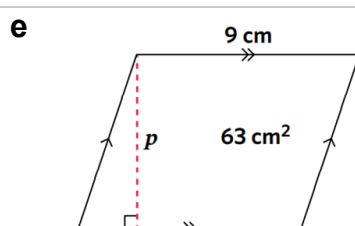
2 cm



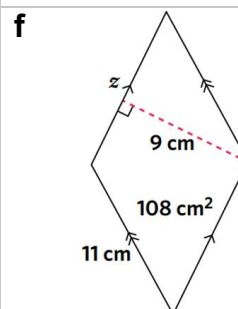
5 cm



8 cm



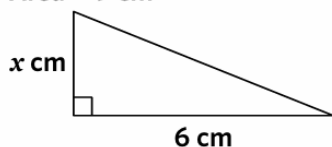
7 cm



12 cm

3 Find the missing value for each pronumeral.

a Area = 9 cm^2



$$A = \frac{bh}{2}$$

$$9 = \frac{6x}{2}$$

$$\times 2 \quad \times 2$$

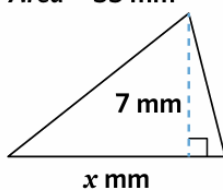
$$18 = 6x$$

$$\div 6 \quad \div 6$$

$$\dots\dots\dots = x$$

3 cm

b Area = 35 mm^2

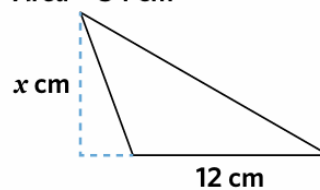


$$A = \frac{bh}{2}$$

$$35 = \frac{7x}{2}$$

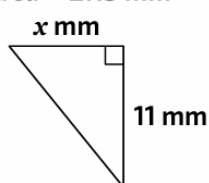
10 mm

c Area = 54 cm^2



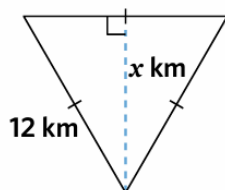
9 cm

d Area = 27.5 mm^2



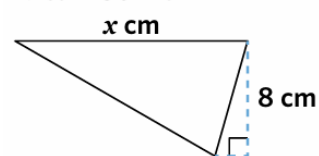
5 mm

e Area = 62.4 km^2



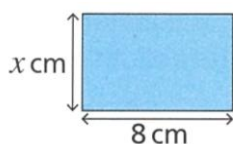
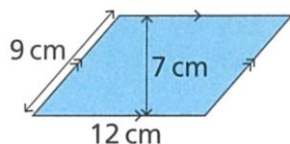
10.4 km

f Area = 36.4 cm^2



9.1 cm

4 The area of the parallelogram is twice the area of the rectangle.
Work out the height of the rectangle.



Area of parallelogram: 84 cm^2

Area of rectangle: 42 cm^2

$$8x = 42$$

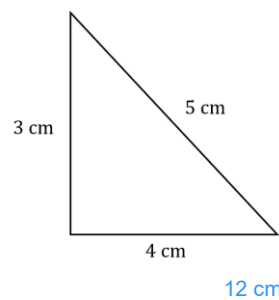
$$x = 5.25 \text{ cm}$$

5 Complete the table.

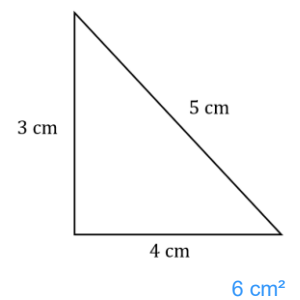
Shape	Base (cm)	Perpendicular Height (cm)	Area (cm ²)
Rectangle	5	7	35
Triangle	5	7	17.5
Triangle	9	4	18
Parallelogram	5	7	35
Parallelogram	9	4	36
Rectangle	20	5	100
Parallelogram	3	12	36
Triangle	12	11	66

6

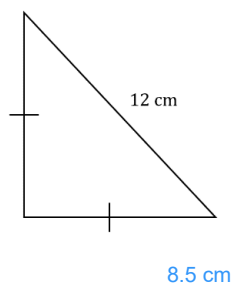
a Find the perimeter.



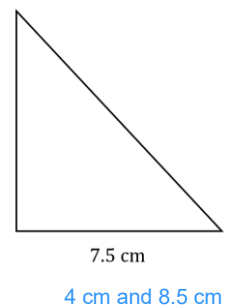
b Find the area.



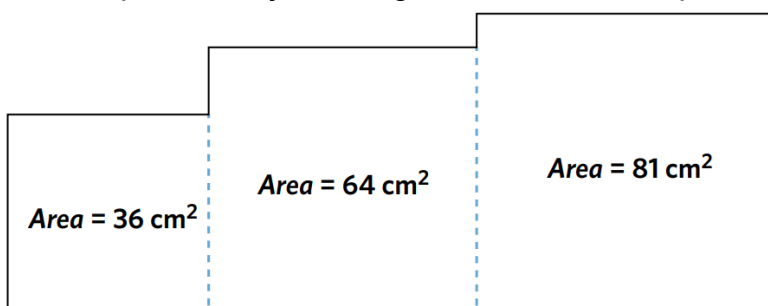
c The perimeter is 29 cm.
Find the side lengths.



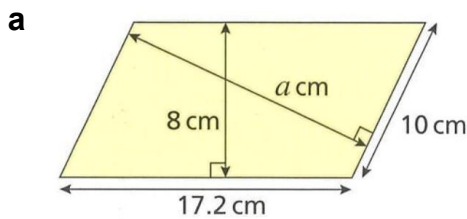
d The area is 15 cm².
The perimeter is 20 cm.
Find the side lengths.



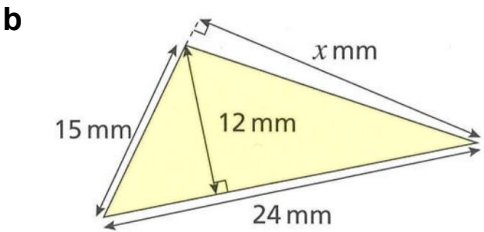
7 Three squares are joined together to form a shape. Calculate the perimeter of the entire shape.



8 Find the missing length.

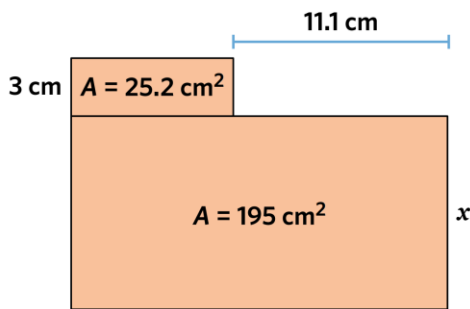


13.76 cm



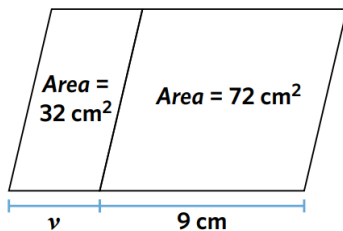
19.2 cm

9 Solve for the pronumeral x .



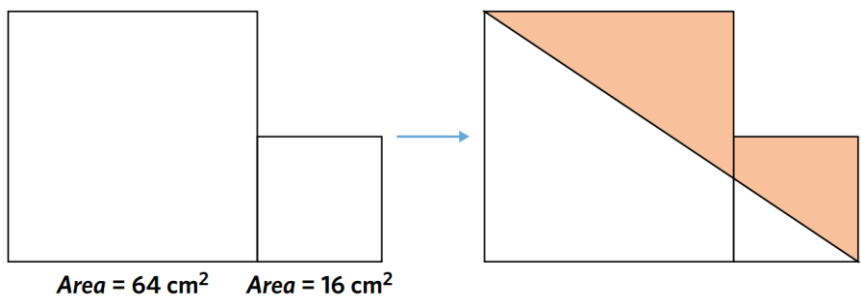
10 cm

10 Find the missing side length.



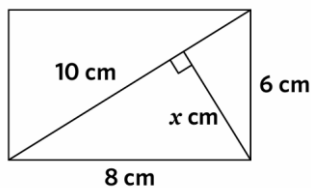
4 cm

11 What is the area of the shaded section?



32 cm²

12 Find the value of x . 10 cm is the length of the entire diagonal.

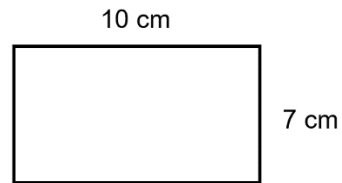


4.8 cm

CHECK YOUR UNDERSTANDING

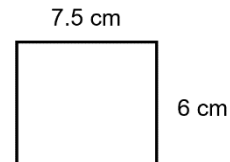
Area of rectangles and squares

1 What is the area of this rectangle?



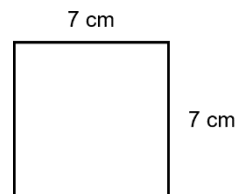
- a** 17 cm^2 **b** 70 cm^2 **c** 34 cm^2 **d** 35 cm^2

2 What is the area of this rectangle?



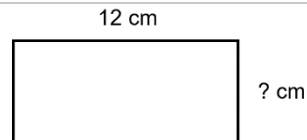
- a** 36 cm^2 **b** 48 cm^2 **c** 45 cm^2 **d** Not enough information

3 What is the area of this square?



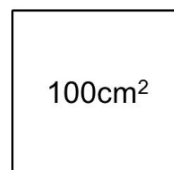
- a** 14 cm^2 **b** 28 cm^2 **c** 49 cm^2 **d** 24.5 cm^2

4 The area of this rectangle is 60 cm^2 . Find the missing side length.



- a** 5 cm **b** 36 cm **c** 48 cm **d** 10 cm

5 The area of this square is 100 cm^2 . What is the side length?



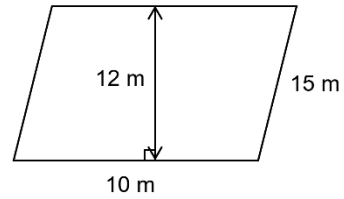
- a** 25 cm **b** 50 cm **c** 10 000 cm **d** 10 cm

6 The area of a square is 36 m^2 . What is the side length?

- a** 1296 m **b** 18 m **c** 9 m **d** 6 m

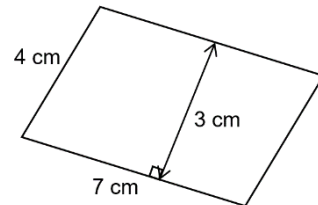
Area of a parallelogram

- 1 Which expression represents the area of this parallelogram?



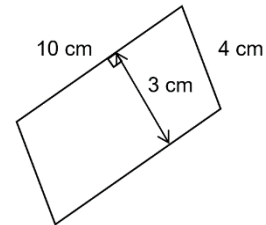
- a $10 \times 5 \times 12$ b 15×10 c 10×12 d $\frac{10 \times 15}{2}$

- 2 What is the area of this parallelogram?



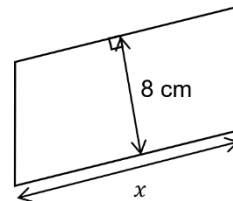
- a 21 cm^2 b 22 cm^2 c 28 cm^2 d 84 cm^2

- 3 What is the area of this parallelogram?



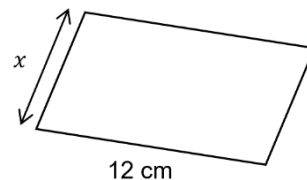
- a 120 cm^2 b 40 cm^2 c 30 cm^2 d 15 cm^2

- 4 The area of this parallelogram is 56 cm^2 . What is the value of x ?



- a 48 cm b 7 cm c 6 cm d Not enough information

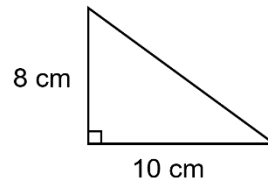
- 5 The area of this parallelogram is 96 cm^2 . What is the value of x ?



- a 84 b 16 c 8 d Not enough information

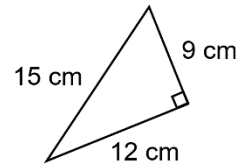
Area of a triangle

1 What is the area of this triangle?



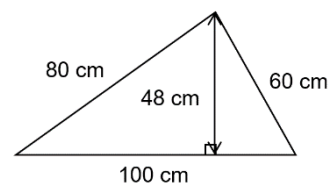
- a** 9 cm^2 **b** 80 cm^2 **c** 40 cm^2 **d** 18 cm^2

2 What is the area of this triangle?



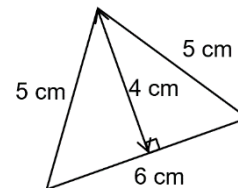
- a** 54 cm^2 **b** 67.5 cm^2 **c** 810 cm^2 **d** 108 cm^2

3 What is the area of this triangle?



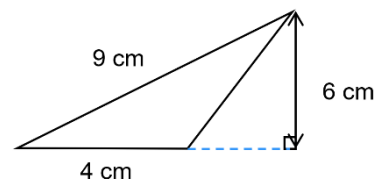
- a** 288 cm^2 **b** 240 cm^2 **c** 2400 cm^2 **d** 4800 cm^2

4 What is the area of this triangle?



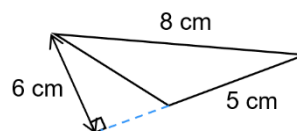
- a** 30 cm^2 **b** 24 cm^2 **c** 15 cm^2 **d** 12 cm^2

5 What is the area of this triangle?



- a** 18 cm^2 **b** 12 cm^2 **c** 24 cm^2 **d** 108 cm^2

6 What is the area of this triangle?



- a** 15 cm^2 **b** 20 cm^2 **c** 30 cm^2 **d** 120 cm^2