Measurement: Area of Parallelograms

Aim:	**Success Criteria:**	**Resources:**
I can calculate the area of parallelograms and triangles. I can find the area of a parallelogram.	I can find the area of a parallelogram by multiplying the length by the height. I can explain why the formula works for a parallelogram. I can solve problems involving calculating the area of parallelograms.	**Lesson Pack**
	Key/New Words: Area, parallelogram, length, height, right-angled triangle, formula.	**Preparation:** Differentiated **Area of Parallelograms Activity Sheet** - one per child

Prior Learning: It will be helpful if children can use a formula to calculate the area of rectangles.

Learning Sequence

	**Match the Area:** Children calculate the area of triangles shown on the **Lesson Presentation** and match the triangle to the correct area.	
	**How to Calculate the Area of a Parallelogram:** Use the **Lesson Presentation** to explain how to calculate the area of a parallelogram, by multiplying the length by the height. Explain why this formula works.	
	**Find the Area of Parallelograms:** Children calculate the area of the parallelograms shown on the **Lesson Presentation**. Work through the answers.	
	**Parallelogram Problems:** Children solve problems involving the calculation of the area of parallelograms. They match each clue to the parallelogram it describes.	
	**Area of Parallelograms:** Children complete the differentiated **Area of Parallelograms Activity Sheet**, calculating the area of parallelograms.  Children calculate the area of a variety of parallelograms, up to 150cm^2. They explain how the formula for calculating the area of a parallelogram works. They answer a simple reasoning question.  Children calculate the area of a variety of parallelograms, up to 600cm^2. They explain how the formula for calculating the area of a parallelogram works. They answer a reasoning question.  Children calculate the area of a variety of parallelograms, up to 3000cm^2, including sides with half measurements. They explain how the formula for calculating the area of a parallelogram works. They answer a more complex reasoning question. An **Extra Challenge Activity Sheet** is also included.	

Diving into Mastery: Schools using a mastery approach may prefer to use the following as an alternative activity. These sheets might not necessarily be used in a linear way. Some children might begin at the 'Deeper' section and in fact, others may 'dive straight in' to the 'Deepest' section if they have already mastered the skill and are applying this to show their depth of understanding.

Children complete fluency problems which involve finding the area of a range of parallelograms and calculating missing measures.

Children explore answering reasoning problems which involve calculating the area of parallelograms to explain if the given statements are correct.

Children use problem-solving skills in order to answer open ended-tasks that involve a greater depth of mathematical thinking. They explore possible dimensions of a parallelogram when given the area and calculate area of parallelograms in a real life context.

Calculate the Base and Height: Children are given the area and either the height or base of a parallelogram and they calculate the unknown measurement.

Exploreit

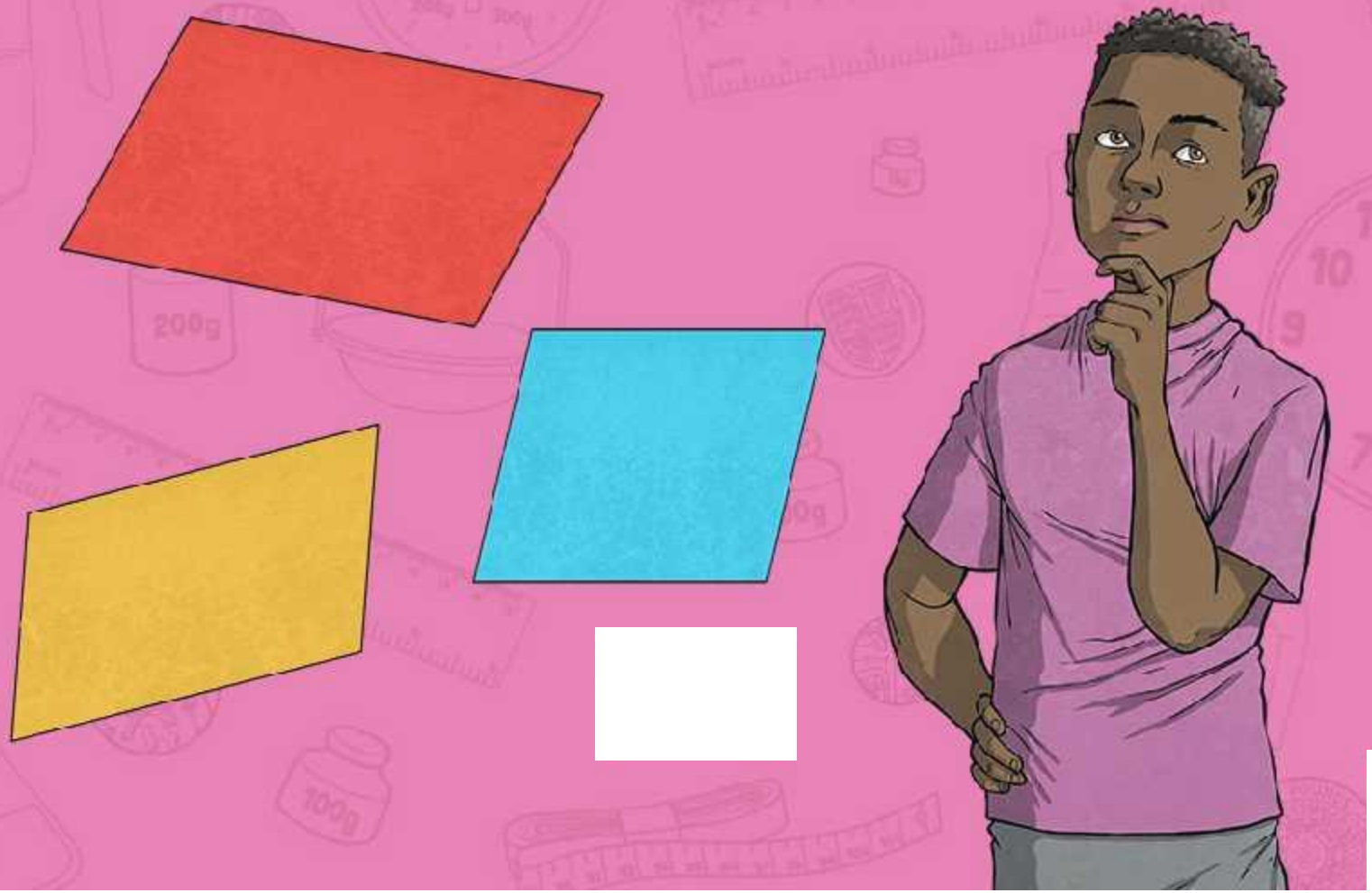
Matchit: Children design a set of matching cards for the area of parallelograms. They swap cards with another pair.

Designit: On squared paper, children draw and cut out squares and triangles. They rearrange the shapes to form another shape or object (like a tangram). They then calculate the area of the whole shape.

Maths

Measurement

Area of Parallelograms



Aim

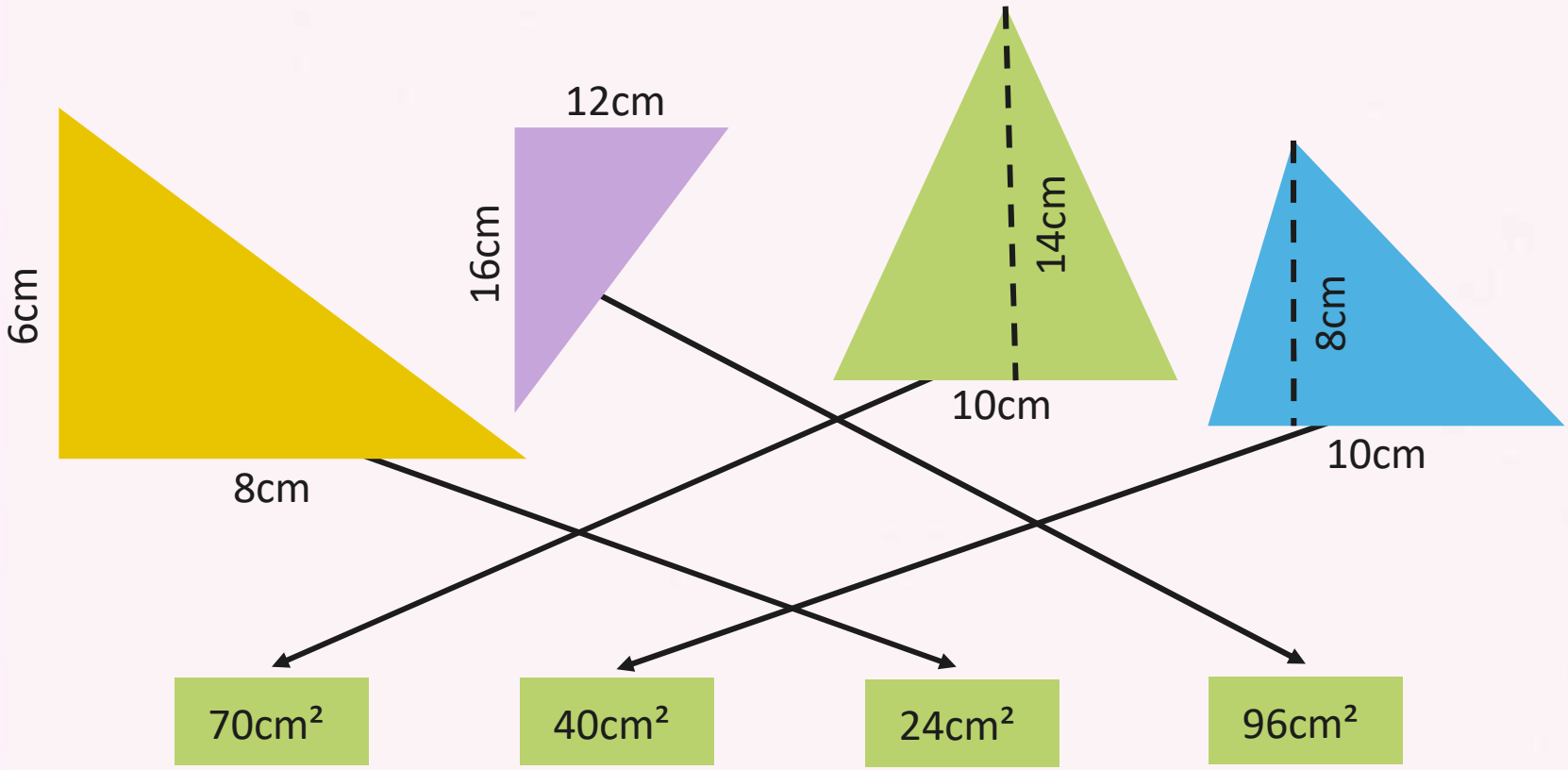
I can find the area of a parallelogram.

Success Criteria

- I can find the area of a parallelogram by multiplying the length by the height.
- I can explain why the formula works for a parallelogram.
- I can solve problems involving calculating the area of parallelograms.

Match the Area

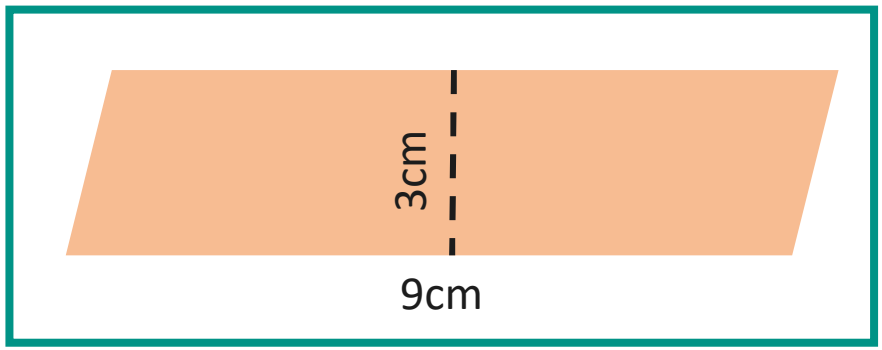
Match these triangles to their areas:



How to Calculate the Area of a Parallelogram

To calculate the area of a parallelogram, you need to multiply the length of the parallelogram by the height (not the sides).

Here is a parallelogram:



9cm × 3cm = 27cm

The area of this parallelogram is **27cm²**.

How to Calculate the Area of a Parallelogram

But why does this formula work when calculating the area of a parallelogram?

To calculate the area of a parallelogram, you need to multiply the length of the parallelogram by the height.

If we were to cut off a right angled-triangle from the end of the parallelogram…

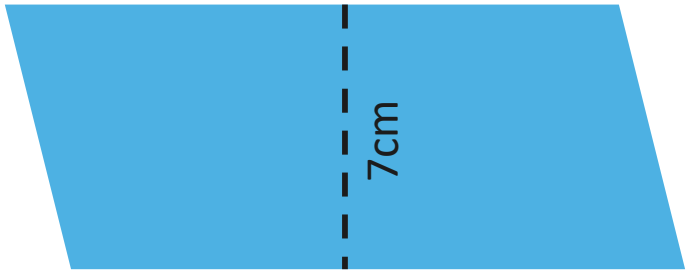
and add it to the other end of the shape…

we would have a rectangle with the dimensions 3cm × 9cm, so the area would be **27cm².**

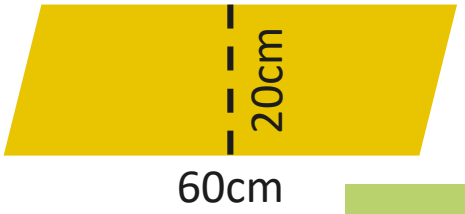
Find the Area of a Parallelogram

Whole Class

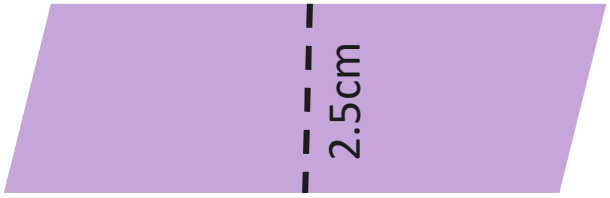
Find the area of these parallelograms:



126cm²



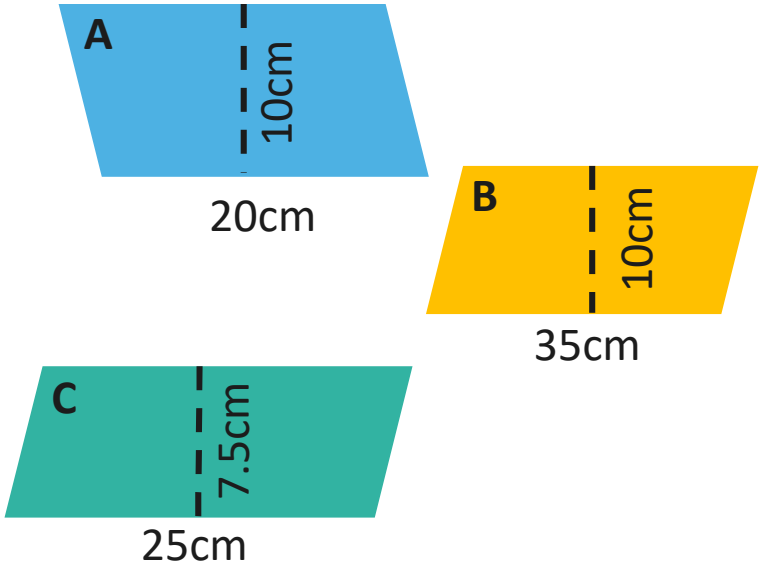
1200cm²



20cm²

Parallelogram Problem

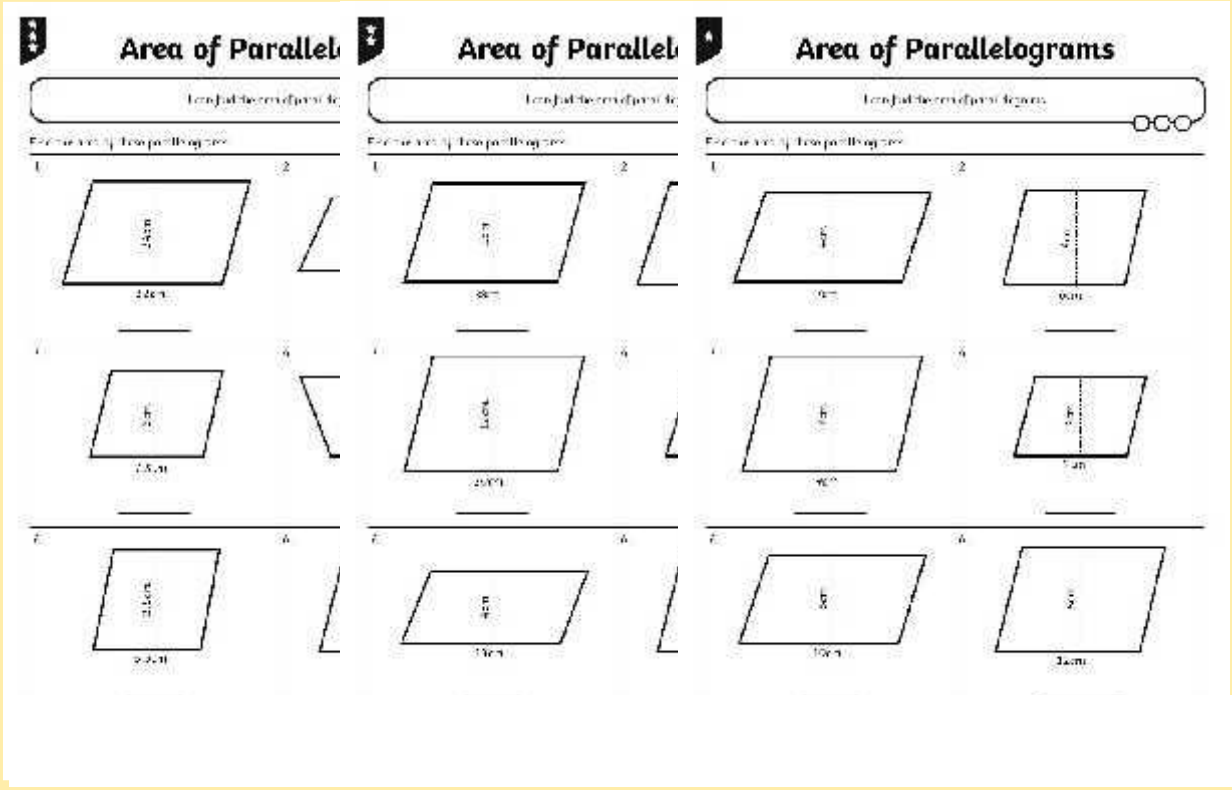
Here are three parallelograms (not drawn to scale). Read each clue and work out which of the parallelograms is being described.



Clue	Parallelogram
This parallelogram has the greatest area.	B
This parallelogram is the only parallelogram which doesn't have a whole number area.	C
If both dimensions of this parallelogram were doubled, this parallelogram would have an area of 800cm².	A
The combined area of these 2 parallelograms is greater than 500cm², but less than 540cm².	B and C

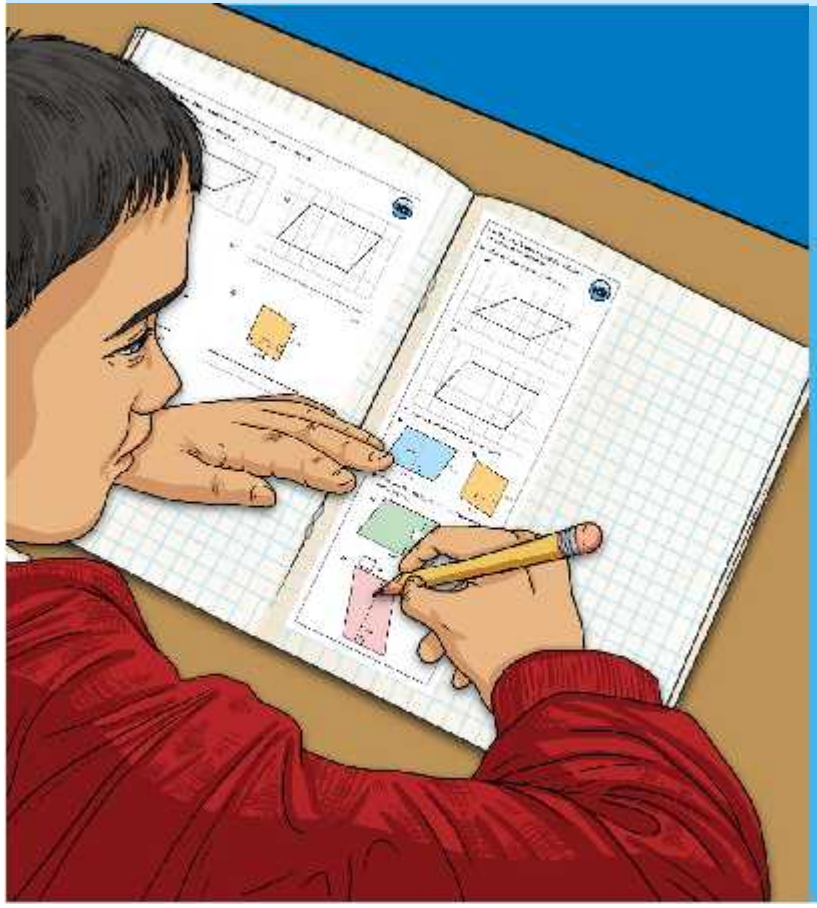
Area of Parallelograms Activity

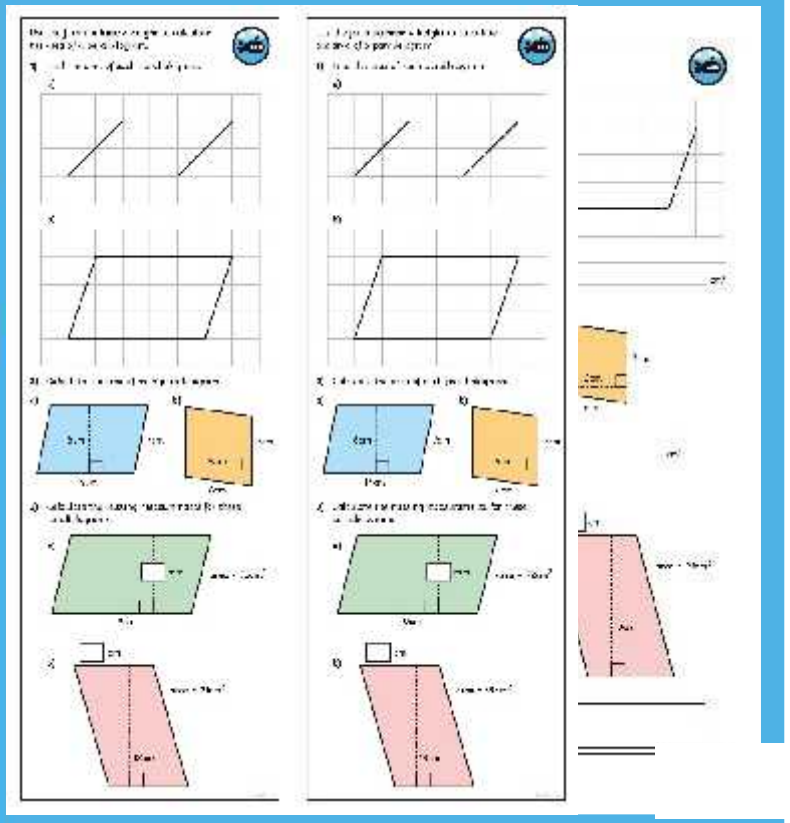
Use your wonderful skills to complete these activity sheets:



Diving into Mastery

Dive in by completing your own activity!





Calculate the Base or Height

Here is a parallelogram. You are given the height and the area. How can you work out the base of the parallelogram?

Let's put the information we know into a calculation:

8 × ☐ = 128cm²

To find out what number will fit into the missing box, we can do an inverse operation:

128cm² ÷ 8 = ☐

128 ÷ 8 = **16**

base = 16cm

Let's check:

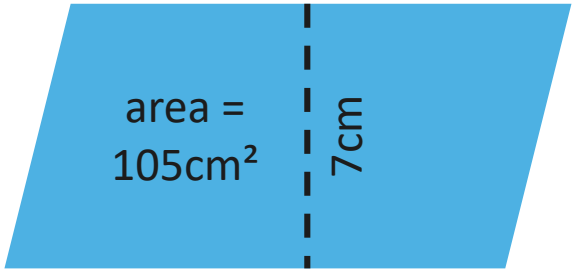
16 × 8 = 128

Answer:

base = 16cm

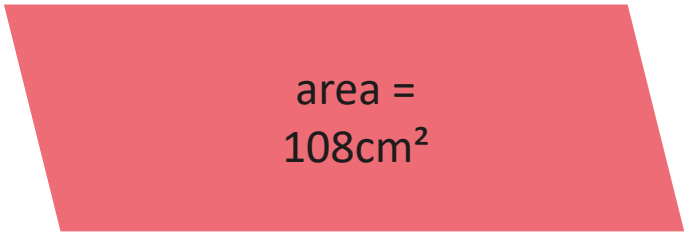
Calculate the Base or Height

Here are 2 parallelograms. Calculate the base or the height of each.



Answer:

base = 15cm



18cm

Answer:

height = 6cm

Aim

I can find the area of a parallelogram.

Success Criteria

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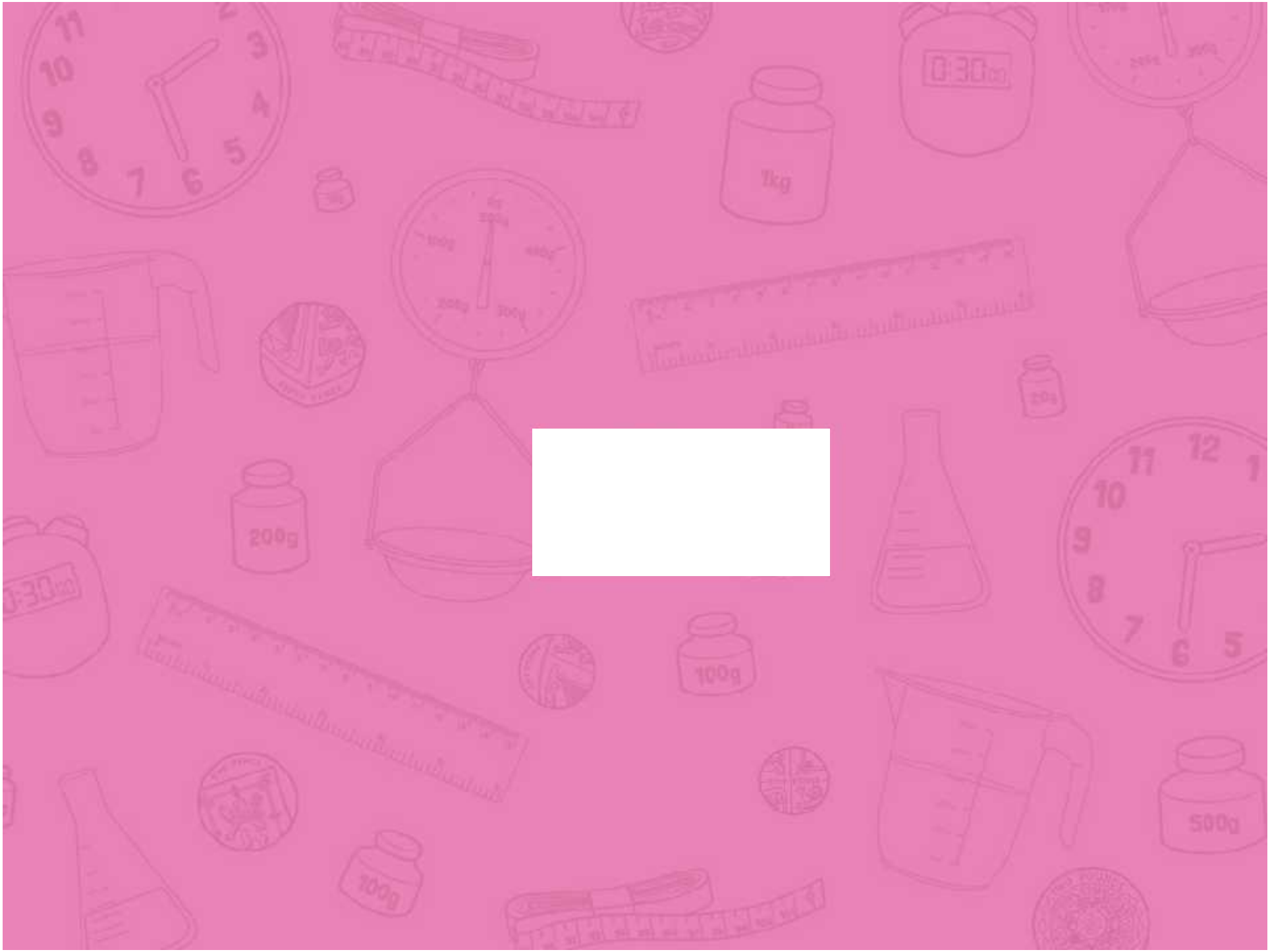

Aim: I can find the area of a parallelogram.				**Date:**					
				Delivered By:			**Support:**		
Success Criteria	**Me**	**Friend**	**Teacher**	**T**	**PPA**	**S**	**I**	**AL**	**GP**
I can find the area of a parallelogram by multiplying the length by the height.				**Notes/Evidence**					
I can explain why the formula works for a parallelogram.									
I can solve problems involving calculating the area of parallelograms.									

Next Steps

- _____
- _____

T	Teacher	**I**	Independent
PPA	Planning, Preparation and Assessment	**AL**	Adult Led
S	Supply	**GP**	Guided Practice

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Next Steps

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T	Teacher	**I**	Independent
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Area of Parallelograms

I can find the area of parallelograms.

Find the area of these parallelograms:

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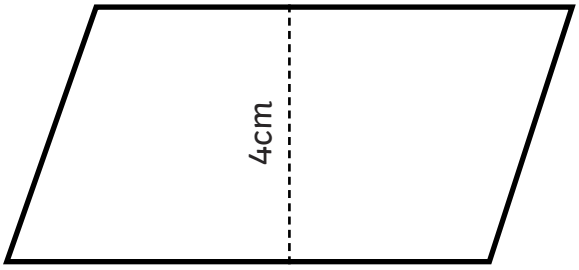

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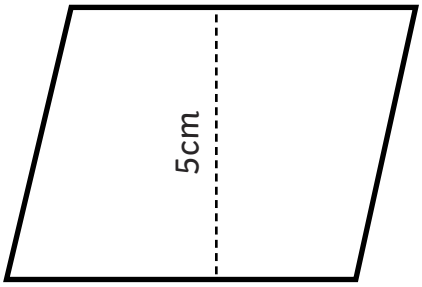

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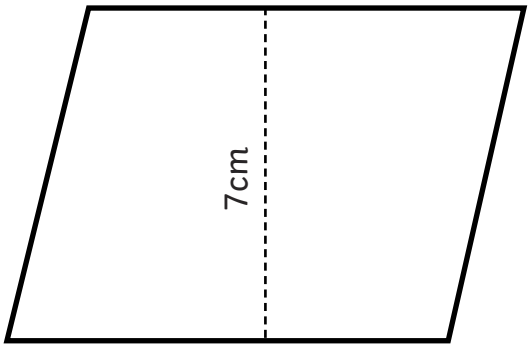

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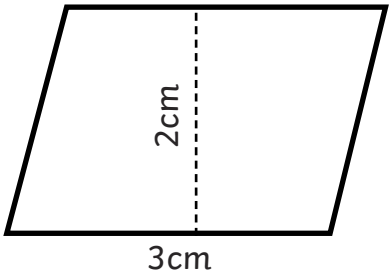

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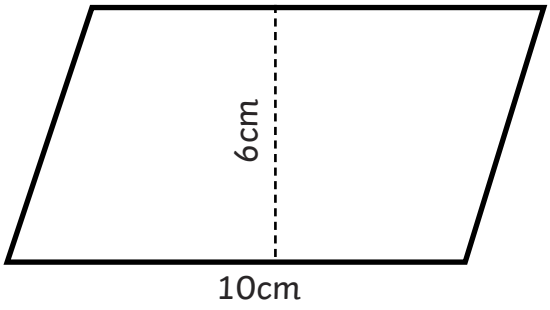

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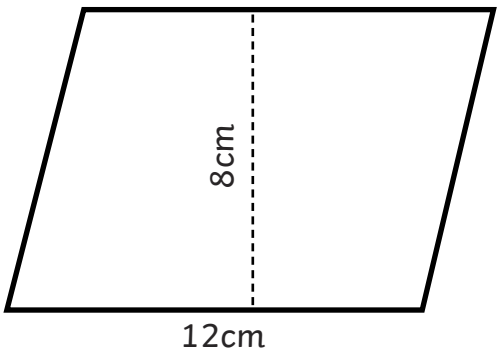

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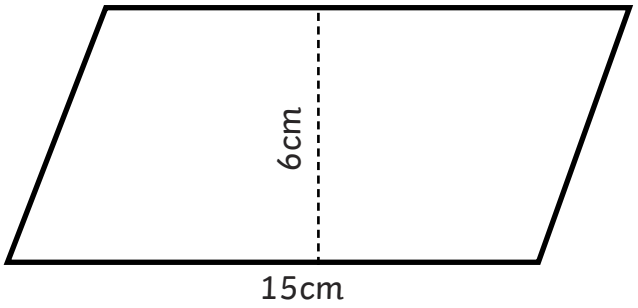

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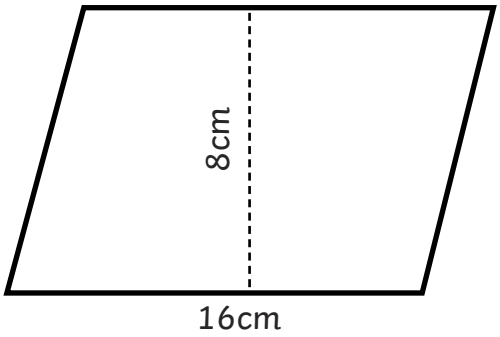
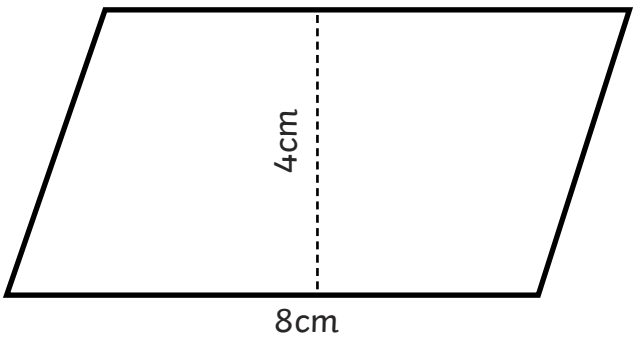


9. Explain why the area of a parallelogram is the length of the base multiplied by the height. Draw a diagram to help your explanation.

10. Change one of the measurements of this parallelogram so that it has an area of 40cm^2.



Area of Parallelograms **Answers**

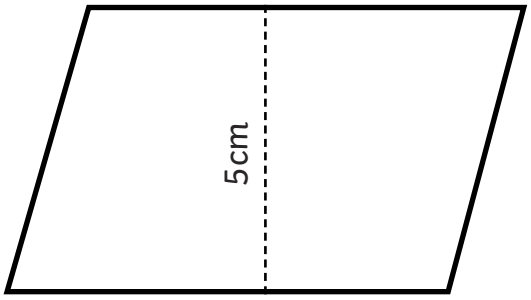
Question	Answer
1.	28cm²
2.	30cm²
3.	63cm²
4.	6cm²
5.	60cm²
6.	96cm²
7.	90cm²
8.	128cm²
9.	Explain why the area of a parallelogram is the length of the base multiplied by the height. Draw a diagram to help your explanation.
	Explanation and drawings show an understanding that if you cut off a right-angled triangle from one side of the parallelogram and place it on the other side, you would have a rectangle and the area would be length × height.
10.	Change the one of the measurements of this parallelogram so that it has an area of 40cm².
	The new shape could be 4cm × 10cm or 8cm × 5cm.

Area of Parallelograms

I can find the area of parallelograms.

Find the area of these parallelograms:

1.



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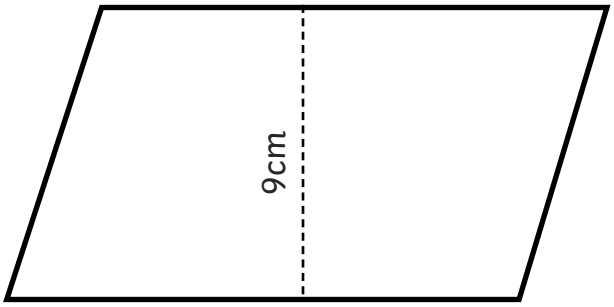

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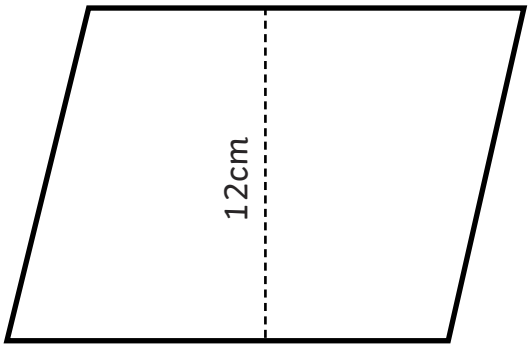

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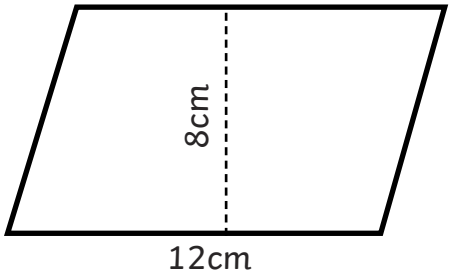

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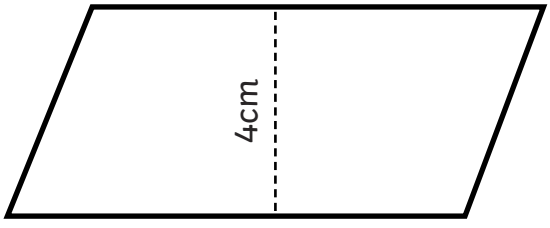

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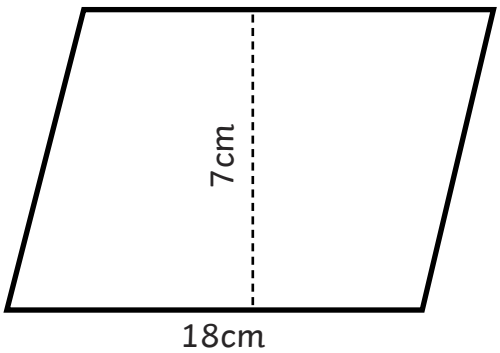

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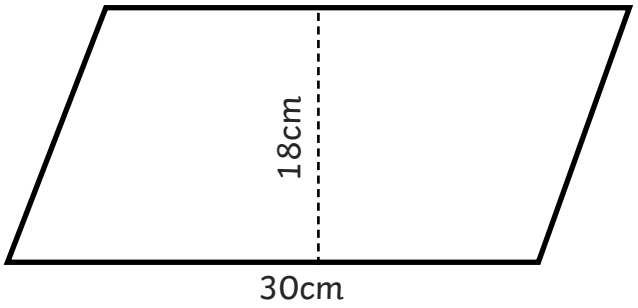

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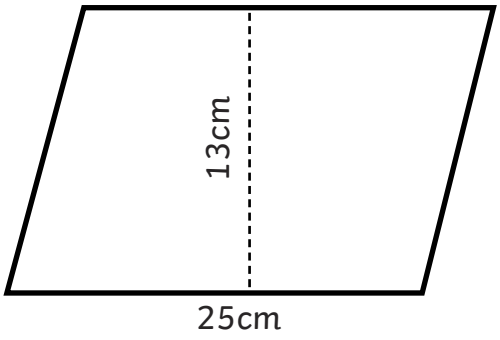
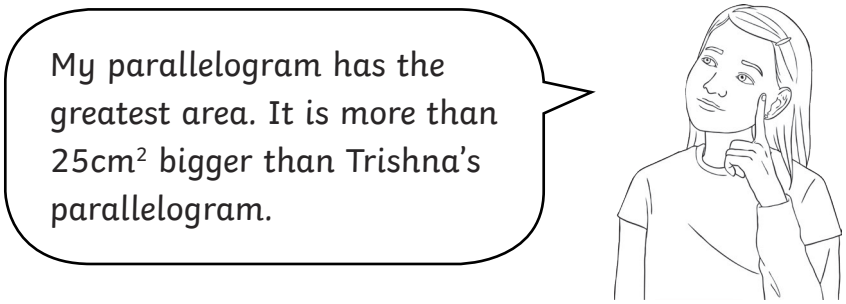


9. Explain why the area of a parallelogram is the length of the base multiplied by the height. Draw a diagram to help your explanation.

10. Lena and Trishna have each drawn a parallelogram. Lena's parallelogram has a base of 18cm and height 9cm. Trishna's parallelogram has a base of 12cm and height 11cm.



Is Lena correct?

Area of Parallelograms **Answers**

Question	Answer
1.	40cm²
2.	135cm²
3.	240cm²
4.	96cm²
5.	52cm²
6.	126cm²
7.	540cm²
8.	325cm²
9.	Explain why the area of a parallelogram is the length of the base multiplied by the height. Draw a diagram to help your explanation.
	Explanation and drawings show an understanding that if you cut off a right-angled triangle from one side of the parallelogram and place it on the other side, you would have a rectangle and the area would be length × height.
10.	Lena and Trishna have each drawn a parallelogram. Lena's parallelogram has a base of 18cm and height 9cm. Trishna's parallelogram has a base of 12cm and height 11cm. Is Lena correct?
	Lena's parallelogram has an area of 162cm². Trishna's parallelogram has an area of 132cm². The difference between the areas of the two parallelograms is 30cm². This is greater than 25cm². Lena is correct.

Area of Parallelograms

I can find the area of parallelograms.

Find the area of these parallelograms:

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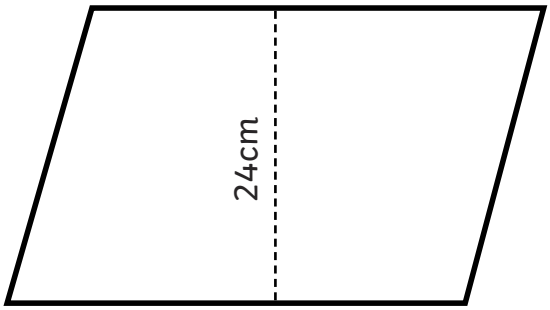

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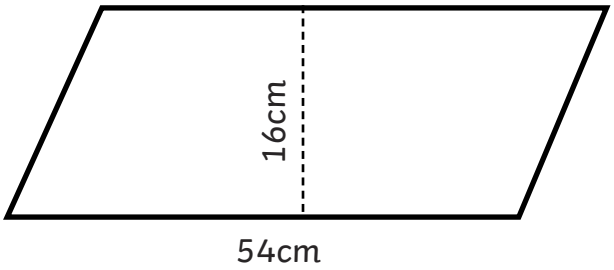

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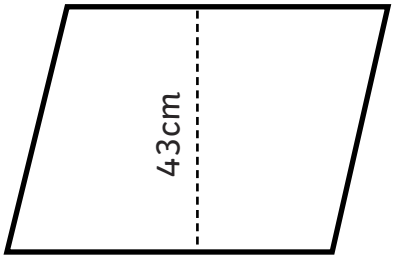

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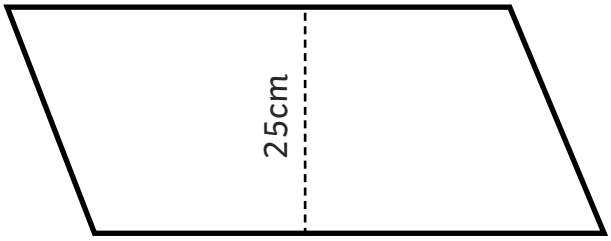

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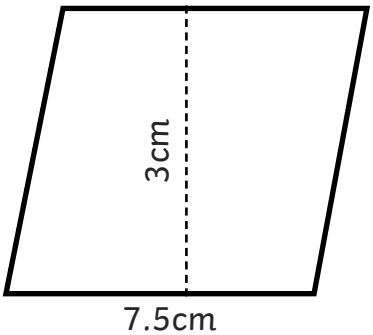

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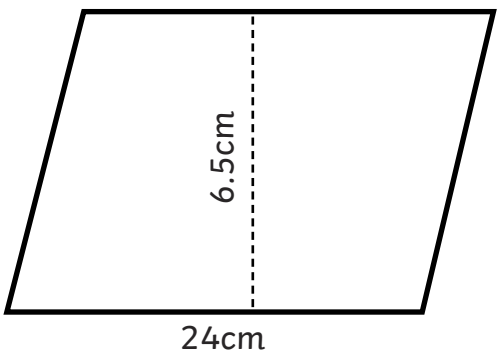

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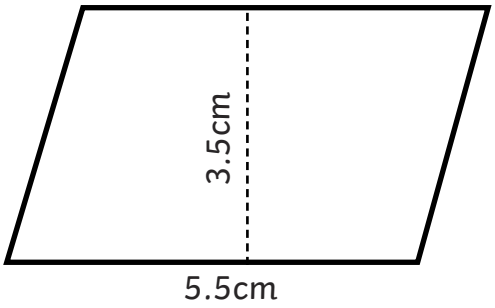

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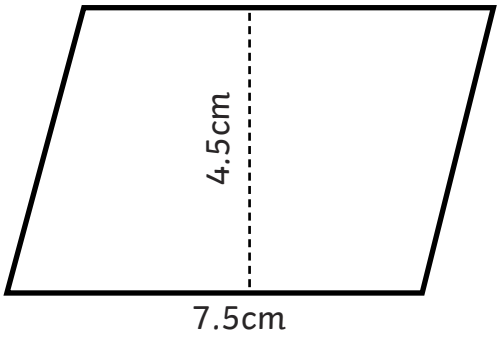


9. Explain why the area of a parallelogram is the length of the base multiplied by the height. Draw a diagram to help your explanation.

10. Katie says, "I have drawn a parallelogram which has a base of 12cm and height 8cm. If I doubled either the base or the height, the area would be double the area of my first parallelogram." Is Katie correct? Show how you know.

Area of Parallelograms **Answers**

Question	Answer
1.	768cm²
2.	864cm²
3.	2881cm²
4.	1875cm²
5.	22.5cm²
6.	156cm²
7.	19.25cm²
8.	33.75cm²
9.	Explain why the area of a parallelogram is the length of the base multiplied by the height. Draw a diagram to help your explanation.
	Explanation and drawings show an understanding that if you cut off a right-angled triangle from one side of the parallelogram and place it on the other side, you would have a rectangle and the area would be length × height.
10.	Katie says 'I have drawn a parallelogram which has a base of 12cm and height 8cm. If I doubled either the base or the height, the area would be double the area of my first parallelogram.' Is Katie correct? Show how you know.
	Katie is correct. The original parallelogram has an area of 96cm² (12cm × 8cm). If you doubled the base, the area would be 24cm × 8cm = 192 cm². If you doubled the height, the area would be 12cm × 16cm = 192 cm². 192 cm² is double 96cm².

1) a) $4 \times 2 = 8cm^2$

   b) $5 \times 3 = 15cm^2$

2) a) $14cm \times 6cm = 84cm^2$

   b) $7cm \times 5cm = 35cm^2$

3) a) 80mm

   b) 7cm

---

1) Ania is incorrect. Using the formula base × perpendicular height to calculate the area of both the rectangle and the parallelogram will show Ania that both shapes actually have the same area of $32cm^2$.

2) No. Although Hamish has correctly calculated that the first parallelogram has an area of $42cm^2$, in the second parallelogram he has multiplied the base by a side length, rather than the perpendicular height. The correct area of the second parallelogram is $7cm \times 5cm = 35cm^2$ so both of these parallelograms do not have an area of $42cm^2$.

---

1) The parallelogram has an area of $84cm^2$ so it could have the following dimensions:

   base = b and height = h
   b = 3cm and h = 28cm
   b = 4cm and h = 21cm
   b = 6cm and h = 14cm
   b = 7cm and h = 12cm

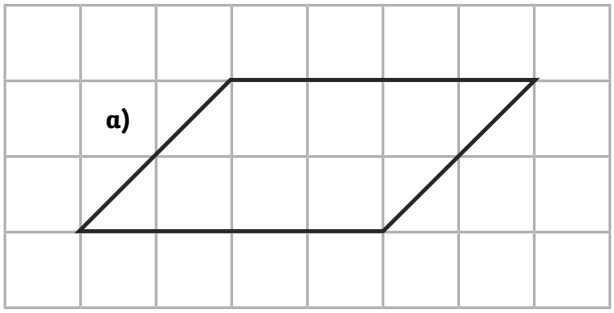
   a) Each tile has an area of $240cm^2$.
   $4800 \div 240 = 20$
   DIY Dan needs 20 tiles for this wall.

   b) £175 ÷ £3.50 = 50
   Dan used 50 more tiles to decorate the rest of his bathroom.

Use the formula **base × height** to calculate the area of a parallelogram.

1) Find the area of each parallelogram.

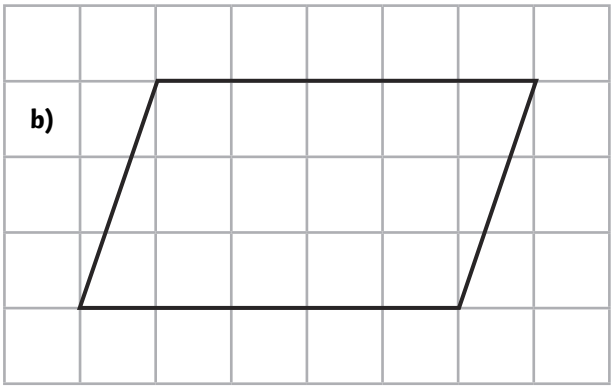
a)



_____

_____ cm^2

b)

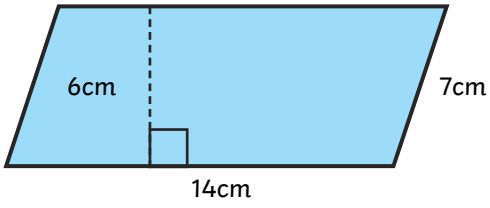


_____

_____ cm^2

2) Calculate the area of each parallelogram.

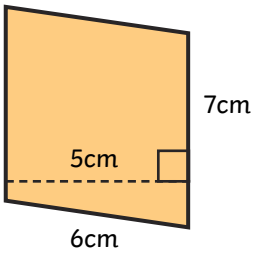
a)



_____

_____ cm^2

b)

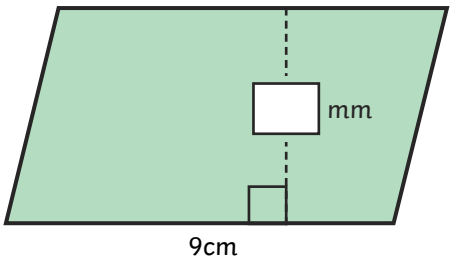


_____

_____ cm^2

3) Calculate the missing measurements for these parallelograms.

a)

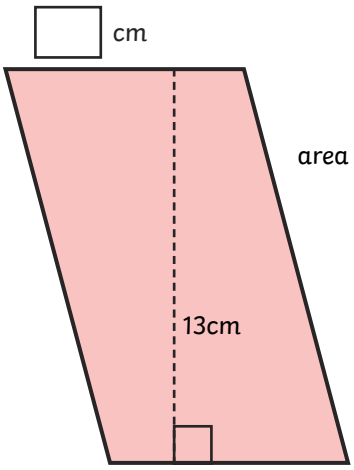


area = $72cm^2$

_____

_____

b)



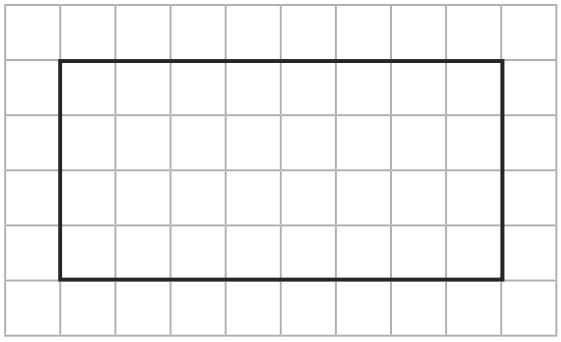
area = $91cm^2$

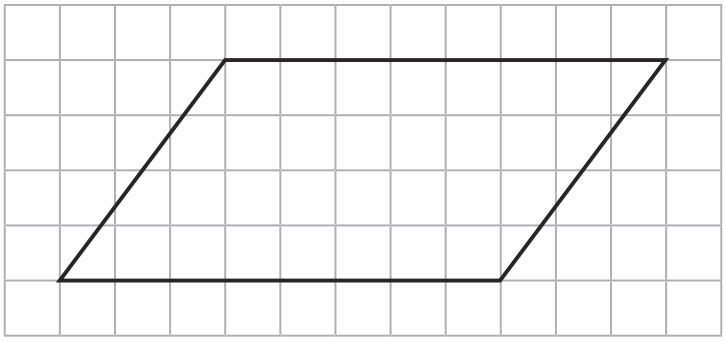
_____

_____

Use the formula **base × height** to calculate the area of a parallelogram.

1) Ania has been counting squares to find the area of these shapes.

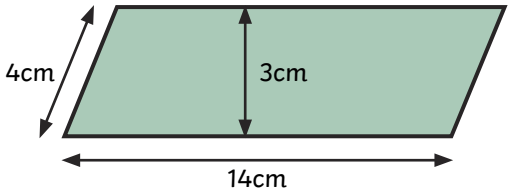




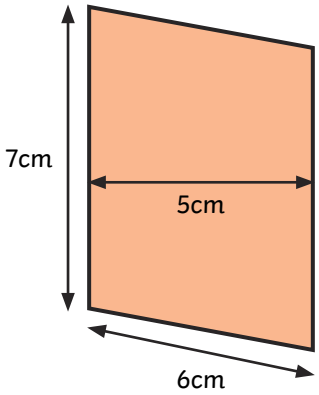
I think that the parallelogram has a larger area than the rectangle.

Is Ania correct? Explain to Ania how to check if she is correct by using a calculation.

2) Hamish has worked out that each parallelogram has an area of 42cm^2.



14cm × 3cm = 42cm²

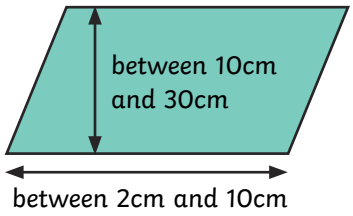


7cm × 6cm = 42cm²

Do you agree with Hamish? Explain why.

Use the formula **base × height** to calculate the area of a parallelogram.

1) I am thinking of a parallelogram with side lengths that are whole numbers.



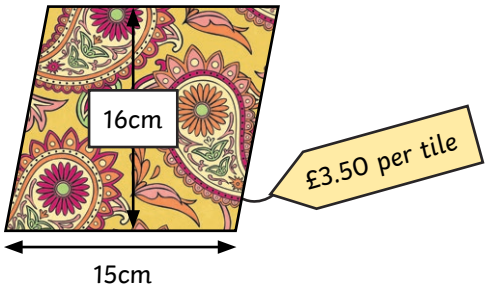
It has an area of 84cm^2.

Its height measures between 10cm and 30cm.

Its base measures between 2cm and 10cm.

Give the dimensions of all the possible parallelograms I could be thinking of.

2) DIY Dan is decorating his bathroom with these tiles:



One wall of his bathroom has an area of 4800cm^2.

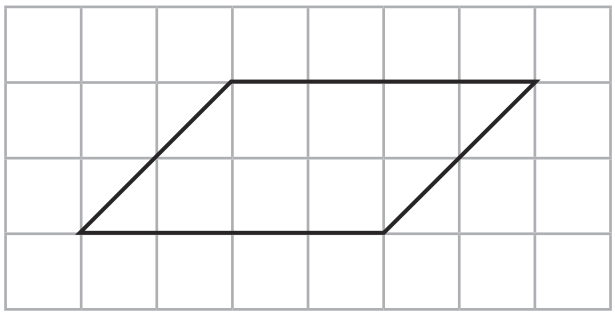
a) How many tiles will DIY Dan need to decorate this wall?

b) DIY Dan spends another £175 decorating the rest of his bathroom with tiles. How many more tiles did DIY Dan use?

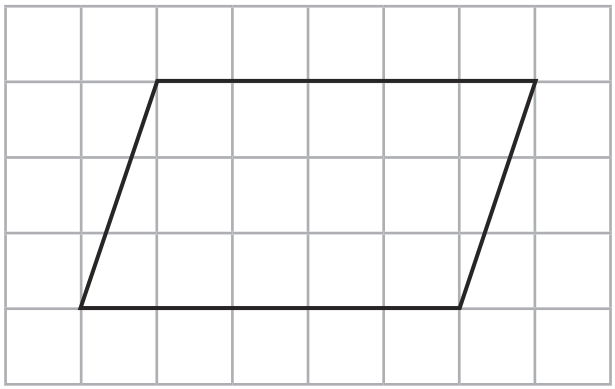
Use the formula **base × height** to calculate the area of a parallelogram.

1) Find the area of each parallelogram.

a)

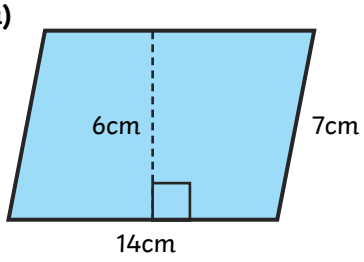


b)

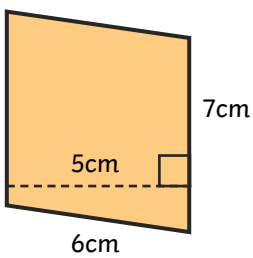


2) Calculate the area of each parallelogram.

a)

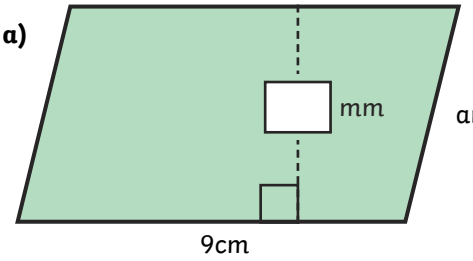


b)

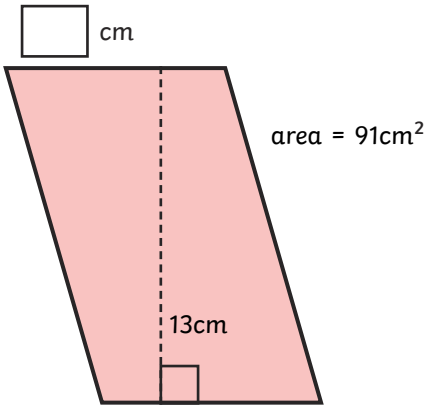


3) Calculate the missing measurements for these parallelograms.

a)



b)



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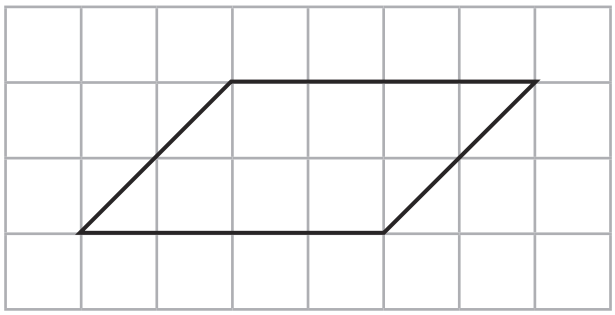
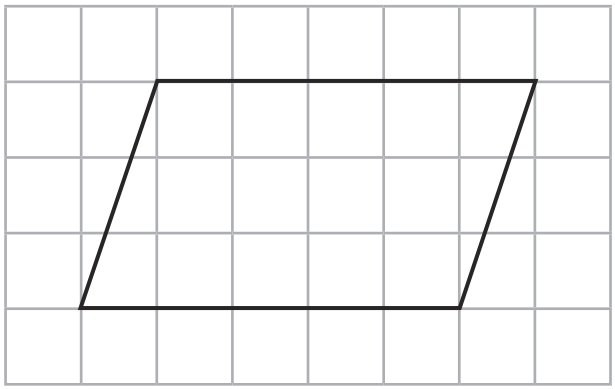
a)



b)



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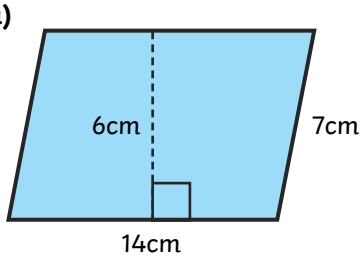
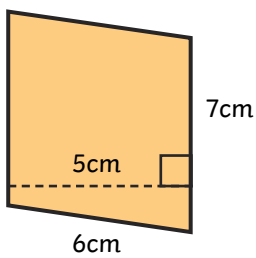


b)



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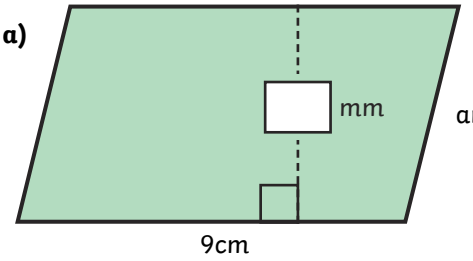
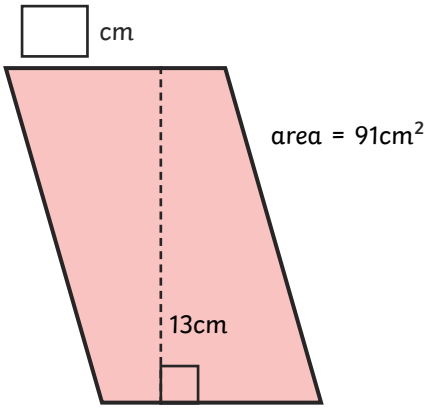
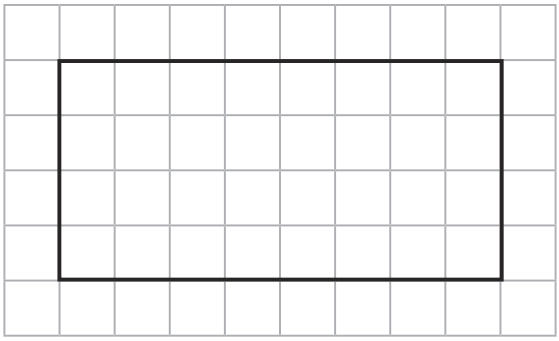


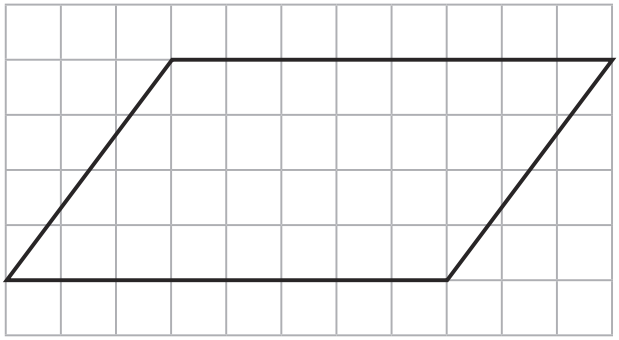
b)



Use the formula **base × height** to calculate the area of a parallelogram.

1) Ania has been counting squares to find the area of these shapes.





I think that the parallelogram has a larger area than the rectangle.

Is Ania correct? Explain to Ania how to check if she is correct by using a calculation.

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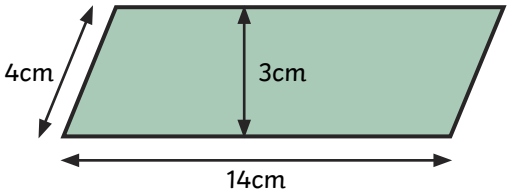
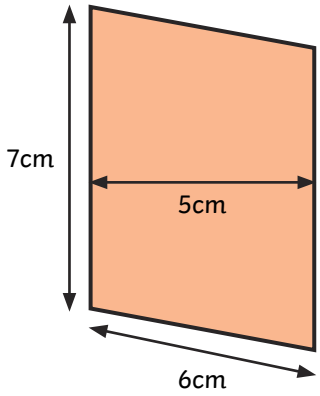


14cm × 3cm = 42cm²



7cm × 6cm = 42cm²

Do you agree with Hamish? Explain why.

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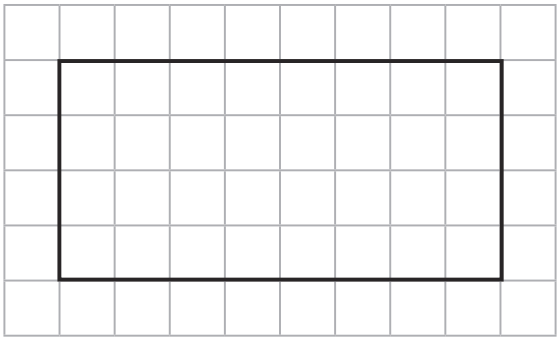

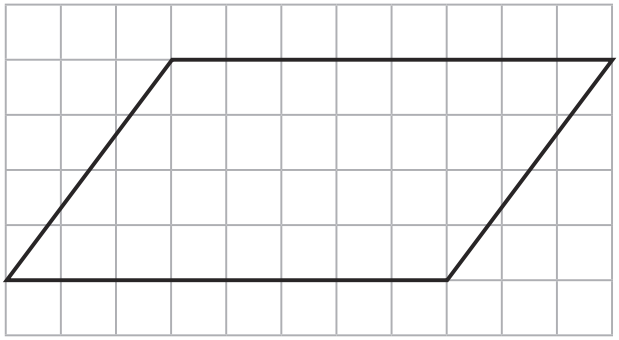

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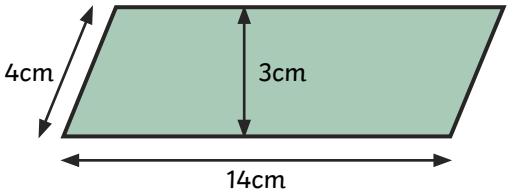

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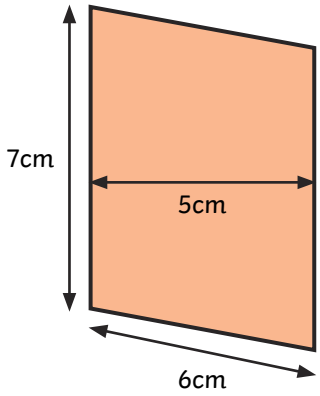


7cm × 6cm = 42cm²

Do you agree with Hamish? Explain why.

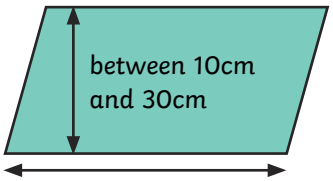
Use the formula **base × height** to calculate the area of a parallelogram.

1) I am thinking of a parallelogram with side lengths that are whole numbers.

It has an area of 84cm^2.

Its height measures between 10cm and 30cm.

Its base measures between 2cm and 10cm.



Give the dimensions of all the possible parallelograms I could be thinking of.

2) DIY Dan is decorating his bathroom with these tiles:

One wall of his bathroom has an area of 4800cm^2.

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b) DIY Dan spends another £175 decorating the rest of his bathroom with tiles. How many more tiles did DIY Dan use?

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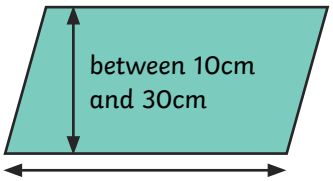

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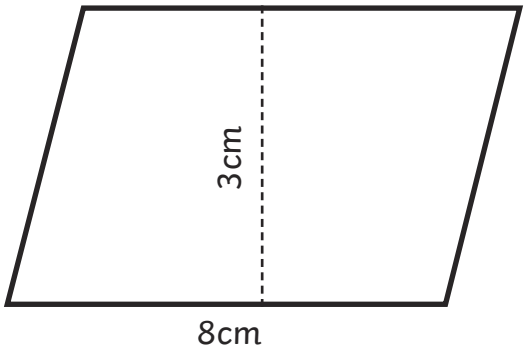
Find the Dimensions

I can find the area of parallelograms.

Calculate the area of each parallelogram, then give the possible dimensions of two other parallelograms which have the same area. You may use fractional measurements, for example 3.5cm.

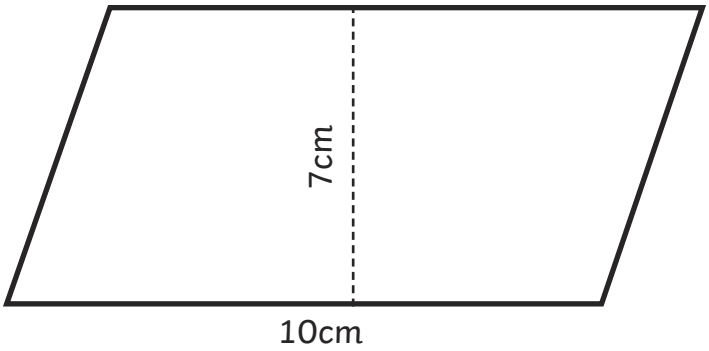
a) **Shape 1**



Area = ☐

	Length	Height
Shape 2		
Shape 3		

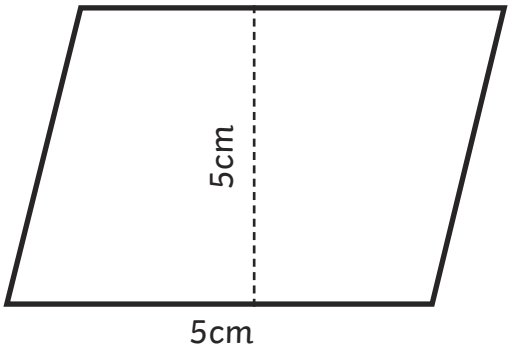
b) **Shape 1**



Area = ☐

	Length	Height
Shape 2		
Shape 3		

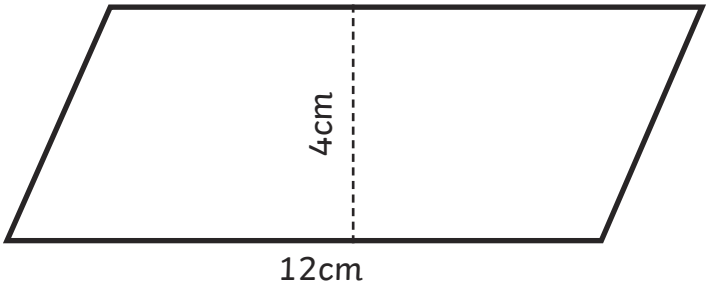
c) **Shape 1**



Area = ☐

	Length	**Height**
Shape 2		
Shape 3		

d) **Shape 1**



Area = ☐

	Length	**Height**
Shape 2		
Shape 3		

Find the Dimensions **Answers**

a) Shape area = **24cm²**
Other 2 shapes have dimensions which give an area of 24cm² when multiplied together. Allow half unit measurements, e.g. 1cm × 24cm, 1.5cm × 16cm, 2cm × 12cm, 4cm × 6cm.

b) Shape area = **70cm²**
Other 2 shapes have dimensions which give an area of 70cm² when multiplied together. Allow half unit measurements, 1cm × 70cm, 2cm × 35cm, 2.5cm × 28cm, 5cm × 14cm, 3.5cm × 20cm.

c) Shape area = **25cm²**
Other 2 shapes have dimensions which give an area of 25cm² when multiplied together. Allow half unit measurements, 1cm × 25cm, 2cm × 12.5cm, 2.5cm × 10cm.

d) Shape area = **48cm²**
Other 2 shapes have dimensions which give an area of 48cm² when multiplied together. Allow half unit measurements, 1cm × 48cm, 1.5cm × 32cm, 2cm × 24cm, 3cm × 16cm, 6cm × 8cm.

Measurement | Area of Parallelograms

I can find the area of a parallelogram.		
I can find the area of a parallelogram by multiplying the length by the height.		
I can explain why the formula works for a parallelogram.		
I can solve problems involving calculating the area of parallelograms.		

Measurement | Area of Parallelograms

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