

















Measurement: Area and Perimeter Reasoning

Aim: I can recognise that shapes with the same areas can have different perimeters and vice versa. I can solve reasoning questions involving area and perimeter.	Success Criteria: I can break down complex problems into smaller steps. I can use mathematical language to explain solutions to problems.	Resources: Lesson Pack Mini whiteboards - one per child
	Key/New Words: Area, perimeter, centimetre, metre.	Preparation: Differentiated Area and Perimeter Reasoning Activity Sheet - one per child

Prior Learning: It will be helpful if children know how to calculate area and perimeter.

Learning Sequence

	Guided Maths Question 1: Use the step-by-step slides on the Lesson Presentation to model how to answer a reasoning question based on solving a word problem involving perimeter and area .	
	Partner Maths Question 1: The children work in pairs to apply the previous teacher modelling to a similar question displayed on the Lesson Presentation , discussing their reasoning. Answer included.	
	Guided Maths Question 2: Use the step-by-step slides on the Lesson Presentation to model how to answer a second reasoning question based on solving an investigative problem involving area and perimeter .	
	Partner Maths Question 2: The children work in pairs to apply the previous teacher modelling to a similar question displayed on the Lesson Presentation , discussing their reasoning. Answer included.	
	Guided Maths Question 3: Use the step-by-step slides on the Lesson Presentation to model how to answer a third reasoning question based on solving an investigative problem involving area and perimeter .	
	Partner Maths Question 3: The children work in pairs to apply the previous teacher modelling to a similar question displayed on the Lesson Presentation , discussing their reasoning. Answer included.	
	Reasoning Practice: Children complete the Area and Perimeter Reasoning Activity Sheet to show that they solve reasoning questions involving area and perimeter .	
	Reasoning Answers: Use the slides on the Lesson Presentation to discuss the answers to the independent activity questions and self-assess.	



Maths

Measurement

Area and Perimeter Reasoning



Aim

- I can solve reasoning questions involving area and perimeter.

Success Criteria

- I can break down complex problems into smaller steps.
- I can use mathematical language to explain solutions to problems.

Guided Maths Question 1



Read this reasoning question carefully.

Here is a problem involving area and perimeter:

A landscape gardener is designing a garden. Part of the garden has a fenced grassed area. The area needs to be 20m^2 and have a perimeter of less than 20m . Find a possible rectangular shape that would fit this specification.

Let's **highlight** the important information and key vocabulary to show we **understand** the question.

Guided Maths Question 1



Now we are ready to **apply our learning** to solve the question.

A landscape gardener is designing a garden. Part of the garden has a fenced grassed area. The area needs to be 20m^2 and have a perimeter of less than 20m . Find a possible rectangular shape that would fit this specification.

The only shape which has a perimeter less than 20m is the rectangle with the dimensions $5\text{m} \times 4\text{m}$.

$1\text{m} \times 1\text{m}$
 $2\text{m} \times 2\text{m}$
 $5\text{m} \times 4\text{m}$

The rectangle which has the dimensions 5×4 has a perimeter of: $(5 + 4) \times 2 = 18\text{m}$

Guided Maths Question 1



Let's check our answer by finding perimeter in an alternative way.

$$\begin{aligned} \text{Perimeter of } 20\text{m} \times 1\text{m} &= \\ 20 + 1 + 20 + 1 &= \mathbf{42\text{m}}. \end{aligned}$$

$$\begin{aligned} \text{Perimeter of } 10\text{m} \times 2\text{m} &= 10 \\ + 2 + 10 + 2 &= \mathbf{24\text{m}}. \end{aligned}$$

$$\begin{aligned} \text{Perimeter of } 5\text{m} \times 4\text{m} &= \\ 5 + 4 + 5 + 4 &= \mathbf{18\text{m}}. \end{aligned}$$

Answer:

A shape of 5m × 4m would give an area of 20m² and a perimeter less than 20m.

A landscape gardener is designing a garden. Part of the garden has a fenced grassed area. The area needs to be 20m² and have a perimeter of less than 20m. Find a possible rectangular shape that would fit this specification.

Partner Maths Question 1



Working with a partner, use your reasoning skills to answer this question

The garden must be a rectangle with the dimensions **12m × 3m** or **9m × 4m**.

A landscape gardener is designing a garden. Part of the garden has a fenced grassed area. The area needs to be 36m^2 and have a perimeter between 25m and 35m. Find a possible rectangular shape that would fit this specification.

Guided Maths Question 2

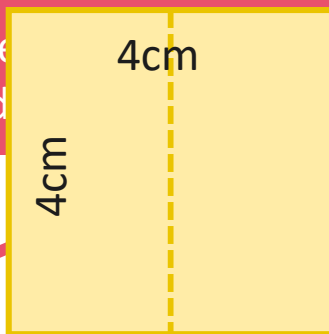


Read this reasoning question carefully.

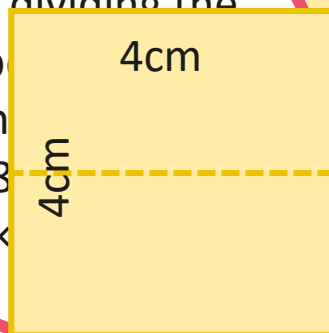
Now let's review our work to answer the question.

A shape has an area of 16cm^2 . The shape has been divided into two identical rectangles. What could be the perimeter of each of the identical rectangles?

By dividing the shape like this, the perimeter would be:



By dividing the shape like this, the perimeter would be:
 $(2\text{cm} + 4\text{cm}) \times 2 = 12\text{cm}$



So, to answer the question... the perimeter could be either **12cm, 18cm** or **33cm**.

Guided Maths Question 2



Answer:
Perimeters could
be either **13cm**,
14cm, **22cm**
or **41cm**.

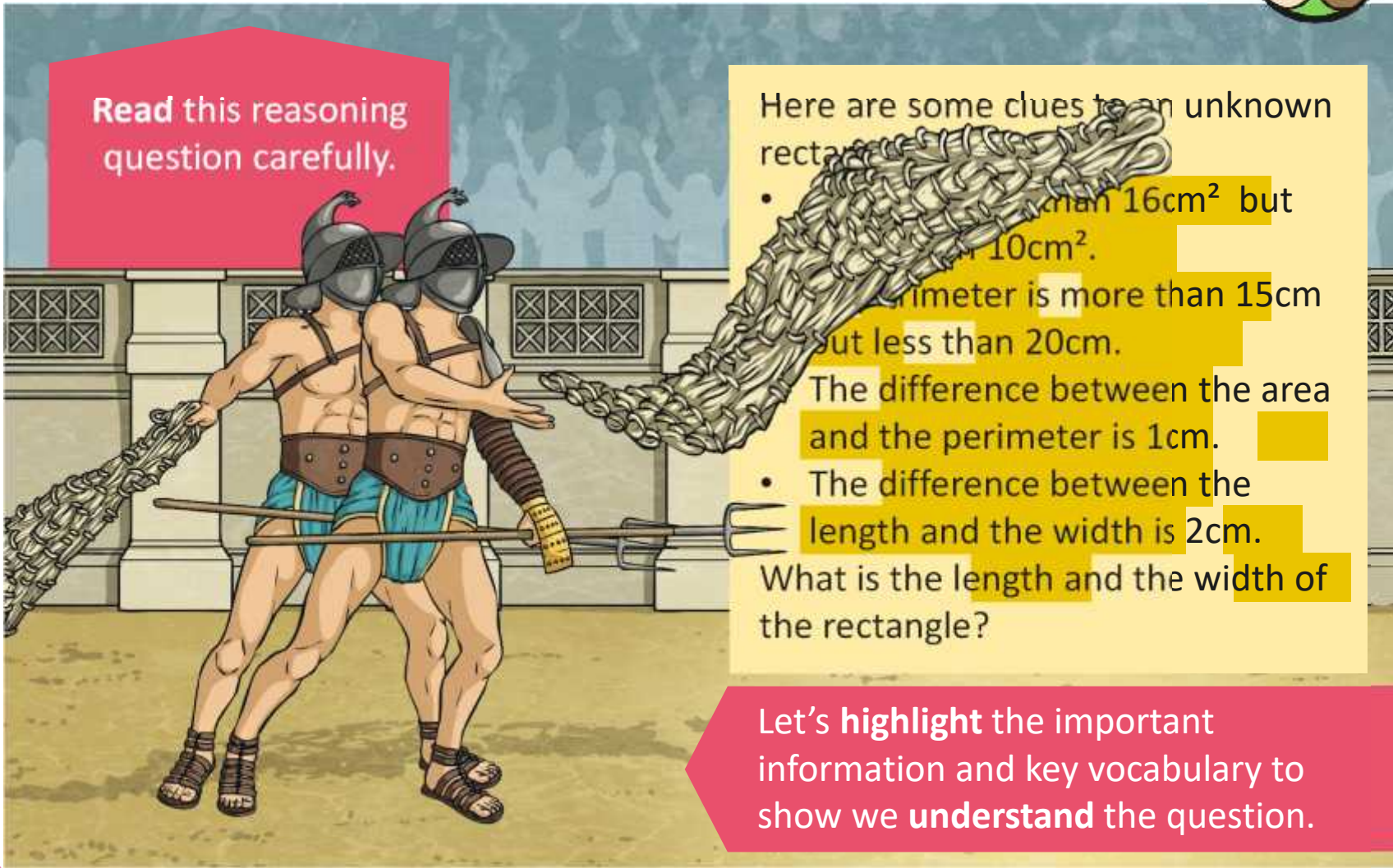
Working with
a partner, use
your reasoning
skills to answer
this question

A shape has an area of 20cm^2 . The shape has been divided into two identical rectangles. What could be the perimeter of each of the identical rectangles?

Guided Maths Question 3



Read this reasoning question carefully.



Here are some clues to an unknown rectangle.

- The area is more than 16cm^2 but less than 10cm^2 .
- The perimeter is more than 15cm but less than 20cm .

The difference between the area and the perimeter is 1cm .

- The difference between the length and the width is 2cm .

What is the length and the width of the rectangle?

Let's **highlight** the important information and key vocabulary to show we **understand** the question.

Guided Maths Question 3



Now let's look at the last clue. The only rectangle that fits the difference between the area and the perimeter is 15cm².

Answer: A shape with a length of 3cm and a width of 5cm would have an area of 15cm² and a perimeter of 16cm. The difference between the area and the perimeter is 1cm.

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

Let's find rectangles with a length of 5cm, which have an area of 15cm².

- $1\text{cm} \times 15\text{cm}$
- $3\text{cm} \times 5\text{cm}$

Here are some clues to an unknown rectangle:

- Its area is less than 16cm^2 but more than 10cm^2 .
- Its perimeter is more than 15cm but less than 20cm .
- The difference between the area and the perimeter is 1cm .
- The difference between the length and the width is 2cm .

What is the length and the width of the rectangle?

Next, let's think about what we **already know** in order to help us answer the question correctly.

Partner Maths Question 3



Working with a partner,
use your reasoning skills to
answer this question.

Here are some clues to an unknown rectangle:

- Its area is less than 25cm^2 but more than 20cm^2 .
- Its perimeter is more than 19cm but less than 22cm .
- The difference between the area and the perimeter is 4cm .
- The difference between the length and the width is 2cm .

What is the length and the width of the rectangle?

Answer:
 $4\text{cm} \times 6\text{cm}$
or
 $6\text{cm} \times 4\text{cm}$

Reasoning Practice



Area and Perimeter Reasoning

I can solve reasoning questions involving area and perimeter.

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I can solve reasoning questions involving area and perimeter.

Solve these reasoning questions.

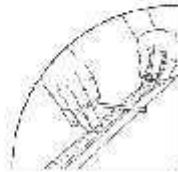
1

A local school is being redesigned a garden. Part of the garden has a perfect grassed area. The area needs to be 35m^2 and have a perimeter more than 30m . Find all possible rectangular shapes that would fit this specification.



2

A shape has an area of 96m^2 . The shape has been divided into two identical rectangles. What could be the perimeter of the two rectangles?



3

How many squares can you make from a rectangle (not a square)?

- The area is less than 40m^2 but more than 25m^2 .
- Its perimeter is more than 25m but less than 32m .
- The difference between the area and the perimeter is 12 .
- The difference between the length and the width is 6m .

What is the length and the width of the rectangle?



Have a go at independently solving the reasoning questions on your activity sheet.

Reasoning Practice Answers



Did you correctly answer the **first** reasoning question?



A landscape gardener is designing a garden. Part of the garden has a fenced grassed area. The area needs to be at least 30m^2 and have a perimeter of less than 25m . The gardener thinks that the grassed area could be $8\text{m} \times 5\text{m}$. Is he right? Show how you know.

The area of the grassed area is $8\text{m} \times 5\text{m} = 40\text{m}^2$.

So the area is OK.

The perimeter of the grassed area is $(8\text{m} + 5\text{m}) \times 2 = 26\text{m}$. This is more than 25m , so this is not OK.

The grassed area could not be $8\text{m} \times 5\text{m}$.



Reasoning Practice Answers

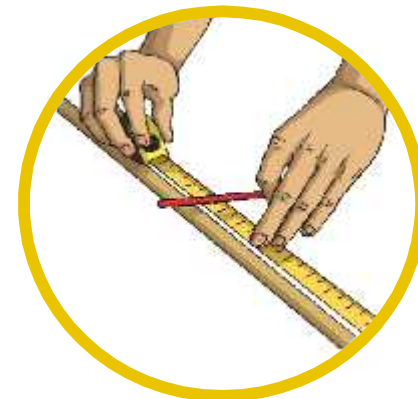


Did you correctly answer the **second** reasoning question?



A shape has an area of 12cm^2 . The shape has been divided into two identical rectangles. What could be the perimeter of the two rectangles?

**The perimeters could be: 10cm, 11cm, 14cm or 25cm.
Any of these answers is correct.**



Reasoning Practice Answers



Did you correctly answer the **third** reasoning question?



Here are some clues to an unknown rectangle:

- Its area is 36cm^2 .
- Its perimeter is less than 36cm .
- The difference between the area and the perimeter is 6.
- Both sides are a whole number of centimetres in length.

What is the length and the width of the rectangle?

The rectangle is $12\text{cm} \times 3\text{cm}$.

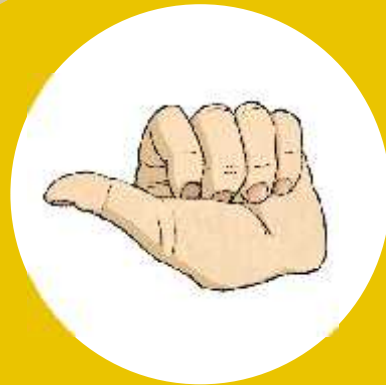


Reasoning Practice Answers



How confident do you feel about these types of reasoning question?

Show me using a silent signal:



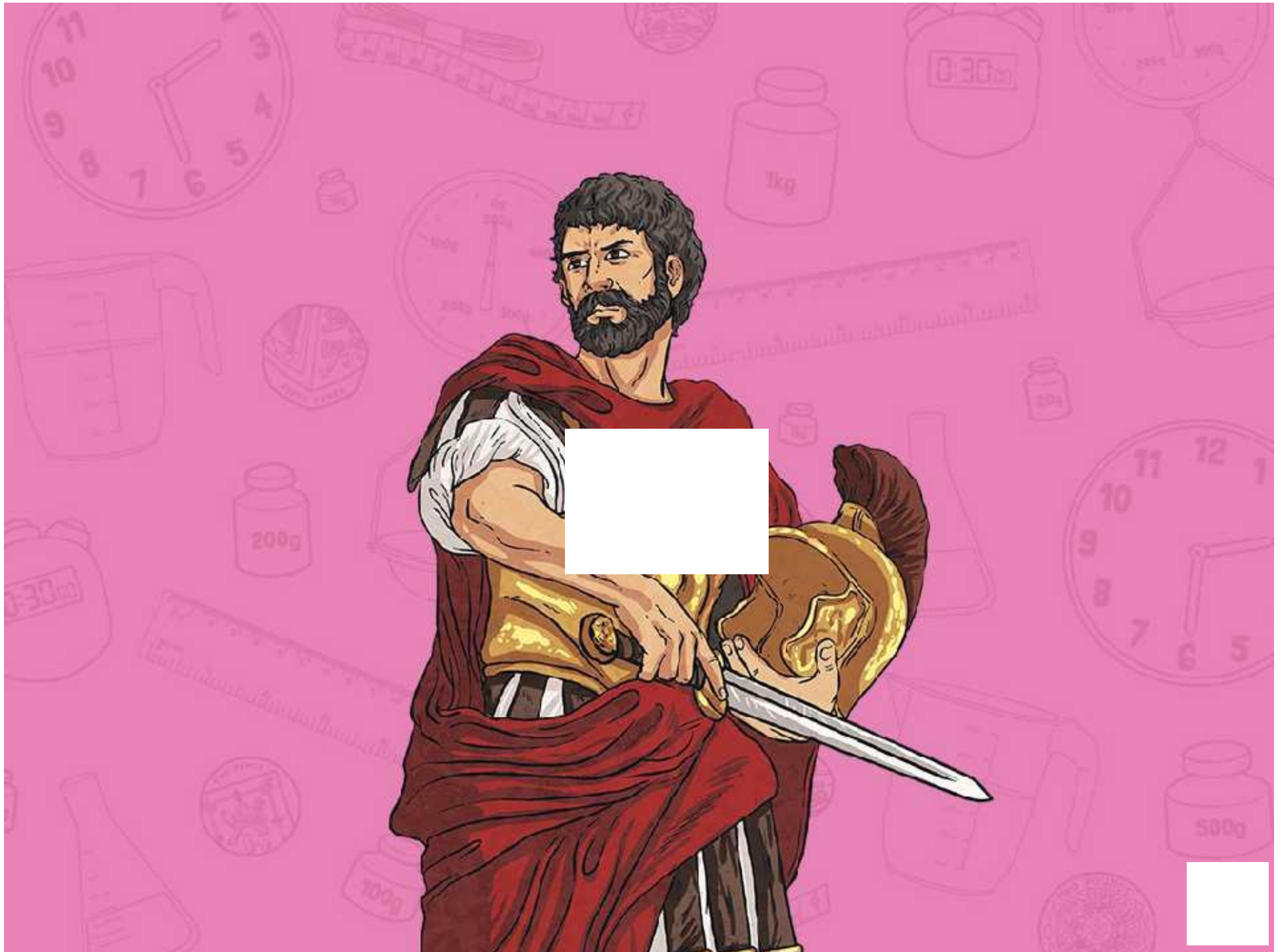
Aim



- I can solve reasoning questions involving area and perimeter.

Success Criteria

- I can break down complex problems into smaller steps.
- I can use mathematical language to explain solutions to problems.



Aim: I can solve reasoning questions involving area and perimeter.				Date:					
				Delivered By:			Support:		
Success Criteria	Me	Friend	Teacher	T	PPA	S	I	AL	GP
I can break down complex problems into smaller steps.				Notes/Evidence					
I can use mathematical language to explain solutions to problems.									
Next Steps									
) _____									
) _____									

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

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Area and Perimeter Reasoning

I can solve reasoning questions involving area and perimeter.

Solve these reasoning questions:

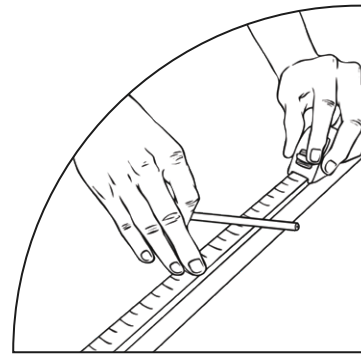
1

A landscape gardener is designing a garden. Part of the garden has a fenced grassed area. The area needs to be at least 30m^2 and have a perimeter of less than 25m . The gardener thinks that the grassed area could be $8\text{m} \times 5\text{m}$. Is he right? Show how you know.



2

A shape has an area of 12cm^2 . The shape has been divided into two identical rectangles. What could be the perimeter of the two rectangles?

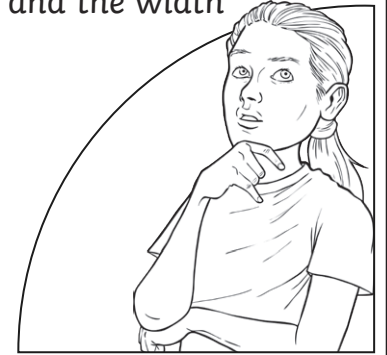


3

Here are some clues to an unknown rectangle:

- Its area is 36cm^2 .
- Its perimeter is less than 36cm .
- The difference between the area and the perimeter is 6.
- Both sides are a whole number of centimetres in length.

What is the length and the width of the rectangle?





Area and Perimeter Reasoning

I can solve reasoning questions involving area and perimeter.



Solve these reasoning questions:

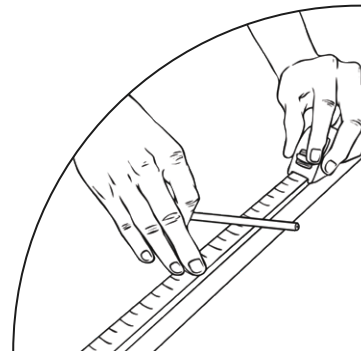
1

A landscape gardener is designing a garden. Part of the garden has a fenced grassed area. The area needs to be 24m^2 and have a perimeter more than 25m. Find a possible rectangular shape that would fit this specification.



2

A shape has an area of 30cm^2 . The shape has been divided into two identical rectangles. What could be the perimeter of the two rectangles?



3

Here are some clues to an unknown rectangle:

- Its area is less than 30cm^2 but more than 25cm^2 .
- Its perimeter is more than 20cm but less than 25cm.
- The difference between the area and the perimeter is 6.
- The difference between the length and the width is 3cm.

What is the length and the width of the rectangle?





Area and Perimeter Reasoning

I can solve reasoning questions involving area and perimeter.



Solve these reasoning questions:

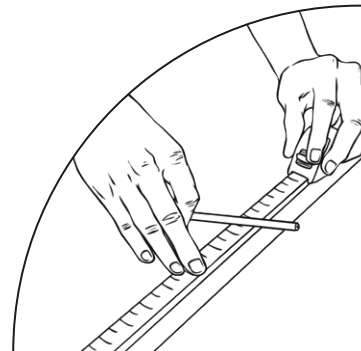
1

A landscape gardener is designing a garden. Part of the garden has a fenced grassed area. The area needs to be 30m^2 and have a perimeter more than 30m . Find all possible rectangular shapes that would fit this specification.



2

A shape has an area of 48cm^2 . The shape has been divided into two identical rectangles. What could be the perimeter of the two rectangles?

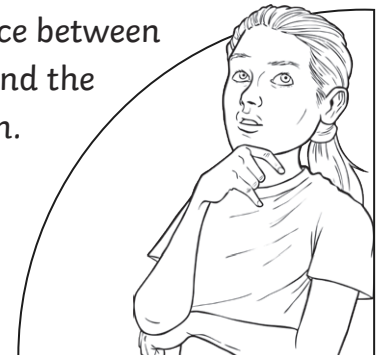


3

Here are some clues to an unknown rectangle (not a square):

- Its area is less than 42cm^2 but more than 35cm^2 .
- Its perimeter is more than 25cm but less than 32cm .
- The difference between the area and the perimeter is 12 .
- The difference between the length and the width is 6cm .

What is the length and the width of the rectangle?



Area and Perimeter Reasoning Answers

★	
1	<p>The area of the grassed area is $8m \times 5m = 40m^2$. So the area is OK.</p> <p>The perimeter of the grassed area is $(8m + 5m) \times 2 = 26m$. This is more than 25m, so this is not OK.</p> <p>The grassed area could not be $8m \times 5m$.</p>
2	The perimeters could be: 10cm, 11cm, 14cm or 25cm. Any of these answers is correct.
3	The rectangle is 12cm \times 3cm.

★★	
1	The grassed area could have a perimeter of 24m \times 1m or 12m \times 2m. Either of these answers is correct.
2	The perimeters could be: 16cm, 17cm, 19cm, 23cm, 32cm or 61cm. Any of these answers is correct.
3	The rectangle is 7cm \times 4cm.

★★★	
1	The grassed area could have a perimeter of 30m \times 1m or 15m \times 2m. Both of these answers needed to be correct.
2	The perimeters could be: 20cm, 22cm, 28cm, 35cm, 50cm or 97cm. Any of these answers is correct.
3	The rectangle is 10cm \times 4cm.

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