Measurement: Same Perimeter, Different Area

Aim:	**Success Criteria:**	**Resources:**
I can recognise that shapes with the same areas can have different perimeters and vice versa. I can find shapes with the same perimeter but different areas.	I can find squares and rectangles which have the same perimeter. I can organise my results to ensure I have found all possible variations. I can solve problems involving perimeter and area.	**Lesson Pack** Squared paper
	Key/New Words: Area, perimeter, investigate, order.	**Preparation:** Differentiated **Perimeter and Area Activity Sheet** – one per child **Extra Challenge Activity Sheet** – as required

Prior Learning:	It will be helpful if children have investigated shapes with the same area but different perimeters *(covered in Area and Perimeter (Lesson 1): Same Area, Different Perimeter).*

Learning Sequence

	**Same Area, Different Perimeter:** Children draw as many different squares and rectangles as they can with an area of 20 squares, but with different perimeters. They use only whole-number measurements. Repeat with shapes of area 18 squares.	
	**Perimeter and Area:** Children find squares and rectangles which have a perimeter of 16m, but have different areas. Use the **Lesson Presentation** to explain how using an ordered table helps to find all possibilities. They then find all squares and rectangles which have perimeters of 24m. The shapes they find use only whole number measurements.	
	**Linking Perimeter and Area:** Children complete the differentiated **Perimeter and Area Activity Sheet**, finding all squares and rectangles with a given perimeter. The shapes they find use only whole number measurements.  Children find all the possible rectangles and squares with perimeters of 12cm and 20cm. Children answer a simple reasoning style question.  Children find all the possible rectangles and squares with perimeters of 30cm and 42mm. Children answer a reasoning type question.  Children find all the possible rectangles and squares with perimeters of 38mm and 50m. Children answer two reasoning type questions. An **Extra Challenge Activity Sheet** is provided.	
	**Perimeter Problem:** Children complete a problem which involves finding a shape with the smallest area and calculating the cost of fencing and turf.	

Exploreit

Designit: Children choose a perimeter measurement, for example, 80cm. They find all the different rectangles and squares which have this perimeter. They then display their findings in the form of a poster.

Createit: Children create their own word problems like the problems in the lesson, linking perimeter and area. They work out the answers and share with other children.

Maths

Measurement

Same Perimeter, Different Area

Aim

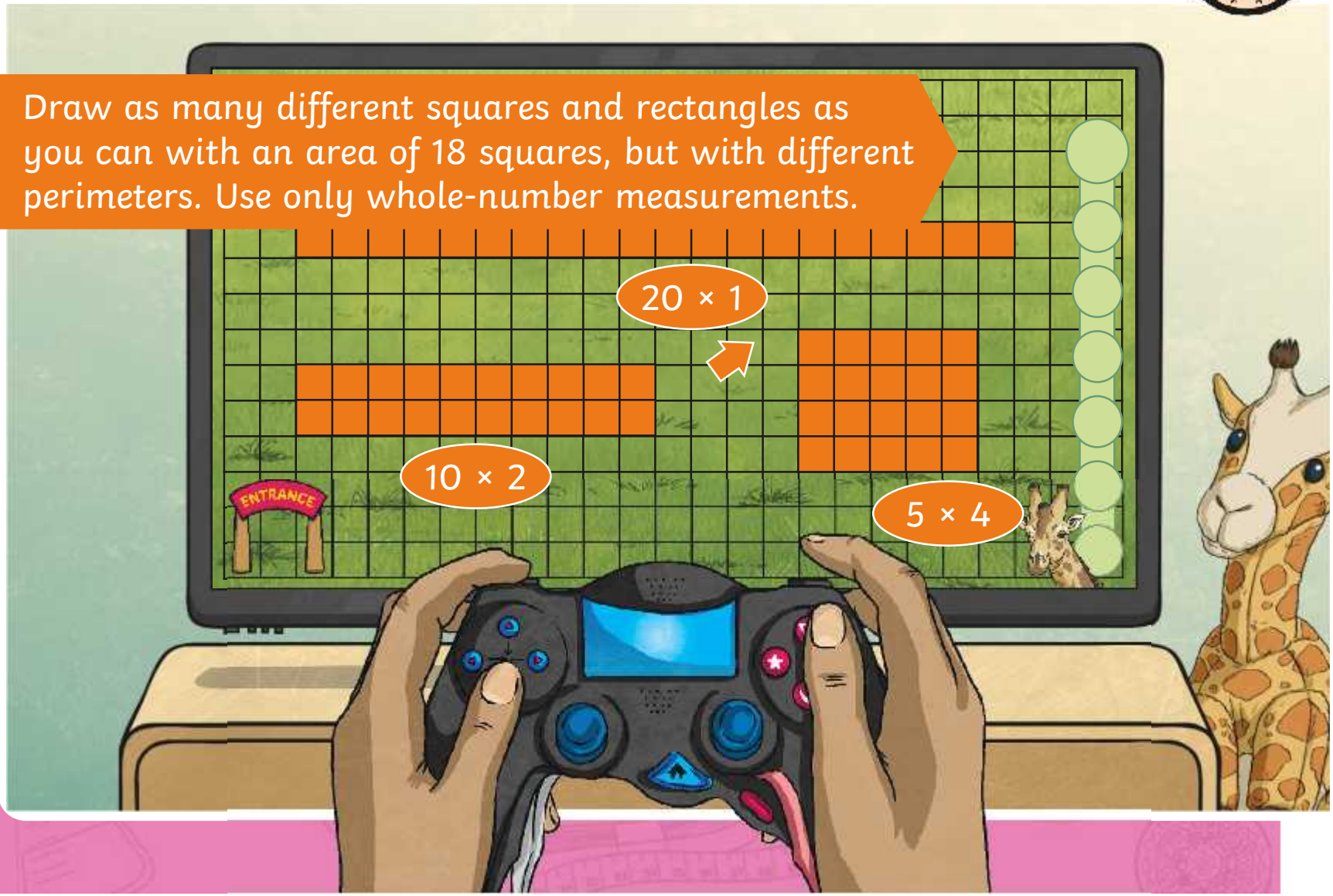
- I can investigate shapes with the same perimeter but different areas.

Success Criteria

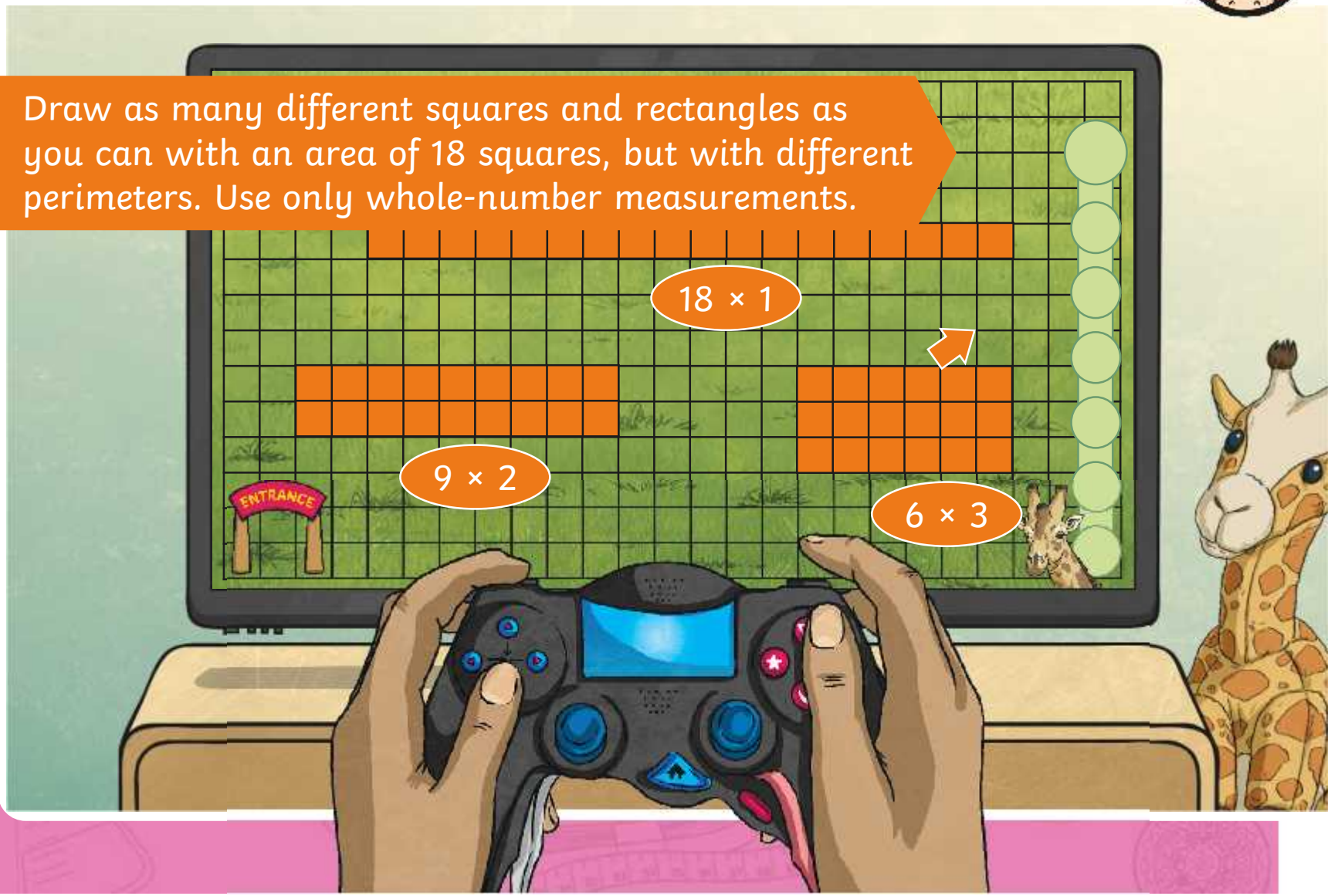
- I can find squares and rectangles which have the same perimeter.
- I can organise my results to ensure I have found all possible variations.
- I can solve problems involving perimeter and area.

Same Area, Different Perimeter

Draw as many different squares and rectangles as you can with an area of 18 squares, but with different perimeters. Use only whole-number measurements.



Same Area, Different Perimeter



Perimeter and Area

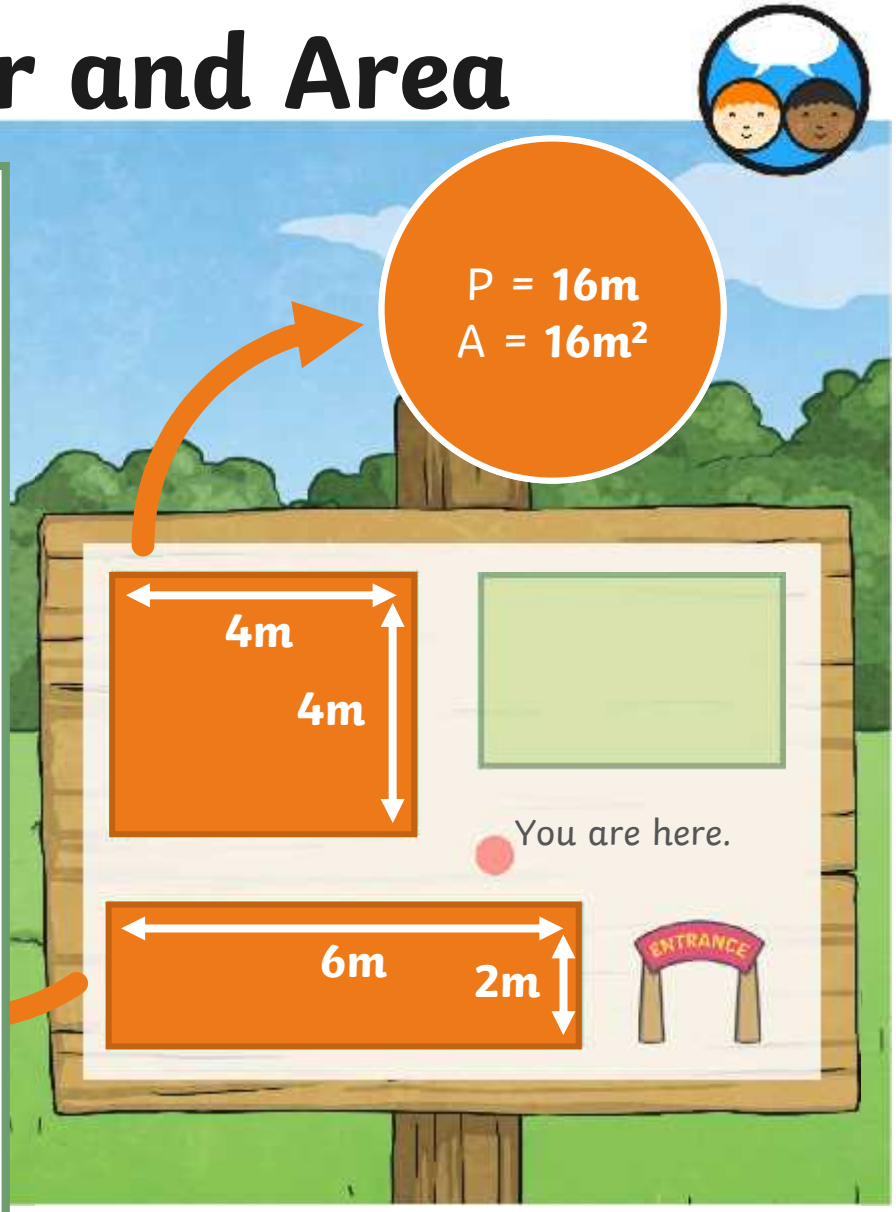
Using only whole-number measurements, how would you find another rectangle or square which also has a perimeter of 16m?

Find pairs of numbers which add up to 8.

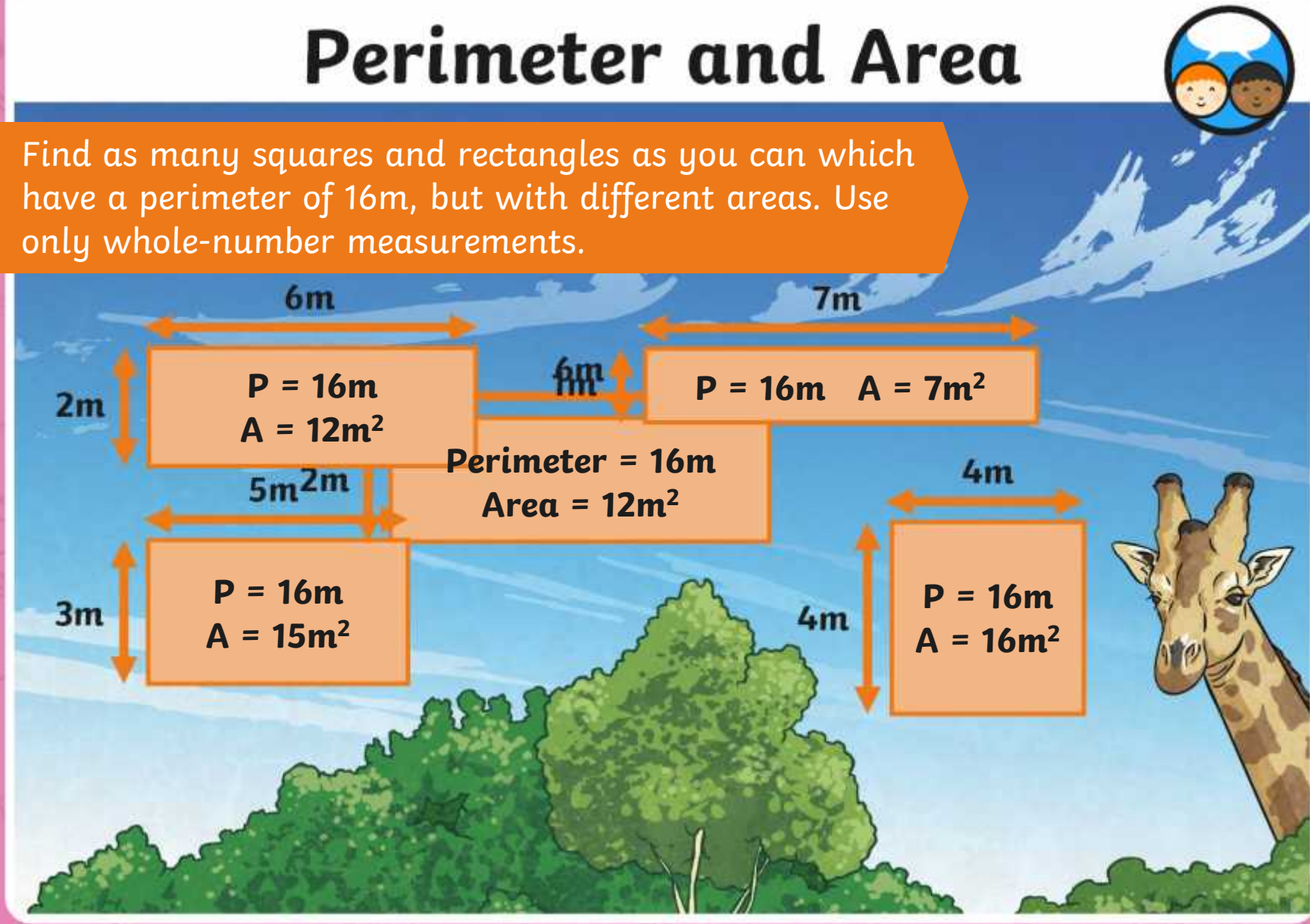
Why?

Perimeter = **(length + width) × 2**

The length and width need to total half of the perimeter.

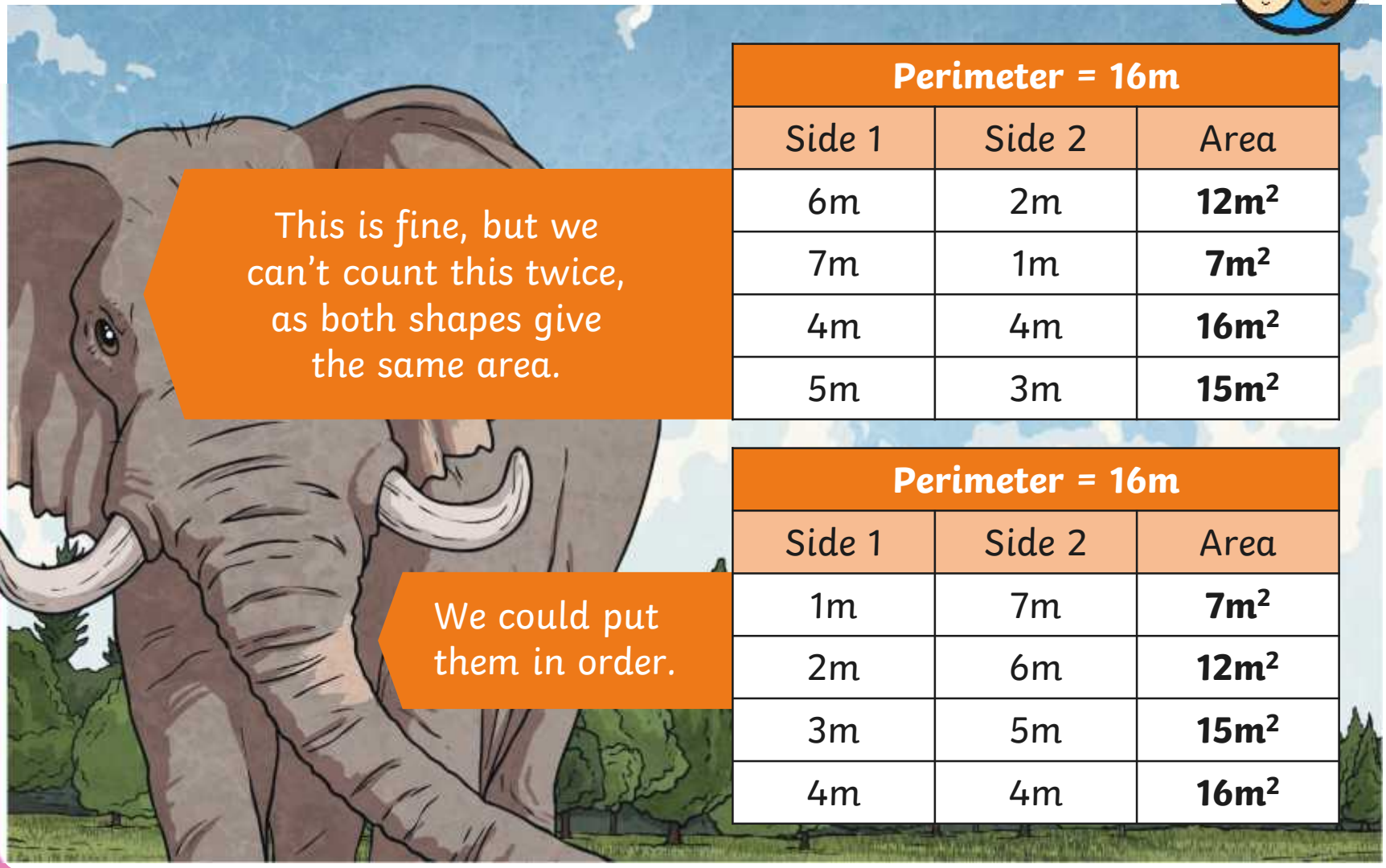


Perimeter and Area



Find as many squares and rectangles as you can which have a perimeter of 16m, but with different areas. Use only whole-number measurements.

Perimeter and Area



This is fine, but we can't count this twice, as both shapes give the same area.

We could put them in order.

Perimeter = 16m		
Side 1	Side 2	Area
6m	2m	**12m²**
7m	1m	**7m²**
4m	4m	**16m²**
5m	3m	**15m²**

Perimeter = 16m		
Side 1	Side 2	Area
1m	7m	**7m²**
2m	6m	**12m²**
3m	5m	**15m²**
4m	4m	**16m²**

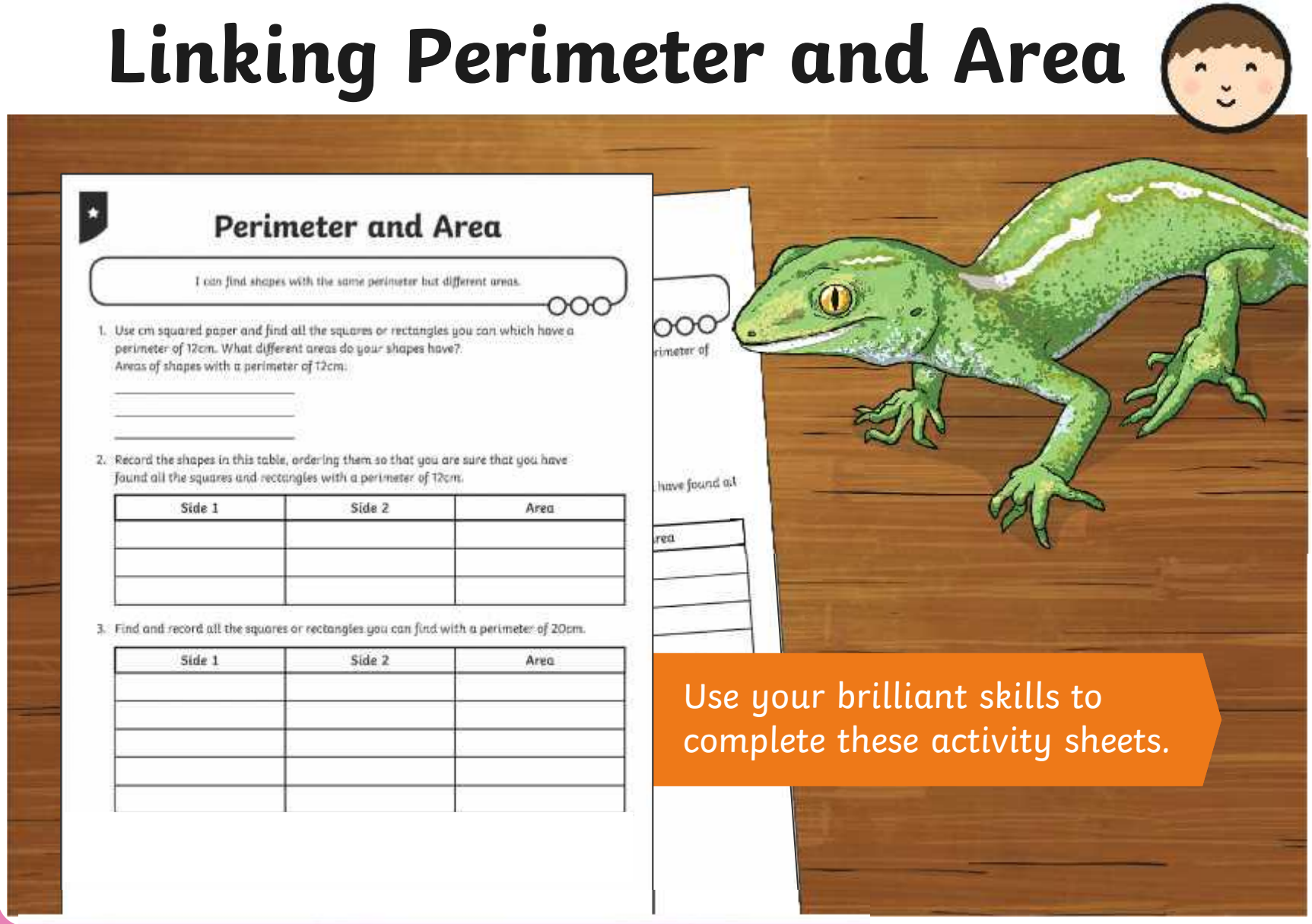
Perimeter and Area

Find as many squares and rectangles you can which have perimeters of 24cm, but have different areas. Use only whole-number measurements.

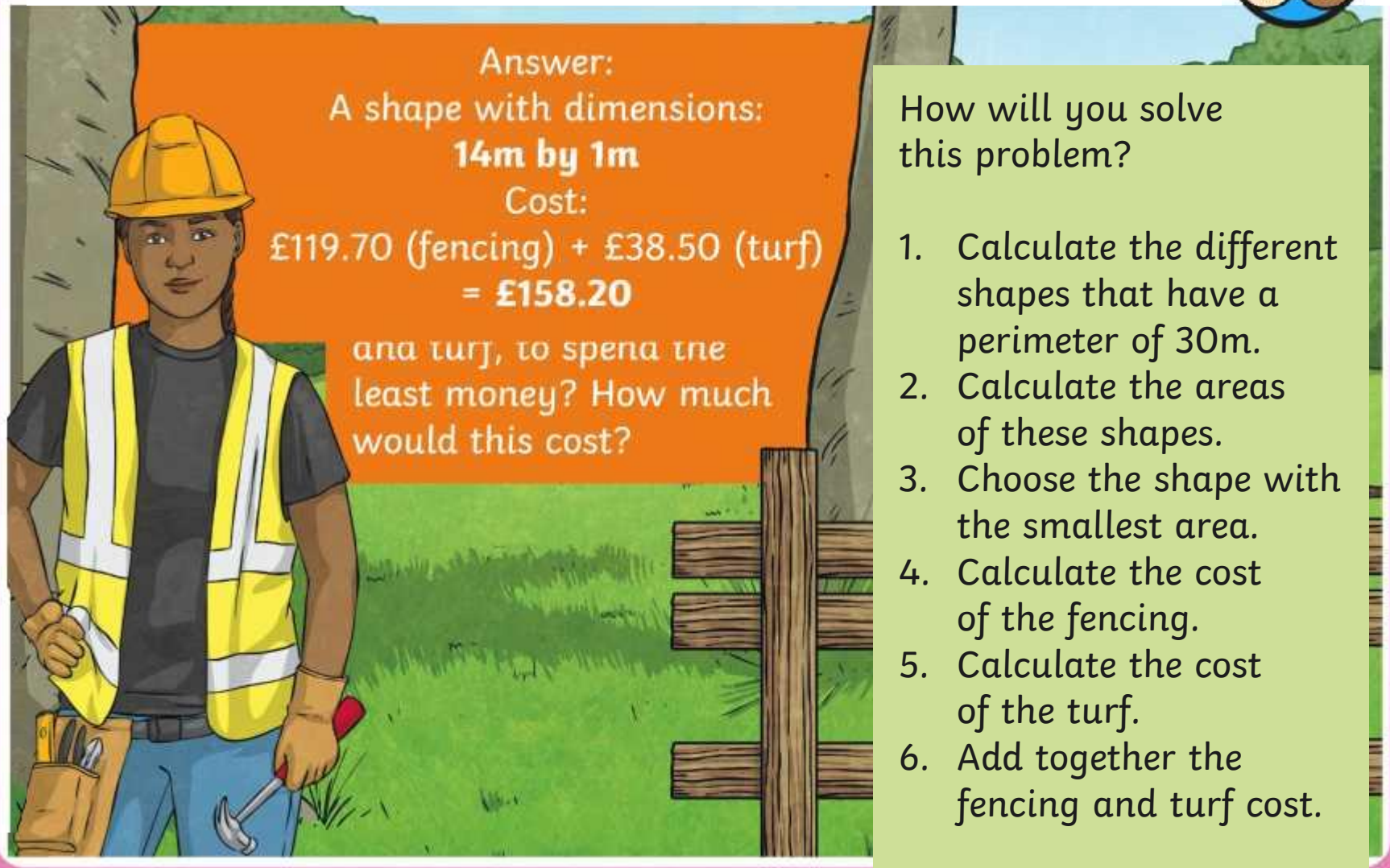
Side 1	Side 2	Area
6cm	6cm	**36cm²**
5cm	7cm	**35cm²**
4cm	8cm	**32cm²**
3cm	9cm	**27cm²**
2cm	10cm	**20cm²**
1cm	11cm	**11cm²**

Or the table could be written the other way around.

Linking Perimeter and Area



Perimeter Problem



How will you solve this problem?

1. Calculate the different shapes that have a perimeter of 30m.
2. Calculate the areas of these shapes.
3. Choose the shape with the smallest area.
4. Calculate the cost of the fencing.
5. Calculate the cost of the turf.
6. Add together the fencing and turf cost.

Aim

- I can investigate shapes with the same perimeter but different areas.

Success Criteria

- I can find squares and rectangles which have the same perimeter.
- I can organise my results to ensure I have found all possible variations.
- I can solve problems involving perimeter and area.

Aim: I can find shapes with the same perimeter but different areas.				**Date:**					
				Delivered By:			**Support:**		
Success Criteria	**Me**	**Friend**	**Teacher**	**T**	**PPA**	**S**	**I**	**AL**	**GP**
I can find squares and rectangles which have the same perimeter.				**Notes/Evidence**					
I can organise my results to ensure I have found all possible variations.									
I can solve problems involving perimeter and area.									

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

- _____
- _____

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

Perimeter and Area

I can find shapes with the same perimeter but different areas.

1. Use cm squared paper and find all the squares or rectangles you can which have a perimeter of 12cm. What different areas do your shapes have?
   Areas of shapes with a perimeter of 12cm:

   _____

   _____

   _____

2. Record the shapes in this table, ordering them so that you are sure that you have found all the squares and rectangles with a perimeter of 12cm.

Side 1	Side 2	Area

3. Find and record all the squares or rectangles you can find with a perimeter of 20cm.

Side 1	Side 2	Area

4. A shape has a perimeter of 16cm and an area of 16cm^2. Draw the shape and label the sides.

Perimeter and Area Answers

Areas:

5cm²,
8cm²,
9cm²
(in any order)

2.

Side 1	Side 2	Area
5cm	1cm	5cm²
4cm	2cm	8cm²
3cm	3cm	9cm²

or

Side 1	Side 2	Area
1cm	5cm	5cm²
2cm	4cm	8cm²
3cm	3cm	9cm²

It could also be written the other way:

Side 1	Side 2	Area
3cm	3cm	9cm²
4cm	2cm	8cm²
5cm	1cm	5cm²

or

Side 1	Side 2	Area
3cm	3cm	9cm²
2cm	4cm	8cm²
1cm	5cm	5cm²

3.

Side 1	Side 2	Area
9cm	1cm	9cm²
8cm	2cm	16cm²
7cm	3cm	21cm²
6cm	4cm	24cm²
5cm	5cm	25cm²

or

Side 1	Side 2	Area
1cm	9cm	9cm²
2cm	8cm	16cm²
3cm	7cm	21cm²
4cm	6cm	24cm²
5cm	5cm	25cm²

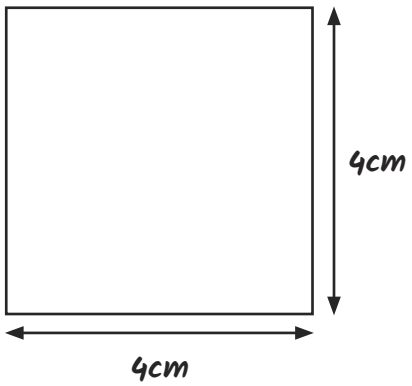
It could also be written the other way:

Side 1	Side 2	Area
5cm	5cm	25cm²
6cm	4cm	24cm²
7cm	3cm	21cm²
8cm	2cm	16cm²
9cm	1cm	9cm²

or

Side 1	Side 2	Area
5cm	5cm	25cm²
4cm	6cm	24cm²
3cm	7cm	21cm²
2cm	8cm	16cm²
1cm	9cm	9cm²

4. Shape does not need to be drawn to scale.



Perimeter and Area

I can find shapes with the same perimeter but different areas.

1. Use plain paper and find all the squares or rectangles you can which have a perimeter of 30cm. What different areas do these shapes have?

2. Record the shapes in this table, ordering them so that you are sure that you have found all the squares and rectangles with an perimeter of 30cm.

Side 1	Side 2	Area

3. Find and record all the squares or rectangles you can find with a perimeter of 42mm.

Side 1	Side 2	Area

4. The perimeter of a shape is 24m. The area is 20m^2. What are the dimensions of the shape?

Perimeter and Area Answers

1. Areas: **14cm², 26cm², 36cm², 44cm², 50cm², 54cm², 56cm²** (in any order)

2.

Side 1	Side 2	Area
14cm	1cm	14cm²
13cm	2cm	26cm²
12cm	3cm	36cm²
11cm	4cm	44cm²
10cm	5cm	50cm²
9cm	6cm	54cm²
8cm	7cm	56cm²

or

Side 1	Side 2	Area
1cm	14cm	14cm²
2cm	13cm	26cm²
3cm	12cm	36cm²
4cm	11cm	44cm²
5cm	10cm	50cm²
6cm	9cm	54cm²
7cm	8cm	56cm²

It could also be written the other way:

Side 1	Side 2	Area
8cm	7cm	56cm²
9cm	6cm	54cm²
10cm	5cm	50cm²
11cm	4cm	44cm²
12cm	3cm	36cm²
13cm	2cm	26cm²
14cm	1cm	14cm²

or

Side 1	Side 2	Area
7cm	8cm	56cm²
6cm	9cm	54cm²
5cm	10cm	50cm²
4cm	11cm	44cm²
3cm	12cm	36cm²
2cm	13cm	26cm²
1cm	14cm	14cm²

Side 1	Side 2	Area
20mm	1mm	20mm²
19mm	2mm	38mm²
18mm	3mm	54mm²
17mm	4mm	68mm²
16mm	5mm	80mm²
15mm	6mm	90mm²
14mm	7mm	98mm²
13mm	8mm	104mm²
12mm	9mm	108mm²
11mm	10mm	110mm²

or

Side 1	Side 2	Area
1mm	20mm	20mm²
2mm	19mm	38mm²
3mm	18mm	54mm²
4mm	17mm	68mm²
5mm	16mm	80mm²
6mm	15mm	90mm²
7mm	14mm	98mm²
8mm	13mm	104mm²
9mm	12mm	108mm²
10mm	11mm	110mm²

It could also be written the other way:

Side 1	Side 2	Area
11mm	10mm	110mm²
12mm	9mm	108mm²
13mm	8mm	104mm²
14mm	7mm	98mm²
15mm	6mm	90mm²
16mm	5mm	80mm²
17mm	4mm	68mm²
18mm	3mm	54mm²
19mm	2mm	38mm²
20mm	1mm	20mm²

or

Side 1	Side 2	Area
10mm	11mm	110mm²
9mm	12mm	108mm²
8mm	13mm	104mm²
7mm	14mm	98mm²
6mm	15mm	90mm²
5mm	16mm	80mm²
4mm	17mm	68mm²
3mm	18mm	54mm²
2mm	19mm	38mm²
1mm	20mm	20mm²

4. The dimensions are 10m by 2m.

Perimeter and Area

I can find shapes with the same perimeter but different areas.

Try to do these questions just by calculating without drawing the shapes, then check by drawing.

1. Find all the squares or rectangles you can which have a perimeter of 38mm. What different areas did your shapes make?

2. Record the shapes in this table, ordering them so that you are sure that you have found all the squares and rectangles with a perimeter of 38mm.

Side 1	Side 2	Area

3. Find and record all the squares or rectangles you can find with a perimeter of 50m.

Side 1	Side 2	Area

4. The perimeter of a shape is 40cm. The area is 51cm^2. What are the dimensions of the shape?

5. If the perimeter is an odd number, what will this mean about the length of the sides? Place a tick by any statement which you think is true and give an example to show why you think it is correct:

   ○ The length and the width are both odd numbers.

   _____

   ○ The length and the width need to be an odd and an even number.

   _____

   ○ At least one of the sides of the rectangle will not be a whole number.

   _____

Perimeter and Area Answers

1. Areas: **18mm², 34mm², 44mm², 60mm², 70mm², 78mm², 84mm², 88mm², 90mm²** (in any order)

2.

Side 1	Side 2	Area
18mm	1mm	18mm²
17mm	2mm	34mm²
16mm	3mm	48mm²
15mm	4mm	60mm²
14mm	5mm	70mm²
13mm	6mm	78mm²
12mm	7mm	84mm²
11mm	8mm	88mm²
10mm	9mm	90mm²

or

Side 1	Side 2	Area
1mm	18mm	18mm²
2mm	17mm	34mm²
3mm	16mm	48mm²
4mm	15mm	60mm²
5mm	14mm	70mm²
6mm	13mm	78mm²
7mm	12mm	84mm²
8mm	11mm	88mm²
9mm	10mm	90mm²

It could also be written the other way:

Side 1	Side 2	Area
10mm	9mm	90mm²
11mm	8mm	88mm²
12mm	7mm	84mm²
13mm	6mm	78mm²
14mm	5mm	70mm²
15mm	4mm	60mm²
16mm	3mm	48mm²
17mm	2mm	34mm²
18mm	1mm	18mm²

or

Side 1	Side 2	Area
9mm	10mm	90mm²
8mm	11mm	88mm²
7mm	12mm	84mm²
6mm	13mm	78mm²
5mm	14mm	70mm²
4mm	15mm	60mm²
3mm	16mm	48mm²
2mm	17mm	34mm²
1mm	18mm	18mm²

3.

Side 1	Side 2	Area
24m	1m	24m²
23m	2m	46m²
22m	3m	66m²
21m	4m	84m²
20m	5m	100m²
19m	6m	114m²
18m	7m	126m²
17m	8m	136m²
16m	9m	144m²
15m	10m	150m²
14m	11m	154m²
13m	12m	156m²

or

Side 1	Side 2	Area
1m	24m	24m²
2m	23m	46m²
3m	22m	66m²
4m	21m	84m²
5m	20m	100m²
6m	19m	114m²
7m	18m	126m²
8m	17m	136m²
9m	16m	144m²
10m	15m	150m²
11m	14m	154m²
12m	13m	156m²

It could also be written the other way:

Side 1	Side 2	Area
13m	12m	156m²
14m	11m	154m²
15m	10m	150m²
16m	9m	144m²
17m	8m	136m²
18m	7m	126m²
19m	6m	114m²
20m	5m	100m²
21m	4m	84m²
22m	3m	66m²
23m	2m	46m²
24m	1m	24m²

or

Side 1	Side 2	Area
12m	13m	156m²
11m	14m	154m²
10m	15m	150m²
9m	16m	144m²
8m	17m	136m²
7m	18m	126m²
6m	19m	114m²
5m	20m	100m²
4m	21m	84m²
3m	22m	66m²
2m	23m	46m²
1m	24m	24m²

4. The dimensions are 17cm by 3cm.

5. If the perimeter is an odd number, what will this mean about the length of the sides? Place a tick by any statement which you think is true and give an example to show why you think it is correct:

   ○ The length and the width are both odd numbers.

   _____

   ○ The length and the width need to be an odd and an even number.

   _____

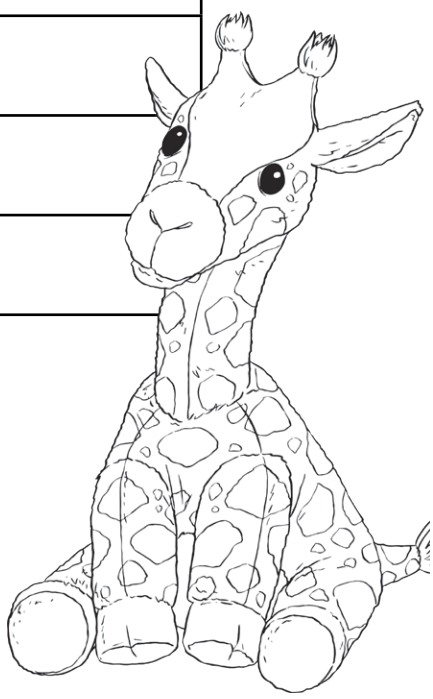
   ✓ At least one of the sides of the rectangle will not be a whole number.
   An example shows that statement c is correct, for example:
   perimeter = 25cm, length = 10cm, width = 2.5cm.

Perimeter and Area Using Half Units

I can investigate shapes with the same perimeter but different areas.

1. Find and record all the squares or rectangles you can find with a perimeter of 20 units. Use both whole and half units for the measurements of sides.

Side 1	Side 2	Area



2. Find and record all the squares or rectangles you can find with a perimeter of 36 units. Use both whole and half units for the measurements of sides.

Side 1	Side 2	Area

Perimeter and Area Using Half Units Answers

1.

Side 1	Side 2	Area
0.5	9.5	4.75
1	9	9
1.5	8.5	12.75
2	8	16
2.5	7.5	18.75
3	7	21
3.5	6.5	22.75
4	6	24
4.5	5.5	24.75
5	5	25

2.

Side 1	Side 2	Area
0.5	17.5	8.75
1	17	17
1.5	16.5	24.75
2	16	32
2.5	15.5	38.75
3	15	45
3.5	14.5	50.75
4	14	56
4.5	13.5	60.75
5	13	65
5.5	12.5	68.75
6	12	72
6.5	11.5	74.75
7	11	77
7.5	10.5	78.75
8	10	80
8.5	9.5	80.75
9	9	81

Measurement | Same Perimeter, Different Area

I can find shapes with the same perimeter but different areas.		
I can find squares and rectangles which have the same perimeter.		
I can organise my results to ensure I have found all possible variations.		
I can solve problems involving perimeter and area.		

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