# Years 4/5

## Small Steps Guidance and Examples

### Block 4: Length & Perimeter

**White R☉se Maths**

# Overview

## Small Steps

| Year 4 | Year 5 |
|---|---|
| Kilometres | Converting between units of length |
| Perimeter on a grid | Measure perimeter |
| Perimeter of a rectangle | Calculate perimeter |
| Perimeter of rectilinear shapes | Find unknown lengths |

# Kilometres

## Notes and Guidance

Here children use their new knowledge of four digit numbers in a real life context.

These contexts could include running, swimming, cycling etc.

## Mathematical Talk

If you were to walk for 1km along the road from your school, where would you be?

How can you tell if your answer is sensible?

Explain to a friend how to convert km to m and vice versa?

How far do you travel to school? Do you travel more or less than 1km?

Visualise 1km – can we measure it out on the school field or the playground?
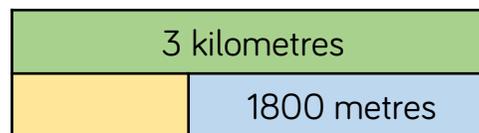
## Varied Fluency

**1** Complete the statements.

3000m    = [＿＿＿] km

5km    = [＿＿＿] m

500m    = [＿＿＿] km

9500m    = [＿＿＿] km

**2** Complete the bar model.

| 3 kilometres |
|---|

|  | 1800 metres |
|---|---|

**3** Use <, > or = to make the statements correct.

500m    ◯    $\frac{1}{2}$ km

7km    ◯    800m

5km    ◯    500m

# Kilometres

## Reasoning and Problem Solving

James and Sita do a sponsored walk for charity.

They walk 15km altogether.

James walks double the amount that Sita walks.

How far does Sita walk?

They each raise £1 for every 500m they walk.

How much money do they each make?
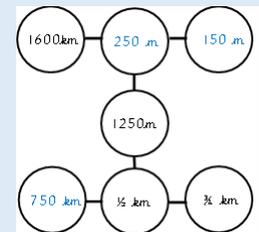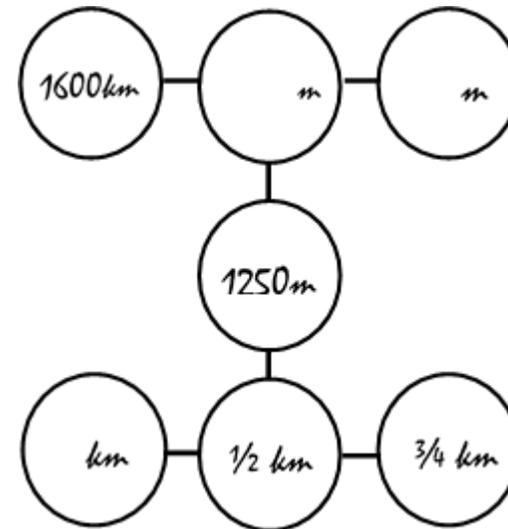
James _____    Sita _____

James walks 10km

Sita walks 5km

James raises £20

Sita raises £10

Complete the missing measurements so that each line of three gives a total distance of 2km.

# Convert Units of Length

## Notes and Guidance

Children will use their knowledge of multiplying and dividing by 10, 100 and 1,000 to convert between different units of length.

Teachers will support children to convert in both directions. E.g. from metres to kilometres and vice versa, where the number of decimal places given varies.

## Mathematical Talk

How many millimetres are equivalent to one centimetre?

How many centimetres are equivalent to one metre?

How many metres are equivalent to one kilometre?

What calculation do you need to do to convert between _____ and _____?

## Varied Fluency

1 Complete the statements below using =, < and >

98 cm ◯ 1 m

10 mm ◯ 1 cm

30,100 m ◯ 31 km

2 Write the height of the 2 people in centimetres.

1 m 23 cm

_____ cm

1 m 76 cm

_____ cm

What would their heights be in millimetres?

3 A football pitch is 90 m long.
A tennis court is 0.023 km long.

How much longer is the football pitch in metres?

# Convert Units of Length

## Reasoning and Problem Solving

A 5p coin has a thickness of 1.6 mm

Sally makes a tower of 5p coins worth 90p

A £1 coin has a thickness of 1.9 mm

Emma makes a tower of £1 coins worth £8.

What is the difference in the height of the two towers in cm?

Sally's tower:
18 x 1.6 mm = 28.8mm/2.88 cm

Emma's tower:
8 x 1.9 mm = 15.2 mm/1.52 cm

Difference:
2.88 cm – 1.52 cm = 1.36 cm

Molly, Daisy and Jess each need some ribbon for presents.

The roll they have is 10 metres long.

Molly needs 2.1 metres of ribbon.

Daisy needs twice as much as Molly.

Jess needs 15cm more than Molly.

The girls think they will need more than 1 roll.

Do you agree with them?

Prove it.

Possible answer:

I don't agree with them because they will need
210 cm + 420 cm + 225 cm
which equals 855 cm.
The roll holds 1000 cm so they will have enough.

# Perimeter on a Grid

## Notes and Guidance

Children calculate the perimeter of rectilinear shapes by counting squares on a grid. They can use cm squares or work in pairs and groups on larger grids.

They should be encouraged to explore which arrangements lead to longer perimeters and begin to see patterns linked to the way the squares are arranged.

## Mathematical Talk

Can you estimate which of two shapes would have the longer perimeter?

How do you decide where to start counting?

Can you make a shape with double the perimeter?

Can you make a shape with half the perimeter of shape x?

When do you need to find the perimeter of a shape in real life?

## Varied Fluency

1 Work out the perimeter of the shape.
Can you draw a different shape with :
a) the same perimeter
b) a perimeter which is 5cm longer
c) a perimeter which is double/half the length of this one.
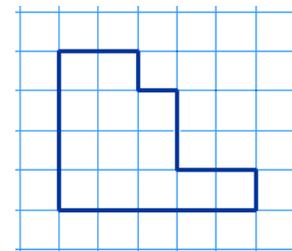


2 Using squared paper draw two rectilinear shapes, each with a perimeter of 28cm
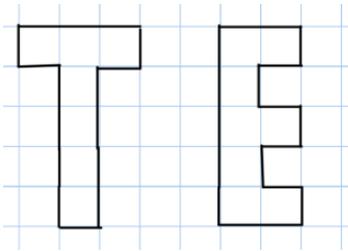What's the same and what's different about these shapes?

3 Draw and find the perimeter of these shapes in cm.
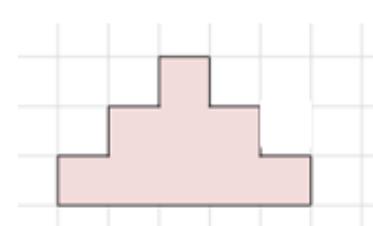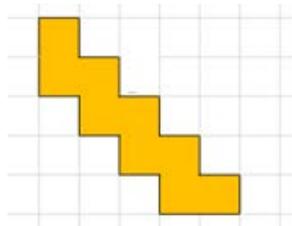
# Perimeter on a Grid

## Reasoning and Problem Solving

Which of these shapes has the longest perimeter?



Explore other letters which could be drawn as rectilinear shapes.

Put them in order of shortest to longest perimeter.

Can you make a word?

E has a greater perimeter it is 18 compared to 16 for T.
Open ended
Letters which could be drawn include:

B C D F I J L O P
Letters with diagonal lines would be omitted.

If heights of letters are kept the same, I or L could be the shortest.

You have 10 paving stones to design a patio. The stones are one metre square.

The stones must be joined to each other so that at least one edge is joined corner to corner.
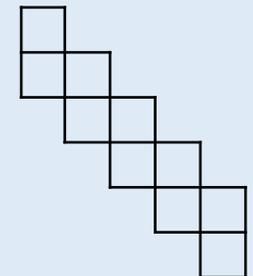


Use squared paper to show which design would give the longest perimeter and which would give the shortest.

The shortest perimeter would be 14m in a 2x5 arrangement or 3x3 square with one added on.
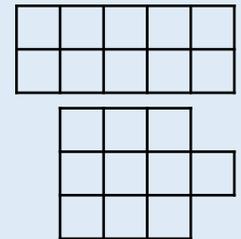


The longest would be 22m.

# Measure Perimeter

## Notes and Guidance

Children measure the perimeter of rectilinear shapes on a grid or by measuring with a ruler.

It is important that children measure all the sides of the shape and label them as they work round the shape to ensure they measure accurately.
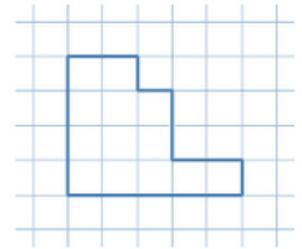
## Mathematical Talk

What rules do I need to remember to ensure I am measuring accurately with a ruler?

How can I make sure I don't miss any sides when measuring the perimeter?

Can I use facts about opposite sides of a rectangle to check if I am accurate with my measuments?
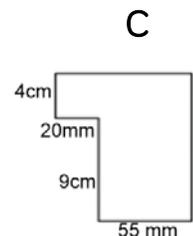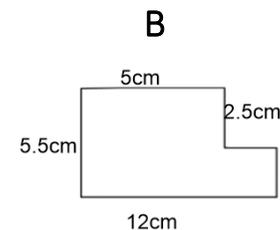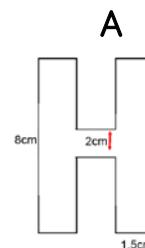
## Varied Fluency

1   Here is a shape drawn on a cm$^2$ grid. Draw the shape to scale and find the perimeter.

2   Use a ruler to measure the perimeter of the shape.

3   Draw the following shapes to scale and find the perimeter of each shape.
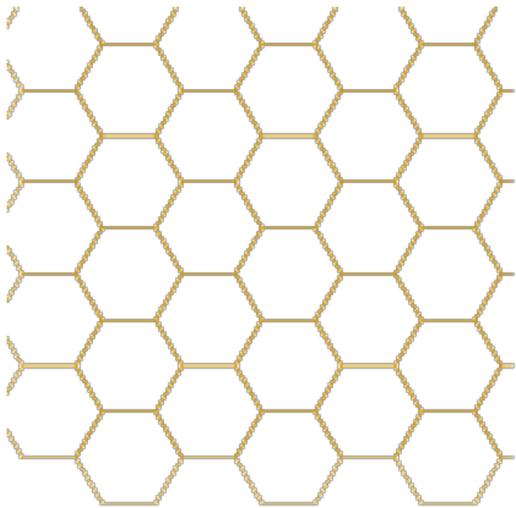Order them from smallest to greatest

A

8cm    2cm
1.5cm

B

5cm
2.5cm
5.5cm
12cm

C

4cm
20mm
9cm
55 mm

# Measure Perimeter

## Reasoning and Problem Solving

Each regular hexagon has sides measuring 2cm.

Can you construct a shape with a perimeter of 44cm?



**Possible answer**



Investigate the different ways you can make composite rectilinear shapes with a perimeter of 54cm.

# Perimeter of a Rectangle

## Notes and Guidance

In this step, children look at rectangles no longer on a square grid where some values may be missing.

They should explore different ways of expressing the calculation using known number facts including multiplication and division.

## Mathematical Talk

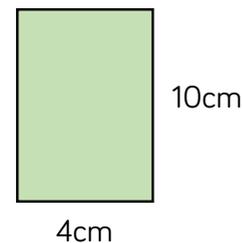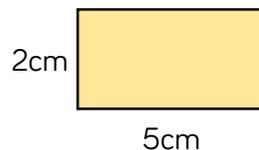What do you need to know to work out the perimeter?

How do you know the value of each side?

What shape is this? (square) If you only have the length of one side, how can you calculate the perimeter?
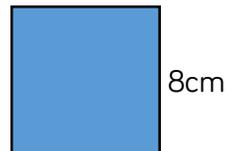
What is a more efficient way of calculating the perimeter?

## Varied Fluency

1. Work out the perimeter of the rectangles.

2cm

5cm

10cm

4cm

2. Work out the perimeter of the square.

8cm

3. The perimeter of the rectangle is 36m. What is the length of the longest side?

6cm

# Perimeter of a Rectangle

## Reasoning and Problem Solving

The width of a rectangle is 2 metres less than the length.
The perimeter of the rectangle is between 20m and 30m.
What could the dimensions of the rectangle be?

Draw all the rectangles that fit these rules.
Use 1cm=1m.

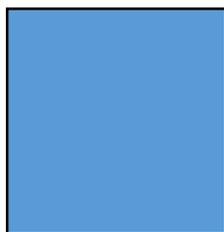If the perimeter ...
20m
Length = 6m
Width = 4m
24m
Length = 7m
Width = 5m
28m
Length = 8m
Width = 6cm

The perimeter of a square is 16cm. How long is each side?

4cm

**Always, sometimes, never.**
When all the sides of a rectangle are odd numbers, the perimeter is even.
Prove it.

Always because when adding an odd and an odd they always equal an even number.

Here is a square. Each of the sides is whole number of metres.

Which of these lengths could be the perimeter of the shape?
24m, 34m, 44m, 54m, 64m, 74m

Why could the other values not be the perimeter?

24cm

Sides = 6cm

44cm

Sides = 11cm

64cm

Sides 16cm

# Calculate Perimeter

## Notes and Guidance

Children calculate the perimeter of rectilinear shapes where they are given all the lengths.

They use their addition skills to calculate the perimeter and use their number bonds to add more efficiently.

Children draw a variety of shapes with the same perimeter.

## Mathematical Talk

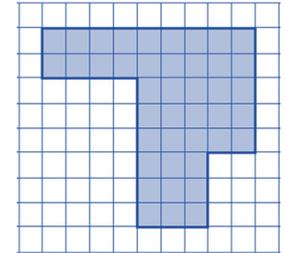How can you ensure that you add up the length of every side?

Do you have to add them in a specific order, can you look for number bonds to add more efficiently?

Can you work systematically to draw a variety of shapes with the same perimeter?
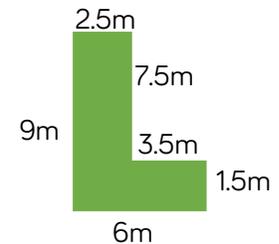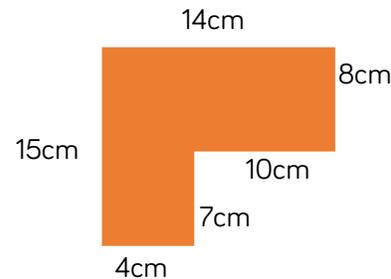
## Varied Fluency

1  Here is a shape drawn on a centimetre squared grid.

Label the length of each side of the shape.

Calculate the perimeter of the shape.
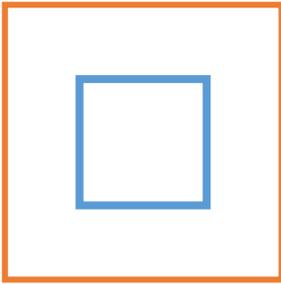
2  Calculate the perimeter of the rectilinear shapes.

14cm
8cm
15cm
10cm
7cm
4cm

2.5m
7.5m
9m
3.5m
1.5m
6m

3  How many hexagons can you draw with a perimeter of 30cm?

# Calculate Perimeter

## Reasoning and Problem Solving

Here is a square inside another square.



The perimeter of the inner square is 16cm
The outer square's perimeter is four times the size of the inner square.
What is the length of one side of the outer square?
How do you Know? What do you notice?

Small square = 16cm

Large square = 64cm

Length of one of the outer sides is 8cm, because 64 is a squared number.

Here are two shapes.



Shape A

Shape B

Stacey says 'The perimeter of shape B must be larger because it has more sides.'

Do you agree with Stacey?
Explain your answer.

Possible explanation: I do not agree with Stacey because the shapes have the same perimeter. Shape B has the same length and width overall as Shape A, the sides are just in a different direction to make it an irregular hexagon.

# Perimeter of Rectilinear Shapes

## Notes and Guidance

In this step, children will begin to calculate perimeter of rectilinear shapes from diagrams without grids.

They need to apply their knowledge of missing numbers to work out dimensions by finding the difference.

Children need to have experience of drawing their own shapes in this step.

## Mathematical Talk

Which measures are missing from the diagram?

Explain to your partner why you think the line is ____cm long. Can you prove it?

Can you make a rectilinear shape where your partner can work out the perimeter if you miss off the length of one of the sides?
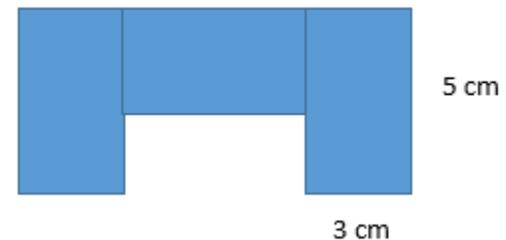
If you know the length of one side and part of the opposite side is known. Could you use a bar model to help?

## Varied Fluency

1 Find the perimeter of the shapes.
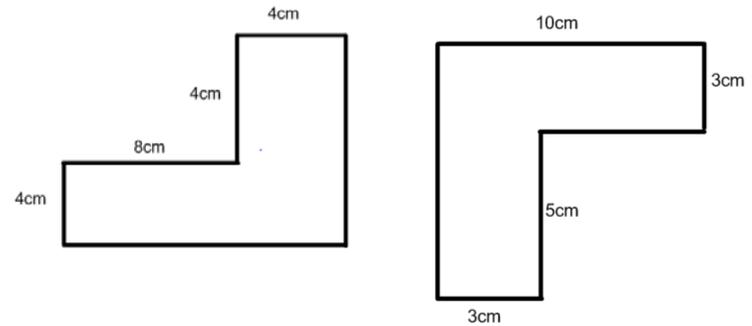


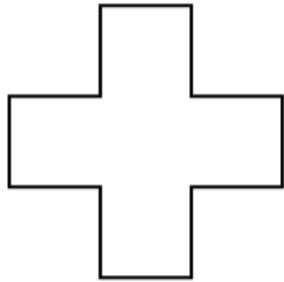2 The shape is made from 3 identical rectangles. Find the perimeter of the shape.



3 How many different shapes can you make with a perimeter of 24cm? How many sides do they have?

# Perimeter of Rectilinear Shapes

## Reasoning and Problem Solving

Here is a rectilinear shape. All the sides are the same length and are a whole number of centimetres.



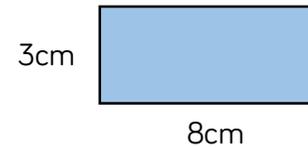Which of these lengths could be the perimeter of the shape?

48cm   36cm   80cm   120cm   66cm

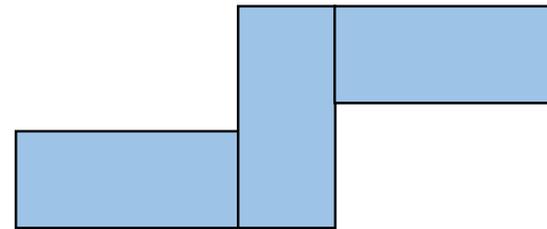Can you think of any other answers which could be correct?

48cm, 36cm or 120cm as there are 12 sides and these numbers are all multiples of 12

Any other answers suggested are correct if they are a multiple of 12
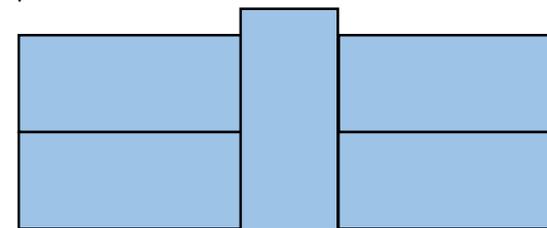
Bob has some rectangles all the same size.



3cm

8cm

He makes this shape using his rectangles. What is the perimeter?



He makes another shape using the same rectangles. Calculate the perimeter of this shape.



54cm

54cm

# Finding Unknown Lengths

## Notes and Guidance

Children apply their knowledge of measuring and finding perimeter to find unknown lengths.

When calculating perimeter of shapes, encourage children to mark off the sides as they add them up to prevent repetition of counting/omission of sides.
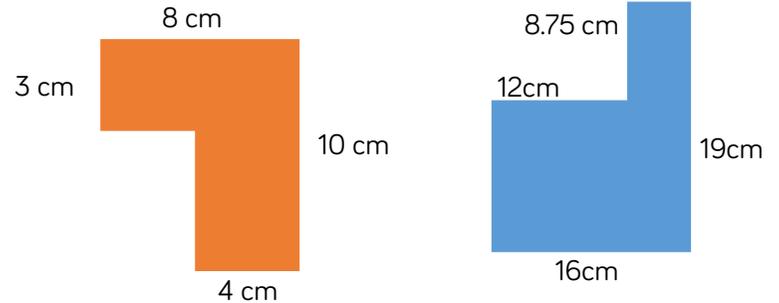
## Mathematical Talk

How can you use the sides you do know to calculate the missing lengths?

Can you draw the shape to scale on centimetre squared paper to help you find the unknown lengths?

## Varied Fluency

**1** Find the perimeter of the shapes.

8 cm
3 cm
10 cm
4 cm

8.75 cm
12cm
19cm
16cm

**2** A square and a rectangle both have a perimeter of 24cm².
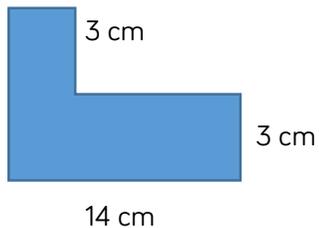Calculate the missing lengths.

4 cm

**3** How many rectangles can you draw where the length and width have a difference of 5 centimetres?
What is the perimeter of each rectangle?

## Calculate Perimeter

### Reasoning and Problem Solving

Harry calculates the perimeter of the shape as 20 centimetres.



3 cm

3 cm

14 cm

Is Harry correct?

Explain your answer.

Harry is incorrect as he has only added up the sides that are labelled. The perimeter of the shape is 40 centimetres.

The yellow rectangle has a perimeter of 38cm.

What is the value of a?



a

4.8 cm

Total perimeter = 38cm

38 – (4.8 + 4.8) = 28.4

So 28.4 divided by 2 = 14.2cm