

White

**Rose
Maths**

Autumn - Block 3

Length & Perimeter

Overview

Small Steps

Notes for 2020/21

- Equivalent lengths - m and cm R
- Equivalent lengths - mm and cm R
- Kilometres
- Add lengths R
- Subtract lengths R
- Measure perimeter R
- Perimeter on a grid
- Perimeter of a rectangle
- Perimeter of rectilinear shapes

We've added extra time in autumn term to look at content children have likely missed at the end of Y3, particularly on metric units and conversion between them.

This is often a skill children find difficult to remember and grasp, so we think this extra time will be useful.

Equivalent Lengths – m & cm

Notes and Guidance

Children recognise that 100 cm is equivalent to 1 metre. They use this knowledge to convert other multiples of 100 cm into metres and vice versa.

When looking at lengths that are not multiples of 100, they partition the measurement and convert into metres and centimetres. At this stage, children do not use decimals. This is introduced in Year 4.

Mathematical Talk

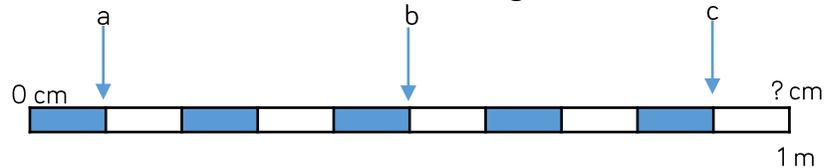
If there are 100 cm in 1 metre, how many centimetres are in 2 metres? How many centimetres are in 3 metres?

Do we need to partition 235 cm into hundreds, tens and ones to convert it to metres? Is it more efficient to partition it into two parts? What would the two parts be?

If 100 cm is equal to one whole metre, what fraction of a metre would 50 cm be equivalent to? Can you show me this in a bar model?

Varied Fluency R

❖ If $a = 10$ cm, calculate the missing measurements.



$b = \underline{\quad}$ cm $c = \underline{\quad}$ cm 1 metre = $\underline{\quad}$ cm

❖ Can you match the equivalent measurements?

| |
|-----------------|
| 100 cm |
| 5 m |
| 300 cm |
| 2 m |
| 900 centimetres |

| |
|---------|
| 9 m |
| 200 cm |
| 500 cm |
| 1 metre |
| 3 m |

❖ Eva uses this diagram to convert between centimetres and metres.

Use Eva's method to convert:

- 130 cm
- 230 cm
- 235 cm
- 535 cm
- 547 cm

| | |
|----------|-------|
| 120 cm | |
| 100 cm | 20 cm |
| 1 m | 20 cm |
| 1m 20 cm | |

Equivalent Lengths – m & cm

Reasoning and Problem Solving



Mo and Alex each have a skipping rope.

Alex says,



I have the longest skipping rope. My skipping rope is $2\frac{1}{2}$ metres long.

Mo says,



My skipping rope is the longest because it is 220 cm and 220 is greater than $2\frac{1}{2}$

Who is correct?
Explain your answer.

Alex is correct because her skipping rope is 250 cm long which is 30 cm more than 220 cm.

Three children are partitioning 754 cm

Teddy says,



75 m and 4 cm

Whitney says,



7 m and 54 cm

Jack says,



54 cm and 7 m

Who is correct?
Explain why.

Whitney and Jack are both correct. Teddy has incorrectly converted from cm to m when partitioning.

Equivalent Lengths – mm & cm

Notes and Guidance

Children recognise that 10 mm is equivalent to 1 cm. They use this knowledge to convert other multiples of 10 mm into centimetres and vice versa.

When looking at lengths that are not multiples of 10, they partition the measurement and convert into centimetres and millimetres. At this stage, children do not use decimals. This is introduced in Year 4.

Mathematical Talk

What items might we measure using millimetres rather than centimetres?

If there are 10 mm in 1 cm, how many mm would there be in 2 cm?

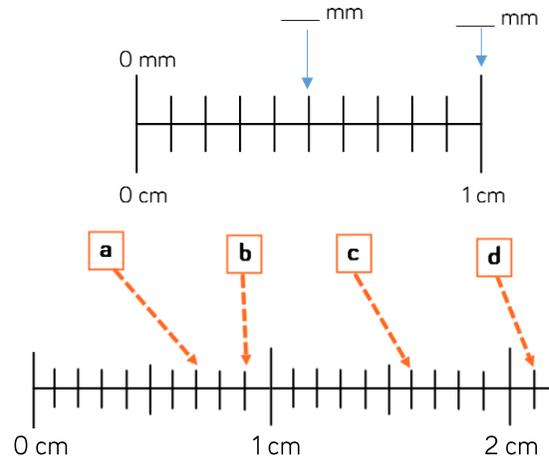
How many millimetres are in $\frac{1}{2}$ cm?

How many different ways can you partition 54 cm?

Varied Fluency



Fill in the blanks.

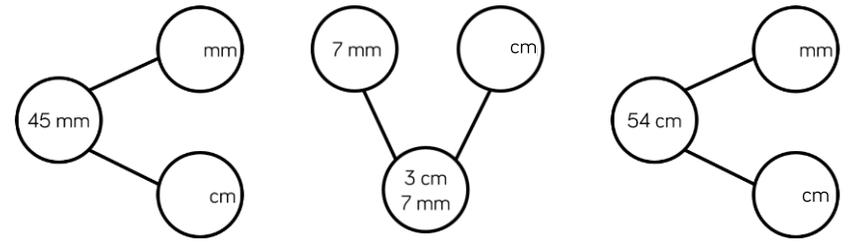


There are ___ mm in 1 cm.

- a = ___ cm ___ mm
- b = ___ cm ___ mm
- c = ___ cm ___ mm
- d = ___ cm ___ mm

Measure different items around your classroom. Record your measurements in a table in cm and mm, and just mm.

Complete the part whole models.

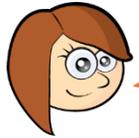


Equivalent Lengths – mm & cm

Reasoning and Problem Solving



Rosie is measuring a sunflower using a 30 cm ruler.
Rosie says,



The sunflower is 150 cm tall.

Rosie is incorrect.
Explain what mistake she might have made.
How tall is the sunflower?

Rosie is incorrect.
She has used the wrong unit on the ruler.
The sunflower is 15 cm tall or 150 mm tall.

Ron is thinking of a measurement.
Use his clues to work out which measurement he is thinking of.



- In mm, my measurement is a multiple of 2
- It has 8 cm and some mm
- It's less than 85 mm
- In mm, the digit sum is 12

Ron is thinking of 84 mm (8 cm and 4 mm)

Kilometres

Notes and Guidance

Children multiply and divide by 1,000 to convert between kilometres and metres.
 They apply their understanding of adding and subtracting with four-digit numbers to find two lengths that add up to a whole number of kilometres.
 Children find fractions of kilometres, using their Year 3 knowledge of finding fractions of amounts. Encourage children to use bar models to support their understanding.

Mathematical Talk

Can you research different athletic running races? What different distances are the races? Can you convert the distances from metres into kilometres? Which other sports have races over distances measured in metres or kilometres?
 If 10 children ran 100 metres each, how far would they run altogether? Can we go outside and do this? How long do you think it will take to run 1 kilometre?
 How can we calculate half a kilometre? Can you find other fractions of a kilometre?

Varied Fluency

Complete the statements.

$3,000 \text{ m} = \underline{\quad} \text{ km}$

$8 \text{ km} = \underline{\quad\quad\quad} \text{ m}$

$5 \text{ km} = \underline{\quad} \text{ m}$

$3 \text{ km} + 6 \text{ km} = \underline{\quad\quad\quad} \text{ m}$

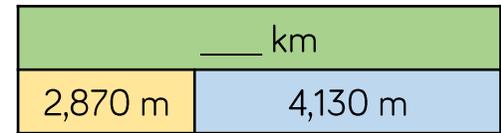
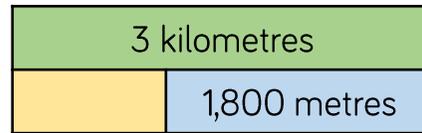
$500 \text{ m} = \underline{\quad} \text{ km}$

$250 \text{ m} = \underline{\quad\quad\quad} \text{ km}$

$9,500 \text{ m} = \underline{\quad} \text{ km}$

$4,500 \text{ m} - 2,000 \text{ m} = \underline{\quad\quad\quad} \text{ km}$

Complete the bar models.



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

- | | | |
|-------|-----------------------|------------------|
| 500 m | <input type="radio"/> | $\frac{1}{2}$ km |
| 7 km | <input type="radio"/> | 800 m |
| 5 km | <input type="radio"/> | 500 m |

Kilometres

Reasoning and Problem Solving

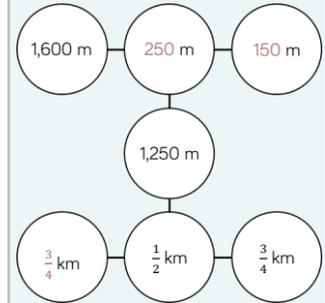
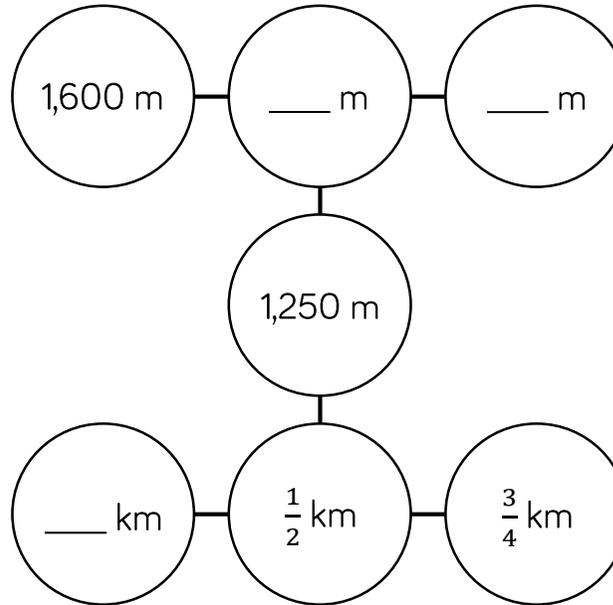
Dexter and Rosie walk 15 kilometres altogether for charity.
 Rosie walks double the distance that Dexter walks.
 How far does Dexter walk?

Rosie walks 10 km.
 Dexter walks 5 km.

Dexter and Rosie each raise £1 for every 500 metres they walk.
 How much money do they each make?

Rosie raises £20
 Dexter raises £10

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



Add Lengths

Notes and Guidance

Children add lengths given in different units of measurement. They convert measurements to the same unit of length to add more efficiently. Children should be encouraged to look for the most efficient way to calculate and develop their mental addition strategies.

This step helps prepare children for adding lengths when they calculate the perimeter.

Mathematical Talk

How did you calculate the height of the tower?

Estimate which route is the shortest from Tommy's house to his friend's house.

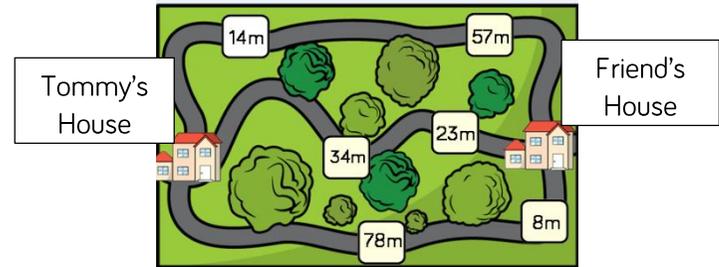
Which route is the longest?

Why does converting the measurements to the same unit of length make it easier to add them?

Varied Fluency

R

- Ron builds a tower that is 14 cm tall.
Jack builds a tower that is 27 cm tall.
Ron puts his tower on top of Jack's tower.
How tall is the tower altogether?
- Tommy needs to travel to his friend's house.
He wants to take the shortest possible route.
Which way should Tommy go?



- Miss Nicholson measured the height of four children in her class.
What is their total height?

95 cm

1 m and
11 cm

1 m and
50 mm

89 cm

Add Lengths

Reasoning and Problem Solving



Eva is building a tower using these blocks.



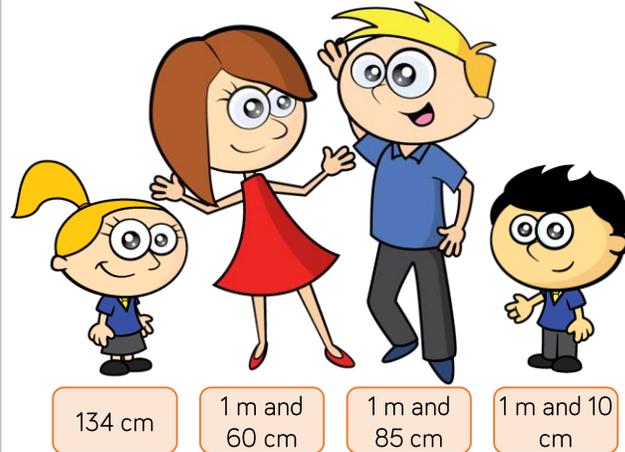
How many different ways can she build a tower measuring 56 cm?
Can you write your calculations in mm and cm?

Possible answer:

Four 100 mm blocks and two 80 mm blocks.

There are many other solutions.

Eva and her brother Jack measured the height of their family.



Eva thinks their total height is 4 m and 55 cm

Jack thinks their total height is 5 m and 89 cm

Who is correct? Prove it.

Jack is correct.
Eva has not included her own height.

Subtract Lengths

Notes and Guidance

Children use take-away and finding the difference to subtract lengths. Children should be encouraged to look for the most efficient way to calculate and develop their mental subtraction strategies.

This step will prepare children for finding missing lengths within perimeter.

Mathematical Talk

What is the difference between the length of the two objects?

How would you work it out?

How are Alex's models different? How are they the same?

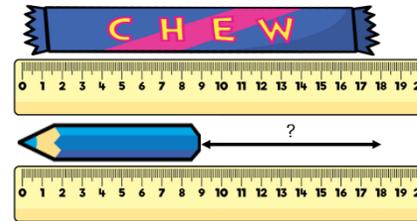
Which model do you prefer? Why?

What is the most efficient way to subtract mixed units?

Varied Fluency

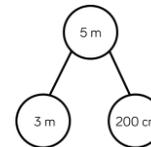


- Find the difference in length between the chew bar and the pencil.



The chew bar is ___ cm long.
 The pencil is ___ cm long.
 The chew bar is ___ cm longer than the pencil.

- Alex has 5 m of rope. She uses 1 m and 54 cm to make a skipping rope. She works out how much rope she has left using two different models.



$$5 \text{ m} - 1 \text{ m} = 4 \text{ m}$$

$$4 \text{ m} - 54 \text{ cm} = 3 \text{ m } 46 \text{ cm}$$

$$200 \text{ cm} - 154 \text{ cm} = 46 \text{ cm}$$

$$3 \text{ m} + 46 \text{ cm} = 3 \text{ m } 46 \text{ cm}$$

Use the models to solve:

- Mrs Brook's ball of wool is 10 m long. She uses 4 m and 28 cm to knit a scarf. How much does she have left?
- A roll of tape is 3 m long. If I use 68 cm of it wrapping presents, how much will I have left?

Subtract Lengths

Reasoning and Problem Solving



A bike race is 950 m long. Teddy cycles 243 m and stops for a break.

He cycles another 459 m and stops for another break.

How much further does he need to cycle to complete the race?

Teddy needs to cycle 248 metres further.

A train is 20 metres long.
A car is 15 metres shorter than the train.
A bike is 350 cm shorter than the car.

Calculate the length of the car.
Calculate the length of the bike.
How much longer is the train than the bike?



The car is 5 m and the bike is 150 cm or 1 m 50 cm.

The train is 18 metres and 50 cm longer than the bike.

Annie has a 3 m roll of ribbon.



She is cutting it up into 10 cm lengths. How many lengths can she cut?

Annie gives 240 cm of ribbon to Rosie. How much ribbon does she have left? How many 10 cm lengths does she have left?

Annie can cut it in to 30 lengths.

Annie has 60 cm left. She has 6 lengths left.

Measure Perimeter

Notes and Guidance

Children are introduced to perimeter for the first time. They explore what perimeter is and what it isn't.

Children measure the perimeter of simple 2-D shapes. They may compare different 2-D shapes which have the same perimeter.

Children make connections between the properties of 2-D shapes and measuring the perimeter.

Mathematical Talk

What is perimeter?

Which shape do you predict will have the longest perimeter?

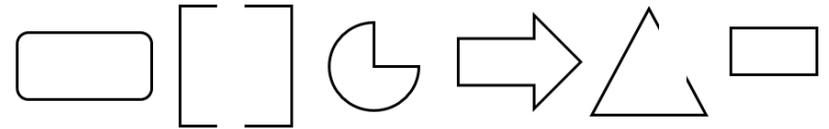
Does it matter where you start when you measure the length of the perimeter? Can you mark the place where you start and finish measuring?

Do you need to measure all the sides of a rectangle to find the perimeter? Explain why.

Varied Fluency

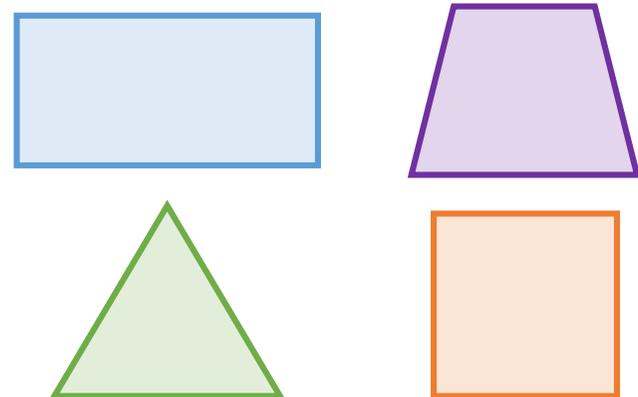
R

- Using your finger, show me the perimeter of your table, your book, your whiteboard etc.
- Tick the images where you can find the perimeter.



Explain why you can't find the perimeter of some of the images.

- Use a ruler to measure the perimeter of the shapes.



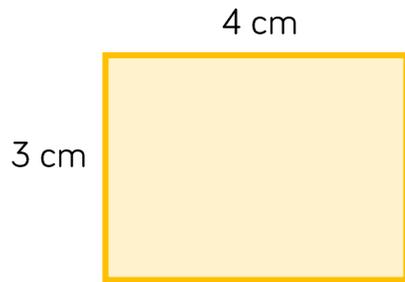
Measure Perimeter

Reasoning and Problem Solving



Amir is measuring the shape below. He thinks the perimeter is 7 cm.

Can you spot his mistake?



Amir has only included two of the sides. To find the perimeter he needs all 4 sides. It should be 14 cm.

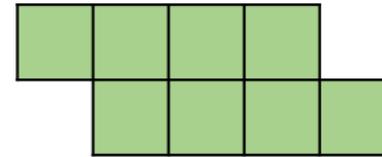
Whitney is measuring the perimeter of a square. She says she only needs to measure one side of the square.

Do you agree? Explain your answer.

Whitney is correct because all four sides of a square are equal in length so if she measures one side she can multiply it by 4

Here is a shape made from centimetre squares.

Find the perimeter of the shape.



Can you use 8 centimetre squares to make different shapes?

Find the perimeter of each one.

The perimeter is 14 cm.

There are various different answers depending on the shape made.

Perimeter on a Grid

Notes and Guidance

Children calculate the perimeter of rectilinear shapes by counting squares on a grid. Rectilinear shapes are shapes where all the sides meet at right angles.

Encourage children to label the length of each side and to mark off each side as they add the lengths together. Ensure that children are given centimetre squared paper to draw the shapes on to support their calculation of the perimeter.

Mathematical Talk

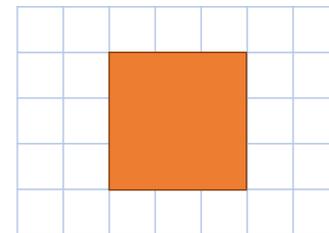
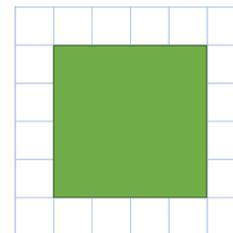
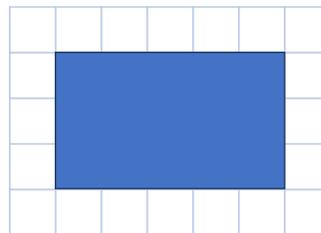
What is perimeter? How can we find the perimeter of a shape?

What do you think rectilinear means? Which part of the word sounds familiar?

If a rectangle has a perimeter of 16 cm, could one of the sides measure 14 cm? 8 cm? 7 cm?

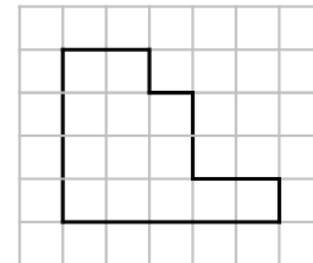
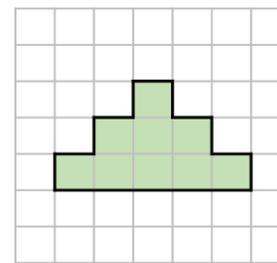
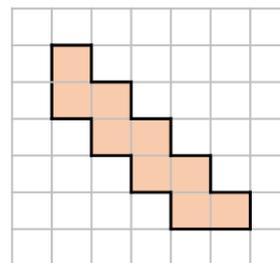
Varied Fluency

- Calculate the perimeter of the shapes.



- Using squared paper, draw two rectilinear shapes, each with a perimeter of 28 cm. What is the longest side in each shape? What is the shortest side in each shape?

- Draw each shape on centimetre square paper.

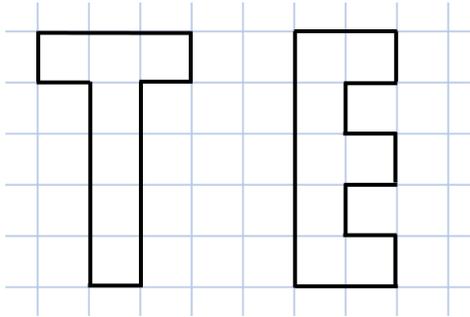


Order the shapes from smallest to largest perimeter.

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.

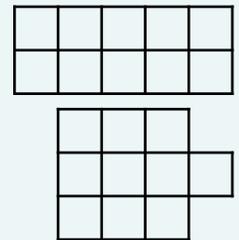
You have 10 paving stones to design a patio. The stones are one metre square.

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

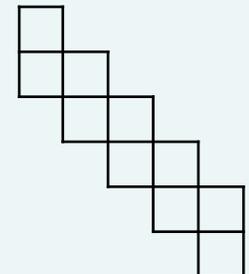


Use squared paper to show which design would give the longest perimeter and which would give the shortest.

The shortest perimeter would be 14 m in a 2×5 arrangement or 3×3 square with one added on.



The longest would be 22 m.



Perimeter of a Rectangle

Notes and Guidance

Children calculate the perimeter of rectangles (including squares) that are not on a squared grid. When given the length and width, children explore different approaches of finding the perimeter: adding all the sides together, and adding the length and width together then multiplying by 2

Children use their understanding of perimeter to calculate missing lengths and to investigate the possible perimeters of squares and rectangles.

Mathematical Talk

If I know the length and width of a rectangle, how can I calculate the perimeter? Can you tell me 2 different ways? Which way do you find the most efficient?

If I know the perimeter of a shape and the length of one of the sides, how can I calculate the length of the missing side?

Can a rectangle where the length and width are integers, ever have an odd perimeter? Why?

Varied Fluency

Calculate the perimeter of the rectangles.

| | | | |
|-------------------------------------------------------------------------------------------|------|------|------|
| 2 cm | | | |
| | 5 cm | 4 cm | 8 cm |
| $__ \text{ cm} + __ \text{ cm} + __ \text{ cm} + __ \text{ cm} = __ \text{ cm}$ | | | |

Eva is finding the perimeter of the rectangle.

I added the length and width together and then multiplied by 2

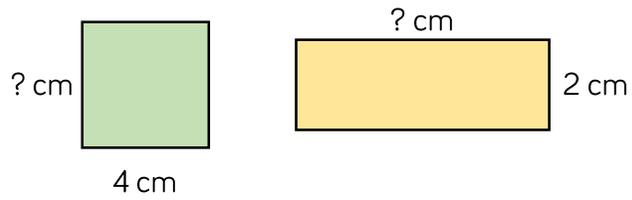
5 cm
 10 cm
 $5 \text{ cm} + 10 \text{ cm} = 15 \text{ cm}$
 $15 \text{ cm} \times 2 = 30 \text{ cm}$

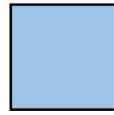
Use Eva's method to find the perimeter of the rectangles.

| | | |
|-----|------|------|
| 6 m | | |
| | 16 m | 9 cm |
| | | 9 cm |

Perimeter of a Rectangle

Reasoning and Problem Solving

| | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>The width of a rectangle is 2 metres less than the length. The perimeter of the rectangle is between 20 m and 30 m. What could the dimensions of the rectangle be? Draw all the rectangles that fit these rules. Use 1 cm = 1 m.</p> | <p>If the perimeter is: 20 m Length = 6 m Width = 4 m 24 m Length = 7 m Width = 5 m 28 m Length = 8 m Width = 6 m</p> |
| <p>Each of the shapes have a perimeter of 16 cm. Calculate the lengths of the missing sides.</p>  | <p>4 cm 6 cm</p> |

| | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Always, Sometimes, Never When all the sides of a rectangle are odd numbers, the perimeter is even. Prove it.</p> | <p>Always because when adding an odd and an odd they always equal an even number.</p> |
| <p>Here is a square. Each of the sides is a whole number of metres.</p>  <p>Which of these lengths could be the perimeter of the shape? 24 m, 34 m, 44 m, 54 m, 64 m, 74 m</p> <p>Why could the other values not be the perimeter?</p> | <p>24 cm Sides = 6 cm 44 cm Sides = 11 cm 64 cm Sides = 16 cm They are not divisible by 4</p> |

Perimeter of Rectilinear Shapes

Notes and Guidance

Children will begin to calculate perimeter of rectilinear shapes without using squared paper. They use addition and subtraction to calculate the missing sides. Teachers may use part-whole models to support the understanding of how to calculate missing sides.

Encourage children to continue to label each side of the shape and to mark off each side as they calculate the whole perimeter.

Mathematical Talk

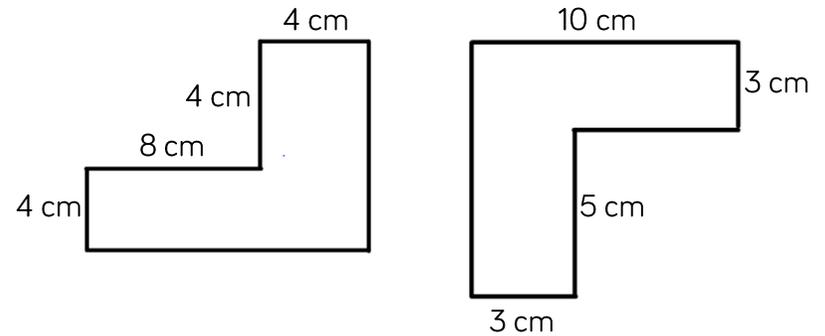
Why are opposite sides important when calculating the perimeter of rectilinear shapes?

If one side is 10 cm long, and the opposite side is made up of two lengths, one of which is 3 cm, how do you know what the missing length is? Can you show this on a part-whole model?

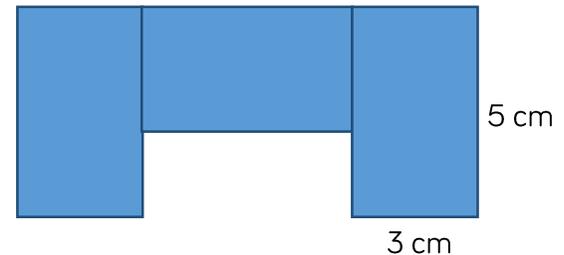
If a rectilinear shape has a perimeter of 24 cm, what is the greatest number of sides it could have? What is the least number of sides it could have?

Varied Fluency

Find the perimeter of the shapes.



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

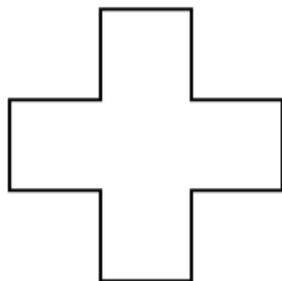


How many different rectilinear shapes can you draw with a perimeter of 24 cm? How many sides do they each have? What is the longest side? What is the shortest side?

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.



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

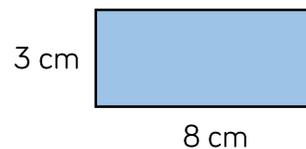
Any other answers suggested are correct if they are a multiple of 12

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

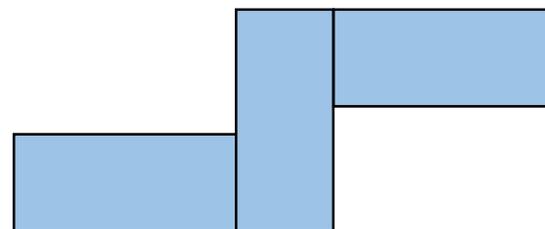
48 cm, 36 cm, 80 cm, 120 cm, 66 cm

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

Amir has some rectangles all the same size.

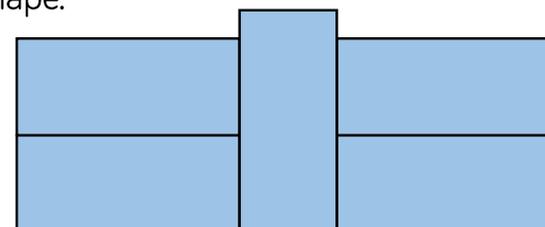


He makes this shape using his rectangles. What is the perimeter?



54 cm

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



54 cm