White Rose Maths

Spring - Block 4

Length & Perimeter

Overview

Small Steps

- Measure length
- Equivalent lengths – m & cm
- Equivalent lengths – mm & cm
- Compare lengths
- Add lengths
- Subtract lengths
- Measure perimeter
- Calculate perimeter

NC Objectives

Measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml).

Measure the perimeter of simple 2-D shapes.

Measure Length

Notes and Guidance

Children are introduced to millimetres for the first time and build on their understanding of centimetres and metres.

Children use different measuring equipment including rulers, tape measures, metre sticks and trundle wheels. They discuss which equipment is the most appropriate depending on the object they are measuring.

Mathematical Talk

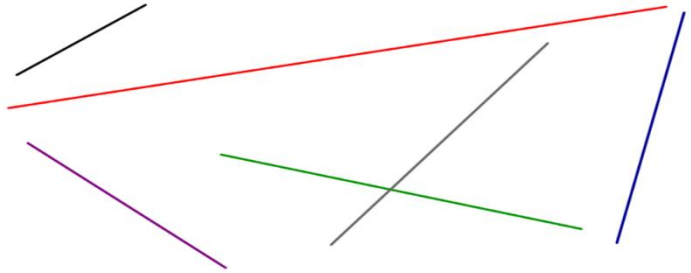
What would be the best equipment to measure _____ with? (e.g. tape measure, ruler, metre stick)

What do we have to remember when using a ruler to measure? Which unit of measurement are we going to use to measure? Centimetres or millimetres?

What unit of measure would be best to measure____ ?

Varied Fluency

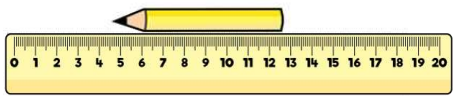
- Measure the lines to the nearest centimetre.
  Can you measure the lines in millimetres?



- What unit of measurement would you use to measure these real life objects? Millimetres, centimetres or metres?

Fingernail	Eraser	Pencil
Height of a house	Length of a playground	Length of a table

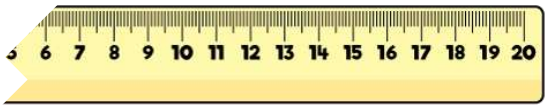
- What is the length of each pencil?



Measure Length

Reasoning and Problem Solving

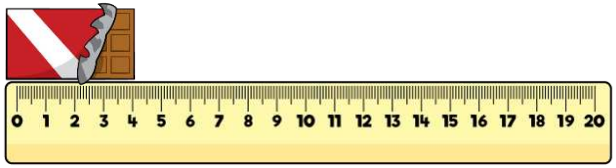
Whitney's ruler is broken.
How could she use it to still measure items?



Possible answer:

She could start from a different number and count on.

Tommy thinks that this chocolate bar is 4 cm long.
Is he correct?

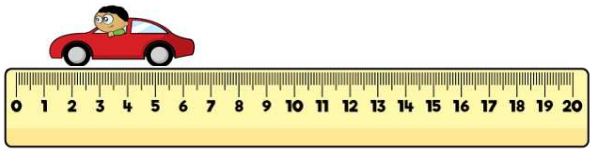


Convince me.

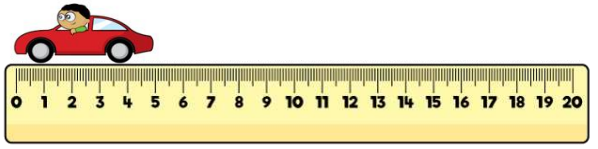
He is incorrect because he has not placed the chocolate bar at 0, he has put it at the end of the ruler.

Three children measured the same toy car.

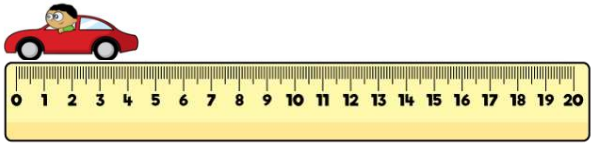
Eva says that the car is 6 cm and 5 mm



Dexter says the car is 5 cm



Annie says the car is 4 cm 5 mm



Who is correct?
Who is incorrect?
Explain why.

Dexter is correct. The other two children have not lined up the ruler correctly: Eva has started at 1 cm and 5 mm instead of 0 and Annie has started at the end of the ruler.

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

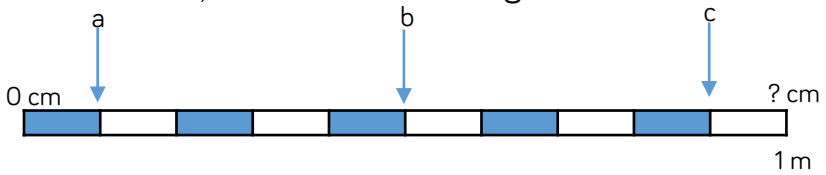
If there are 100 cm in 1 metre, how many centimetres are in 2 metres? How many centimetres are in 3 metres?

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

If a = 10 cm, calculate the missing measurements.



b = ____ cm c = ____ cm 1 metre = ____ cm

Can you match the equivalent measurements?

100 cm	9 m
5 m	200 cm
300 cm	500 cm
2 m	1 metre
900 centimetres	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?

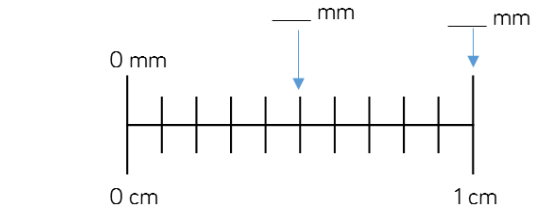
If there are 10 mm in 1 cm, how many mm would there be in 2 cm?

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

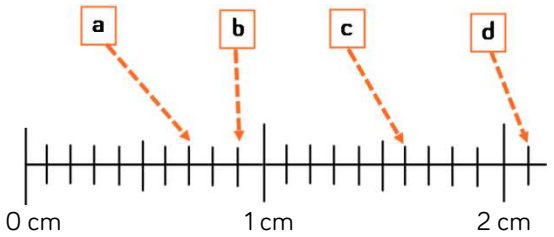
How many different ways can you partition 54 cm?

Varied Fluency

- Fill in the blanks.



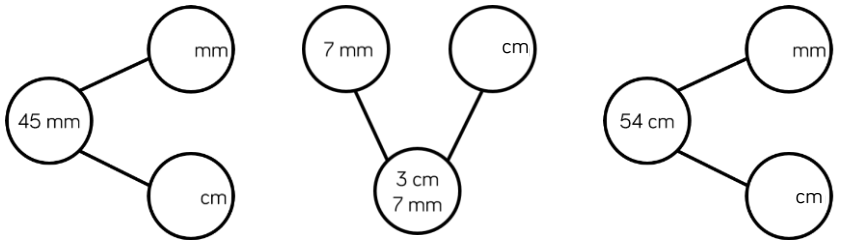
There are ____ mm in 1 cm.



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.

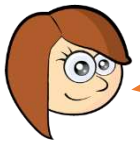
- Complete the part whole models.



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)

Compare Lengths

Notes and Guidance

Children compare and order lengths based on measurements in mm, cm and m.

They use their knowledge of converting between units of measurement to help them compare and order. Encourage children to convert all the measurements to the same unit of length before comparing.

Mathematical Talk

Is descending order, shortest to tallest or tallest to shortest?

Can you order the children's heights in ascending order?

Why does converting to the same unit of length, make it easier to compare lengths?

Estimate which child's tower you think will be the tallest. Explain why.

Varied Fluency

Complete the sentences.

Child	Height
Rosie	109 cm
Amir	1 m 5 cm
Jack	135 cm
Dora	1 m 45 mm

Rosie is _____ than Jack.

Jack is _____ than Dora.

Amir is _____ than Rosie.

Dora is _____ than Amir.

Four friends are building towers.
Eva's tower is 22 cm and 7 mm tall.
Teddy's tower is 22 cm tall.
Annie's tower is 215 mm tall.
Dexter's tower is 260 mm tall.
Order the children's towers in descending order.

☐ < ☐ < ☐ < ☐

Using a ruler, measure the width of 5 different books to the nearest mm. Record your results in a table, then compare and order them.

Compare Lengths

Reasoning and Problem Solving

Always, Sometimes, Never?

mm lengths are smaller than cm lengths.

Possible answer:

Sometimes.
E.g. 1 mm is smaller than 1 cm but 70 mm is larger than 3 cm.

Sort the lengths into the table.

Longer than a metre	Shorter than a metre

1 m 65 cm | 165 mm | 165 m | 165 cm | 16 cm 5 mm | 1 cm 65 mm

Are any of the lengths equivalent?

1 m 65 cm, 165 cm and 165 m are longer than a metre.
165 mm, 16cm 5 mm and 1 cm 65 mm are shorter than a metre.

1 m 65 cm is equivalent to 165 cm.
165 mm is equivalent to 16 cm 5 mm.

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.

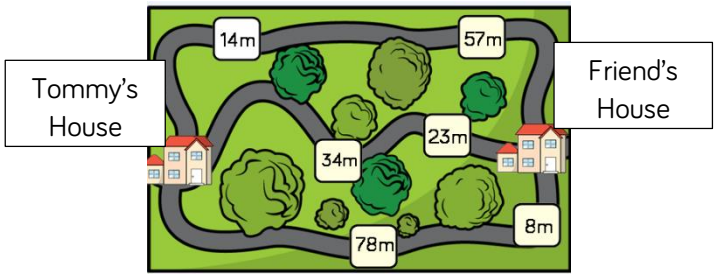
Which route is the longest?

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

Varied Fluency

- Ron builds a tower that is 14 cm tall.
  Jack builds a tower than 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?



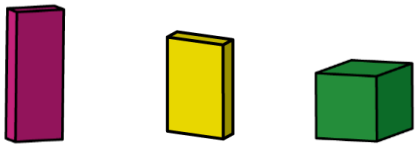
- Miss Nicholson measured the height of four children in her class.
  What is their total height?

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.



100 mm 80 mm 50 mm

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.

134 cm | 1 m and 60 cm | 1 m and 85 cm | 1 m and 10 cm

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?

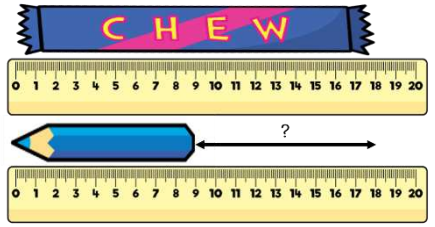
How are Alex's models different? How are they the same?

Which model do you prefer? Why?

What is the most efficient way to subtract mixed units?

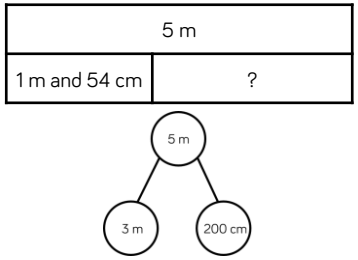
Varied Fluency

- 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 m − 1 m = 4 m
4 m − 54 cm = 3 m 46 cm

200 cm − 154 cm = 46 cm
3 m + 46 cm = 3 m 46 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.

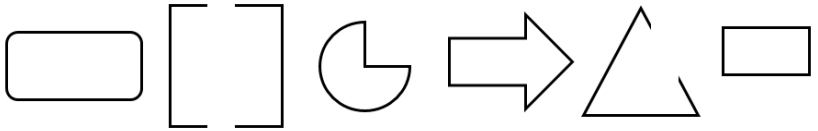
Mathematical Talk

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

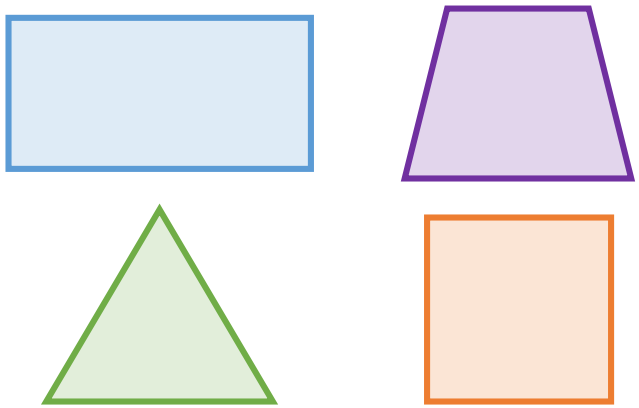
- Using your finger, show me the perimeter of your table, your book, your whiteboard etc.

- 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.

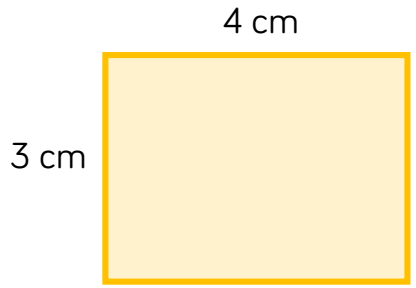


Measure Perimeter

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.

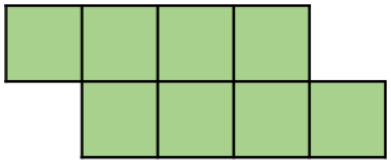
Whitney is measuring the perimeter of a square.
She says she only needs to measure one side of the square.

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.



The perimeter is 14 cm.

Can you use 8 centimetre squares to make different shapes?

Find the perimeter of each one.

There are various different answers depending on the shape made.

Calculate Perimeter

Notes and Guidance

Children use their understanding of the properties of shape to calculate the perimeter of simple 2-D shapes.

It is important to note they will not explore the formula to find the perimeter of a rectangle at this point.

They explore different methods for calculating the perimeter of a shape. For example, they may use repeated addition or they may make connections to multiplication.

Mathematical Talk

How can we calculate the perimeter of each shape?

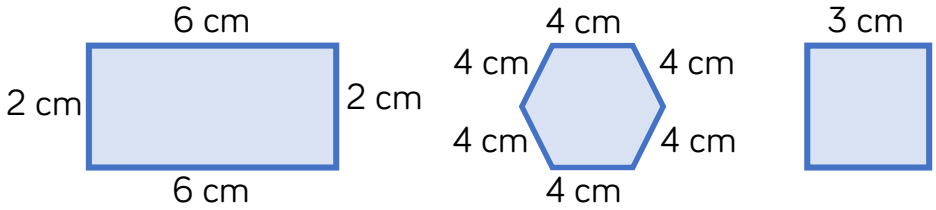
Can we calculate the perimeter using a different method?

What is the same about the two methods? What is different?

How can we work out the length of the missing side? What other information do we know about the rectangle? Can we write on the lengths of all the sides?

Varied Fluency

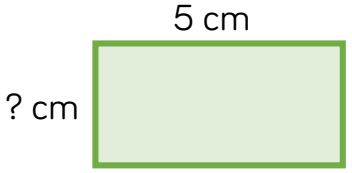
- Calculate the perimeter of the shapes.



Can you find more than one way to calculate the perimeter?

- Use two different methods to calculate the perimeter of the squares.

- What is the length of the missing side?



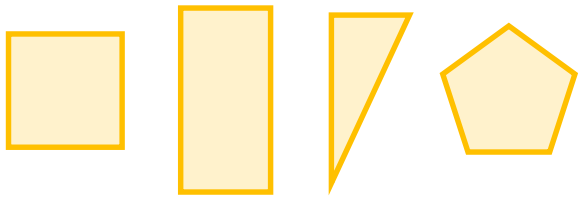
Perimeter = 16 cm

Calculate Perimeter

Reasoning and Problem Solving

Teddy says,

You only need to know the length of one side of these 2-D shapes to work out the perimeter.



Do you agree with Teddy?
Explain your answer.

You only need to know the length of one side for the square and the pentagon as all the sides are the same.
However, Teddy is wrong because for the rectangle you need to know two lengths and for the triangle you need to know all of them.

Each side of this shape is of equal length.
The perimeter is 60 cm.
How long is each side?

The shape has 10 sides so the length of each side is 6 cm

How many different rectangles can you draw with a perimeter of 20 cm?

There are 5 different rectangles.

1 cm by 9 cm
2 cm by 8 cm
3 cm by 7 cm
4 cm by 6 cm
5 cm by 5 cm