Summer Block 5

Converting units

Small steps

Step 1	Kilograms and kilometres
Step 2	Millimetres and millilitres
Step 3	Convert units of length
Step 4	Convert between metric and imperial units
Step 5	Convert units of time
Step 6	Calculate with timetables

Kilograms and kilometres

Notes and guidance

Children first encountered kilograms in Year 3 and kilometres in Year 4. This small step revisits both of these units of measure and their relationships to grams and metres, respectively.

Begin by discussing what units of measure are and how different units of measure are used for different purposes. Remind children of what kilograms and kilometres are, discussing examples of when each would be used. Then explain that the prefix “kilo-” always means one thousand, so 1,000 grams is equivalent to 1 kilogram and 1,000 metres is equivalent to 1 kilometre. Bar models and double number lines are useful representations for showing the conversions. Make links to multiplying and dividing integers and decimals by 1,000, covered earlier in the year.

Children should also be confident with conversions of simple fractions such as $\frac{1}{2}$ kg = 500 g and $\frac{3}{4}$ km = 750 m.

Things to look out for

- Children may perform the wrong operation, for example multiplying instead of dividing.
- Children may confuse “kilo-” with “centi-” and use the factor of 100 instead of 1,000

Key questions

- What are units of measure?
- What might you measure using kilograms/kilometres?
- What is the same about kilograms and kilometres? What is different?
- What does the prefix “kilo-” mean?
- How many grams are there in ______ kilograms?
- How can you convert from kilometres to metres? What is the same and what is different about converting from metres to kilometres?

Possible sentence stems

- 1 kilometre = ______ m,
  so ______ kilometres = ______ × 1,000 m = ______ m
- ______ g = 1 kg, so ______ g = ______ ÷ 1,000 = ______ kg

National Curriculum links

- Convert between different units of metric measure [for example, kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre]

Kilograms and kilometres

Key learning

- Complete the bar models.

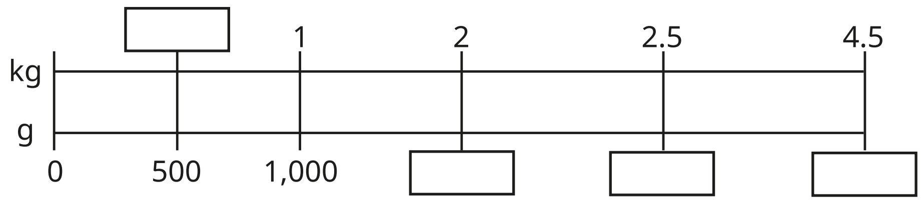
1 km	1 km
m	m

2 km = ______ m

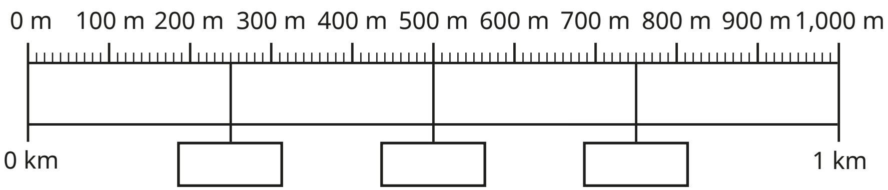
1,000 g	1,000 g	1,000 g	1,000 g
kg	kg	kg	kg

4,000 g = ______ kg

- Find the missing values on the double number line.



- Use the double number line to help you complete the sentences.



  - 1 km is equivalent to ______ m.
  - $\frac{1}{4}$ km is equivalent to ______ m.
  - $\frac{1}{2}$ km is equivalent to ______ m.
  - $\frac{3}{4}$ km is equivalent to ______ m.

- Write <, > or = to compare the measurements.

5 kg ◯ 4,500 g   12 kg ◯ 12,000 g

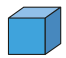
3.7 km ◯ 370 m   37,000 m ◯ 3.7 km

- Fill in the missing numbers.
  - $\frac{1}{10}$ kg = ______ g
  - $\frac{3}{10}$ km = ______ m
  - 7 kg + $\frac{1}{4}$ kg = ______ g
  - 12 km + ______ km = 12,500 m

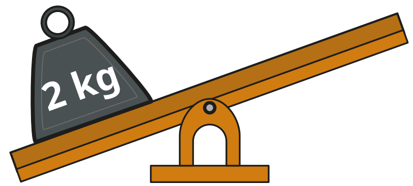
- Eva walks 1,750 m to the bus stop.

  She then rides on the bus for 5.2 km.

  How far has she travelled in total?

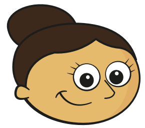
- Each cube has a mass of 250 g. 

  How many cubes must be added to balance the scales?



Kilograms and kilometres

Reasoning and problem solving



To convert from kilometres to metres, I multiply by 1,000

$10 \text{ km} = 10 \times 1{,}000$
$= 10{,}000 \text{ m}$ and
$0 \text{ km} = 0 \times 1{,}000$
$= 0 \text{ m}$

Do you agree with Dora?

Explain your answer.

Yes

Dani bakes a cake that has a mass of 2.4 kg.

She cuts it into eight equal pieces.

She eats a piece and gives a piece to each of her two friends.

What is the mass of the remaining cake in grams?

1,500 g

Mr Lee buys 2,500 g of potatoes and 2,000 g of carrots.

78p per kg

£1.46 per kg

He pays with a £5 note.

How much change does he get?

13p

Mo and Nijah are both doing a sponsored run.

They are each given 25p for every 100 m that they run.

- Mo runs 5.7 km.
- Nijah runs 6,300 m.

How much more money does Nijah raise than Mo?

Compare methods with a partner.

£1.50

Millimetres and millilitres

Notes and guidance

Children first encountered millimetres and millilitres as units of measure in Year 3. In this small step, they convert between millimetres and metres and between millilitres and litres for the first time.

As in the previous step, begin by reminding children what these units of measure are and what they are likely to be used for. Then discuss the prefix "milli-", explaining that it means one thousandth. Model conversions by multiplying amounts given in litres and metres by 1,000 and dividing amounts given in millimetres and millilitres by 1,000. The use of bar models and double number lines will help children's understanding of these conversions.

Children then move on to converting amounts given in litres and metres, including decimals and fractions. Finally, they use this understanding to solve problems that require conversions between these units of measure.

Things to look out for

- Children may perform the wrong operation, for example multiplying instead of dividing.
- Children may confuse the different prefixes "kilo-", "milli-" and "centi-".

Key questions

- What might you measure in metres/litres?
- What might you measure in millimetres/millilitres?
- What does the prefix "milli-" mean?
- What is the same and what is different about the prefixes "milli-" and "kilo-"?
- How can you convert from litres/metres to millilitres/millimetres?
- How many litres are equivalent to ______ millilitres?
- Which is the greatest length, 1 mm, 1 km or 1 m?
- What unit of measure would you use for measuring ______?

Possible sentence stems

- To convert from litres to millilitres, I ______ by 1,000
- To convert from millimetres to metres, I ______ by 1,000

National Curriculum links

- Convert between different units of metric measure [for example, kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre]

Millimetres and millilitres

Key learning

- Use the bar models to complete the conversions.

1,000 ml	1,000 ml	1,000 ml	1,000 ml
l	l	l	l

4,000 ml = ______ l

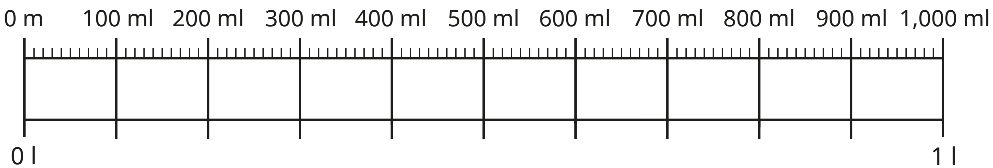
1 m	1 m	1 m	1 m	1 m	1 m
mm	mm	mm	mm	mm	mm

6 m = ______ mm

1 l	1 l	1 l	
ml	ml	ml	

$2\frac{1}{2}$ l = ______ ml

- Use the double number line to complete the conversions.



▶ 1 l = ______ ml
▶ 200 ml = $\frac{\square}{\square}$ l
▶ ______ ml = 0.4 l
▶ $\frac{1}{10}$ l = ______ ml
▶ ______ . ______ l = 700 ml

- Use the fact to help you complete the conversions.

1,000 mm = 1 m

▶ 5,000 mm = ______ m
▶ 500 mm = ______ m
▶ 50,000 mm = ______ m
▶ 5,500 mm = ______ m

- Write <, > or = to compare the measurements.

2 l ◯ 1,500 ml
60 l ◯ 6,000 ml
2.8 m ◯ 280 mm
3,700 m ◯ 3.7 mm

- Fill in the missing numbers.

▶ $\frac{1}{1000}$ m = ______ mm
▶ 2 l + ______ ml = 2,500 ml
▶ $\frac{1}{100}$ m = ______ mm
▶ 3 l + $\frac{1}{4}$ l = ______ ml
▶ $\frac{1}{10}$ m = ______ mm
▶ 3 l + ______ l = 3,400 ml

- Brett has a 2 litre jug of juice.

He pours 350 ml of juice into each of three cups.

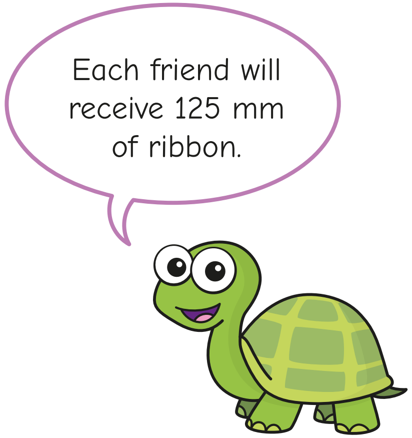
How much juice is left in the jug?

Millimetres and millilitres

Reasoning and problem solving

5 m of ribbon is shared equally between four friends.

5 m			
mm	mm	mm	mm



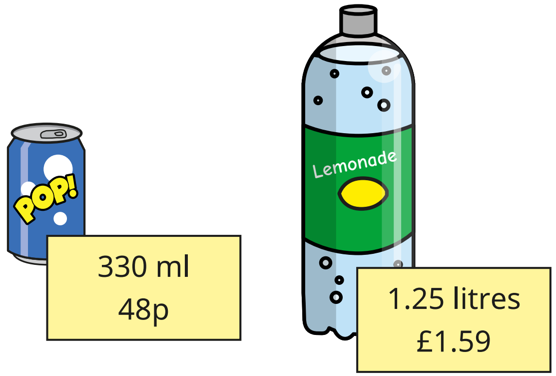
Do you agree with Tiny?

Explain your answer.

No

There are not 100 mm in 1 m.

Lemonade is sold in cans and bottles.



Alex buys 5 cans and 3 bottles.

She sells the lemonade in 100 ml glasses to raise money for charity.

She sells all the lemonade.

How many glasses does she sell?

Alex charges 50p per glass.

How much profit does she make?

54

£19.83

Convert units of length

Notes and guidance

In this small step, children build on their learning in the previous two steps to convert the units of metric lengths – millimetres, centimetres and metres.

Recap what types of things would be measured by each unit of measure, and when each one would be inappropriate, for example measuring the playground in millimetres or measuring a pencil sharpener in metres. Measuring and drawing lines of specific lengths in centimetres and millimetres help with children's understanding of these measures.

Model how to convert between these units. Begin by discussing the difference between milli- and centi-, meaning that they multiply a length given in metres by 100 to convert it to centimetres, and by 1,000 to convert it to millimetres. Then use division to convert the other way. When children are confident with integer values, they can move on to converting fractional and decimal lengths in metres.

Things to look out for

- Children may confuse when to multiply or divide and/or when to use 10, 100 or 1,000
- Children may confuse the units of measure or omit them from their answers.

Key questions

- What units of length do you know?
- What objects would you measure with millimetres/ centimetres/metres?
- Which unit of measure would you use to measure ______?
- How many mm/cm are there in ______ cm/m?
- How can you convert from mm/cm/m to mm/cm/m?
- When do you need to divide/multiply by 10/100/1,000?

Possible sentence stems

- There are ______ mm in ______ cm.
- There are ______ mm in ______ m.
- There are ______ cm in ______ m.
- To convert between mm/cm/m and mm/cm/m, I ______ by ______

National Curriculum links

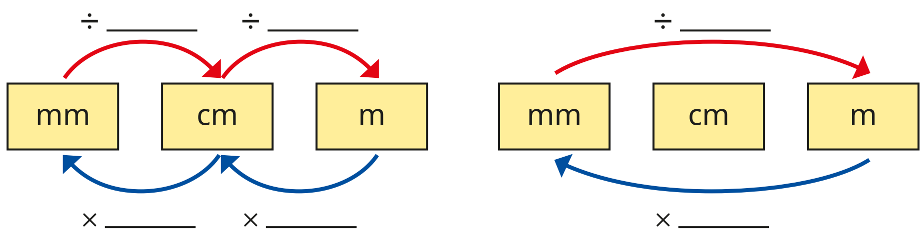
- Convert between different units of metric measure [for example, kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre]

Convert units of length

Key learning

- There are 10 mm in 1 cm and 100 cm in 1 m.

  Use this to help you complete the conversion diagrams.



- Fill in the missing numbers in the conversions.
  - 10 mm = ______ cm
  - ______ cm = 1 m
  - 55 mm = ______ cm
  - 300 mm = ______ cm = ______ m
  - ______ mm = 98 cm = ______ m
  - 2 cm = ______ mm
  - ______ m = 300 cm
  - ______ m = 670 cm
  - 5 m = ______ cm
  - 5.6 m = ______ cm

- Measure each line.

  Write the lengths in both centimetres and millimetres.

- Here are the heights of four children.

Esther	Scott	Aisha	Filip
1.3 m	124 cm	1.32 m	141 cm

  Put the children in height order, starting with the shortest.

  Write their heights in millimetres.

- Write <, > or = to compare the measurements.

  55 mm ◯ 6 cm

  100 m ◯ 1 cm

  6.8 cm ◯ 7 mm

  0.25 m ◯ 300 mm

- Line A is 6 centimetres long.

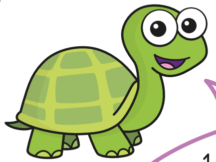
  Line B is 54 millimetres longer than line A.

  Line C is $\frac{2}{3}$ of line B.

  Draw lines A, B and C.

Convert units of length

Reasoning and problem solving



$\frac{1}{2}$ a metre is 500 cm.
That means that $\frac{1}{2}$ a metre is 5,000 mm because to convert between cm and mm, I multiply by 10

Is Tiny correct?

Explain your answer.

No

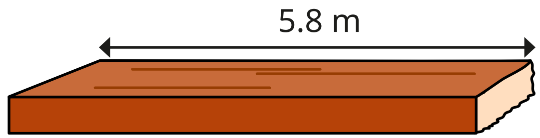
Dexter has a pencil that is 9.5 cm long.

He uses it every day for a week, and it is now 6.9 cm long.

How many millimetres shorter is his pencil now than it was a week ago?

26 mm

A plank of wood is 5.8 metres long.



Two lengths are cut from the wood.

175 cm	$3\frac{4}{5}$ m

What length of the plank is left?

25 cm or 0.25 m

A 10p coin is 2 mm thick.

Rosie makes a pile of 10p coins worth £1.30

What is the height of the pile of coins in centimetres?

2.6 cm

White Rose Maths

Convert between metric and imperial units

Notes and guidance

In this small step, children are introduced to imperial units of measure and learn to convert between metric and imperial units.

Begin by having a conversation about different units of measure, asking children to name as many as they can. Sort children's suggestions into metric and imperial units. Explain that the metric and imperial systems are different ways of measuring the same type of thing and it can depend on where you are as to which you use, for example road signs in England are in miles, but in France they are in kilometres.

Model exchanging between the units covered in this step: inches and centimetres, kilograms and pounds, and pints and millilitres. It is important to explain the term "approximately" in this context and that the conversions given are not exact. Explain the meaning of "≈" as "approximately equal to".

When children are confident converting between units, they can solve problems that include both metric and imperial measures.

Things to look out for

- Children may confuse ≈ and =.
- Children may forget to include units of measure in their answers.

Key questions

- What different types of units of measure do you know?
- How can you sort the units of measure into groups?
- What is the difference between imperial and metric units of measure?
- What does "approximately equal to" mean? What symbol is used to mean "approximately equal to"?
- How can you convert from cm/kg/ml to inches/lb/pints?
- How can you convert from inches/lb/pints to cm/kg/ml?

Possible sentence stems

- 1 kg is approximately equal to ______ lb, so ______ kg is approximately equal to ______ × ______ = ______ lb.
- 1 pint is approximately equal to ______ ml, so ______ pints is approximately equal to ______ × ______ = ______ ml.
- 1 inch is approximately equal to ______ cm, so ______ cm is approximately equal to ______ ÷ ______ = ______ inches.

National Curriculum links

- Understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints

Convert between metric and imperial units

Key learning

- 1 inch is approximately equal to 2.5 cm.

  1 inch ≈ 2.5 cm

  Use this fact to complete the conversions.

  - 2 inches ≈ _______ cm
  - 20 inches ≈ _______ cm
  - _______ inches ≈ 7.5 cm
  - _______ inches ≈ 12.5 cm

- The area of the rectangle is 50 cm^2

  What is the approximate perimeter of the rectangle in inches?

- 1 kilogram is approximately equal to 2.2 pounds.

  1 kg ≈ 2.2 lb

  Use this fact to complete the conversions.

  - _______ kg ≈ 4.4 lb
  - _______ kg ≈ 22 lb
  - 4 kg ≈ _______ lb
  - 100 kg ≈ _______ lb

- Apples are sold in 2 kg bags.

  Huan buys 4 bags of apples.

  He uses 2.6 lb of the apples.

  What is the approximate mass of Huan's remaining apples in pounds?

- Use the fact to complete the conversions.

  1 pint ≈ 568 ml

  - 2 pints ≈ _______ ml
  - $\frac{1}{2}$ pint ≈ _______ ml
  - _______ pints ≈ 56.8 ml
  - _______ pints ≈ 5,680 ml

- There are 8 pints in a gallon.

  A class is given 2 gallons of lemonade.

  They drink 3 litres of lemonade in total.

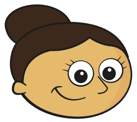
  About how many millilitres of lemonade do they have left?

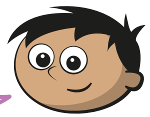
1 gallon	1 gallon
pints	pints
ml	ml

_______ ml

Convert between metric and imperial units

Reasoning and problem solving

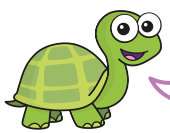




Who was heavier when they were born, Dora or Amir?

Explain your answer.

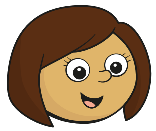
Dora



Is Tiny correct?

Explain your answer.

No



Approximately how many litres of milk are delivered to Kim's house each week?

Kim uses about 200 ml of milk every day on her cereal.

Approximately how many pints of milk does Kim use for her cereal in a week?

approximately 6.8 litres

approximately $2\frac{1}{2}$ pints

Convert units of time

Notes and guidance

Children have encountered units of time and converted between them in previous years. In this small step, they revisit and extend this learning and solve problems involving units of time.

Ask children to name as many different units for measuring time as they can. Encourage them to think of longer units such as days, weeks, months and years as well as smaller units such as seconds, minutes and hours.

Model the different conversions, many of which, such as days in a week and minutes in an hour, will be familiar from previous learning and everyday experience, but others, such as days in a year or days in different months, may need recapping.

Double number lines are a useful representation to support many of the conversions. Once children are confident converting between different units of time, they can solve problems that involve different units.

Things to look out for

- Children may be confused when converting measures that involve division (for example, days to weeks) if there is a remainder.
- Children may think that time conversions behave like decimals, for example 0.25 minutes = 25 seconds.

Key questions

- What units of measure do we use for time?
- How can you put the units of measure for time in order from shortest to longest?
- How many seconds/minutes/hours are there in ______ minutes/hours/days?
- How can you convert from ______ to ______?
- When using division to convert times, what happens if there is a remainder?

Possible sentence stems

- There are ______ seconds/minutes in a minute/hour, so in ______ minutes/hours there are ______ × ______ = ______ seconds/minutes.
- There are ______ hours in a day, so in ______ hours there are ______ ÷ ______ = ______ full days and ______ hours.
- To convert ______ into ______, I ______ by ______

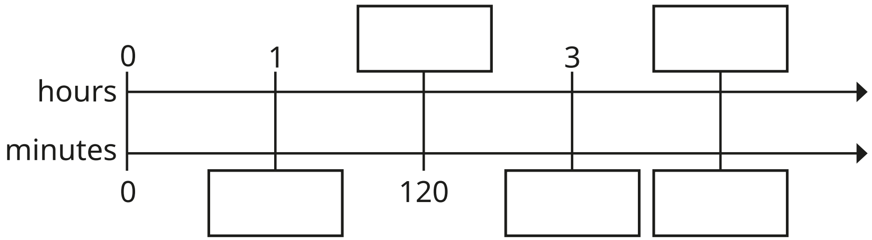
National Curriculum links

- Solve problems involving converting between units of time

Convert units of time

Key learning

- Complete the double number line.



Use the double number line to help work out the conversions.

- 5 hours = ______ minutes
- ______ hours = 600 minutes
- $\frac{1}{2}$ hour = ______ minutes
- ______ hours = 150 minutes

- There are 60 seconds in a minute.
  - How many seconds are there in 5 minutes?
  - How many minutes are equivalent to 630 seconds?

- Sam is boiling an egg.

  She wants to boil it for $4\frac{1}{2}$ minutes, but she accidentally boils it for an extra 45 seconds.

  How many seconds does she boil the egg for?

- There are 7 days in a full week.

  How many full weeks are there in 23 days?

  How many days are left over?

- Complete the table.

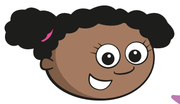
Days	Weeks and days
42 days	
	5 weeks and 5 days
	10 weeks and 5 days
100 days	

- Complete the conversions.
  - 1 year = ______ months
  - ______ years = 60 months
  - 3 years and 2 months = ______ months
  - ______ years and ______ months = 75 months
  - ______ years = 24 months
  - 2.5 years = ______ months

Convert units of time

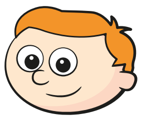
Reasoning and problem solving

Whitney, Ron and Tiny are converting units of time.



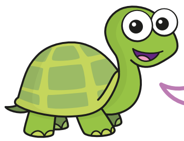
Whitney

There are 60 seconds in a minute.



Ron

There are 60 minutes in an hour.



Tiny

That means that there are 120 seconds in an hour.

Do you agree with Tiny?

Explain your answer.

No

Tiny has worked out 60 + 60 instead of 60 × 60

There are 3,600 seconds in an hour.

Tom is exactly 11 years old.

There have been two leap years in his life.

How many days has Tom been alive?

Convert your answer to hours.

Investigate for other ages.

4,017 days

96,408 hours

Three children are running a race.

- Dani finishes the race in 3 minutes and 5 seconds.
- Eva finishes the race in 192 seconds.
- Alex finishes the race in 2 minutes and 82 seconds.

Who wins the race?

Compare methods with a partner.

Dani

Calculate with timetables

Notes and guidance

Earlier in the year, in the statistics block, children read and interpreted timetables. In this small step, this learning is revisited and extended to include using timetables to solve problems that involve calculations with time.

Begin by recapping what timetables are, their purpose and how they are used. Show different timetables and explain how they show what is happening when. Model how to calculate using a timetable, for example lengths of time between events, how long a television programme is, times between stops on a train/bus journey. These can be challenging, especially when the times cross an hour; a number line can be used to support these calculations.

Children answer questions across a range of different timetables, then think of their own questions that could be answered with the information given in a timetable. Finally, children create their own accurate timetable with information provided.

Things to look out for

- Children may confuse 12-hour and 24-hour clock times.
- Children may try to subtract times using the column method, misinterpreting times as decimals.

Key questions

- What information can a timetable give you?
- Why are some parts of the timetable blank?
- How do you convert between times given using 12-hour and 24-hour clocks?
- How long does ______ take?
- How many minutes are there between ______ and ______?
- How can a number line help you to find the difference between two times?
- What questions could you ask about this timetable?

Possible sentence stems

- The ______ train/bus from ______ takes ______ minutes to get to ______
- From ______ to the next hour is ______ minutes.
  From ______ to ______ is ______ minutes.
  The total time taken is ______ + ______ = ______ minutes.

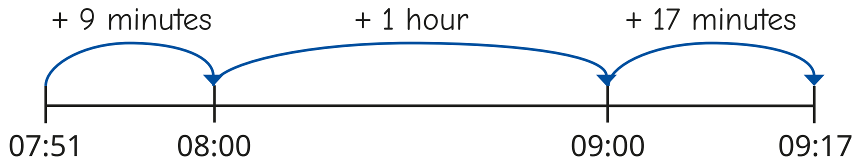
National Curriculum links

- Solve problems involving converting between units of time

Calculate with timetables

Key learning

- Use Mo's number line to work out how long it is between 07:51 and 09:17



- Use the timetable to answer the questions.

Bus Station	06:05	06:35	07:10	07:43	08:15
Shelf Roundabout	06:15	06:45		07:59	08:31
Shelf Village Hall	06:16	06:46	07:25	08:00	08:32
Woodside	06:21	06:50	07:28		
Odsal	06:26	06:55	07:33	08:15	08:45
Railway Station	06:40	07:10	07:48	08:30	09:00

  - Why are some of the times blank?
  - How long does it take the 06:35 bus to travel from the bus station to Odsal?
  - How long does it take the 08:32 bus to get from Shelf Village Hall to the railway station?

- Use the timetable to answer the questions.

Ilkley	14:01	14:31	15:01	15:31
Ben Rydding		14:39	15:09	15:39
Burley in Wharfedale	14:12	14:44		15:44
Menston	14:17	14:49	15:15	15:49
Guiseley	14:20		15:18	15:52
Leeds	14:31	14:59	15:29	16:33

  - How long does the 14:01 train from Ilkley take to get to Menston?
  - How often do trains leave Ilkley for Leeds?
  - How much longer does it take the 15:39 train from Ben Rydding to get to Guiseley than the 15:09 train from Ben Rydding to Guiseley?
  - Teddy arrives in Burley in Wharfedale at 2:50 pm.

    He wants to get to Leeds.

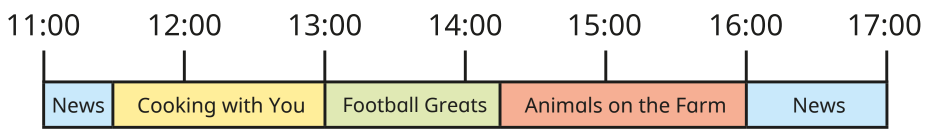
    When is the earliest he will arrive in Leeds?

Ask a partner more questions that can be answered using the timetable.

Calculate with timetables

Reasoning and problem solving

Here is an extract from a TV guide.



Rosie turns on the TV at 12 noon.

What will be on?

Estimate how long *Animals on the Farm* lasts.

Between 11 am and 5 pm, how many minutes is the news on for altogether?

Ask a partner more questions that can be answered using the guide.

Cooking with You | 1 hour and 45 minutes | 90 minutes

Here is part of a bus timetable.

Trinity Street	05:40	06:00	06:20	06:35	06:50
Marford Hill	05:51	06:13	06:33	06:48	07:05
Chister Business Park	06:07	06:25	06:48	07:03	07:20
Railway Station	06:18	06:38	07:00	07:15	07:35

Mr Khan is getting the train from the railway station at 07:05

- He lives a 9-minute walk from Marford Hill bus stop.
- The train platform is an 8-minute walk from the railway station bus stop.
- The train journey is 1 hour and 18 minutes.

What time does Mr Khan need to leave his house?

How long will it be from Mr Khan leaving his house to getting off the train?

6:04 | 2 hours 19 minutes