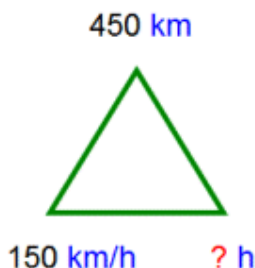# Train Journey

What's this one all about?

Your pupils are going on a train journey – real or imaginary. Where does the train stop? How long does each section of the journey take? What's the distance between stations? What speed does the train travel at?

450 km

150 km/h   ? h

Distance = 450 km

Time = ? h

Speed = 150 km/h

You can take a week over this, discovering how train timetables work (download the relevant ones from the web), working out time intervals between stops, finding the route on an atlas, learning about scale, measuring with string, taking averages, calculating distances etc, etc.

For those that need more of a challenge, you can then work out how to change from times in minutes to times in fractions of an hour and so work out the average speed for each section of the route.

Finally get the children (either individually or in teams) to design an information booklet for the journey, including timetables, distance tables and interesting facts about places along the route. If you are going on the journey for real, then photocopy the booklets and take them with you!

The teacher bits...

Learning Intentions:

Time: I can interpret 24 hour clock times. I can use a timetable to find out which stations a train stops at and what time it gets to a particular place. I can calculate the interval between two times and show my working using a timeline.

Measurement: I can measure accurately a distance on a map. I can convert between different metric measurements. I can use a scale and conversion table to calculate distances in real life.

Averages: I can find the median of a set of measurements.

Calculation: I understand how dividing by 60 relates to dividing by 6. I can express the answers to mental and SWM divisions as decimals. I can round a decimal answer to an appropriate degree of accuracy. I can convert times in hours and minutes into decimal fractions of an hour. I can calculate speeds.

Ages: 10-13

What you need: Class whiteboard, individual whiteboards, train timetables, atlases, pencils & paper.

Note: This investigation offers great scope for investigating timetables and time calculations, maps, metric measurements, the use of averages, and ways of calculating speeds. The progression below is a guide only. Feel free to depart from it and follow the children's interests. Use your judgement as to how far to take the investigation and which parts to focus on.
A variety of photocopy masters is supplied in case you wish to use them. Several are given in more than one form to allow for differing needs. **Do not feel that you have to use them all.** *You may wish to use some as supplied, use individual whiteboards for other parts of the topic, and in other places ask pupils to draw their own tables. Be flexible!*

The investigation

Initial Discussion

Remind the pupils about their forthcoming train journey. Share with them your idea that they could make an information booklet about the route to take with them. Initiate discussion about its size (A4/A5) and what could go in it:

- train times
- names, times and interesting facts about intermediate stations
- map of the route
- distances between places, etc

Ask the children how fast they think their train will travel. How could they work this out? Establish that you can work out the train's speed by knowing how far it travels and how long it takes. Discuss how you could find out distances (atlas) and times (train timetable).

Discuss the information that you will need to gather for the project and where you might get it: rail enquires at www.nationalrail.co.uk, train company web site, atlas, etc

Discuss the skills that the pupils will need:

- how to read a timetable

- how to calculate journey times

- how to work measure distances on a map

- how to work out real distances using the map scale

- how to calculate speeds

Establish an action plan similar to the one below...

Part 1: Timetables

Learn how to use the online rail enquires at www.nationalrail.co.uk to find departure and arrival times of suitable trains.

- Show the pupils how to access the journey planner and take them through the first part of an imaginary booking process. Discuss different time and fare options.

Find out how to locate and print a conventional train timetable from a railway company web site.

- Show the pupils how to access the train company web site. Locate the full timetables for the route in question (These can usually be printed in .pdf format). Find the appropriate pages in the timetable and print them (or have ones that you have prepared earlier!)

Learn how to read a train conventional timetable by establishing the following facts:

- Each column in the timetable is one train.

- Times in bold show stations that the train stops at. Those in normal type or italics show times of arrival or departure using connecting trains. The main train does not stop at these stations.

- d = depart, a = arrive. For most stations only the departure time is shown: it can be assumed that the arrival time is the same - the train only stops very briefly. For

a few major stations a separate arrival time is given. The train stops for longer here.

- A train is described by its departure time, departure station and terminating station. Eg 'The 11 o'clock from London to Glasgow.'

Learn how to answer questions from the timetable, eg:

- At what time does the 10 o'clock from _____ to _____ arrive in _____?'

- If I am travelling from _____ to _____ and miss the _____ what time is the next train?

- How long does the 10 o'clock from _____ to _____ take to get from _____ to _____?

Learn how to calculate journey times using a timeline by establishing the following:

- Start and finish times are clock times given in 24 hour clock (eg 09:30)

- Journey times are given in hours and minutes (eg 1 hour 25 mins)

- A timeline can be used to help work out journey times. On the timeline you put arrows showing jumps forward in whole hours and groups of minutes. You add the jumps to find the total time taken.

Activities: (see photocopy masters)

- Identify start and finish times for the journey in one or both directions.

- Identify names and times of arrival and departure for intermediate stations.

- Calculate journey times.

- Answer questions about the journey(s).

Part 2a: Interpreting Maps

Learn to use maps in the atlas.

- Locate on the atlas the starting point for the train journey(s) and identify how a railway line is shown (thin black line). Trace the route in the atlas, locating the intermediate stopping points. Locate key points on the coast on the atlas map and cross-reference them to points on the map outline.

Activities:

- Transfer the stopping points as accurately as possible to the map outline.

- Sketch in the route.

Part 2b: Measuring Distances and Averaging

Establish strategies for measuring curved distances on a map.

- Discuss ways of measuring distances on the map. Establish that the best way will be using string, since the route is not straight.

- Discuss possible sources of error and strategies for dealing with them. Agree that repeating each measurement several times will be a good idea.

- Establish how to identify and challenge rogue measurements by comparing answers in a group.

- Establish how to find the median of a set of reasonable answers to get the most accurate result.

Activity:

- Work in teams and then as a whole class to find a median measurement that everyone can agree on for each of the sections of the route in one or both directions.

Part 2c: Using Scale

Establish how to use the scale on the map to work out real distances.

- Locate the scale on the map. Discuss the purpose of the scale and establish through teacher-led mental/written calculation the number of km represented by 1cm on the map.

- Discuss the idea that if we know what 1cm represents, we can work out 2cm, 3cm etc. Show how a conversion table can be built up to help with these calculations.

Activities:

- Build a conversion table.

- Use class medians of measured distances in cm to work out real distances in km, correct to one decimal place.

Part 3: Calculating Speeds

Through discussion and/or investigation establish the multiplication triangle relationship between speed, distance and time.

- 120km per hour means you travel 120 km in 1 hour.

- A conversion table can help you work out the number of km travelled in 2, 3, 4 hours etc.

- To work out speed you divide the distance by the time.

Learn how to convert times in minutes to decimal times in hours.

- There are 60 mins in an hour, 30 mins in 0.5 hours.

- 1 tenth of an hour is 6 mins. 6 mins = 0.1 hours.

- You can build patterns to explore the in-between numbers of minutes.

- Dividing the numbers of minutes by 60 gives the decimal times in hours.

- To divide by 60 you divide by 6 and make the number 10 times smaller.

Activity:

- Calculate average speeds for the different sections of the route.

Part 4: Creating the booklet

Look at the sample booklet made previously and discuss how it could be improved.

Agree suitable success criteria.

- A labelled map of the route showing the stations we stop at.

- Appropriate use of text boxes, tables to give:

   o The times when the train stops at the different places (in one or both directions).

   o The distances for each section of the journey.

   o Facts about some of the places we will pass on the way.

Create the booklets:

- Work individually or in teams to create A5 booklets (eg front cover showing tables of stops and times in one direction, back cover showing stops and times in the other direction, inside double-page spread showing map of the route with distances and interesting facts.)

Evaluate the booklets:

- Work in pairs to evaluate the finished booklets against the success criteria.

Use the booklets:

- Take the booklets (or photocopies of them) on the train journey and spot the places on route.

Train Journey

Task:

Create an information booklet for your train journey.

What it might include:

- A map of the route showing the stations we stop at.

- A chart giving the times when the train stops at the different places (in one or both directions).

- The distances for each section of the journey.

- Average speeds for the different sections of the route.

- Interesting facts about some of the places we will pass on the way.

WWLF

- Labelled diagram

- Text boxes

- Tables

I Can

Time:

- I can interpret 24 hour clock times.

- I can use a timetable to find out which stations a train stops at and what time it gets to a particular place.

- I can calculate the interval between two times and show my working using a timeline.

Measurement:

- I can measure accurately a distance on a map.

- I can convert between different metric measurements.

- I can use a scale and conversion table to calculate distances in real life.

Averages:

- I can find the median of a set of measurements.

Calculation:

- I how dividing by 60 relates to dividing by 6.

- I can express the answers to mental and SWM divisions as decimals.

- I can round a decimal answer to an appropriate degree of accuracy.

- I can convert times in hours and minutes into decimal fractions of an hour.

- I can calculate speeds.

Name: _____   Class: _____   Date: _____

I Can

Time:

- I can interpret 24 hour clock times.

- I can use a timetable to find out which stations a train stops at and what time it gets to a particular place.

- I can calculate the interval between two times and show my working using a timeline.

Measurement:

- I can measure accurately a distance on a map.

- I can convert between different metric measurements.

- I can use a scale and conversion table to calculate distances in real life.

Averages:

- I can find the median of a set of measurements.

Name: _____ Class: _____ Date: _____

Stops on the Journey

_____ to _____

Complete this chart to show where the train stops on the journey and when it *arrives* at and *departs* from each station.

Station	Arrive	Depart

When you have finished, compare your answers with someone else who has finished. Discuss any differences of opinion.

Name: _____   Class: _____   Date: _____

Journey Times

_____ to _____

Use these timelines to work out the journey times for each section of the journey.
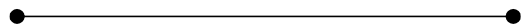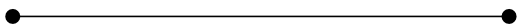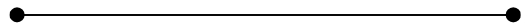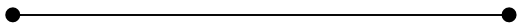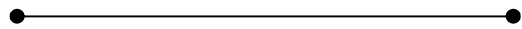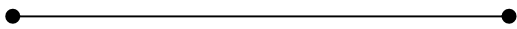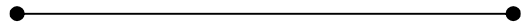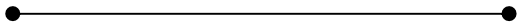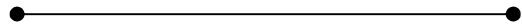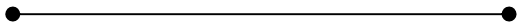
Record your answers in the chart overleaf.

_____ to _____

From	To	Journey Time

When you have finished, compare your answers with someone else who has finished. Discuss any differences of opinion.

Name: _____   Class: _____   Date: _____

Distances on the Map

_____ to _____

Group Task: Teams of 6

Divide your team into 3 pairs.   Each pair use string to measure the distances on the map between the places on the journey.

Record your distances and those for the other pairs. Compare answers. Re-measure any that are very different.

Write the *median* of your final measurements.

| From	To	1st pair	2nd pair	3rd pair	Median

PTO

Work as a class to find the *class median* of the group medians.

From	To	List of Group Medians	Class Median

Calculating Real Distances Using the Map Scale

_____ to _____

The scale of the map is 1: _____

This means that 1cm on the map represents _____ cm in real life.

How many metres is that?   _____

How many kilometres is that?   _____

So 1cm on the map represents ____ km in real life.

Make a conversion table showing some other map and real life distances.

Map	Real Life
1 cm	_____ km
2 cm	_____ km
3 cm	_____ km
4 cm	_____ km
5 cm	_____ km
6 cm	_____ km
7 cm	_____ km
8 cm	_____ km
9 cm	_____ km

Map	Real Life
0.1 cm	_____ km
0.2 cm	_____ km
0.3 cm	_____ km
0.4 cm	_____ km
0.5 cm	_____ km
0.6 cm	_____ km
0.7 cm	_____ km
0.8 cm	_____ km
0.9 cm	_____ km

Skill Check:
Use your table to work out these distances.

1.5 cm → ____ km

3.5 cm → ____ km

4.7 cm → ____ km

2.9 cm → ____ km

5.3 cm → ____ km

Name: _____ Class: _____ Date: _____

Calculating Real Distances Using the Map Scale

_____ to _____

The scale of the map is 1: _____

This means that 1cm on the map represents _____ cm in real life.

How many metres is that?   _____

How many kilometres is that?   _____

So 1cm on the map represents ____ km in real life.

Make a conversion table showing some other map and real life distances.

Map	Real Life
1 cm	_____ km
2 cm	_____ km
3 cm	_____ km
4 cm	_____ km
5 cm	_____ km
10 cm	_____ km
20 cm	_____ km

Skill Check:
Use your table to work out these distances.

6 cm → ____ km

8 cm → ____ km

12 cm → ____ km

15 cm → ____ km

25 cm → ____ km

Name: _____ Class: _____ Date: _____

Real Distances

_____ to _____

Use your conversion table (or long multiplication!) to work out the real distance for each section of the journey. Make sure you use the *class median* measurement for each of the map distances, not your own one!

From	To	Median Map Distance (cm)	Real Distance (km)

Record any working carefully on the back of the sheet.

Compare answers as a group. Investigate any differences of opinion.
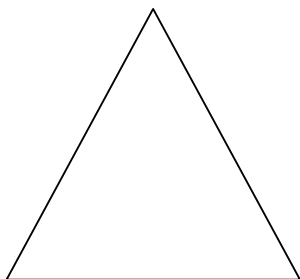
Name: _____ Class: _____ Date: _____

Speed, Distance, Time

The speed of a train is measured in kilometres per hour. If its average

speed is 120km per hour this means it will travel 120 km in 1 hour.

Complete this table to show how far the train will travel in longer times.

Distance (km)	Time (hours)	Speed (km per hour)
120	1	120
	2	120
	3	120
	5	120
	10	120

Look at the numbers in your chart. Complete this multiplication triangle:

_____ × _____ = _____

_____ × _____ = _____

_____ ÷ _____ = _____

_____ ÷ _____ = _____

Distance, Speed, Time

Name: _____ Class: _____ Date: _____

Converting Minutes to Decimal Hours

To work out speed in km per hour we need to:

Divide a *distance in km* by a *time in hours.*

If we have times in hours and minutes we need to convert these to

decimal hours. Build patterns to investigate how to do this.

Quarters of an Hour	
30 mins	0.5 hours
15 mins	___ hours
45 mins	___ hours

Sixths of an Hour	
10 mins	_____ hours
20 mins	_____ hours
30 mins	0.5 hours
40 mins	_____ hours
50 mins	_____ hours
60 mins	1 hour

Tenths of an Hour	
__ mins	0.1 hours
__ mins	0.2 hours
__ mins	0.3 hours
__ mins	0.4 hours
30 mins	0.5 hours

Sixtieths of an Hour	
1 min	_____ hours
2 mins	_____ hours

Complete:

To convert to decimal hours you _____ the time in minutes by ____.

Calculating Average Speeds

Work out the average speeds for the different sections of the route.

- Use a calculator.

- Give the time in decimal hours to *4 decimal places*.

- Round *the speed* to *the nearest whole number*.

From	To	Distance (km)	Time (mins)	Time (decimal hours)	Speed
		_____ km	___ mins	_____ hrs	_____km/h
		_____ km	___ mins	_____ hrs	_____km/h
		_____ km	___ mins	_____ hrs	_____km/h
		_____ km	___ mins	_____ hrs	_____km/h
		_____ km	___ mins	_____ hrs	_____km/h
		_____ km	___ mins	_____ hrs	_____km/h
		_____ km	___ mins	_____ hrs	_____km/h
		_____ km	___ mins	_____ hrs	_____km/h
		_____ km	___ mins	_____ hrs	_____km/h
		_____ km	___ mins	_____ hrs	_____km/h

Compare answers as a group. Investigate any differences of opinion.