Maps and Scales

What's this one all about?

Using real maps can get children really engaged in work on scale and you'll find that they will achieve far more than they would if working from a text book.

Map	Real Life	Map	Real Life
1 cm	_____ km	11 cm	_____ km
2 cm	_____ km	11.5 cm	_____ km
3 cm	_____ km	12 cm	_____ km

If you use real maps you also get real-world numbers. But don't be scared of these! The children can handle them if you teach them the strategy of 'try a simpler case'.

This investigation looks at how to work out real distances between places, based on measured distances on the map.

The secret is to build conversion tables, starting with 1cm, 2cm and so on, and then moving to larger numbers.

This cuts out the need for complicated multiplication sums and 'makes sense' to the children.

If you load up the online pattern builder, you then have an automatic checking system, and the pupils can be let loose on a whole range of different measurements of their choice, which they can convert and mark as they go along.

You can use the same approach for investigating speeds.

The teacher bits...

Learning Intentions:

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.

Ages: 8-12

What you need: Class whiteboard, atlases, pencils & paper.

Note: A variety of worksheets is given below. Please select the ones you need to suit your purpose.

The investigation

Initial Discussion

Remind the pupils about their area of study or their planned journey. Discuss the idea that it would be interesting to know the distances between the places that they have been studying or how far their journey is going to be altogether. Identify that an atlas will be useful.

Interpreting Maps

Learn to use maps in an atlas.

- Locate on the atlas the first two places of interest, or the start and end point for the first leg of the journey. Trace a route from one to the other.

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 discussion the number of km represented by 1cm on the map.

(Depending on the age of your pupils and how the map scale is written, you may wish to explain briefly how the ratio form of the scale links to the cm/km form.

eg Scale of 1: 1,000,000. 1cm on the map represents 1 million cm in real life. Talk about the number 1 million. Demonstrate trying to walk 1 million centimetres one at a time and joke about how long it would take. Ask how many cm in a metre. Show a metre stick and agree that there are 100.

Ask how many m in a km. Explain the idea that 'kilo' represents 1000. So there are 1000m in a km. There are 100cm in a m an 1000m in a km so there are 100,000 (one hundred thousand cm in a km)

So in 10km there are ten hundred thousand cm which is one million cm.

So we have found out that 1cm on the map represents 10km in real life.)

- 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. (You can use the online Pattern Builder for this – go into Measure, Map Scales.)

Activity:

- Build a conversion table and practise using it to find some real distances.

Note: For younger pupils (age 8 or 9) a map with a scale of 1cm:10km (1: 1,000,000) is ideal. Converting from map distances to real distances is then simply a case of multiplying by 10. This investigation can then be an excellent one for consolidating earlier teaching on multiplying by 10, particularly if the pupils decide to express their cm measurements using decimals – eg 6.5cm → 65km, 13.2cm → 132km etc

If you have access to the online pattern builder, this can be used to explore this.

Measuring Distances and Averaging

Establish strategies for measuring distances on a map.

- Discuss ways of measuring distances on the map. Discuss the difference between measuring the distance 'as the crow flies' using a ruler or measuring the actual journey along a road using string.

- Discuss possible sources of error and strategies for dealing with them. [eg making sure you start at zero on the ruler) Agree that repeating each measurement several times will be a good idea.

- If you are going to measure with string, establish how to find the median of a set of reasonable answers to get the most accurate result.

Activity:

- Work in teams and either...

    o measure the distance as the crow flies for each leg of the journey.

    o measure the road distance with string and find a median measurement that everyone can agree on for each of the sections of the route.

- Use the conversion table and agreed measured distances in cm to work out real distances in km.

Estimating the time for the journey

Through discussion and/or investigation establish how many miles or kilometres it might be reasonable to expect to travel in one hour.

- Eg Average speed of 40km per hour – so 40 km in one hour.

- A conversion table can help you work out the number of km travelled in 2, 3, 4 hours etc. (Use the online Pattern Builder – Speed, Distance, Time)

Activity:

- Using the previously calculated distances, work out an estimate for how many hours will be needed for each leg of the journey.

Name: _____ Class: _____ Date: _____

Calculating Real Distances Using the Map Scale

The scale of the map is 1: _____

1cm on the map represents _____ cm in real life.

1cm on the map represents _____ m in real life.

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

Make conversion tables 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

Map	Real Life
11 cm	_____ km
11.5 cm	_____ km
12 cm	_____ km
12.5 cm	_____ km
13 cm	_____ km
13.5 cm	_____ km

Map	Real Life
6 cm	_____ km
6.2 cm	_____ km
6.4 cm	_____ km
6.6 cm	_____ km
6.8 cm	_____ km
7 cm	_____ km

Map	Real Life
10 cm	_____ km
20 cm	_____ km
30 cm	_____ km

To think about:

What do you have to do to the map distance to change it into the real life distance?

Name: _____   Class: _____   Date: _____

Real Distances

Use your conversion table to work out the real distance for each section of the journey.

From	To	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.

Distances on the Map

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

Name: _____   Class: _____   Date: _____

Building a Time Distance Table

Your average speed is _____ km per hour.

Use this table to work out how far you can get in different times.

Time	Distance
1 hour	_____ km
2 hours	_____ km
3 hours	_____ km
4 hours	_____ km
5 hours	_____ km
6 hours	_____ km
7 hours	_____ km
8 hours	_____ km
9 hours	_____ km

Time	Distance
$\frac{1}{4}$ hour	_____ km
$\frac{1}{2}$ hour	_____ km
$\frac{3}{4}$ hour	_____ km
1 hour	_____ km

Roughly how long would it take

to travel

50km?   _____

100km?   _____

150km?   _____

200km?   _____

Name: _____ Class: _____ Date: _____

How long will it take?

Your average speed is _____ km per hour. Use your conversion table to work out roughly how long it will take to travel between the different places.

From	To	Real Distance (km)	Time (hours)

Name: _____ Class: _____ Date: _____

How long will it take?

Your average speed is _____ km per hour. Use your conversion tables to work out the real distances and roughly how long it will take to travel between the different places.

From	To	Map (cm) Distance	Real (km) Distance	Time (hours)