

Wider skills practice

1 Ann travels to school.

- She walks 0.3 km from home to the bus stop in 4 minutes.
- She then waits 2 minutes for the bus.
- The bus travels 1.2 km in 5 minutes to a bus stop near the school.
- Ann walks the last 0.2 km to school in 4 minutes.

- a** Draw a horizontal axis from 0 minutes to 16 minutes using a scale of 1 cm to represent 1 minute. Draw a vertical axis from 0 km to 2 km using a scale of 1 cm to represent 0.1 km.

Plot a travel graph to illustrate Ann's journey to school.

- b** What is the average speed of the bus in metres per minute?

- c** Convert this speed to kilometres per hour.

2 Angela, Bob and Cathy leave Deetown and travel in the same direction.

- Angela sets off at 11:30 a.m. and travels 48 km by car.
It takes her $1\frac{1}{2}$ hours.
- Bob leaves at 10:30 a.m., walks 4 km in an hour and then catches a bus which travels another 13 km.
The bus journey takes 1 hour.
- Cathy cycles, setting off at 11 a.m.
She travels 28 km in 2 hours.

- a** Draw axes from 10 a.m. to 2 p.m. on the horizontal axis and from 0 km to 50 km on the vertical axis.

Plot the travel graphs for all three people.

- b** At what time does Angela pass Bob?

- c** At what time does Angela pass Cathy?

- d** At what times does Cathy pass Bob?

- e** At what speed is Angela driving?

- f** At what speed is Cathy cycling?

- 3** Tandeep and Ruth are studying changes of state in their chemistry lesson. They heat some solid paraffin wax in a test tube until it melts. Then they measure its temperature every 2 minutes as it cools and solidifies. The table shows their results.

Time (minutes)	Temperature (°C)
0	86
2	70
4	62
6	57
8	55
10	55
12	55
14	55
16	55
18	55
20	55
22	53
24	50

Time (minutes)	Temperature (°C)
26	45
28	41
30	37
32	33
34	30
36	28
38	26
40	24
42	23
44	22
46	22
48	22
50	22

- a** Plot these points on a graph, with time in minutes on the x axis and temperature in $^{\circ}\text{C}$ from 0 to 90 on the y axis.
Join the points with a smooth curve.
This graph is the cooling curve for paraffin wax.
- b** What is the temperature of the paraffin wax after
- 5 minutes
 - 27 minutes?
- c** How long does it take the wax to cool from its initial temperature to 65°C ?
- d** When a liquid cools to its melting point, the temperature stays the same until it has all become solid.
What is the melting point of paraffin wax?
- e** What is room temperature?
- f** Tandeep and Ruth repeat the experiment with a different wax.
This wax has a melting point of 64°C .
Starting from the same initial temperature sketch a cooling curve for this wax.

- 4 Look at the line graph in this newspaper article.

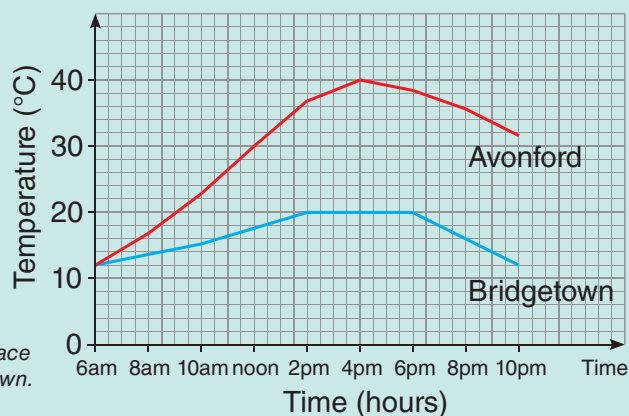
THE AVONFORD STAR

What A Scorcher!!

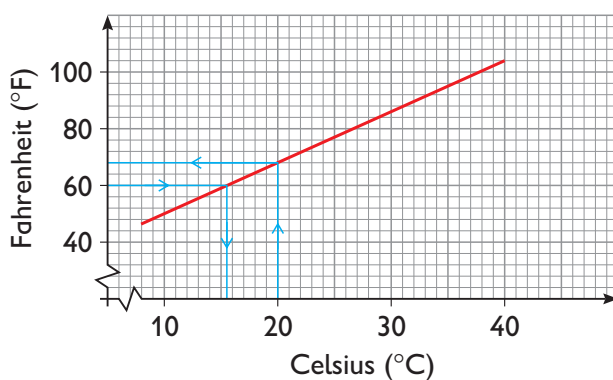
Temperatures in Avonford reach a record high!

Avonford has just got in to the record books with having the hottest day since records began. The temperature soared to a sizzling 40°C and only fell to 18°C last night.

Avonford compared with the coldest place in Britain yesterday, Bridgetown.



- a What is the temperature in both towns at 11 o'clock?
- b At which times is the temperature in Bridgetown 18°C ?
- c This is a conversion graph.
You can use it to convert between Fahrenheit and Celsius temperatures.



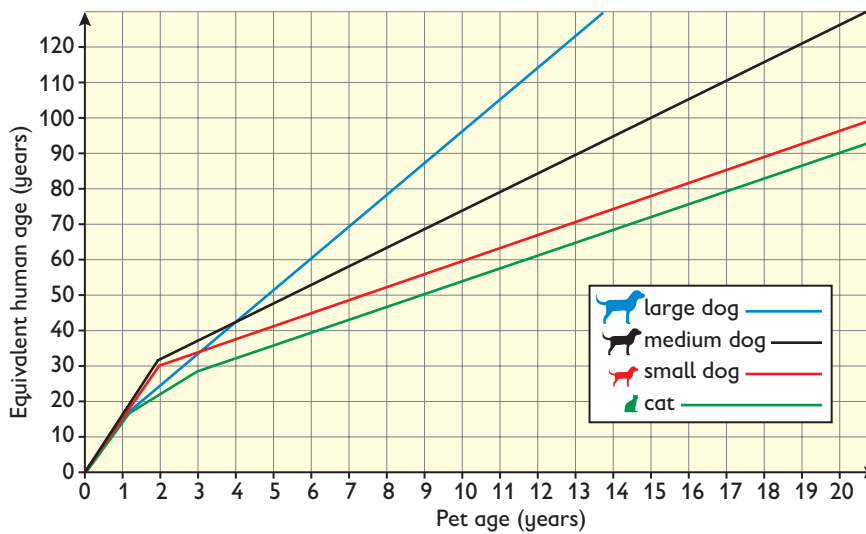
Write down the temperature in each town for every hour.
Use the conversion graph to convert the temperatures to Fahrenheit.

- d Make your own newspaper article and line graphs using the Fahrenheit temperatures.
- e Comment on the shape of your line graphs compared with the line graphs in the newspaper article.
- f Can you convert exactly between Celsius and Fahrenheit by using the conversion graph?

5 Katie is talking to her mother.



Katie does not believe her mother.
She gets this graph from the vet.



- What is Tiger's age in human years?
- Which is older, in human years, a 10-year-old large dog or a 19-year-old cat?
- Is it ever true that a dog's human age is seven times its real age?
- Is it ever true that a cat's human age is seven times its real age?
- Look at the gradients of the lines on this graph.
What do they tell you?

- 6** The faster you drive, the more space you need to stop.
The Highway Code gives this information about stopping distances.

Typical stopping distances

20 mph 6 m 6 m = **12 m (40 feet)**

30 mph 9 m 14 m = **23 m (75 feet)**

40 mph 12 m 24 m = **36 m (118 feet)**

50 mph 15 m 38 m = **53 m (175 feet)**

60 mph 18 m 55 m = **73 m (240 feet)**

70 mph 21 m 75 m = **96 m (315 feet)**

The distances shown are a general guide. The distance will depend on your attention (thinking distance), the road surface, the weather conditions and the condition of your vehicle at the time.

Thinking distance

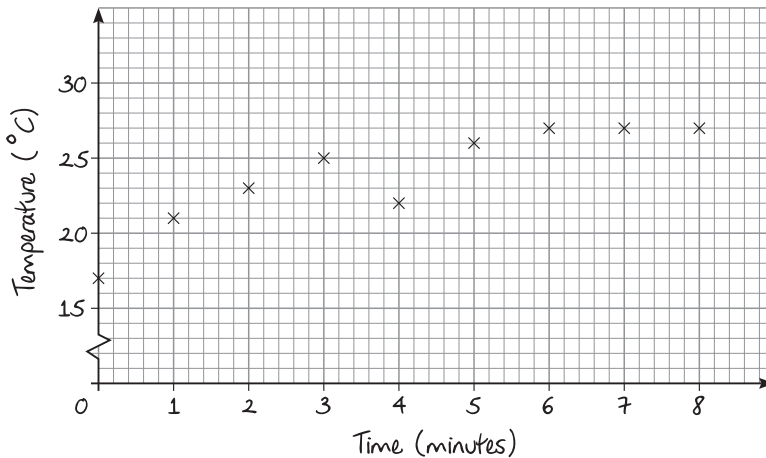
Braking distance

Reasoning

- Bruce is driving at 45 miles an hour (mph) and Brenda is driving at 65 mph. What are their stopping distances?
- Draw a graph of stopping distances.
Use the horizontal axis for the speed, going up to 80 mph (scale: 1 cm to 10 mph).
Use the vertical axis for the distance, going up to 500 feet (scale: 1 cm to 50 feet).
Plot the six points from the Highway Code and join them with a smooth curve.
- Use your graph to check your answers to part **a**.
- What is the stopping distance for 52 mph?
- What is the stopping distance for 15 mph?
(You will need to extend your curve.)
- You are driving 200 feet behind Bruce. What is your maximum safe speed?
- Do you think the curve should go through (0, 0)? Explain your answer.

- 7 Janine has made an electrical heater for a plant propagator. She tests it in a container of damp soil and plots the data on a graph.

Time (minutes)	0	1	2	3	4	5	6	7	8
Temperature (to nearest °C)	17	21	23	25	22	26	27	27	27



- Janine thinks one of her readings is wrong. Which one is this?
- What should she do about it?
- How should she join the data points?