Spring Block 5

Statistics

Small steps

Step 1 | Draw line graphs

Step 2 | Read and interpret line graphs

Step 3 | Read and interpret tables

Step 4 | Two-way tables

Step 5 | Read and interpret timetables

Draw line graphs

Notes and guidance

In Year 4, children interpreted and drew line graphs for the first time, focusing on examples where the horizontal axis was a measure of time. In this small step, they revisit this learning and build upon it by looking at other types of graph, for example conversion graphs.

Encourage children to join points using a straight dashed line and discuss the fact that this is used because they cannot be certain of exact values between the given values at two points. However, this does not apply to conversion graphs.

Explore different sets of data that call for a range of intervals on the vertical axis. Children can decide what intervals to use by looking at the greatest and lowest values and using an appropriate scale.

Things to look out for

- Children may need support in choosing appropriate intervals for the vertical axis.

- Children may begin a scale from zero even if the lowest value is considerably greater than this.

- Children may not estimate accurately between two given values.

Key questions

- What information do you want to show with your line graph?

- What does the vertical/horizontal axis on the graph represent?

- What information will go on which axis? Why?

- Will you join the points with a solid line or a dashed line? Why?

- What scale would be most appropriate for the vertical axis?

- How can you use multiples to support your choice of intervals for the vertical axis?

Possible sentence stems

- The horizontal axis shows _____
  The vertical axis shows _____

- The intervals on the vertical axis go up in _____

National Curriculum links

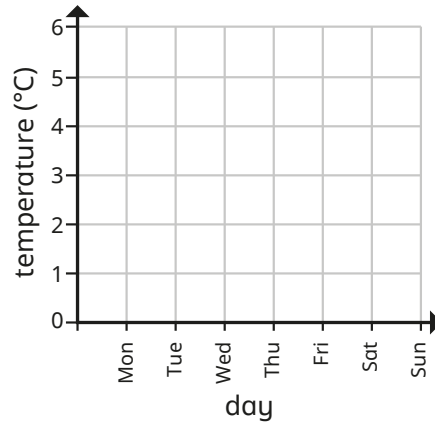- Solve comparison, sum and difference problems using information presented in a line graph

Draw line graphs

Key learning

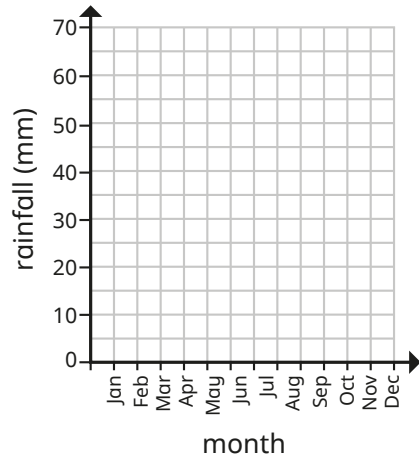- Scott records the temperature every day for a week.

  Use his results to draw the line graph.

Day	Temperature (°C)
Monday	2
Tuesday	3
Wednesday	3
Thursday	5
Friday	4
Saturday	2
Sunday	1

- The table shows the average rainfall in Leicester over a year.

  Draw the graph using the information from the table.

Month	Rainfall (mm)	Month	Rainfall (mm)
Jan	55	Jul	69
Feb	45	Aug	64
Mar	49	Sep	58
Apr	57	Oct	63
May	60	Nov	61
Jun	66	Dec	60

- The table shows the average temperature for each month in Halifax.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature (°C)	4	4	5	8	10	15	17	16	13	11	6	5

Draw this information as a line graph.

- Dora measures her shadow in the playground every hour and records her results.

Time	9 am	10 am	11 am	noon	1 pm	2 pm	3 pm
Length of shadow (cm)	125	113	82	53	69	108	132

Draw the line graph for the data.
Start the vertical axis at 50

- Here is a table showing the conversion between pounds and Indian rupees.

Pounds	1	2	3	4	5	6	7	8	9	10
Rupees	80	160	240	320	400	480	560	640	720	800

Present the information as a line graph.

What do you notice about the graph?

Draw line graphs

White Rose Maths

Reasoning and problem solving

Collect your own data and present it as a line graph.

You could collect data linked to a Science investigation.

Possible investigations could be:

- measuring shadows over time
- melting and dissolving substances
- plant growth

multiple possible answers

Here is a table of data.

Time (minutes)	15	30	45	60	75
Distance (km)	25	46	67	72	98

What intervals would be most appropriate for the vertical axis of the line graph?

Explain your answer.

multiple possible answers, e.g.

starting from zero, go up in 10s or 20s

starting from 20, go up in 10s

The chart shows the change in population of a village over 7 years.

Year	2016	2017	2018	2019	2020	2021	2022
Population	562	105	243	498	1,287	2,950	2,689

Mo, Eva and Rosie are turning the information into a line graph.

Mo: The intervals on the vertical axis should go up in 2s.

Rosie: The intervals on the vertical axis should go up in 1,000s.

Eva: The intervals on the vertical axis should go up in 200s.

Who do you agree with? Why?

Draw the line graph.

Eva

Read and interpret line graphs

Notes and guidance

In the previous step, children drew their own line graphs. In this small step, they interpret information that has been presented on a line graph and answer questions and solve problems using them.

Children read the graph at specific points to get information about one variable based on the other. They also find the difference between two points, the amount of time spent above/below certain points and make inferences based on information presented to them. Model questions such as the difference between two points by drawing straight lines between the graph points and the axis and then reading the scales accordingly.

Children should also explore estimating points between two intervals and should be able to explain why these are only estimates.

Things to look out for

- Children may not draw straight lines from the axis to the graph when reading off, so give inaccurate answers "by eye".

- Children may choose an inappropriate estimate when the point is between two intervals.

Key questions

- What information is being presented on the line graph?

- What does each axis on the line graph show?

- How can you summarise what the graph shows?

- What lines can you draw to help read the graph?

- Why do you think the direction of the line changes at this point in the line graph?

- Is your answer exact or an estimate?

Possible sentence stems

- The horizontal axis shows _____ and the vertical axis shows _____

- At _____ , the graph reads _____
  At _____ , the graph reads _____
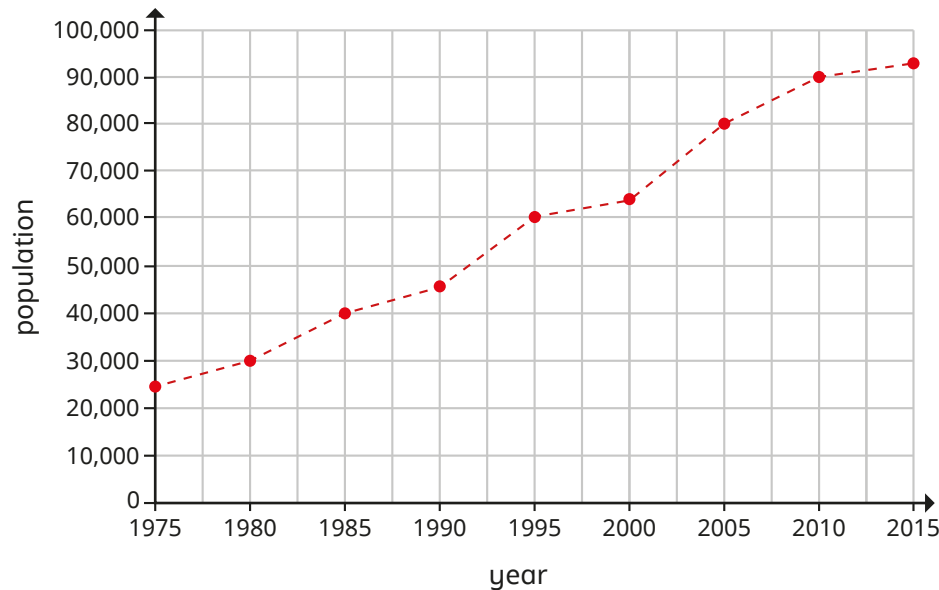 The difference between the two points is _____

National Curriculum links

- Solve comparison, sum and difference problems using information presented in a line graph

Read and interpret line graphs

Key learning

- The line graph shows the population growth of a town.

- In what years was the population recorded? How do you know?

- What was the population in 1985?

- What year did the population reach 80,000?

- Is it possible to know the exact population in 1997? Why?

- Estimate the year that the population reached 50,000

- Estimate the population in 2003

- The graph shows the night-time temperatures in a garden.
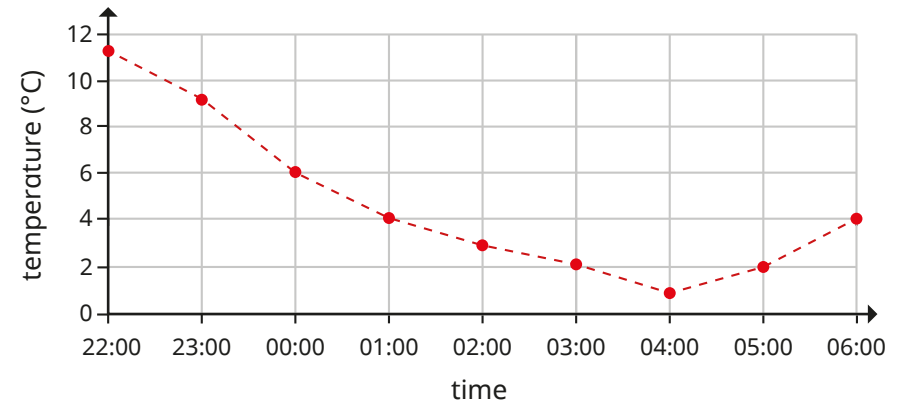
- How often was the temperature recorded? How do you know?

- What was the temperature at midnight?

- Is it possible to tell the exact temperature at 02:30? Why?

- What was the highest recorded temperature? At what time did this temperature happen?

- What was the lowest recorded temperature? At what time did this temperature happen?

- What is the difference between the highest and the lowest temperature?
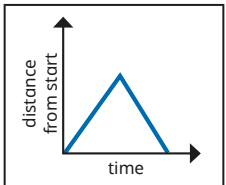
- What else can you find out?

Read and interpret line graphs
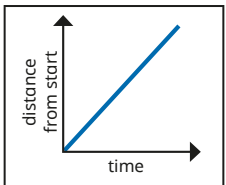
Reasoning and problem solving

Match the graphs to the descriptions.
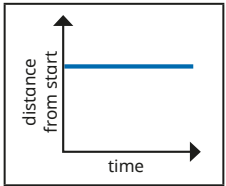
A car travels at a constant speed on the motorway.

A car is parked outside a house.

A car drives to the end of the road and back.

first graph, second statement

second graph, third statement

third graph, first statement

Explain your answers.

The line graph shows the level of water in a bath.

Write a story to explain what is happening in the graph.
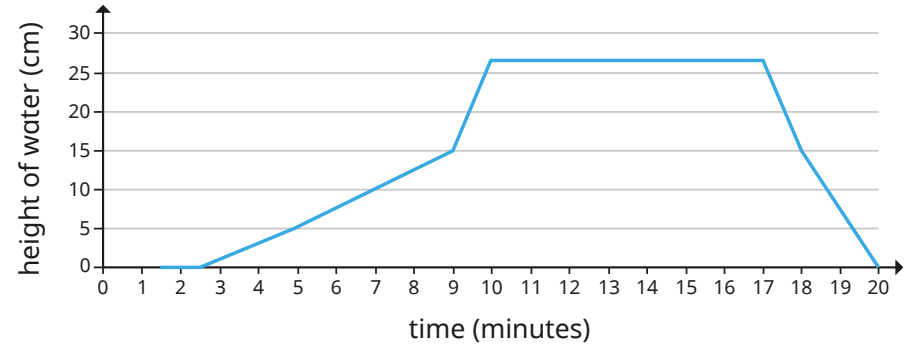
How long did it take to fill the bath?

How long did it take to empty?

The bath does not fill at a constant rate.

How does the graph show this?

Why might this be the case?

approximately 10 minutes | approximately 3 minutes

Read and interpret tables

Notes and guidance

In this small step, children read and interpret data presented in a table. They look at the data in a table and work out the information that they need to extract from the table to answer questions on the data. Look at a range of questions that can be asked about information in a table, beginning with simple retrieval questions and moving on to comparing amounts, inferring reasons behind information and grouping information. Encourage children to generate their own questions that can be answered using the table.

This step is a good opportunity for children to practise their addition and subtraction skills, as well as making comparisons.

This learning can be linked to Science and topic work.

Things to look out for

- Children may use the incorrect operation when answering questions about a table, especially for questions such as "How many more … ?"

- Tables with more than two categories of information can be harder to interpret.

Key questions

- What information is given in this table?

- What are the column/row headings of the table?

- Why is it important to include the units of measure in the table?

- What is the total of _____ ?

- How can you find the difference between two pieces of information given in the table?

- How is a table similar to/different from a line graph?

Possible sentence stems

- The value in _____ is _____
  The value in _____ is _____
  The difference between the values is _____

- The _____ with the most/least _____ is _____

National Curriculum links

- Complete, read and interpret information in tables, including timetables

Read and interpret tables

Key learning

- Mo collects information from children about their favourite colour.

  He puts the information into a table.

Colour	Red	Yellow	Green	Blue	Orange	Purple
Number of children	3	7	5	17	6	7

  ▶ How many children prefer orange?

  ▶ What is the most popular colour?

  ▶ What is the least popular colour?

  ▶ How many children did Mo ask?

  ▶ How many more children like purple than like green?

  What other questions could you ask about this table?

- Use the table to answer the questions.

City	Leeds	Wakefield	Bradford	Liverpool	Coventry
Population	720,000	316,000	467,000	440,000	305,000

  ▶ What is the difference between the highest and lowest populations?

  ▶ Which two cities have a combined population of 621,000?

  ▶ How much larger is the population of Liverpool than Coventry?

- Use the table to answer the questions.

City	London	Sydney	New York	Reykjavik	Tokyo
January temperature (°C)	7	27	2	0	10
July temperature (°C)	21	17	30	13	30

  ▶ In which city is the difference in temperature between January and July greatest?

  ▶ How much warmer is New York in July than Reykjavik in January?

- Here is a table with information about four planets.

Planet	Time for revolution	Diameter (km)	Time for rotation
Mercury	88 days	4,878	59 days
Venus	225 days	12,104	116 days
Earth	365 days	12,756	24 hours
Mars	687 days	6,794	25 hours

  ▶ How many of the planets take more than one day to rotate?

  ▶ Which planet takes more than one year for one revolution?

  ▶ Write the diameter of Venus in words.

  ▶ What is the difference between the time for rotation of Mercury and the time for rotation of Earth?

Read and interpret tables

Reasoning and problem solving

The table shows some results from sports day.

	100 m sprint (seconds)	Shot-put (m)	50 m sack race (seconds)	Javelin (m)
Amir	15.5	6.5	18.9	11.2
Dani	16.2	7.5	20.1	13.3
Teddy	15.8	6.9	19.3	13.9
Rosie	15.6	7.2	18.7	14.1
Ron	17.9	6.3	18.7	13.3

Ron thinks that he won the 100 m sprint, because he has the greatest number.

Do you agree with Ron?

Explain your answer.

What other questions can you ask using the table?

No

The greatest number means the longest running time, so Ron is the slowest.

The table shows the six largest football stadiums in Europe.

Stadium	City	Country	Capacity
Camp Nou	Barcelona	Spain	99,365
Wembley	London	UK	90,000
Signal Iduna Park	Dortmund	Germany	81,359
Estadio Santiago Bernabeu	Madrid	Spain	81,044
Luzhniki Stadium	Moscow	Russia	81,006
San Siro	Milan	Italy	80,018

Are the statements true or false?

The fourth largest stadium is San Siro.

There is one stadium with a capacity greater than 90,000

Three of the largest stadiums are in Spain.

False   True   False

Two-way tables

Notes and guidance

In this small step, children explore two-way tables. Two-way tables show more than one piece of information about each variable, for example the number of adults and children in a school and how many do/do not wear glasses.

Start by looking at examples as a class, asking what information can be seen from the table. By generating their own questions, children will see the range of possible answers that a two-way table can show, identifying the meaning of each cell by looking at both the horizontal and vertical labels.

Children learn to find missing values in the table, such as the total number or one of the parts from given totals.

Things to look out for

- When finding the overall total, children may add the totals of the columns and the rows, and so find double the answer.

- Children may use the incorrect operation when finding missing numbers, for example adding instead of subtracting.

- Children may need support to identify the correct cell in a table that has the information they need.

Key questions

- What information is given by this table?
- What are the column/row headings of the table?
- How can you find the difference between two pieces of information given in the table?
- How can you work out missing information in the table?
- Do you need to add or subtract? How do you know?
- What conclusions can you draw from the table?

Possible sentence stems

- The columns show _____ and the rows show _____
- Where the _____ column meets the _____ row, this shows _____
- To find a missing total, I need to _____ the numbers in a _____ or _____
- To find a missing value, I need to _____ from _____

National Curriculum links

- Complete, read and interpret information in tables, including timetables

Two-way tables

Key learning

- The two-way table shows the staff at a police station.

	No glasses	Glasses	Total
Constable	55	24	79
Sergeant	8	5	13
Inspector	2	4	6
Chief Inspector	1	1	2
Total	66	34	100

  ► How many inspectors wear glasses?

  ► How many sergeants do not wear glasses?

  ► How many constables are there altogether?

  ► How many people work at the police station?

- The table shows information about type of pet and the pet's gender.

	Male	Female	Total
Dogs		44	
Cats	38		
Total	125		245

Fill in the missing numbers in the table.

  ► How many more male dogs are there than female dogs?

  ► How many more female cats are there than male cats?

- The table shows some information about how children in Key Stage 1 and Key Stage 2 travel to school each morning.

	KS1	KS2	Total
Walk		95	118
Car	45		70
Bus	9	27	
Bike		56	56
Total			

  ► Complete the table.

  ► Which key stage has more children in it?

  ► What is the most popular method of getting to school for each key stage?

- The table shows the number of football matches won and lost by three different teams.

	Liverpool	Manchester United	Chelsea	Total
Lost	38	42	29	
Won	174	76	126	
Total				

  ► Complete the table.

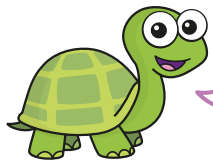 ► Write some questions about the information for a partner to answer.

Two-way tables

Reasoning and problem solving

The table shows the types of sandwiches chosen by a group of children on a school trip.

	White bread	Brown bread	Total
Ham		15	25
Cheese	13		35
Jam		8	17
Tuna	15		23
Total			

$\frac{1}{5}$ of the children asked for a ham sandwich on white bread.

Do you agree with Tiny?

Explain your answer.

No

120 people were asked where they went on holiday during the summer months.

Use this information to create a two-way table.

- In June, 6 people went to France and 18 went to Spain.
- In July, 10 people went to France and 19 went to Italy.
- In August, 15 went to Spain.
- Altogether, 35 people went to France and 39 went to Italy.
- 35 people went away in June and 43 in August.

	June	July	August	Total
France	6	10	19	35
Spain	18	13	15	46
Italy	11	19	9	39
Total	35	42	43	120

Read and interpret timetables

Notes and guidance

In this small step, children explore timetables, which are a special type of two-way table.

Start by showing children a timetable they are familiar with, such as their school day. Explain why it is important to have this information available and how anyone can read the timetable to understand information they may wish to know. Move on to other timetables that may be relevant to the children's lives, such as TV guides and timetables for local buses and swimming pools.

For this step, the questions will mainly focus on interpreting timetables.

Calculations using timetables will be covered in detail later in the year.

Things to look out for

- Children may assume that blank spaces need filling in, rather than understanding that buses or trains do not stop at that stop.

- Difficulties with times presented in digital form may hamper children interpreting timetables.

Key questions

- What information does this timetable tell you?

- How is a timetable the same as/different from a two-way table?

- What is the same and what is different about each row/column of the timetable?

- What does the _____ row/column tell you?

- At what time does the _____ from _____ get to _____?

- How many _____ are there?

- What does a blank space in a timetable mean?

Possible sentence stems

- The _____ train from _____ gets to _____ at _____

- The next available _____ is at _____

- The journey/lesson/programme starts at _____ and ends at _____

National Curriculum links

- Complete, read and interpret information in tables, including timetables

Read and interpret timetables

Key learning

- This is Alex's school timetable.

	Daily Assembly (09:00–09:15)	1 09:15–09:55	2 09:55–10:45	Break (10:45–11:05)	3 11:05–11:55	4 11:55–12:45	Lunchtime (12:45–13:45)	5 13:45–14:35	6 14:35–15:25
Mon		Literacy	English		Maths	ICT		PSHCE	Geog
Tue		English	Art		French	Science		DT	
Wed		Literacy	DT		Art	Drama		ICT	Science
Thur		PE	Maths		RE	English		History	PSHCE
Fri		Literacy	Maths		Art	Science		PE	

- ► How many Literacy lessons does Alex have in a week?

- ► Which afternoons does she only have one subject?

- ► How many more Maths lessons does Alex have in a week than ICT lessons?

- ► At what time does Alex's Science lesson on Friday start?

What other questions can you think of for Alex's timetable?

- Here is part of a train timetable.

London Euston	06:35	15:10	16:10	18:40
Watford Junction	06:50	15:25	16:25	18:55
Milton Keynes Central	07:10		16:50	
Northampton	07:15	15:55	16:55	19:25
Rugby	07:24	16:04	17:04	19:34
Coventry	07:44	16:14	17:13	19:43
Birmingham New Street	08:09	16:41	16:41	20:11

- ► What time does the 15:10 train from London Euston get to Coventry?

- ► Annie gets on the train at Northampton.

  How many stops are there before she gets to Birmingham New Street?

- ► Ron gets a train from Watford Junction to Rugby.

  He arrives in Rugby at 16:04

  What time did he get on the train?

- ► Why are some parts of the table blank?

Read and interpret timetables

Reasoning and problem solving

Here is part of a TV guide.

	5 pm			6 pm			7 pm
NatureWatch	News	Weather	Deep Blue	Pampered Pets	In the Wild		Safari
NatureWatch + 1	Puppy Playtime			News	Weather	Deep Blue	Pampered Pets
QuizTime	Talk the Talk		Quizdom	What's the Q?	aMAZEment		Buzzed Out
CookeryPro	Cheese Please			Cook with Lydia	Pizza Pro	5 Minute Menu	Budget Baker

Huan wants to watch *Cheese Please*, *Pampered Pets*, *aMAZEment* and *Budget Baker*.

Will Huan be able to watch all the programmes he has chosen?

Yes

Here is a bus timetable.

Bus terminal	09:32	10:02	10:22	10:32
Shopping centre	09:41	10:11	10:31	10:41
Football stadium	09:59	10:29	10:49	10:59
University campus	10:13	10:43	11:03	11:13
Library	10:16	10:46	11:06	11:16
Cinema	10:21	10:51	11:11	11:21
Museum	10:28	10:58	11:18	11:28

Sam lives a 15-minute walk from the bus terminal.

She wants to visit Whitney, who lives a 10-minute walk from the cinema.

She says she will meet Whitney at Whitney's house at 11:15

What time does Sam need to leave her house?

09:47