

**White**

**Rose  
Maths**

Autumn - Block 3

**Statistics**

# Overview

## Small Steps

## Notes for 2020/21

- ▶ Interpret charts R
- ▶ Comparison, sum and difference R
- ▶ Introduce line graphs R
- ▶ Read and interpret line graphs
- ▶ Draw line graphs
- ▶ Use line graphs to solve problems
- ▶ Read and interpret tables
- ▶ Two-way tables
- ▶ Timetables

Children may have missed learning on statistics in Year 4.

We have included a recap on some of the trickier aspects of the topic such as interpreting charts and comparing results.

# Interpret Charts

## Notes and Guidance

Children revisit how to use bar charts, pictograms and tables to interpret and present discrete data.

They decide which scale will be the most appropriate when drawing their own bar charts.

Children gather their own data using tally charts and then present the information in a bar chart. Questions about the data they have gathered should also be explored so the focus is on interpreting rather than drawing.

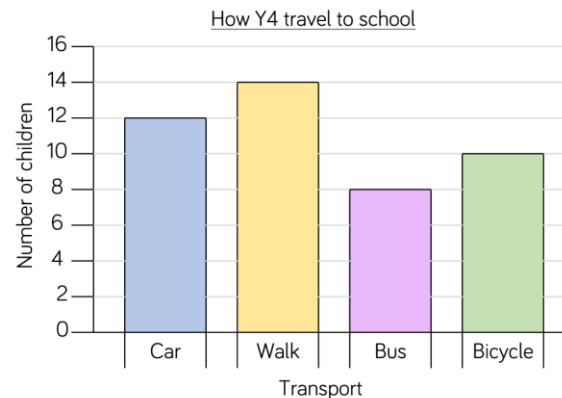
## Mathematical Talk

- What are the different ways to present data?
- What do you notice about the different axes?
- What do you notice about the scale of the bar chart?
- What other way could you present the data shown in the bar chart?
- What else does the data tell us?
- What is the same and what is different about the way in which the data is presented?
- What scale will you use for your own bar chart? Why?

## Varied Fluency



Complete the table using the information in the bar chart.



Transport	Number of children
Car	
Walk	
Bus	
Bicycle	

What is the most/least popular way to get to school?  
How many children walk to school?

Produce your own table, bar chart or pictogram showing how the children in your class travel to school.

Represent the data in each table as a bar chart.

Team	Number of house points
Sycamore	
Oak	
Beech	
Ash	

= 20 points

Day	Number of tickets sold
Monday	55
Tuesday	30
Wednesday	45
Thursday	75
Friday	85

# Interpret Charts

## Reasoning and Problem Solving



Halifax City Football Club sold the following number of season tickets:


- Male adults – 6,382
- Female adults – 5,850
- Boys – 3,209
- Girls – 5,057

Would you use a bar chart, table or pictogram to represent this data? Explain why.

Possible answer: I would represent the data in a table because it would be difficult to show the exact numbers accurately in a pictogram or bar chart.

Alex wants to use a pictogram to represent the favourite drinks of everyone in her class.



I will use this image  to represent 5 children.

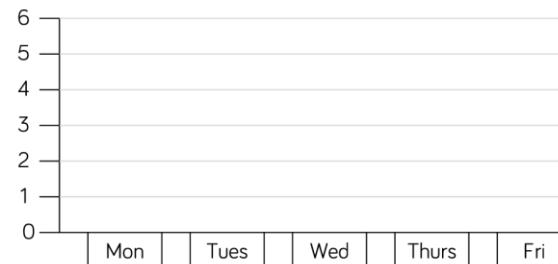
Explain why this is not a good idea.

It is not a good idea, because it would be difficult to show amounts which are not multiples of 5

Here is some information about the number of tickets sold for a concert.

Day	Number of tickets sold
Monday	55
Tuesday	30
Wednesday	45
Thursday	75
Friday	85

Jack starts to create a bar chart to represent the number of concert tickets sold during the week.



What advice would you give Jack about the scale he has chosen?

What would be a better scale to use?

Is there anything else missing from the bar chart?

Possible response: I would tell Jack to use a different scale for his bar chart because the numbers in the table are quite large.

The scale could go up in 5s because the numbers are all multiples of 5 Jack needs to record the title and he needs to label the axes.

# Comparison, Sum & Difference

## Notes and Guidance

Children solve comparison, sum and difference problems using discrete data with a range of scales. They use addition and subtraction to answer questions accurately and ask their own questions about the data in pictograms, bar charts and tables. Although examples of data are given, children should have the opportunity to ask and answer questions relating to data they have collected themselves.

## Mathematical Talk

- What does a full circle represent in the pictogram?
- What does a half/quarter/three quarters of the circle represent?
- What other questions could we ask about the pictogram?
- What other questions could we ask about the table?
- What data could we collect as a class?
- What questions could we ask about the data?

## Varied Fluency



Team	Number of house points
Sycamore	
Oak	
Beech	
Ash	

= 20 points

- How many more points does the Sycamore team have than the Ash team?
- How many points do Beech and Oak teams have altogether?
- How many more points do Ash need to be equal to Oak?



Activity	Number of votes
Bowling	9
Cinema	10
Swimming	7
Ice-skating	14

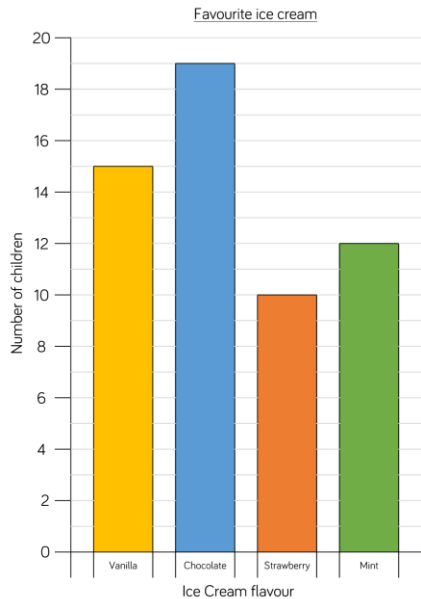
- How many people voted in total?
- $\frac{1}{4}$  of the votes were for \_\_\_\_\_.
- 7 more people voted for \_\_\_\_\_ than \_\_\_\_\_.



- As a class, decide on some data that you would like to collect, for example: favourite books, films, food. Collect and record the data in a table. Choose a pictogram or a bar chart to represent your data, giving reasons for your choices.
- What questions can you ask about the data?

# Comparison, Sum & Difference

## Reasoning and Problem Solving



Rosie has read the bar chart incorrectly. 15 people chose vanilla, 19 people chose chocolate, 10 chose strawberry and 12 chose mint. That means 56 people were asked altogether.

Rosie says,



We asked 54 people altogether.

Can you spot Rosie's mistake?  
How many people were asked altogether?

Attraction	Number of visitors on Saturday	Number of visitors on Sunday
Animal World Zoo	1,282	2,564
Maltings Castle	2,045	1,820
Primrose Park	1,952	1,325
Film Land Cinema	2,054	1,595

True or false?

- The same number of people visited Maltings Castle as Film Land Cinema on Saturday.
- Double the number of people visited Animal World Zoo on Sunday than Saturday.
- The least popular attraction of the weekend was Primrose Park.

• False  
The Film Land Cinema had 9 more visitors that Maltings Castle

• True  
1,282 doubled is 2,564

• True  
Animal World Zoo - 3,846  
Maltings Castle - 3,865  
Primrose Park - 3,277  
Film Land Cinema - 3,649

# Introducing Line Graphs

## Notes and Guidance

Children are introduced to line graphs in the context of time. They use their knowledge of scales to read a time graph accurately and create their own graphs to represent continuous data.

It is important that children understand that continuous data can be measured (for example time, temperature and height) but as values are changing all the time, the values we read off between actual measurements are only estimates.

## Mathematical Talk

How is the line graph different to a bar chart?

Which is the  $x$  and  $y$  axis? What do they represent?

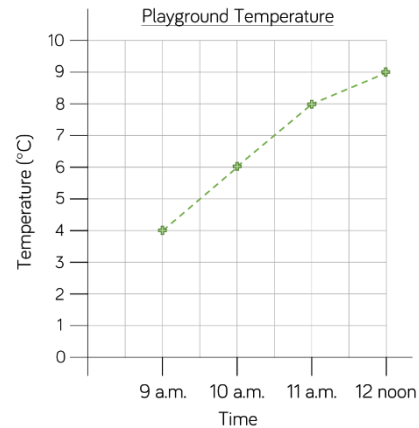
How would you estimate the temperature at 9:30 a.m.?

How would you estimate the time it was when the temperature was 7 degrees?

## Varied Fluency



The graph shows the temperature in the playground during a morning in April.



The temperature at 9 a.m. is \_\_\_\_\_ degrees.

The warmest time of the morning is \_\_\_\_\_.

Class 4 grew a plant. They measured the height of the plant every week for 6 weeks. The table shows the height of the plant each week.

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
4 cm	7 cm	9 cm	12 cm	14 cm	17 cm



Create a line graph to represent this information.

What scale would you use on the  $x$  and  $y$  axes?

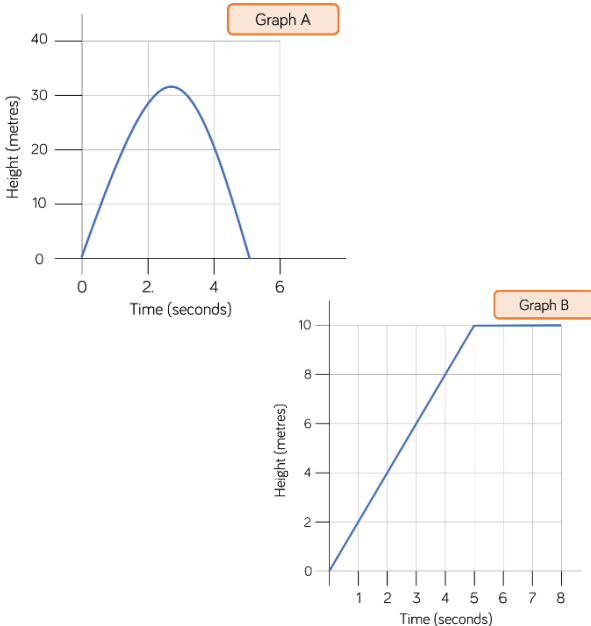
Between which two weeks did the plant reach a height of 10 cm?

# Introducing Line Graphs

## Reasoning and Problem Solving



Jack launched a toy rocket into the sky. After 5 seconds the rocket fell to the ground. Which graph shows this? Explain how you know.

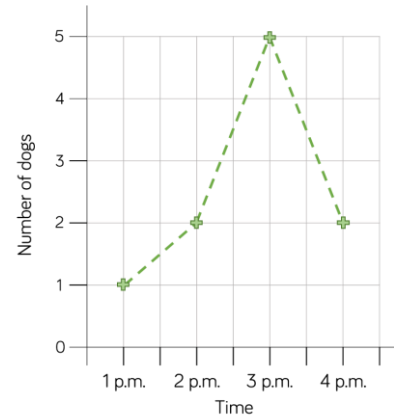


Make up your own story for the other graph.

**Graph A**  
The height of the rocket increases then decreases quickly again, returning to a height of 0 at 5 seconds.

**Example story:**  
A bird flew up from the ground. It continued to fly upwards for 5 seconds then flew at the same height for another 3 seconds.

Tommy created a line graph to show the number of dogs walking in the park one afternoon.



Tommy says,



At half past one there are 1.5 dogs in the park.

Why is Tommy incorrect?

What would be a better way of presenting this data?

Tommy is incorrect because you cannot have 1.5 dogs.

A better way of presenting this data would be using a bar chart, pictogram or table because the data is discrete.



# Read & Interpret Line Graphs

## Notes and Guidance

Children read and interpret line graphs. They make links back to using number lines when reading the horizontal and vertical axes. Children can draw vertical and horizontal lines to read the points accurately.

Encourage children to label all the intervals on the axes to support them in reading the line graphs accurately. When reading between intervals on a line graph, children can give an estimate of the value that is represented.

## Mathematical Talk

How can we use a ruler to support us to read values from a line graph?

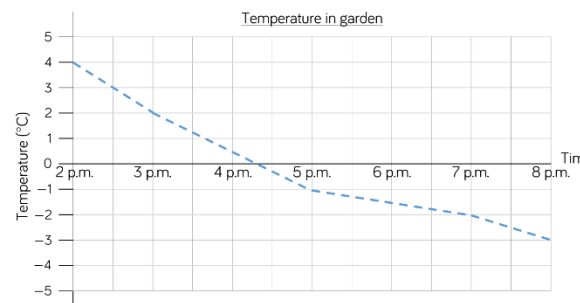
Where do we see examples of line graphs in real life?

How is the line graph different to a bar chart? How is it the same?

How can we estimate the value between intervals? Does it matter if we are not perfectly accurate? Why?

## Varied Fluency

Here is a line graph showing the temperature in a garden.



What was the temperature at 5 p.m.?

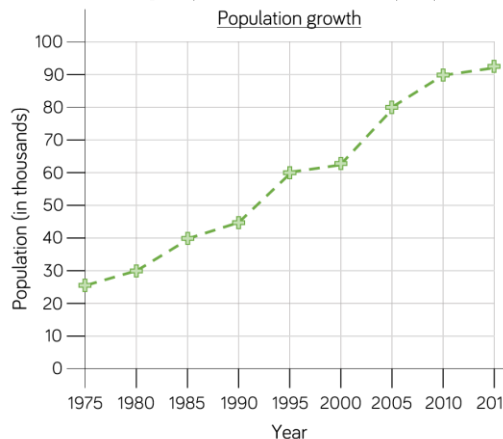
What was the difference in temperature between 3 p.m. and 7 p.m.?

When was the temperature 4°C?

Estimate the time when the temperature was 0°C.

Estimate the temperature at 6 p.m.

This line graph shows the population growth of a town.



What was the population in 1985?

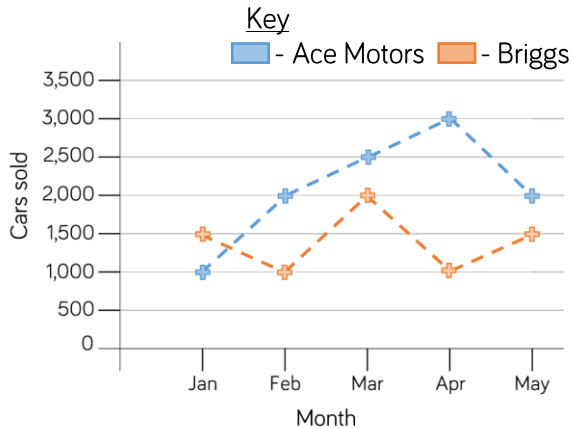
How much did the population grow between 1990 and 2010?

When was the population double the population of 1985?

# Read & Interpret Line Graphs

## Reasoning and Problem Solving

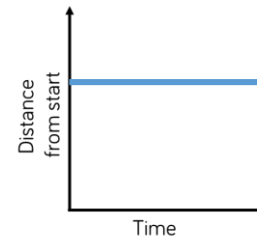
The graph shows the number of cars sold by two different companies.



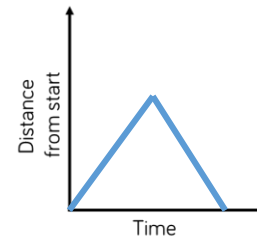
- How many more cars did Ace Motors sell than Briggs in April?
- From January to March, how many cars did each company sell? Who sold more? How many more did they sell?
- Crooks Motors sold 250 more cars than Briggs each month. Plot Crooks Motors' sales on the graph.

2,000  
 Ace 5,500  
 Briggs 4,500  
 Difference of 1,000  
 Ace sold more.  
 Points on graph are all half an interval up from Briggs.

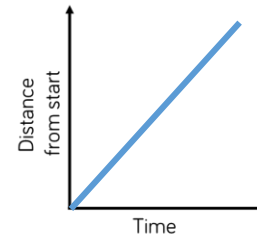
Match the graph to the activity.



A car travels at constant speed on the motorway.



A car is parked outside a house.



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

The first graph matches with the second statement.  
 Second graph with the third statement.  
 Third graph with the first statement.

# Draw Line Graphs

## Notes and Guidance

Children use their knowledge of scales and coordinates to represent data in a line graph. Drawing line graphs is a Year 5 Science objective and has been included here to support this learning and link to reading and interpreting graphs.

Children draw axes with different scales depending on the data they are representing. Encourage children to collect their own data to present in line graphs focusing on accurately plotting the points.

## Mathematical Talk

On the rainfall graph, if the vertical axis went up in intervals of 5 mm, would the graph be more or less accurate? Why?

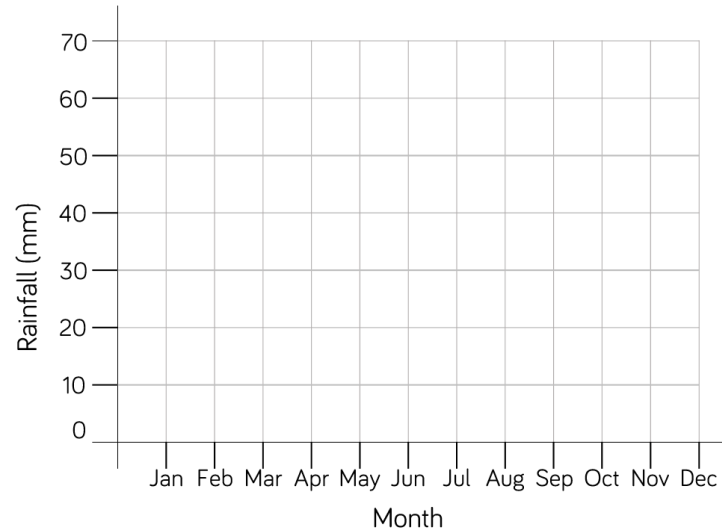
What scale will you use for the rupees on the conversion graph?

Which axis will you use for the pounds on the conversion graph? Explain why you have chosen this axis.

How can we use multiples to support our choice of intervals on the vertical axis?

## Varied Fluency

The table shows average rainfall in Leicester over a year. Complete the graph using the information from the table.



Month	Rainfall (mm)
Jan	54
Feb	40
Mar	38
Apr	38
May	48
Jun	46
Jul	58
Aug	60
Sep	50
Oct	57
Nov	65
Dec	50

Here is a table showing the conversion between pounds and rupees. Present the information as a line graph.

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

# Draw Line Graphs

## Reasoning and Problem Solving

Encourage the children to collect their own data and present it as a line graph. As this objective is taken from the science curriculum, it would be a good idea to link it to investigations.

Possible investigations could be:

- Measuring shadows over time
- Melting and dissolving substances
- Plant growth

Here is a table of data.

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

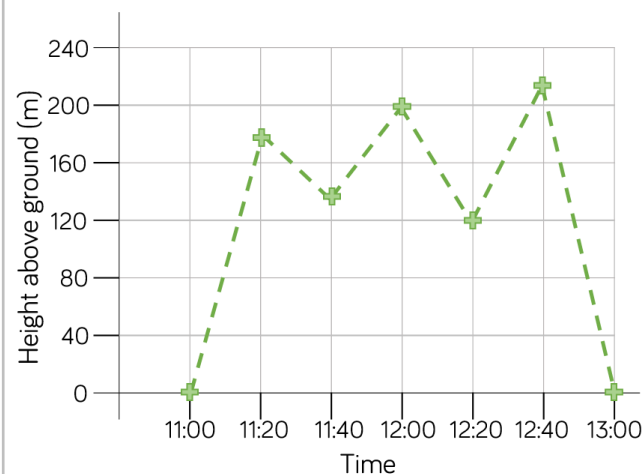
Which intervals would be the most appropriate for the vertical axis of the line graph?  
Explain your answer.

Children will present a range of line graphs over the year.

Children may give different answers but should give clear reasons. Intervals may range from 2s up to 10s. The most appropriate scale may be in 5s.

Rosie has used the data in the table to plot the line graph.

Time	11:00	11:20	11:40	12:00	12:20	12:40	13:00
Height above ground (m)	0	180	150	200	210	120	0



What mistakes has Rosie made?  
Can you draw the line graph correctly?

Rosie has plotted the time for 11:40 inaccurately, it should be closer to 160 than 120  
She has mixed up the points for 12:20 and 12:40 and plotted them the other way round.

# Problems with Line Graphs

## Notes and Guidance

Children use line graphs to solve problems. They use prepared graphs or graphs which they have drawn themselves, and make links to other subjects, particularly Science.

Children solve comparison, sum and difference problems. They can also generate their own questions for others to solve by reading and interpreting the line graphs.

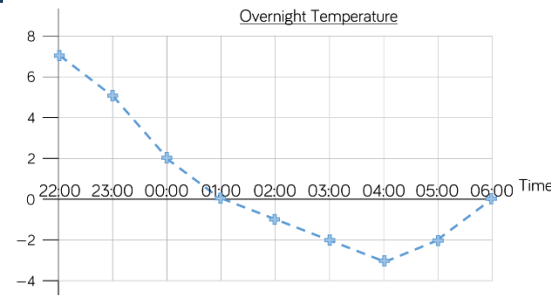
## Mathematical Talk

How does drawing vertical and horizontal lines support me in reading the line graph?

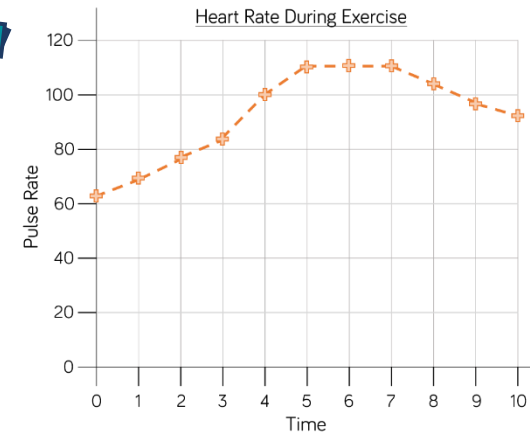
How will you plan out your own heart rate experiment? What information will you need to gather? What unit will you measure in? How will you label your axes?

Can we measure the temperature in our classroom? How could we gather the data? How could we present the data?

## Varied Fluency



What was the highest/lowest temperature?  
 What time did they occur?  
 What is the difference between the highest and lowest temperature?  
 How long did the temperature stay at freezing point or less?



How long did it take for the pulse rate to reach the highest level? Explain your answer, using the graph to help.  
 What could have happened at 5 minutes?  
 What could have happened at 7 minutes?

Estimate what the pulse rate was after 2 and a half minutes. How did you get an accurate estimate?

# Problems with Line Graphs

## Reasoning and Problem Solving

Carry out your own exercise experiment and record your heart rate on a graph like the one shown in the section above. How does it compare?

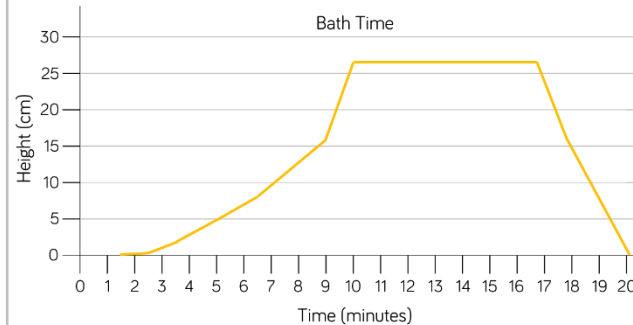


Can you make a set of questions for a friend to answer about your graph?

Can you put the information into a table?

*Various answers.*  
 Children can be supported by being given part-drawn line graphs.

Here is a line graph showing a bath time. Can you 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 doesn't fill at a constant rate. Why might that be?

*Discussions around what happens to the water level when someone gets in the bath would be useful.*  
 Approximately 9 and a half mins to fill the bath.  
 Approximately 3 and a half mins to empty.  
 One or two taps could be used to fill.

## Read & Interpret Tables

### Notes and Guidance

Children read tables to extract information and answer questions. There are many opportunities to link this learning to topic work within class and in other subject areas.

Encourage children to generate their own questions about information in a table. They will get many opportunities to apply their addition and subtraction skills when solving sum and difference problems.

### Mathematical Talk

Why are column and row headings important in a table?

If I am finding the difference, what operation do I need to use?

Can you think of your own questions to ask about the information in the table?

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

### Varied Fluency

Here is a table with information about planets. Use the table to answer the questions.

Planet	Time for Revolution	Diameter (km)	Time for Rotation
Mercury	88 days	4,878	59 days
Venus	225 days	12,104	243 days
Earth	365 days	12,756	24 hours
Mars	687 days	6,794	25 hours
Jupiter	12 years	142,984	10 hours
Saturn	29 years	120,536	11 hours
Uranus	84 years	51,118	17 hours
Neptune	165 years	49,500	17 hours

How many planets take more than one day to rotate?  
Which planets take more than one year to make one revolution?  
Write the diameter of Jupiter in words.

What is the difference between the diameter of Mars and Earth?  
What is the difference between the time for rotation between Mercury and Venus?

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 population?  
Which two cities have a combined population of 621,000?  
How much larger is the population of Liverpool than Coventry?

# Read & Interpret Tables

## Reasoning and Problem Solving

	100 m sprint (s)	Shot put (m)	50 m Sack race (s)	Javelin (m)
Amir	15.5	6.5	18.9	11.2
Dora	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's number is the biggest but this means he was the slowest therefore he did not win the 100 m sprint.

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

Do you agree?  
Explain your answer.

This table shows the 10 largest stadiums in Europe.

Stadium	City	Country	Capacity
Camp Nou	Barcelona	Spain	99,365
Wembley	London	England	90,000
Signal Iduna Park	Dortmund	Germany	81,359
Santiago Bernabeu	Madrid	Spain	81,044
San Siro	Milan	Italy	80,018
Stade de France	Paris	France	80,000
Luzhniki Stadium	Moscow	Russia	78,300
Ataturk Olimpiyat Stadium	Istanbul	Turkey	76,092
Old Trafford	Manchester	England	75,811
Allianz Arena	Munich	Germany	75,000

### True or False?

- The fourth largest stadium is the San Siro.
- There are 6 stadiums with a capacity of more than 80,000
- Three of the largest stadiums are in England.

False

False

False



# Two-way Tables

## Notes and Guidance

Children read a range of two-way tables. These tables show two different sets of data which are displayed horizontally and vertically.

Children answer questions by interpreting the information in the tables. They complete two-way tables, using their addition and subtraction skills. Encourage children to create their own questions about the two-way tables.

## Mathematical Talk

Which column do I need to look in to find the information?  
Which row do I need to look in to find the information?

How can I calculate the total of a row/column?  
If I know the total, how can I calculate any missing information?

Can you create your own two-way table using information about your class?

## Varied Fluency

This two-way table shows the staff at Liverpool police station.

	Male	Female	Total
Constable	55	24	79
Sergeant	8	5	13
Inspector	2	4	6
Chief Inspector	1	1	2
Total	66	34	100

- How many female inspectors are there?
- How many male sergeants are there?
- How many constables are there altogether?
- How many people work at Liverpool police station?
- How many male inspectors and female constables are there altogether?

Complete the table.

	Man United	Liverpool	Chelsea	TOTAL
Lost	36	42	29	
Won	174	76	126	
TOTAL				

Write questions about the information for a friend to solve.

# Two-way Tables

## Reasoning and Problem Solving

This table shows how many children own dogs and cats.

Fill in the missing gaps and answer the questions below.

	Boys	Girls	Total
Dogs		44	
Cats	38		
Total	125		245

- How many more boys have dogs than girls?
- How many more girls have cats than dogs?
- How many more children have dogs than cats?

Completed table:

	Boys	Girls	Total
Dogs	87	44	131
Cats	38	76	114
Total	125	120	245

43

32

17

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



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 people went to Spain.

35 people went to France altogether.

39 people went to Italy altogether.

35 people went away in June.

43 people went on holiday in August.

You can choose to give children a blank template.

Children may not know where to put the 120, or realise its importance.

Children will need to work systematically in order to get all of the information.

As a teacher, you could choose not to give the children the complete total and let them find other possible answers.

# Timetables

## Notes and Guidance

Children read timetables to extract information. Gather local timetables for the children to interpret to make the learning more relevant to the children’s lives, this could include online timetables.

Revisit children’s previous learning on digital time to support them in reading timetables more accurately. Consider looking at online apps for timetables to make links with ICT.

## Mathematical Talk

Where do you see timetables and why are they useful?

What information is displayed in a row when you read across the timetable?

What information is displayed in a column when you read down the timetable?

Why is it important to use 24-hour clock or a.m./p.m. on a timetable?

## Varied Fluency

Use the timetable to answer the questions.

Bus Timetable					
Halifax	06:05	06:35	07:10	07:43	08:15
Shelf	06:15	06:45		07:59	08:31
Shelf Village	06:16	06:46	07:23	08:00	08:32
Woodside	06:21	06:50	07:28		
Odsal	06:26	06:55	07:33	08:15	08:45
Bradford	06:40	07:10	07:48	08:30	09:00

On the 06:35 bus, how long does it take to get from Shelf to Bradford?

Can you travel to Woodside on the 07:43 bus from Halifax?

Which journey takes the longest time between Shelf Village and Bradford?

If you needed to travel from Halifax to Odsal and had to arrive by 08:20, which would be the best bus to catch? Explain your answer.

Which bus takes the longest time from Halifax to Bradford?

Amir travels on the 06:35 bus from Halifax to Woodside, how many minutes is he on the bus?

The 08:15 bus is running 12 minutes late, what time does it arrive at Odsal?

# Timetables

## Reasoning and Problem Solving

NatureWatch		NatureWatch +1		QuizTime		Cookery Channel	
5 p.m.	News	5 p.m.	Puppy Playtime	5 p.m.	Talk the Talk	5 p.m.	Cheese Please
5:30 p.m.	Weather	6 p.m.	News	5:30 p.m.	Quizdom	6 p.m.	Cook with Lydia
5:45 p.m.	Deep Blue	6:30 p.m.	Weather	6 p.m.	What's the Q?	6:30 p.m.	Pizza Pasta Pietro
6 p.m.	Pampered Pets	6:45 p.m.	Deep Blue	6:30 p.m.	aMAZEment	6:45 p.m.	5 Minute Menu
7 p.m.	Safari	7 p.m.	Pampered Pets	7:30 p.m.	Buzzed Out	7 p.m.	Budget Baker
8:15 p.m.	Animal Antics	8 p.m.	Safari	8 p.m.	Guess the Noise	8 p.m.	Lots of Lollies
9:15 p.m.	Worldly Wonders	9:15 p.m.	Animal Antics	9 p.m.	Dance & Decide	9:15 p.m.	Biscuit Bites

Ron wants to watch the following TV programmes: Cheese Please, What's the Q, aMAZEment, Budget Baker, Safari, Dance & Decide.

Will Ron be able to watch all the shows he has chosen?

It is 18:45. How long is it until 'Guess the Noise' is on?

No, Budget Baker is on at the same time as aMAZEment. Safari also overlaps with Dance & Decide by 15 minutes.

Guess the Noise is on in 1 hour and 15 minutes.

Here is Rosie's weekly timetable from secondary school.

Y7CM	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
Monday		Literacy	English		Maths	I.C.T.		P.S.H.C.E.	Geography
Tuesday		English	Art		French	Science		D.T.	
Wednesday		Literacy	D.T.		Art	Drama		I.C.T.	Science
Thursday		P.E.	Maths		R.E.	English		History	P.S.H.C.E.
Friday		Literacy	Maths		Art	Science		P.E.	

### True or False?

- Rosie has 2 hours and 20 minutes of PE in a week.
- Rosie has 130 minutes of literacy in a week.
- Rosie does Art for the same length of time as Maths each week.
- Rosie does Art for the same length of time as English each week.

True

False, 120 mins (2 hours)

True

False (150 mins of Art, 140 mins of English)