# Year 6

# Small Steps Guidance and Examples

## Block 3 - Statistics

White Rose Maths

# Year 6 – Yearly Overview

| | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 | Week 7 | Week 8 | Week 9 | Week 10 | Week 11 | Week 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Autumn** | Number- Place Value | | Number- Addition, Subtraction, Multiplication and Division | | | | Fractions | | | | Geometry- Position and Direction | Consolidation |
| **Spring** | Number- Decimals | | Number- Percentages | | Number- Algebra | | Measurement Converting units | Measurement Perimeter, Area and Volume | | Number- Ratio | | Consolidation |
| **Summer** | Geometry- Properties of Shapes | | Problem solving | | | Statistics | | Investigations | | | | Consolidation |

# Overview

## Small Steps

Read and interpret line graphs

Draw line graphs

Use line graphs to solve problems

Circles

Read and interpret pie charts

Pie charts with percentages

Draw pie charts

The mean

## NC Objectives

Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius.

Interpret and construct pie charts and line graphs and use these to solve problems.

Calculate the mean as an average.

# Read and Interpret Line Graphs

## Notes and Guidance

Children will build on their experience of interpreting data in context from Year 5, using their knowledge of scales to read information accurately.

Although example graphs are given, it would be useful if children can see real data from across the curriculum. It is worth noting that line graphs represent continuous data not discrete data.

Children need to explore effective ways to read the information accurately, including where more than one set of data is on the same graph.

## Mathematical Talk
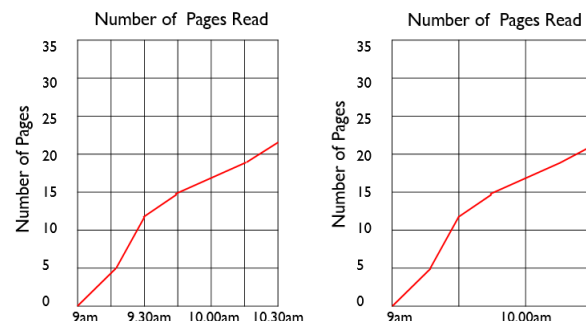
Where might you see a line graph used in real life?

Why is the 'Water Consumption' graph more difficult to interpret?

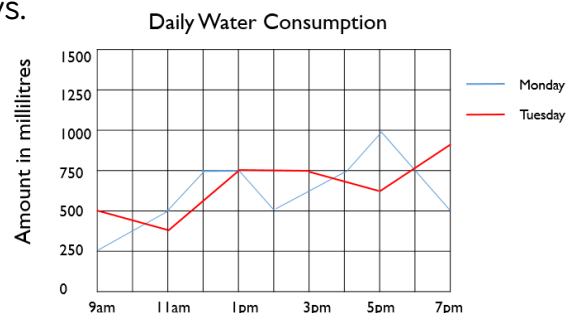How can you make sure that you read the information accurately?

## Varied Fluency

**1** What is the same and what is different about the 2 graphs?



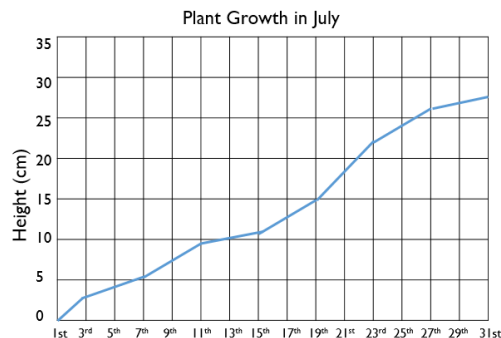**2** Here is a graph showing daily water consumption over two days.



At what times of the day was the same amount of water consumed on Monday and Tuesday?

Was more water consumed on Monday or Tuesday morning? How much more?

# Read and Interpret Line Graphs

## Reasoning and Problem Solving

Jill has created a graph to track the growth of a plant in her house.

**Plant Growth in July**



Jill recorded the following facts about the graph.

a) On the 9th of July the plant was about 9 cm tall.

b)Between the 11th and 19th July the plant grew 5 cm.

c)At the end of the month the plant was twice as tall as it had been on the 13th.

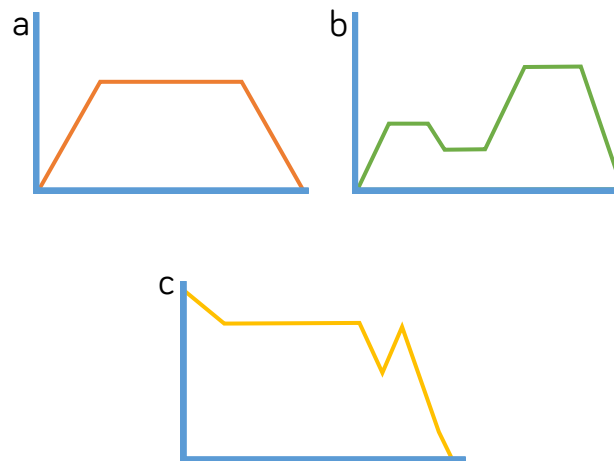Can you spot and correct Jill's mistakes?

a) On the 9th July a more accurate measurement would be 7.5 cm.

b) Correct.

c) On the 31st the plant was approximately 28 cm tall, but on the 13th it was only 10 cm which is not half of 28 cm. The plant was closer to 14 cm on the 17th July.

Write a story and 3 questions for each of the 3 graphs below.

a



b



c



Possible context for each story:

a) A car speeding up, travelling at a steady speed, then slowing down.

b) A bike ride where the speed varies due to the terrain.

c) The outside temperature on a winters day.

# Draw Line Graphs

## Notes and Guidance

Children will build on their experience of reading and interpreting data in order to draw their own line graphs.

Although example contexts are given, it would be useful if children can see real data from across the curriculum.

Children will need to decide on the most appropriate scales and intervals to use depending on the data they are representing.

## Mathematical Talk

What will the $x$ axis represent? What intervals will you use?

What will the $y$ axis represent? What intervals will you use?

How will you make it clear which line represents which set of data?

Why is it useful to have both sets of data on one graph?

## Varied Fluency

1 This table shows the height a rocket reached between 0 and 60 seconds.

Create a line graph to represent the information.

| Time (seconds) | Height (metres) |
| --- | --- |
| 0 | 0 |
| 10 | 8 |
| 20 | 15 |
| 30 | 25 |
| 40 | 37 |
| 50 | 50 |
| 60 | 70 |

2 The table below shows the population in the UK and Australia from 1990 to 2015.

| | 1990 | 1995 | 2000 |
| --- | --- | --- | --- |
| UK | 57,200,000 | 58,000,000 | 58,900,000 |
| Australia | 17,000,000 | 18,000,000 | 19,000,000 |
| | 2005 | 2010 | 2015 |
| UK | 60,300,000 | 63,300,000 | 65,400,000 |
| Australia | 20,200,000 | 22,100,000 | 23,800,000 |

Create one line graph to represent the population in both countries. Create three questions to ask your friend about your completed graph.
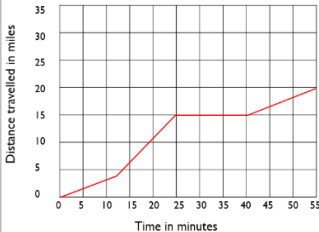
# Draw Line Graphs

## Reasoning and Problem Solving

This graph shows the distance a car travelled.
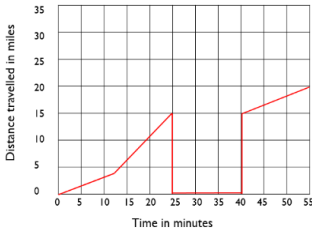


Kim and Rory were asked to complete the graph to show the car had stopped.
Here are their completed graphs.

Kim:                          Rory:



Who has completed the graph correctly?
Explain how you know.

Kim has completed the graph correctly.
The car has still travelled 15 miles in total, then stopped for 15 minutes before carrying on.

This table shows the distance a lorry travelled during the day.

| Time | Distance in miles |
| --- | --- |
| 7.00 am | 10 |
| 8.00 am | 28 |
| 9.00 am | 42 |
| 10.00 am | 58 |
| 11.00 am | 70 |
| 12.00 am | 95 |
| 1.00 pm | 95 |
| 2.00 pm | 118 |

Create a line graph to represent the information where the divisions along the $x$ axis are 2 hourly.
Create a second line graph where the divisions along the $x$ axis are 1 hourly.
Compare your graphs, which graph is more accurate?
Would a graph with divisions at each half hour be even more accurate?

Children may find that the second line graph is easier to draw and interpret as it matches the data given directly. They may discuss that it would be difficult to draw a line graph showing half hour intervals, as we cannot be sure the distance travelled at each half hour.

# Use Line Graphs to Solve Problems

## Notes and Guidance

Once children can read, interpret and draw lines graphs they need to be able to use line graphs to solve problems.

Children need to use their knowledge of scales to read information accurately. They need to be exposed to graphs that have more than one set of data.

At this point, children should be secure with the terms $x$ and $y$ axis, frequency and data.

## Mathematical Talk

What do you notice about the scale on the vertical axis? What other scale could you use?
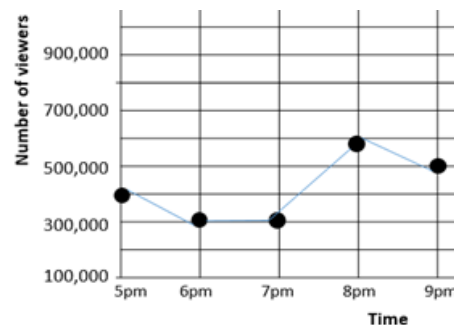
How is the information organised? Is it clear? What else does this graph tell you? What does it not tell you?

How can you calculate _____? Why would this information be placed on a line graph and not a different type of graph?
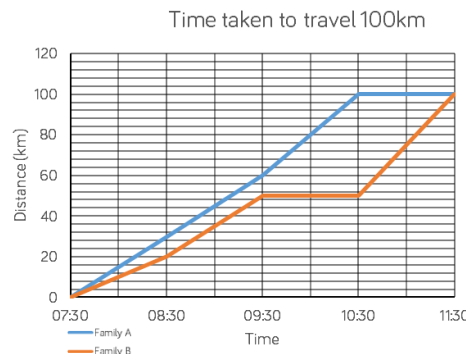
## Varied Fluency

1 Fred and Joanne watched the same channel, but at different times.  Fred watched 'Chums' at 5pm. Joanne



watched 'Countup' at 8pm. What was the difference between the number of viewers for each programme? What was the difference in viewers between 6pm and 8pm? Which time had twice as many viewers than 6pm?

2 Two families were travelling to Bridlington for their holidays. They set off at the same time but arrived at different times.
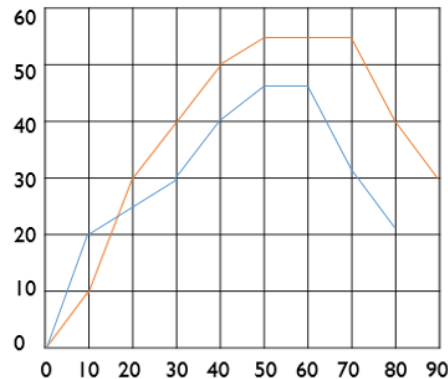


What time did family A arrive? How many km had each family travelled at 08:45? Which family stopped midway through their journey? How much further had they left to travel?

# Use Line Graphs to Solve Problems
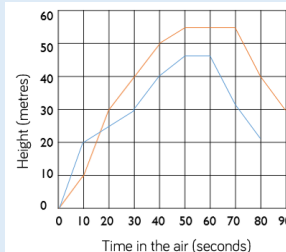
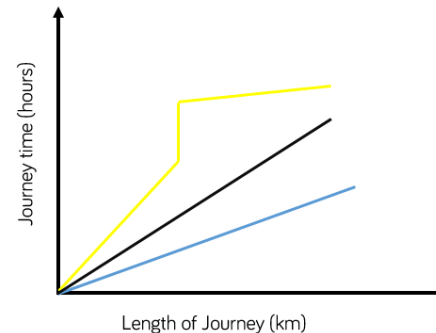## Reasoning and Problem Solving

What could this graph be showing?



Label the axis to show this.

Is there more than one way to label the axis?

Possible response:
This graph shows the height of a drone and the time it was in the air.
For example:



The graph below shows some of Mr Woolley's journeys.



What is the same and what is different about each of these journeys?

What might have happened during the yellow journey?

Possible responses:
All the journeys were nearly the same length.

The journeys all took different lengths of time.

The black and blue journey were travelling at constant speeds but black was travelling quicker than blue.

During the yellow journey, Mr Woolley might have been stuck in traffic. This might explain why the time increases but the length of the journey doesn't.

# Circles

## Notes and Guidance

Children will illustrate and name parts of circles, using the words radius, diameter, centre and circumference confidently.

They will also explore the relationship between the radius and the diameter and recognise the diameter is twice the length of the radius.
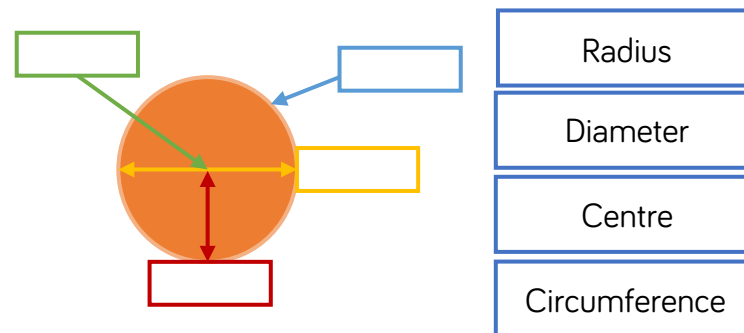
## Mathematical Talk

Why is the centre important?

What is the relationship between the dimeter and the radius? If you know one, how can you calculate the other?

Can you think of real life situations where you may need to use this maths?
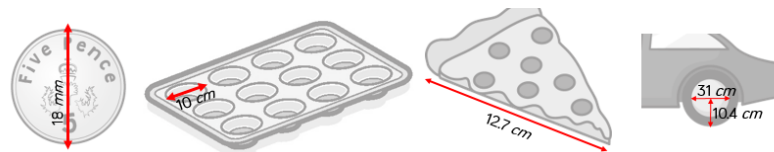
## Varied Fluency

1 Using the labels complete the diagram:

| Radius |
| Diameter |
| Centre |
| Circumference |

2 Find the radius or the diameter for each object below:

18 mm    10 cm    12.7 cm    31 cm    10.4 cm

The radius is ___ The diameter is ___ I know this because ___

3 Complete the table:

| Radius | Diameter |
| --- | --- |
| 26 cm | |
| | 37 mm |
| 2.55 m | |
| | 99 cm |
| | 19.36cm |

# Circles

## Reasoning and Problem Solving

Stephanie says:

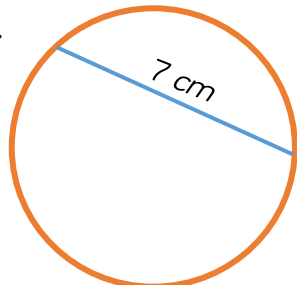> The bigger the radius of a circle, the bigger the diameter.

Do you agree? Explain your reasoning.

Answer:
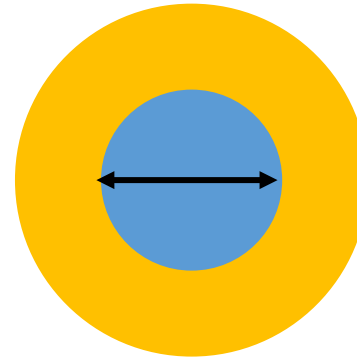I agree with Stephanie because the diameter is twice the length of the radius.

Spot the mistake!
Ross has measured and labelled the diameter of the circle below.
He thinks that the radius of this circle will be 3.5 cm.

7 cm

Is Ross right? Explain why.

Answer: Ross has measured the diameter inaccurately because the diameter always goes through the centre of the circle from one edge to another.

Here are 2 circles. Circle A is orange; Circle B is blue. The diameter of Circle A is $^3/_4$ the diameter of Circle B.

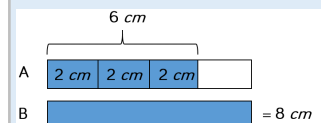If the diameter of Circle A is 6cm, what is the diameter of Circle B?
If the diameter of Circle A is 6cm, what is the radius of Circle B?
If the diameter of Circle B is 16cm, what is the diameter of Circle A?
If the diameter of Circle B is 16cm, what is the radius of Circle A?

Answers: This problem can be solved using a bar model.

6 cm
A | 2 cm | 2 cm | 2 cm |
B | = 8 cm

a) 8 cm
b) 4 cm
c) 12 cm
d) 6 cm

# Read and Interpret Pie Charts

## Notes and Guidance

Children will build on their understanding of circles to start interpreting pie charts. They will understand how to calculate fractions of amounts to interpret simple pie charts.

Children should understand what the whole of the pie chart represents and use this when solving problems.

## Mathematical Talk

What does the whole pie chart represent? What does ____ segment represent?

Do you recognise any of the fractions? How can you use this to help you?

What's the same and what's different about the favourite drinks pie charts?
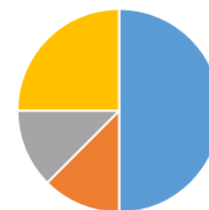
What other questions could you ask about the pie chart?

## Varied Fluency

1. There are 600 pupils at Copingham Primary school. Work out how many pupils travel to school by:
   a) Train
   b) Car
   c) Cycling
   d) Walking

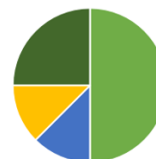   Copingham Primary School

   ■ Walk ■ Cycle ■ Car ■ Train

2. Classes in Year 2 and Year 5 were asked what their favourite drink was. Here are the results:

   Year 5: 96 pupils          Year 2: 48 pupils

   ■ Spritz 'n' ting ■ Rolla Cola ■ Vomto ■ Fizzeraid     ■ Spritz 'n' ting ■ Rolla Cola ■ Vomto ■ Fizzeraid

   What fraction of pupils in Year 5 chose Fizzeraid?
   How many children in Year 2 chose Rolla Cola?
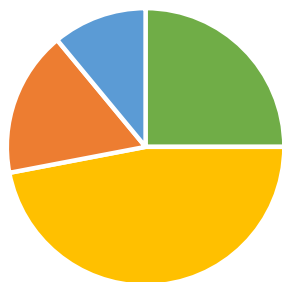   How many more children chose Vomto than Spritz 'n' ting in Year 2?
   What's the difference between the number of Year 2 children that chose Spritz 'n' ting and the number of Year 5 children that chose Fizzeraid?

# Read and Interpret Pie Charts

## Reasoning and Problem Solving

In a survey people were asked what their favourite season of the year was, the results are shown in the pie chart below. If 47 people voted spring, how many people took part in the survey?

Our favourite time of year



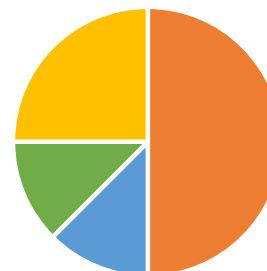■ Summer  ■ Spring  ■ Autumn  ■ Winter

Explain your method.

**Answer:**
Spring is a quarter of the whole pie chart and there are 4 quarters in a whole, so
$47 \times 4 = 188$ people in total.

96 people took part in this survey.

Our favourite pets



■ Dogs  ■ Cats  ■ Hamsters  ■ Horses

How many people voted for cats?
$\frac{3}{8}$ of the people who voted for dogs were male. How many females voted for dogs?
What other information can you gather from the pie chart?
Write some questions about the pie chart for your partner to solve.

**Answers:**
$\frac{1}{2}$ of 96 = 48,
$\frac{1}{4}$ of 96 = 24,
$\frac{1}{8}$ of 96 = 12
12 people voted cats.

48 people voted dogs.
$\frac{1}{8}$ of 48 = 6
$6 \times 5 = 30$.
30 females voted.

| 48 | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |

18       30

Male   Female

# Pie Charts With Percentages

## Notes and Guidance

Children will apply their understanding of calculating percentages of amounts to interpret pie charts.

Children will build on their understanding of what the whole pie chart represents and know that the whole totals 100%.

Encourage children to continue making links to known and recognisable fractions in order to read the pie chart more efficiently.

## Mathematical Talk

How did you calculate the percentage? What fraction knowledge did you use?

How else could you find the difference between Chocolate and Mint Chocolate?

If you know 5% of a number, how can you work out the whole number?

If you know what 5% is, what else do you know?

## Varied Fluency

1. 150 children voted for their favourite ice cream flavours. Here are their results:

Favourite Ice Cream Flavours



- Strawberry
- Banana
- Chocolate
- Vanilla
- Mint Chocolate Chip

How many people voted for Vanilla?
How many more people voted for Chocolate than Mint Chocolate chip?
How many people chose Chocolate, Banana and Vanilla altogether?

2. There are 200 pupils in Key Stage 2 who chose their favourite hobbies.

How many pupils chose each hobby?

KS2 Hobbies



- Walking
- Reading
- Cricket
- Swimming
- Dancing
- Football

# Pie Charts With Percentages

## Reasoning and Problem Solving
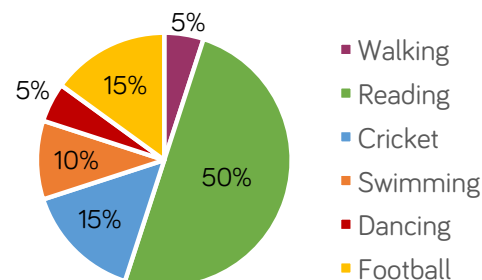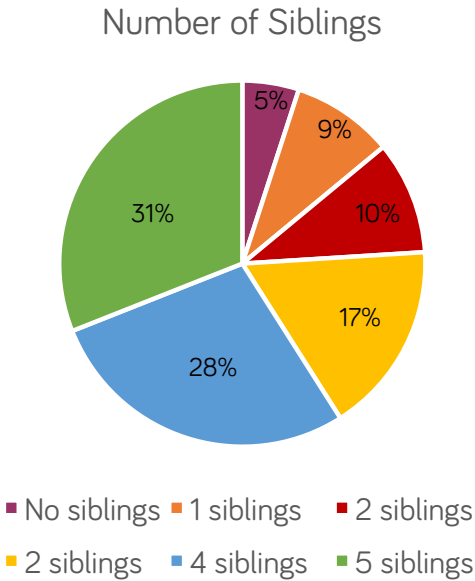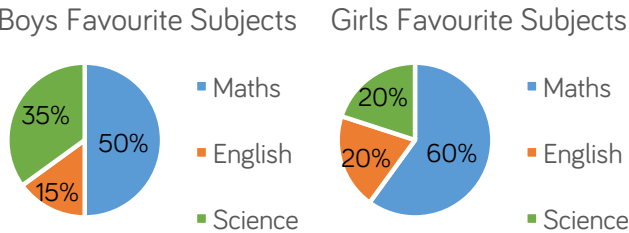
13 people in this survey have no siblings. Use this information to work out how many people took part in the survey altogether.

### Number of Siblings



- No siblings
- 1 siblings
- 2 siblings
- 2 siblings
- 4 siblings
- 5 siblings

Now work out how many people each segment of the pie chart is worth. Can you represent the information in a table?

| No siblings | 13 |
| --- | --- |
| 1 sibling | 22 |
| 2 siblings | 26 |
| 3 siblings | 45 |
| 4 siblings | 73 |
| 5 siblings | 81 |
| Total | 260 |

120 boys and 100 girls were asked which was their favourite subject. Here are the results:

Boys Favourite Subjects     Girls Favourite Subjects



- Maths
- English
- Science

Craig says:

More girls prefer Maths than boys because 60% is bigger than 50%.

Do you agree? Explain why.

Answer:
Craig is incorrect because the same amount of girls and boys like maths.
Boys:
50% of 120 = 60
Girls:
60% of 100 = 60

# Draw Pie Charts

## Notes and Guidance

Pupils will build on their understanding of angles around a point totalling 360 degrees and make connections to this representing 100% of the data within a pie chart. They will convert data into degrees using their factors and multiplication skills.

From this, they will construct a pie chart, using their protractor skills.
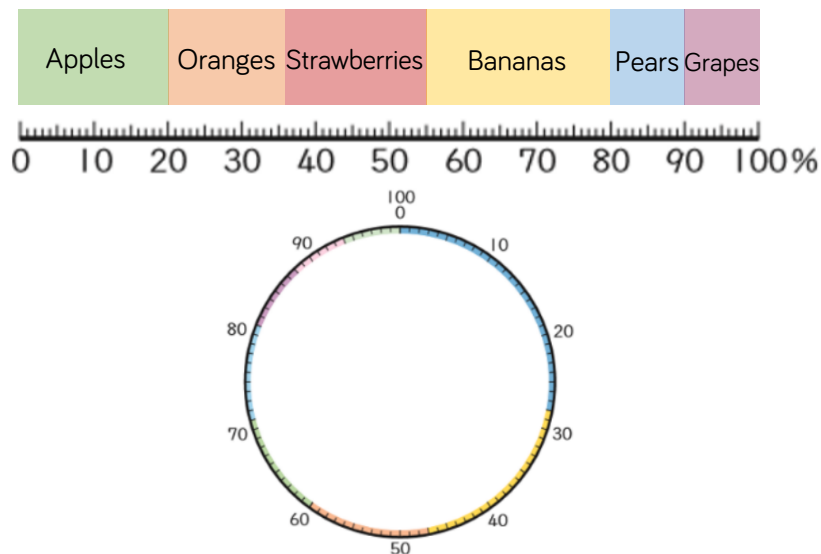
## Mathematical Talk

How many degrees in a circle? How will this help us construct a pie chart?

If the total frequency is ____, how will we work out the number of degrees?

If 180° represents 15 pupils. How many people took part in the survey? Explain why.

## Varied Fluency

1. Construct a pie chart using the percentage bar model.



2. A survey was conducted to show how children in Class 6 travelled to school.
Draw a pie chart to Represent the data.

| Type of transport | Number of children | Convert to degrees |
|---|---|---|
| Car | 12 | 12 × 10 = 120° |
| Bike | 7 | 7 × 10 = 70° |
| Walk | 8 | 8 × 10 = 80° |
| Bus | 5 | 5 × 10 = 50° |
| Scooter | 4 | 4 × 10 = 40° |
| TOTAL = | 36 | 360° |

# Draw Pie Charts

## Reasoning and Problem Solving

A survey was conducted to work out Year 6's favourite sport. Work out the missing information and then construct a pie chart.

| Favourite Sport | Number of Children | Convert to Degrees |
|---|---|---|
| Football | 10 | |
| Tennis | 18 | |
| Rugby | | __ × 6 = 90° |
| Swimming | 6 | 6 × 6 = 36° |
| Cricket | | __ × 6 = 42° |
| Golf | 4 | 4 × 6 = 24° |
| Total | 60 | 360° |

Children will then use this to draw a pie chart.

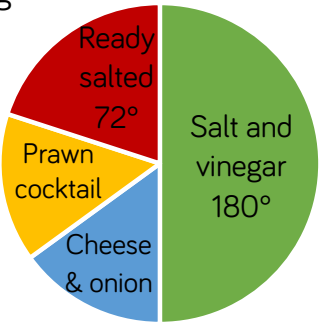| Favourite Sport | Number of Children | Convert to Degrees |
|---|---|---|
| Football | 10 | 10 × 6 = 60° |
| Tennis | 18 | 18 × 6 = 108° |
| Rugby | 15 | 15 × 6 = 90° |
| Swimming | 6 | 6 × 6 = 36° |
| Cricket | 7 | 7 × 6 = 42° |
| Golf | 4 | 4 × 6 = 24° |
| Total | 60 | 360° |

A restaurant was working out which Sunday dinner was the most popular. Use the data to construct a pie chart.

| Dinner Choice | Frequency | Convert to degrees |
|---|---|---|
| Chicken | 11 | |
| Pork | 8 | |
| Lamb | 6 | |
| Beef | 9 | |
| Vegetarian | 6 | |
| Total | 40 | 360° |

Children will then use this table to draw a pie chart.

| Dinner Choice | Frequency | Convert to degrees |
|---|---|---|
| Chicken | 11 | 11 × 9 = 99° |
| Pork | 8 | 8 × 9 = 72° |
| Lamb | 6 | 6 × 9 = 54° |
| Beef | 9 | 9 × 9 = 81° |
| Vegetarian | 6 | 6 × 9 = 54° |
| Total | 40 | 360° |

Miss Jones is carrying out a survey in class about favourite crisp flavours. 15 pupils chose salt and vinegar. How many fewer people chose ready salted?



15 pupils = 180°

180 ÷ 15 = 12

12° = 1 pupil

72 ÷ 12 = 6 pupils

15 − 6 = 9

9 fewer students chose ready salted over salt and vinegar.

# The Mean

## Notes and Guidance

Children will apply their addition and division skills to calculate the mean as an average in a variety of contexts.

Once children understand how to calculate the mean of a simple set of data, allow children time to investigate working out possible and missing data when given the mean.

## Mathematical Talk

What would the total be? If we know the total, how can we calculate the mean?

Do you think calculating the mean age of the family is a good indicator of their actual age? Why?

When will the mean be useful in real life?

## Varied Fluency

**1** Here is a method to find the mean.

| No of glasses of juice drunk by 3 friends | Total glasses of juice drank: | If each friend drank the same no of glasses |
|---|---|---|
|  | 9 |  |

We say the average number of glasses of juice drank by each friend is 3. We call this average the 'mean'. Use this method to calculate the mean average for the number of slices of pizza eaten by each child.



**2** Calculate the mean number of crayons:

| Crayon colour | Amount |
|---|---|
| Blue | 14 |
| Green | 11 |
| Red | 10 |
| Yellow | 9 |

**3** Hassan is the top batsman for the cricket team. His scores over the year are:  134, 60, 17, 63, 38, 84, 11
Calculate the mean number of runs Hassan scored.

# The Mean

## Reasoning and Problem Solving

The mean number of goals scored in 6 football matches was 4.
Use this information to calculate the missing number of goals:

| Match number | Number of goals |
|---|---|
| 1 | 8 |
| 2 | 4 |
| 3 | 6 |
| 4 | 2 |
| 5 | 1 |
| 6 | ___ |

The mean number of goals scored by 3 teams was 2. How many could each team have scored? Can you find at least 10 possible solutions?
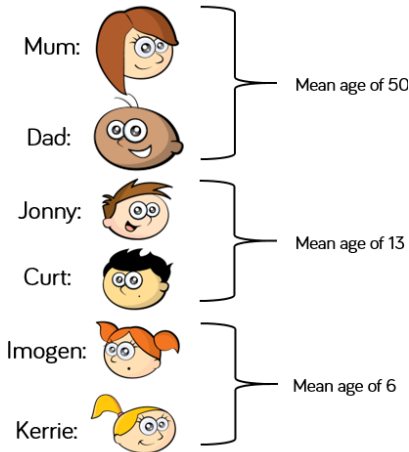
Answer: The missing number of goals is 3.

Possible solutions for each team:

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 6 | 0 | 0 | 5 | 0 | 1 | 4 | 0 | 2 | 4 | 1 |
| 2 | 0 | 6 | 0 | 1 | 5 | 0 | 2 | 4 | 0 | 1 | 4 |
| 3 | 0 | 0 | 6 | 0 | 1 | 5 | 0 | 2 | 4 | 1 | 1 |

Work out the age of each member of the family if:
Mum is 48 years old.
Jonny is 4 years older than Curt and 7 years older than Imogen.

Mum:
Dad: — Mean age of 50
Jonny:
Curt: — Mean age of 13
Imogen:
Kerrie: — Mean age of 6

Calculate the mean age of the whole family.

Answer:

Mum: 48
Dad: 52
Jonny: 15
Curt: 11
Imogen: 8
Kerrie: 4