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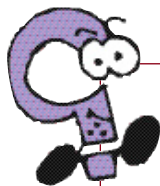
Sample topic from the **Yerwat Guide** to the **Y8 Framework**

Please note: In this book, each section in a topic is meant to take ONE LESSON!

**You have permission to print off this topic
and try it with your students.**

This document contains the complete topic (p01-31) and answers (p32-33)

Teachers' notes, worksheets, Star Challenge answers, revision and assessment for this topic can be downloaded and printed off in the **Y8 Yerwat Resource Sample document.**



Yerwat

ENJOYMENT

The 'Maths is ...' Jugglers

Knowledge

Skills

Understanding

*The Yerwat Guide
to the*

Y8 FRAMEWORK

Topic 10

Working with Data

CONTENTS

- Section 1: Interpreting tables and diagrams
- Section 2: Constructing tables and diagrams (inc. scatter graphs)
- Section 3: Pie charts
- Section 4: Calculating statistics 1 (averages and range)
- Section 5: Calculating statistics 2 (tables of ungrouped data & stem-and-leaf)
- Section 6: Continuous data
- Section 7: Line graphs
- Section 8: Displays using ICT
- Section 9-11 : The project

Worksheets are required for p8-9: Constructing pie charts
p18-19: Continuous data



THE YERWAT GUIDE

There are ten topics in the text.
For each of the 8 long topics, there is a revision sheet and an assessment
in the Teachers' Resource and Assessment Pack.

Topic 1: Number Techniques	(12 sections)	07 – 48
Topic 2: Geometry Is ...	(13 sections)	49 – 96
Topic 3: Sequences, Functions and Graphs	(9 sections)	97 – 124
Topic 4: How Likely Is It ?	(4 sections)	125 – 142
Topic 5: Working with Numbers	(11 sections)	143 – 182
Topic 6: Skills in Algebra	(9 sections)	183 – 214
Topic 7: Areas, Volumes and Other Measures	(9 sections)	215 – 244
Topic 8: Fractions, Decimals and Percentages	(11 sections)	245 – 280
Topic 9: Measurement Skills	(8 sections)	281 – 312
Topic 10: Working with Data	SAMPLE	(11 sections) 313 – 344
Topic 11: Miscellaneous High Level Challenges		345 – 364
ANSWERS		365 – 382

97 sections/lessons altogether (+ 8 possible assessments)

Scheduling note : When there is time available at the end of some of the topics, students could go back and do any Star Challenges that they have missed or work on High Level Challenges.

CHOOSE YOUR OWN ORDER OF WORKING THROUGH THE TOPICS

THE YERWAT GUIDE

**Each topic is delivered in one-lesson sections
with Star Challenges for faster students and/or for homeworks.
Any techniques which are mental/oral starters,
or those which need teaching, are at the beginning of the section.**

At the end of each topic is a section of
HIGH LEVEL CHALLENGES.

Able students are expected to tackle these Challenges when they have finished a section
(rather than moving onto the next section).

They can also do them in their own time.

Some of these challenges have section labels.
These indicate which section should have been completed
before that challenge should be attempted.

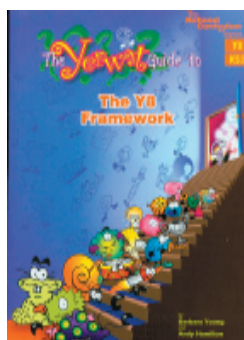
At the end of the book is a section of
MISCELLANEOUS HIGH LEVEL CHALLENGES.

They are not linked to any topics in the book
and can be done at any times and in any order.
They range from short problems to fairly lengthy problems,
to linked sets of problems.

There are two versions of our Y8 Framework Mathematics Course.

The mainstream course (The *Yerwat Guide*) is suitable for the upper 60% of students.

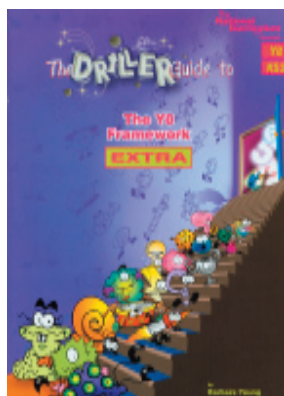
For able students, the *Yerwat Guide* contains **High Level Challenges**, which are linked to the topics being studied, and the **Miscellaneous High Level Challenges**, which are independent of the topics being studied.



A5 text

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A4 text

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The **EXTRA** course (The *Driller Guide*) is suitable for the lower 50% of students.

For low attainers, the *Driller Guide* develops one idea at a time, before combining several ideas that have just been learnt. It also contains **EXTRA** rote practice exercises.

The Mental Arithmetic Course

At the beginning of each topic is a list of mental/oral techniques to be taught/reviewed alongside the topic.

The techniques taught/reviewed should be repeated regularly over the weeks following their introduction.

Regular mental arithmetic practice makes a very positive start to the lesson – and builds up self-confidence quickly.

The **High Level Challenges** were first used in the highly successful predecessor to *Headbanger*, the *Big Edd Guide*.

At Tarporley High School, students in our two top sets loved them. Almost all top set students did every High Level Challenge. Many completed all 152 of them before the end of the year, and came back and asked for more. (So there are now 200 in *Headbanger*.)

But, unexpectedly, many of the students in our two second sets tackled a lot of these problems with great enthusiasm. These students had successes with puzzles and problems that we had thought well beyond them. Confidence and motivation soared and, later, so did exam results.

Other schools using this material report similar reactions.

Order a **half price** copy of Y8 Yerwat
using the Special Offer form
which can be downloaded
from the website
www.mathsisjugglers.co.uk

The DRILLER Guide **EXTRA**

An unusual approach to Mathematics for Low Attainers – that works !!

Students in our lower sets said

“We don’t want a course that only does the easy stuff (a ‘dumbo’ course).

We want to do the same work as everyone else.

So, will you please:

- make the instructions and explanations clearer
- introduce ideas more slowly and put in extra steps
- put in extra practice
- make the work interesting”

SO WE DID !



Our EXTRA texts for LOW ATTAINERS do not follow the route of so many other texts for these students.

Instead of giving them lots of easy material, we took the syllabus and delivered it in such a way that LOW ATTAINERS could understand and cope with the ideas and techniques.

We gave them what they had asked for !!

But we couldn’t have produced these texts had it not been for the active help of the students themselves. We started with the mainstream texts and students really enjoyed finding out what didn’t work for them - but, more importantly, WHY!! They quickly became expert at pinpointing where the material didn’t work for them and helping to find what would work for them.

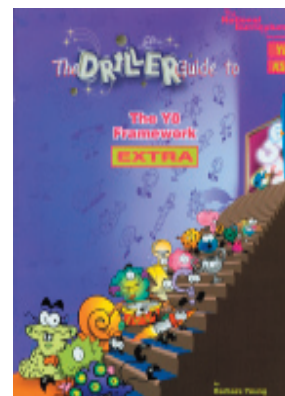
Devising ways that would work took a lot of working/trialling with LOW ATTAINERS, but we ended up with the EXTRA texts – which work exceptionally well, particularly with bottom sets, disaffected students and students at Pupil Referral Units.

This **EXTRA** course :

- has been specially developed for low attainers
- is a version of the Y8 Framework course
- has lots of EXTRA practice on all techniques
- can be run alongside the mainstream course
- can stand on its own
- is suitable for the lower 50% of the ability range

Each student:

- takes responsibility for his/her own learning
- can decide how much practice (s)he needs to do for each technique
- can try Star Challenges when (s)he feels ready for them
- will be capable of taking the mainstream tests



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The authors firmly believe that all students can tackle the material in the mainstream course.

However, some students need :

- more time to get to grips with the ideas and techniques involved
- lots of EXTRA practice
- one idea at a time introduced step-by-step
- to meet ideas and techniques over and over again

Most students in lower sets are underachieving.

This course aims to raise the level of achievement of these students.

Students can transfer to or from the mainstream course.

How does the Star Challenge system work ?

The number of stars is a measure of the difficulty of the Challenge.

So, one star denotes a basic fairly easy challenge.

However, students should not be discouraged from attempting any Challenges.

For example, students may earn fewer stars from many two or three star challenges, with partially correct answers.

Students of lower ability can amaze you with what they can achieve, if they really want to tackle problems that you might think beyond them.

A true cautionary tale

Three very low ability students were working together. They had to. Mark was severely dyslexic - he could not read at all. Jason could read very well, but could make no sense of what he was reading. Matthew was very slow at everything. Between them, they could tackle problems.

Jason would read the question. Mark would explain what it was all about. Together the three of them would work out how to solve the problem.

One day they had done all the one star problems. They asked me if they could try the three star problem - The Chest of Drawers. It contained a mixture of fractions and decimals and both cm and mm. My first reaction was to tell them that it was too difficult for them - but I said they could try it, provided they accepted that they might not be able to do it.

About ten minutes later, they brought me the correct answer. I couldn't believe that they had solved such a complex problem. I changed the data (marked below in blue). They were back a few minutes later with the correct answer. Then I made a big mistake. I asked them to tell me how they had worked it out. I couldn't follow their explanation at all !!

From then on I never restricted the choice of Star Challenges of even the least able students.

Star Challenge

The chest of drawers

A chest of drawers 84 cm high has a 42.5 mm top and a 90 mm base. Four identical drawers fit in between, with 22.5 mm between each drawer.

Work out the height of each drawer in cm.

If the 22.5 mm gaps were reduced to 12.5 mm each, what would be the height of each drawer then?

The diagram shows a chest of drawers with a total height of 84 cm. It has a top panel of $4\frac{1}{4}$ cm and a base of 9 cm. There are four drawers in between. The gap between the top panel and the first drawer is $2\frac{1}{4}$ cm. The gap between the last drawer and the base is $2\frac{1}{4}$ cm. A double-headed arrow with a question mark indicates the height of one of the drawers.

What do schools do with the stars students earn for Star Challenges ?

One school:

- gives a house point for each star.
- has a commendation system and awards a commendation for so many stars. They also award stars for effort when the books are taken in each fortnight.
- gives a smiley face for 5 stars
- gives a Mars Bar for 10 stars
- gives a copy of one of a group of Chaos posters for 20 stars (very popular with low attainers)
-

It doesn't matter what you do. It is the sense of achievement that is most important.

However, a system that awards something for so many stars, then starts them collecting the next set of stars, means that students keep track of how many stars they have and how many more they need towards the next 'prize' – instead of (possibly invidious) comparisons of the total number of stars each student has.

Topic 10

Mental arithmetic

1. Mean and range of small sets of data
2. Mode and median of small sets of data
3. Using an assumed mean
4. Maximum and minimum measurements implied by “to the nearest cm” etc
5. Problems involving time, days, weeks ...
6. Simple word problems
7. How many years ago was it in ... and in how many years will it be ... ?

Mental arithmetic techniques should be repeated regularly over the weeks following their review/introduction.

Working with Data

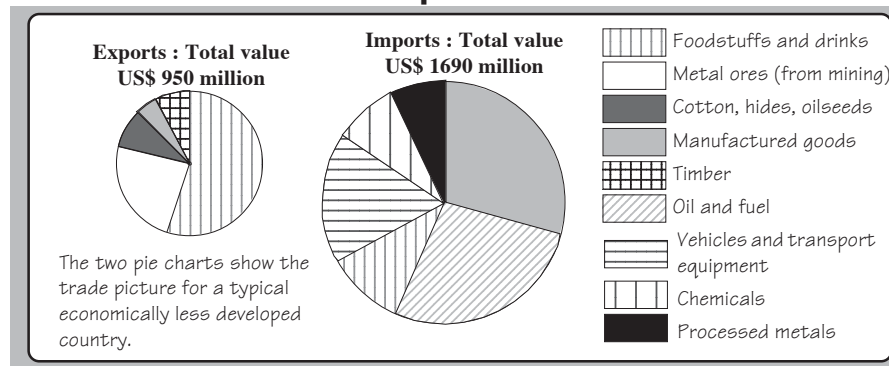
Section 1: Interpreting tables & diagrams

In this section you will:

- interpret information given in two way tables and pie charts
- interpret information given in population pyramids and compound bar charts

DEVELOPMENT

D1.1: Information from pie charts



Imports are goods brought into this country from other countries.
Exports are goods from this country which are sold to other countries.

1. Which has the bigger value, the total export bill or the total import bill ?
2. The trade gap is the value of the difference between the imports and exports.
How big is the trade gap here ?
3. Why are the pie charts different sizes ?
4. What is the biggest import ?
5. What are the second and third biggest imports ?
6. What is the biggest export ?
7. What are the second and third biggest exports ?
8. Do they import vehicles ?
9. Do they export vehicles ?
10. Do they import more, or less, food and drink than they export ?
11. Do they produce enough metal ores, or do they need to import some ?
12. Which is the largest industry in this country :
farming(food, cotton, hides ...), mining or manufacturing goods ?

• Check your answers.

D1.2: Two way tables

Time after waking first cigarette smoked	Number of cigarettes smoked per day		
	20 or more	10-19	0-9
Less than 5 minutes	31%	12%	2%
5-14 minutes	28%	16%	3%
15-29 minutes	19%	17%	6%
30-59 minutes	14%	23%	12%
1 hr – 1hr 59 min	6%	18%	15%
2 hours or more	2%	15%	63%

Source: Smoking
Statistics:
who smokes and
how much, ASH

- Which group starts smoking earliest after they wake ?
- One group smokes mostly socially, in the evening. Which group do you think this is ?
- Of those who smoke 20 or more per day, what percentage have lit up within one hour of waking ?
- Of those who smoke less than 10 per day, what percentage have lit up within one hour of waking ?
- The figures in the 20 or more column add up to 100%. The other two columns each add up to 101%. Which of these do you think is the reason why ?

A: There are 101 people in each of these two groups.

B: There are rounding errors in some, or all, of the figures given here.

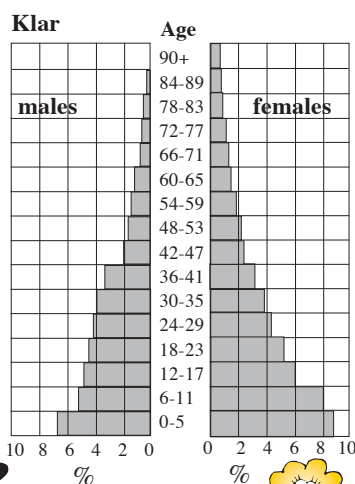
• Check your answers.

D1.3: Population pyramids

This population pyramid shows the age distribution for both males and females on the planet Klar.



Cringo



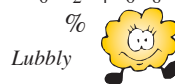
- Are there more males or more females on the planet Klar ?
- Are there more males or more females in the 0 – 11 age group ?
- What percentage of the population is female and less than 12 ?
- Do males live longer than females ? How do you know ?
- Between 30 and 41, there are more males than females ? Otherwise there are more females in each of the age groups. True or false ?



Gizmo



Apul



Lubbly

• Check your answers.

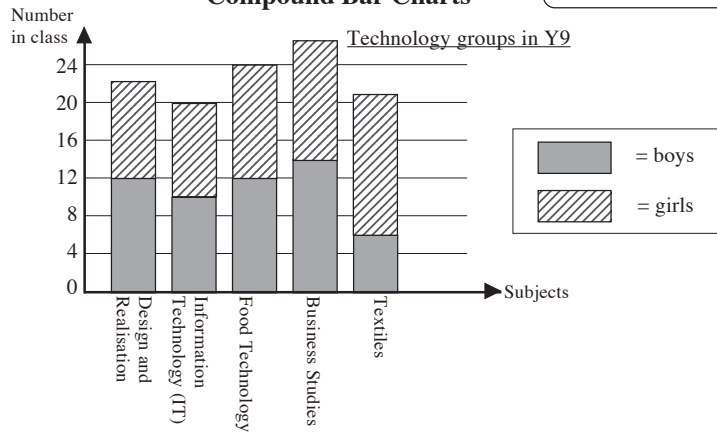
There are two kinds of compound bar charts.
Both are met in the following Star Challenge.

Star Challenge



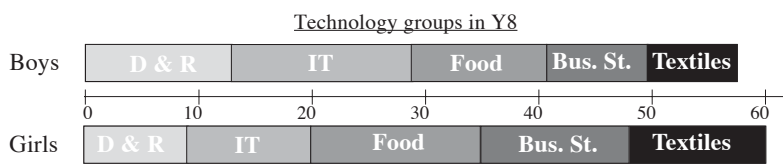
Compound Bar Charts

20-21 marks = 2 stars
17-19 marks = 1 star



1. Design and Realisation is taken by 22 pupils. There are 12 boys.
How many girls take Design and Realisation ? [1 mark]
2. Which subject is done by equal numbers of boys and girls ? [1 mark]
3. How many boys are there in all these classes ? [1 mark]
4. How many girls are there in all these classes ? [1 mark]
5. Copy and complete this two-way table: [12 marks]

Subject	Design & R.	IT	Food Tech.	Bus. Studies	Textiles
Boys	12				
Girls					
Pupils	22	20			



6. Are there more boys or more girls taking IT in Y8 ? [1 mark]
7. Which subject has the most girls in the class ? [1 mark]
8. Which subject has the most boys in the class ? [1 mark]
9. Does the Textiles group have more boys than girls ? [1 mark]
10. Which subject has the most students ? [1 mark]

• Your teacher has the answers to these.

Star Challenge

2 2

All correct = 1 star
Clear explanations = 1 star

Temperature - rainfall diagrams

NW BRITAIN
Cool summers
Mild winters
Heavy rain all year, with more in the winter

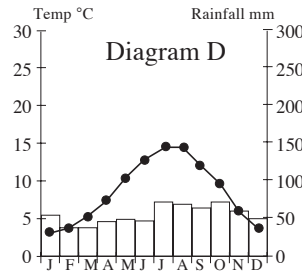
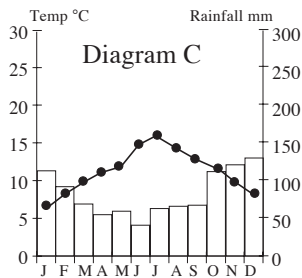
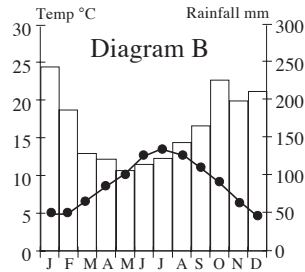
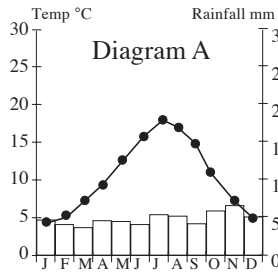
NE BRITAIN
Cool summers
Cold winters
Relatively dry all year

SW BRITAIN
Warm summers
Mild winters
Rain all year, with more in the winter

SE BRITAIN
Warm summers
Cold winters
Some rain all year, with slightly more in summer



Key: rainfall
 temperature



The task: Match each town marked on the map with one of the diagrams.
Explain why you think it is the correct diagram for that town.

• Your teacher has the answers to these.

Section 2: Constructing tables & diagrams

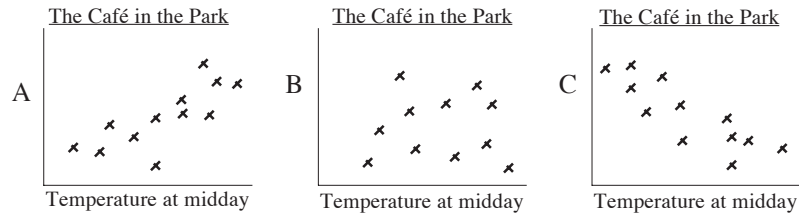
In this section you will:

- meet and construct scatter graphs
- design two way tables and construct compound bar charts

DEVELOPMENT

D2.1: Meet the scatter graph

In a scatter graph, two variables are plotted on a graph.
We then look to see if there is any relationship between the two variables.



The Café in the Park kept a record of the midday temperature each day. They also kept a record of how many icecreams, packets of crisps and hot drinks they sold each day. They plotted three scatter graphs of the data collected (shown here).

The three labels that should go on the vertical axes are:

number of icecreams sold
number of hot drinks sold
number of packets of crisps sold

Your task:

Decide which label goes on which graph.
Explain why you think it should go there.

- Check your answers.

If one variable plotted against the other shows an upward trend, we say that the variables have a positive correlation.
If one variable plotted against the other shows a downward trend, we say that the variables have a negative correlation.
If no trend can be seen, we say that there is no correlation between the variables.

Star Challenge 3★3

8 marks = 2 stars
6-7 marks = 1 star

Is there a relationship ?

distance from centre of city (km)	0.8	3.7	1.6	4.1	2.9	2.5	0.9	2.3
number of people per hectare	52	16	48	15	12	28	46	24

1. Draw a scatter graph for this data. [5 marks]
2. What kind of correlation do you get ? [1 mark]
3. Describe simply any relationship between the number of people per hectare and the distance from the centre of the city. [2 marks]

• Your teacher will need to mark this.

Star Challenge 4

Design two-way tables

All correct = 1 star

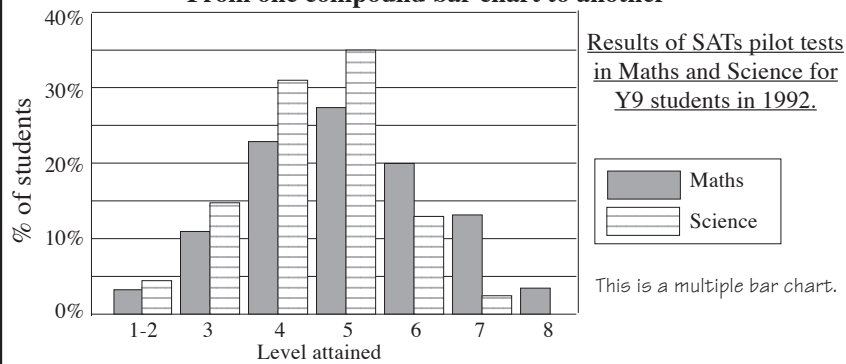
1. Design a two-way table to be used in a car park survey to record both the makes and colours of vehicles.
2. Design a two-way table to record GCSE results (the numbers of students who got A*,A,B,C,D,E,F,G) for both Y11 boys and girls.

• Show your tables to your teacher.

Star Challenge 5 5

Task 1 correct = 1 star
Task 2 correct = 1 star

From one compound bar chart to another

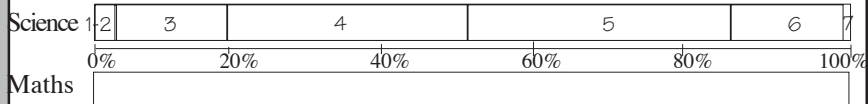


Results of SATs pilot tests in Maths and Science for Y9 students in 1992.

Maths
Science

This is a multiple bar chart.

Here the results of the SATs pilot tests are shown on a multiple bar chart. But, it is much easier to compare Maths and Science results if they are placed side by side in compound bar charts.



Task 1: Copy the compound bar chart, drawn here, for Science. Underneath, using the same scale, draw the compound bar chart for Maths.

Task 2: Use the compound bar charts to say whether each statement below is true (T) or false (F):

- A: Few students achieved Level 7 in Science.
- B: The most common level achieved in both Maths and Science was Level 4.
- C: Around 30% of students attained less than Level 5 in Maths.
- D: Around 50% of students attained less than Level 5 in Science.
- E: More students achieved higher levels in Maths than in Science.
- F: The Science tests appear to have been harder than the Maths tests.

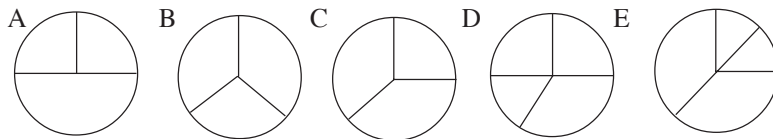
• Your teacher will need to check these.

Section 3: Constructing pie charts

In this section you will find out how to construct pie charts.

DEVELOPMENT

D3.1: Recognising pie charts



Say which pie chart could show each set of information:

- | | | | | |
|--|--|--|---|---|
| 1. 3 red
3 white
3 blue
pie chart ... | 2. 3 black
3 white
2 grey
pie chart ... | 3. 4 black
4 white
8 orange
pie chart ... | 4. 1 black
3 white
1 green
3 blue
pie chart ... | 5. 4 black
3 white
3 green
2 yellow
pie chart ... |
|--|--|--|---|---|

• Check your answers.

D3.2: Working out simple angles

EXAMPLE 3 red and 1 green
What are the angles for
each colour on the pie chart ?



**Full circle
= 360°**

Work out the angle for each colour:

- | 1. <table border="1"><thead><tr><th>Colour</th><th>Number</th><th>Angle</th></tr></thead><tbody><tr><td>Black</td><td>1</td><td>.....</td></tr><tr><td>Purple</td><td>1</td><td>.....</td></tr><tr><td>Red</td><td>1</td><td>.....</td></tr></tbody></table> | Colour | Number | Angle | Black | 1 | | Purple | 1 | | Red | 1 | | 2. <table border="1"><thead><tr><th>Colour</th><th>Number</th><th>Angle</th></tr></thead><tbody><tr><td>White</td><td>1</td><td>.....</td></tr><tr><td>Black</td><td>1</td><td>.....</td></tr><tr><td>Orange</td><td>1</td><td>.....</td></tr><tr><td>Grey</td><td>1</td><td>.....</td></tr></tbody></table> | Colour | Number | Angle | White | 1 | | Black | 1 | | Orange | 1 | | Grey | 1 | | | | | | | | | | | | | | |
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| Orange | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Grey | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| Blue | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Colour | Number | Angle | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Red | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Green | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Blue | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Yellow | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. <table border="1"><thead><tr><th>Colour</th><th>Number</th><th>Angle</th></tr></thead><tbody><tr><td>Orange</td><td>3</td><td>.....</td></tr><tr><td>Lemon</td><td>3</td><td>.....</td></tr><tr><td>Lime</td><td>6</td><td>.....</td></tr></tbody></table> | Colour | Number | Angle | Orange | 3 | | Lemon | 3 | | Lime | 6 | | 6. <table border="1"><thead><tr><th>Colour</th><th>Number</th><th>Angle</th></tr></thead><tbody><tr><td>Red</td><td>4</td><td>.....</td></tr><tr><td>Purple</td><td>4</td><td>.....</td></tr><tr><td>Green</td><td>4</td><td>.....</td></tr><tr><td>Pink</td><td>4</td><td>.....</td></tr></tbody></table> | Colour | Number | Angle | Red | 4 | | Purple | 4 | | Green | 4 | | Pink | 4 | | 7. <table border="1"><thead><tr><th>Colour</th><th>Number</th><th>Angle</th></tr></thead><tbody><tr><td>Yellow</td><td>6</td><td>.....</td></tr><tr><td>Green</td><td>6</td><td>.....</td></tr><tr><td>Blue</td><td>12</td><td>.....</td></tr></tbody></table> | Colour | Number | Angle | Yellow | 6 | | Green | 6 | | Blue | 12 | |
| Colour | Number | Angle | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Orange | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lemon | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lime | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Colour | Number | Angle | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Red | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Purple | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Green | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pink | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Colour | Number | Angle | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Yellow | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Green | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Blue | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

• Check your answers.

D3.3: Working out more difficult angles

EXAMPLE Work out the angles in the pie chart.

Blue	16 pupils	← Given information
Green	12 pupils	
White	8 pupils	

Full circle = 360°

Total 36 pupils ← Step 1: Find total number of pupils

1 pupil	= $360^\circ \div 36$	← Step 2: Find angle for one pupil
	= 10°	

B: 16 pupils	= 160°	← Step 3: Find angles for each set of pupils
G: 12 pupils	= 120°	
W: 8 pupils	= 80°	

Work out the angles in each pie chart. Fill in the gaps.

<p>1. Blue 20 pupils Orange 10 pupils Yellow 6 pupils</p> <p>Totalpupils</p> <table border="1" style="width: 100%;"> <tr> <td>1 pupil = $360^\circ \div \dots$</td> </tr> <tr> <td>=</td> </tr> </table> <p>B: 20 pupils =</p> <p>O: 10 pupils =</p> <p>Y: 6 pupils =</p>	1 pupil = $360^\circ \div \dots$	=	<p>2. Green 10 pupils Yellow 8 pupils</p> <p>Totalpupils</p> <table border="1" style="width: 100%;"> <tr> <td>1 pupil = $360^\circ \div \dots$</td> </tr> <tr> <td>=</td> </tr> </table> <p>G: 10 pupils =</p> <p>Y: 8 pupils =</p>	1 pupil = $360^\circ \div \dots$	=	<p>3. Lemon 15 pupils Orange 3 pupils</p> <p>Totalpupils</p> <table border="1" style="width: 100%;"> <tr> <td>1 pupil = $\dots \div \dots$</td> </tr> <tr> <td>=</td> </tr> </table> <p>L: 15 pupils =</p> <p>O: 3 pupils =</p>	1 pupil = $\dots \div \dots$	=
1 pupil = $360^\circ \div \dots$								
=								
1 pupil = $360^\circ \div \dots$								
=								
1 pupil = $\dots \div \dots$								
=								
<p>4. Oak 3 pupils Elm 3 pupils Beech 4 pupils</p> <p>Totalpupils</p> <p>1 pupil =</p> <p>=</p> <p>O: 3 pupils =</p> <p>E: 3 pupils =</p> <p>B: 4 pupils =</p>	<p>5. Trout 3 pupils Cod 2 pupils Haddock 1 pupil</p> <p>Totalpupils</p> <p>1 pupil =</p> <p>=</p> <p>T: 3 pupils =</p> <p>C: 2 pupils =</p> <p>H: 1 pupil =</p>	<p>6. Yes 7 pupils No 5 pupils Maybe 8 pupils Sometimes 4 pupils</p> <p>Y: =</p> <p>N: =</p> <p>M: =</p> <p>S: =</p>						

• Check your answers.

D3.4: But what if the number doesn't divide into 360 ?

You need to be able to draw pie charts when the total number does not divide into 360° exactly. How ?



EXAMPLE Work out the angles in the pie chart for the results of this survey

Group	Number who chose it
Blur	7 pupils
Pulp	9 pupils
Oasis	11 pupils

← Given information

Full circle = 360°

Total 27 pupils ← Step 1: Find total number of pupils

1 pupil = $360^\circ \div 27 = 13.3^\circ$

← Step 2: Find angle for one pupil

Round answer to nearest 0.1°

Blur: 7 pupils = 93°
 Pulp: 9 pupils = 120°
 Oasis: 11 pupils = 146°

← Step 3: Find angles for each set of pupils.

Round answers to nearest degree

Some pupils in Y7 did a survey on "My worst nightmare"

Nightmare	Number who chose this	Angle in pie chart
Chased by monsters	13	
Swimming with sharks	8	
Taking little brother/sister everywhere	2	
Falling off a cliff	18	

- Copy and complete this table.
- Draw and label the pie chart for this survey.

Get your teacher to check your angles and pie chart before doing the Star Challenge !

Star Challenge



The worst joke teller

1 star for Q1 & 2
1 star for correct pie chart

Pupils in Y8 did a survey on "Which teacher tells the worst jokes ?"
 Their results were:

Teacher	Number who chose this teacher	Angle in pie chart
Mrs. Young	16	
Mr. Hamilton	14	
Mr. Hatton	12	
Mr. Law	7	
Mrs. Howarth	4	

- What is the angle for 1 person ? Give your answer to 0.1°
- Copy and complete this table.
- Draw and label the pie chart for this survey.

• Your teacher will need to mark this.

Section 4: Calculating statistics 1

In this section you will:

- review finding mean, mode, median and the range of raw data
- use an assumed mean to calculate the mean
- use range and one average to make comparisons

DEVELOPMENT

D4.1: Measures of data

The **mode**, **median** and **mean** are three different types of **average**.
Each one is a way of saying where the middle of the data is.
The **range** is a simple measure of the spread of the data.

0 1 3 4 5 5

Mode = most common value

Here, the mode is 5

The mode is also called the **modal value**.

There may be more than one mode.
There may be no mode.

Median = middle value

(when the values are placed in order)
or halfway between the two middle values.
Here, median = halfway between 3 and 4.

Here, the median = 3.5

The median is also called the **median value**.

Mean = $\frac{\text{sum of all values}}{\text{number of values}}$

Here, the mean = $\frac{18 + 6}{3} = 8$

The mean is also called the **mean average**

Range = difference between largest and smallest values

Here, the range = $5 - 0$

range = 5

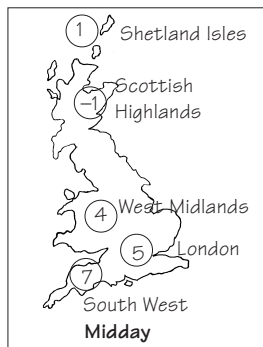
Set A: 4 9 3 6 8

Set B: 5 7 6 6 11 7

Set C: -5 3 -5 -2 0 4 -2

Set D: 2.4 2.1 2.2 2.3

1. Calculate the mean of each set of numbers.
2. Find the mode of each set of numbers. There may be more than one mode. There may be no mode.
3. Put each set of numbers in order and work out the median.
4. Find the range of each set of numbers.



5. What was the mean temperature at midday ?
6. What was the mean temperature at midnight ?
7. What was the temperature range at midday ?
8. What was the temperature range at midnight ?



• Check your answers.

D4.2: Average test marks

The pupils at Alton High School have a report at the end of each term.

The average (mean) test mark for each subject goes on the report.

The range of each set of marks also goes on the report.

All tests are marked out of 20.

Josie Smith	
Subject	Test marks
English	12 15 18 16 14
Maths	15 20 18 16 20 19
Science	18 14 17 18 20 19 13
French	18 16 20 10
History	15 15 16 12 12

Amin Shakar	
Subject	Test marks
English	9 17 10 19 15
Maths	13 10 12 14 11 12
Science	14 17 9 8 15 10
French	19 18 16 15
History	16 17 12 11 9

1. **Josie Smith Report Card**

Subject	Mean mark	Range
English		
Maths		
Science		
French		
History		

Amin Shakar Report Card

Subject	Mean mark	Range
English		
Maths		
Science		
French		
History		

Copy and complete the report cards for Josie and Amin.

- Which subject do you think Josie was best at. Say why.
- Which subject do you think Amin was best at. Say why.
- In Amin's best subject, is he better than Josie ?
Is it the mean of the range that tells you this ?
- In Josie's worst subject, is she better than Amin ?

If you are **'consistent'**, then your marks are close together. The range is small.

- Which of them is most consistent in their maths test marks ?
- Which of them did better in the maths tests ?
- Which is Sally Farrell's best subject ?
- Which is Sally's worst subject ?

Sally Farrell Report Card		
Subject	Mean mark	Range
English	13	3
Maths	16	4
Science	15	4
French	11	3
History	18	2
Music	8	3

- In which subject is she most consistent ?
- Over all their subjects, who is the most consistent ? How can you tell ?
- Josie, Amin and Sally are good friends. So, in order to decide which of them has the best report card, they find the mean average of their mean marks.

Find the mean average of each of their mean marks.
Who did best ?

• Check your answers.

Star Challenge 7 7

A mean shortcut

8 correct = 2 stars
5-7 correct = 1 star

- Work out the mean of :
 - 4 5 6 6 9
 - 24 25 26 26 29
 - 104 105 106 106 109
- Explain how you can find the mean of 54 55 56 56 59
from the mean of 4 5 6 6 9
- Show how to find the mean of 807 809 802
by first subtracting 800 from the number.
- Show how to find the mean of 235 237 238 234
by first subtracting 230 from the number.
- Find the mean of -3 -2 0 2 -2 -1
 - Show how you can use the result from (a) to find the mean of
97 98 100 102 98 99

• Your teacher has the answers to these.

Star Challenge 8 8

Passing the course

1 star for Q 1-3
1 star for Q4

The Pan-Galactic Trainees take 10 examinations during their 2 year course.

To pass the course, they must:

- get more than 50 marks in every exam
- get a mean mark of more than 70, over the ten exams.



Zuk got:
64 82 97 68
73 65 80 51
68 72



Sludge got:
78 67 92 63
88 49 82 64
79 68



Gizmo got:
56 74 89 76
82 52 68 71
56 75

- Find the mean mark for each Trainee.
- Who passed ?
- Two of them failed. Who failed ? Explain why, in each case.

4.



Frizzbang has taken nine of the ten examinations.

His marks were :

58 72 88 78 80 54 66 76 51

Frizzbang has to take one more exam.

What is the least mark he must get to pass ?

• Your teacher has the answers to these.

Section 5: Calculating statistics 2



In this section you will:

- find the mean, mode and range of large amounts of data
- learn to draw stem-and-leaf diagrams
- find mode, median and range from stem-and-leaf diagrams

DEVELOPMENT

D5.1: Frequency tables for large amounts of data

Large amounts of data are usually given in frequency tables.

EXAMPLE For the dice throws shown in the table, find

(a) the mean score (to 2 d.p.) (b) the modal score (c) the range

Score (S)	Frequency (F)	S x F
1	23	23
2	27	54
3	25	75
4	29	116
5	27	135
6	26	156
Totals	132	559

$$\begin{aligned} \text{(a) Mean score} &= \frac{\text{total score}}{\text{number of throws}} \\ &= 559 \div 132 \\ &= \boxed{4.23 \text{ to 2 d.p.}} \end{aligned}$$

$$\begin{aligned} \text{(b) The modal score} &= \text{the mode} \\ &= \boxed{6} \\ & \text{[more sixes than any other number]} \end{aligned}$$

$$\text{(c) Range} = 6 - 1 = \boxed{5}$$

total number of throws

total score

Number of people living in each house on the Great Summer Estate

No. of people (N)	Freq.(F)	N x F
1	15	15
2	26	
3	35	
4	52	
5	29	
6	12	72
7	6	
8	1	
Totals		

1. Copy and complete this table.
2. How many houses have three people living in them ?
3. How many houses have six people living in them ?
4. How many houses are there on the estate ?
5. What is the total number of people living in the houses ?
6. What is the range of the number of people ?
7. What is the modal number of people ?
8. Calculate the mean number of people. Show how you work it out.

• Check your answers.

D5.2: Stem-and-leaf diagrams

A **stem-and-leaf diagram** is a way of organising ungrouped data to show up any patterns.
An ordered stem-and-leaf diagram is easy to use to find the median.

EXAMPLE The ages of the fathers of fifteen Y8 students are:

37 42 33 60 52 41 39 42 43 47 50 37 42 54 36

- (a) Put this data onto a stem-and-leaf diagram which is
(i) unordered (ii) ordered
(b) Find the median age of the fathers. (c) Find the range of ages.

(a) (i) Unordered stem-and-leaf diagram

Ages of fathers of Y8 students 3|7 means 37 years ← (key)

3	7 3 9 7 6	(5)	The numbers in brackets tell us how many leaves belong to each stem. It is not essential to have them, but they are often useful. Their total provides a check that no data value has been missed out.
4	2 1 2 3 7 2	(6)	
5	2 0 4	(3)	
6	0	(1)	
↑	↑		
stem	leaves		

(ii) Ordered stem-and-leaf diagram

Ages of fathers of Y8 students 3|7 means 37 years

3	3 6 7 7 9	(5)	To make an ordered stem-and-leaf diagram, it is usually easier to make an unordered one first.
4	1 2 2 2 3 7	(6)	
5	0 2 4	(3)	
6	0	(1)	

(b) The median age is the age of the 8th father median = 42

There are 15 fathers. When in order, the middle one is the 8th.

- The ages of the mothers of the fifteen Y8 students are:
36 43 39 53 49 38 37 42 34 46 51 37 44 42 34
 - Construct an ordered stem-and-leaf diagram, complete with a key for this data.
 - Find the median age of the mothers.
 - Find the range of ages.
 - There are three modes. What are they ?
- The lengths of feet, in cm, of a group of Y8 girls are:
23.1 24.3 26.6 27.1 22.9 25.8 23.8 24.7 26.9 25.2
22.8 23.4 25.3 26.1 27.0 22.9 26.4 23.3 24.7 25.6
24.0 22.6 25.8 25.4 23.9 24.9 26.4 26.7 24.2
 - Using a key where 22|7 means 22.7, construct an ordered stem-and-leaf diagram for this data.
 - How many lengths were less than 25 cm ?
 - How many lengths were over 26 cm (shoe size 6) ?
 - Find the median and the range of this data. • Check your answers.

Stem-and-leaf diagrams have the clarity of the shape of a bar chart plus the detail of the original data.
 Their stems may have more than one digit
 BUT their leaves can have only one digit.

Star Challenge



Reading stem-and-leaf diagrams

14 marks = 2 stars
 10-13 marks = 1 star

1. The number of days that patients have waited for a first appointment with an eye consultant at Barley Mow Hospital is shown on this stem-and-leaf diagram:

	Number of days	Key 4 2 = 42
1	0 1 2 4	(4)
2	0 1 5 7 9	(5)
3	1 4 6 8 8	(5)
4	0 1 2 2 3 5 7 8 9	(9)
5	2 4 5 8 9 9	(6)
6	1 4 5	(3)
7	1 2	(2)

- (a) A doctor wants to give his patient an estimate of how long they are likely to have to wait for an appointment. **What estimate would you give ?** [2 marks]
 (b) **Work out the median wait and the range of waiting times.** [2 marks]

Direct comparison of two sets of data can be achieved by placing two stem-and-leaf diagrams back-to-back.

2. This back to back stem-and-leaf diagram shows the test marks for two Y8 tests.

	Geometry Test	End-of-Year Test	Key 4 0 = 40%
(0)		3 5	(1)
(0)		4 2	(1)
(3)		5 7 4 2	(3)
(5)	7 7 5 5 2	6 2 4 5 5 6 6 8 9	(8)
(5)	9 7 5 5 4	7 1 1 2 5 6 7 8 9 9 9	(9)
(8)	8 8 7 6 4 2 1 0	8 0 0 1 2 6 7	(6)
(7)	7 5 4 4 1 1 0	9 3 5 6	(3)

- (a) What was the lowest mark ? [1 mark]
 (b) What was the highest mark ? [1 mark]
 (c) Which test was easier ? Explain how you can tell. [2 marks]
 (d) How many students took each test ? [2 marks]
 (e) Work out the median mark for each test. [2 marks]
 (f) On the end-of-year test, students getting over 85% got an award.
 How many were given the award ? [2 marks]

• Your teacher has the answers to these.

Star Challenge



Back-to-back stem-and-leaf diagrams

12 marks = 2 stars 9-11 marks = 1 star

1. Combine the ages of fathers and mothers of Y8 students in a back to back stem-and-leaf diagram. (Data in Example and Q1 of D5.2) [10 marks]
 2. Compare the ages of the fathers and the mothers.
 What do you notice ? [2 marks]

• Your teacher has the answers to these.

Section 6: Continuous data

In this section you will:

- understand what is meant by discrete and continuous data
- work with continuous data and represent it on a frequency diagram

DEVELOPMENT

D6.1: What do you get ?

Task 1: List, where possible, ... [Some are not possible].

1. ...your age in completed years;
2. ...your exact age ;
3. ...all the possible shoe sizes between 1 and 5 inclusive;
4. ...all the heights between 1.8 m and 1.9 m;
5. ...all the scores that you can get with a normal dice;
6. ...all the numbers between 1 and 2.95

Task 2:

These statements are all true.

Sara's height is 172 cm to the nearest cm.

Sara is 172.3 cm to the nearest mm.

Sara is 2 m to the nearest m.

7. Which is the least accurate of the statements.
8. Which is the most accurate of the statements.
9. What is Sara's exact height ?

D6.2: Discrete or continuous data ?

Numerical data can be

- **discrete** - Discrete data can only take exact values.
eg - number of tomatoes on a tomato plant
- **continuous** - Continuous data is data which is **measured**. It cannot be exact. It consists of measurements given to a certain degree of accuracy. eg height, weight, length of time...

State whether each of these is discrete (D) or continuous (C)

1. The score when throwing a 10-sided dice.
2. The time it takes for each member of the group to run 100 metres.
3. The total number of brothers and sisters each member of the group has.
4. The length of each of the desks in your classroom.
5. The shoe sizes of the members of your class.
6. The lengths of the feet of the pupils in your class.
7. The number of books in each pupil's bag.
8. The height of each pupil.
9. The number of coins in people's pockets. • Check your answers.

D6.3: Grouping continuous data

A golfer hits 60 shots. The distances in metres that he hits each are given below:

104.7 101.1 122.4 103.6 111.2 102.8 105.7 102.4 101.3 124.2
 103.9 112.7 110.0 100.7 105.6 106.2 103.7 113.1 101.8 102.5
 111.6 104.5 105.8 121.0 103.9 104.6 101.3 123.3 101.6 110.0
 102.2 104.8 124.1 141.9 143.1 115.7 141.9 110.7 140.0 113.4
 115.7 146.4 121.9 125.1 123.5 122.2 126.9 121.5 124.8 123.6
 124.3 121.5 122.4 123.9 121.6 122.7 125.8 122.0 121.6 124.7

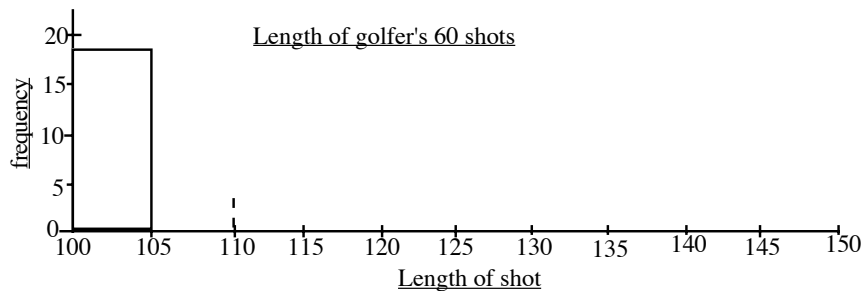
Task 1: Put this raw data into the grouped frequency table below.

You may cross out each distance after you have put it into the table.

READ THIS FIRST!
 The top measurement in each group interval is NOT included in the interval.
 105 is in the second interval – not the first.
 100-----> | 105-----> | 110----->
 1st interval | 2nd interval | 3rd ...

Length of shot	Tally	Frequency
100 -->105		
105 -->110		
110 --> 115		
115 --> 120		
120 --> 125		
125 --> 130		
130 --> 135		
135 --> 140		
140 --> 145		
145 --> 150		

Task 2: Draw a frequency diagram for your frequency table, on the diagram below.



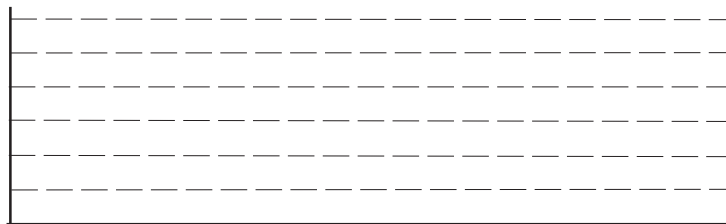
Important: For continuous data, the labels do NOT go in the centre of each bar. They make a continuous scale along the axis. This kind of chart is called a **frequency diagram**.

Task 3: A Y3 class measures how long each child can hold his/her breath.

Length of time in seconds	Tally	Frequency
0 => 10		4
10 => 20	 	9
20 => 30	 	11
30 => 40		3



Draw a frequency diagram to show this data. Use the axes below.
Make sure the scale across the page is continuous.



• Check your answers.

Star Challenge



Continuous challenge

1 star for a correct frequency table
1 star for a correct frequency diagram.

The heights of a class of 40 Mathematics students was measured in metres as:



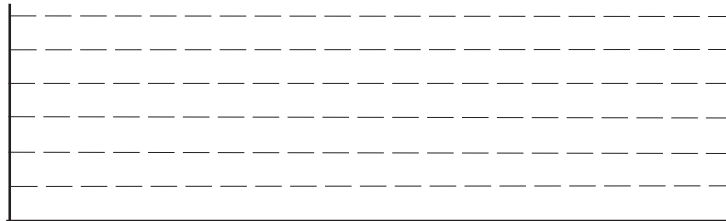
1.98 1.76 1.83 1.92 1.91 1.74 1.83 1.86 1.99 1.90
1.79 1.91 1.84 1.81 1.92 1.87 1.78 1.86 1.82 1.69
1.81 1.78 1.71 1.65 1.73 1.93 1.71 1.77 1.75 1.76
1.73 1.73 1.71 1.74 1.75 1.62 1.73 1.78 1.71 1.73

Task 1: (a) The lowest height. is (b) The tallest height is

(c) Organise this data into a grouped frequency table WITH 4 GROUPS.

Height	Tally	Frequency
-----	-----	-----
-----	-----	-----
-----	-----	-----

Task 2: Draw a frequency diagram to display this data.



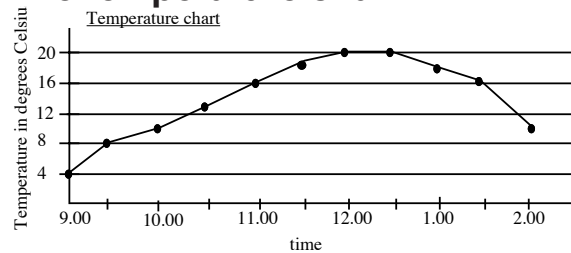
Section 7: Line graphs

In this section you will:

- read information from line graphs
- interpret and construct graphs arising from real-life situations

DEVELOPMENT


D7.1: The temperature chart



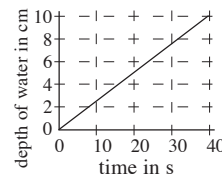
1. What temperature was it at 11.30 am ?
2. At what two times was the temperature 16°C ?
3. In which half hour did the temperature start to fall ?
4. What was the highest recorded temperature ?
5. During which half hour was the largest rise in temperature ?
6. During which half hour was the biggest *change* in temperature ?
7. (a) Estimate the temperature at 9.45 am.
(b) Why is this unlikely to have been the exact temperature at this time ?


• Check answers.

D7.2: Water levels

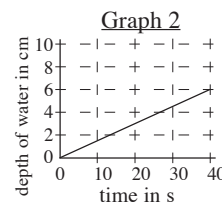
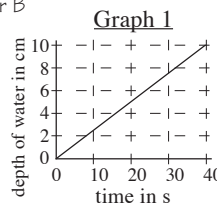
1.  Water is being poured into beaker A at a steady rate. The graph shows the depth of the water, in cm for the first 40 s.

How deep is the water after 20 s ?



2.  Water is being poured into beaker B at the same rate as into A.

Which of these two graphs shows the correct depth of water in B ?



3. Sketch a graph to show the depth of water in beaker A, but using a depth scale of

5	10
4	8
3	6
2	4
1	2
0	0

 instead of

5	10
4	8
3	6
2	4
1	2
0	0
4. In each of these graphs, does every point have a meaning. Explain why or why not.

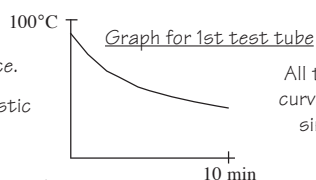
• Check your answers.

D7.3: Cooling curves

Very hot water is put into three test tubes.
Each test tube has a temperature probe in it.
The temperature of each tube is shown on a graph on a computer.

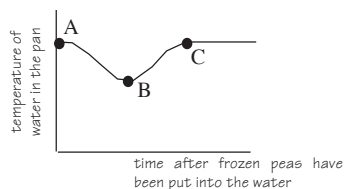
First test tube: no wrapping

The second test tube is wrapped in ice.
The third test tube is wrapped in plastic foam.



All the points on the curve have a meaning, since the data is continuous.

- Copy the graph for the first test tube.
- Using the same scales, sketch graphs for the second and third test tubes.
- This graph shows what happens to the water temperature when frozen peas are put into a pan of boiling water.



- Explain what is happening to the temperature between A and B.
- Explain what is happening to the temperature between B and C.
- Explain what is happening after the point C.

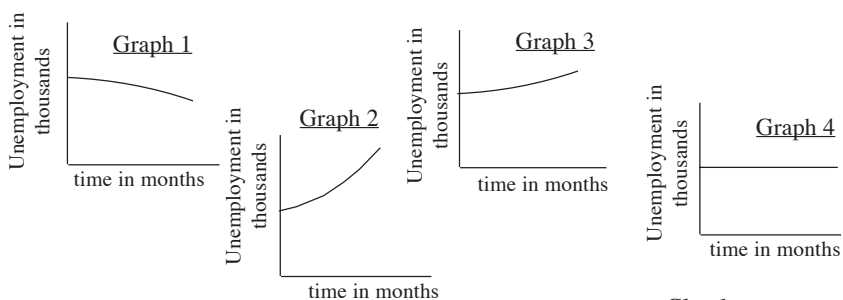
• Check your answers.

D7.4: What is happening here ?

Each one of the statements describes what is happening in one of the graphs.

Match each statement to the correct graph.

- A: Unemployment remains steady.
B: Unemployment is still rising but by less each month.
C: Unemployment is slowly decreasing.
D: Unemployment has been rising more rapidly each month.



• Check your answers.

Star Challenge

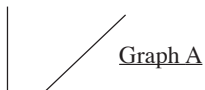


Bathtime challenge

9-10 correct = 2 stars
7-8 correct = 1 star

All of the graphs here show the depth of water in a bath over a period of time.

Task 1: In both of these graphs, the plug is in.
In one graph just one tap is running. In the other, both taps are running.



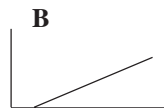
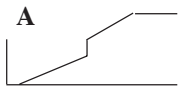
1. In which graph are both taps running ?



2. In which of these two graphs does the bath overflow ?

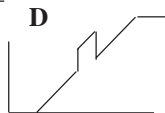
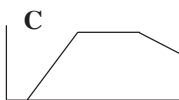
Task 2: Match each set of descriptions with the correct graph.

Case 1
Plug in.
Both taps on.



Case 5
Plug in.
Both taps on.
Bath overflows

Case 2
Plug in.
Both taps on.
Man gets in.
Man sits in bath.
Man gets out.
Bath overflows



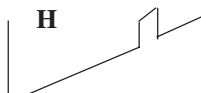
Case 6
Plug in.
One tap on.
Man gets in.
Man gets out.

Case 3
Plug in.
Both taps on.
Bath overflows.
plug out.



Case 7
Plug in.
One tap on.
Man gets in.
Man stays in.
Bath overflows

Case 4
Plug in.
Cold tap on.



Case 8
Plug in.
Both taps on.
Plug out.

Section 8: Displays using ICT

In this section you will display data using pie charts, scatter graphs, frequency diagrams and line graphs.

DEVELOPMENT

D8.1: Which chart do I use for which set of data ?

Task 1: Put these four sets of data onto a spreadsheet.

Time	0.900	10.00	11.00	12.00	13.00	14.00
Temperature (°C)	8	9	12	16	17	16

<u>Heights and weights of Y8 students</u>	
(Heights (in cm), weights, in kg)	
(155, 42)	(160, 46)
(164, 47)	(172, 51)
(168, 43)	

Heights of students	Frequency
150 → 160	4
160 → 170	5
170 → 180	3
180 → 190	2

<u>Students on French Trip</u>	
Year	Frequency
Y7	15
Y8	20
Y9	16
Y10	7

Task 2: Find out how to create pie charts, scatter graphs, frequency diagrams and line graphs, using the chart wizard.

Make as many different charts as you can for each of the sets of data.

- Show your charts to your teacher.

This section can be done at any time before the project is started. Students do not need to have done Sections 3-7 before they do this.

Sections 9-11: The project

Here you will:

- choose a problem that can be addressed by statistical methods
- identify related questions
- collect the required data using a suitable method
- process the data and find an answer to the problem you chose
- choose how to display your findings and justify your choice

DEVELOPMENT

D9.1: Related questions

Class discussion

The project you are going to do must involve numerical data, but it can be discrete or continuous data. As well as trying to answer the original query, you should identify some related questions.

For some or all of the following problems:

- *decide what data would need to be collected and how to get it*
- *discuss a possible sample size*
- *identify related questions that could be explored*

EXAMPLE

Problem: At what time(s) in a football match is there most likely to be a goal.

Related questions:

- Where could I find the data ?
- When is the best time to buy food if you don't wish to miss a goal or to queue at half time ?
- What is the likelihood of missing a goal if I leave the match 10 minutes early ?

1. Compare and contrast TV viewing patterns for children and adults.
2. The local bus service is not as good as it used to be.
3. The girls in Y7 are taller than the boys.
4. The Egyptian cubit was the standard measurement of length throughout the ancient world. Devised about 3 000 BC, it was based on the length of a man's forearm, from his elbow to the tip of his extended middle finger. How long is a cubit ?
5. Football teams in the First Division score more goals in a year than the teams in the Premiership.
6. Women's long distance running times have improved more in the last ten years than men's long distance running times.
7. When released on a sloping ramp, how far does a toy car travel when it reaches the floor ?
8. Lerwick (Scotland) has more hours of sunshine than Penzance (Cornwall).
9. The rises and falls on the London Stock Exchange follow the rises and falls on the New York Stock Exchange.

Star Challenge



The project Small groups

50 or more marks = 3 stars
40-49 marks = 2 stars
30-39 marks = 1 star

The project you are going to do must involve numerical data. If possible you should have at least two sets of numerical data, so that you can use the mean/mode/median and the range to compare the two sets.

Step 1: Choose a problem that can be addressed by statistical methods.

Step 2: Decide what data you will need and how you can get it. Explain how you will collect the data and the sample size you have chosen.

Step 3: Organise your data in one or more frequency tables, (grouped or ungrouped).



Yerwat

Step 4: Decide which tables or charts are most suitable to show the information you have collected.

Step 5: If possible, find the mean, mode, median and range for your data and make comparisons.

Step 6: Make a display of your findings.

It should include some or all of these:

- a short description of your plan (step 2) [up to 2 marks]
 - the data collection sheet or questionnaire (step 3) [up to 4 marks]
 - frequency table or two way table [up to 2 marks per table]
 - frequency diagram (hand drawn) [up to 7 marks]
 - suitable charts produced using ICT [up to 7 marks]
 - pie chart (hand drawn) [up to 6 marks]
 - averages and range for each numerical data set [up to 4 marks per set]
 - comparison of two data sets using average(s) and range [up to 4 marks]
 - related questions [up to 4 marks]
 - a report stating the answer to your problem and justifying it by reference to the data you collected. [up to 6 marks]
 - [marks at the teacher's discretion]
- plus marks will be awarded for a good display [up to 6 marks]

High Level Challenge Section

EXTENSIONS

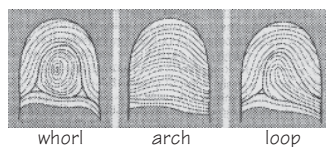
YOUR TEACHER HAS THE ANSWERS TO THESE.

Ch 1: Genetic and ordinary fingerprinting

7 correct = 2 stars
6 correct = 1 star

- One of the most major advances in forensic science this century is the use of genetic fingerprinting (DNA testing). Each of us has a virtually unique DNA structure in all our body cells. The chance of two people having almost identical DNA is 200 000 000 (2 hundred million) to 1.
 - The population of China is approximately one thousand million. Xang lives in China.
Which of these is the most likely number of people in China with a DNA structure almost identical to Xang ?
A: 2 B: 5 C: 50 D: 200 E: 1 000
 - The population in Britain is approximately 58 million.
How many people in Britain are likely to have a DNA structure almost identical to you ?

- There are three main types of fingerprints: the whorl, the arch and the loop. They occur in different proportions amongst different races.



In terms of fingerprint types, the Western World splits into three main groups.

	European	African (Negro)	African (Pygmy & Bushman)
Arches	1 – 10%	3 – 12%	10 – 16%
Whorls	16 – 42%	16 – 42%	16 – 42%
Loops	52 – 76%	52 – 76%	28 – 64%

- The fingerprint records of a number of people belonging to one of these groups show that 8% of them have arches, 39% have whorls and 53% have loops.
Which two of these groups could these people belong to ?
- Another set of people have 2% with arches, 24% with whorls and 74% with loops.
Which one group must they belong to ?
- A third set of people have 11% with arches, 40% with whorls and 49% with loops.
Which one group could they NOT belong to ?
- A fourth set of data shows 10% with arches, 36% with whorls and 34% with loops.
Explain why this data must be wrong.
- A fifth set of data has the figures in the wrong order: 35% with arches, 50% with whorls and 15% with loops.
Correct the order of the data and say which group of people it must belong to.

Ch 2: Blood typing

All correct = 1 star

The four main blood groups are O, A, B and AB. Blood typing cannot be used to prove that a child has a particular father, but it can be used to prove that a particular man could not be the father of the child.

For example: if a child has blood group A and the mother has blood group O, then a man with blood group O cannot be the child's father.

father - mother pairs	possible children
O x O	O
O x A	O, A
O x B	O, B
O x AB	A, B
A x A	O, A
A x B	O, A, B, AB
A x AB	A, B, AB
B x B	O, B
B x AB	A, B, AB
AB x AB	A, B, AB

For each case below, state whether the man could be the father (answer – possibly) or not (answer – no)

	Mother's blood group	Father's blood group	Child's blood group
(a)	O	AB	A
(b)	A	B	AB
(c)	B	O	A
(d)	B	B	O
(e)	AB	B	O
(f)	AB	O	B

All correct = 1 star

Ch 3: Classifying hazards

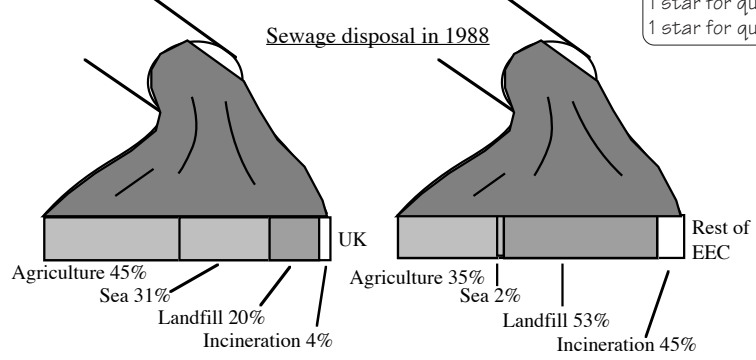
Hazard	Characteristics					Characteristic Score
	Severity	How long	Area affected	How sudden	Other effects	
Drought	1	1	1	4	3	
Earthquake	1	5	1	3	3	
Hurricane	1	2	2	5	1	
Storm	1	3	2	5	3	
Volcano	1	4	4	3	1	
Tsunami	2	4	1	4	5	
Avalanche	2	5	5	1	5	
Flood	2	2	2	4	3	
Fire	3	3	3	2	5	
Landslide	4	2	2	2	5	

Each hazard is graded from 1 (greatest effect) to 5 (smallest effect).

- Which event is the least severe ?
- Which event lasts the longest ?
- Which event is the most sudden ?
- Which three events affect the largest areas ?
- The characteristic score is the sum of the five scores.
Complete the characteristic score column.
- Put the hazards in order of the rank of their characteristic scores.

Ch 4: How do we compare with the rest of Europe ?

1 star for question 1
1 star for question 2



Source : 1988 government reply to Commons Environment Report on Pollution of Rivers & Estuaries

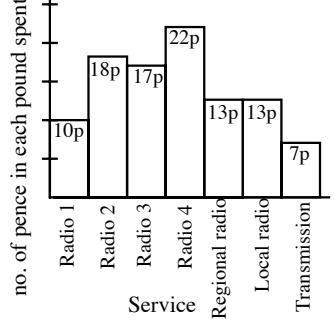
- Display the data on "Sewage Disposal" as (a) a multiple bar chart (b) two pie charts
- Other Europeans have called Britain "the dirty man of Europe" in connection with pollution. Write a short paragraph quoting data from this diagram either justifying or refuting this statement.

Ch 5: Running costs of BBC radio in 1986-7

1 star for question 1
1 star for question 2

Running costs of BBC radio in 1986-7

Section 3



1. Copy and complete this table of angles for a pie chart using this data:

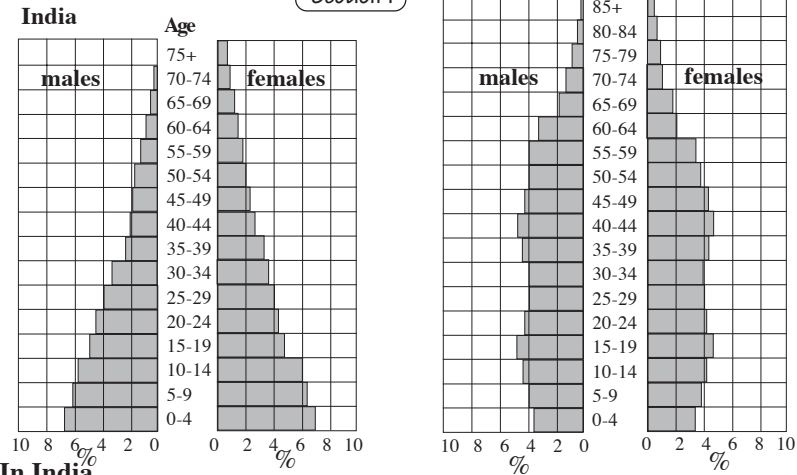
Service	R1	R2	R3	R4	Reg Radio	LocalRadio	Transmission
Angle							

2. Draw a pie chart to show this data.

All correct = 1 star

Ch 6: Population pyramids for India and Japan

Section 1



In India ...

1. ... who live longer, men or women ?
2. ... more than half the population is aged less than 35. True or false ?

In Japan ...

3. ... who live longer, men or women ?
4. ... more than half the population is aged less than 35. True or false ?

Looking at both India and Japan :

5. In which country do people live longer ?
6. India has a larger percentage of children than Japan. True or false ?
7. Both countries have roughly the same percentage of the population at child bearing age (20-30). True or false ?
8. India has a larger percentage of its population over 60 than Japan. True or false ?

All correct = 1 star

Ch 7: Fishing for prizes

Section 4

At Lazy Days Fishing Club, prizes are awarded at the end of the season.

The "Five Best Prize" is worth £20. Second prize is £10.

Third prize is £5. Fourth prize is £3.

Each member works out the average (mean) weight of his/her five heaviest fish.

The highest mean weight wins the "Five Best Prize".

The four best sets of weights were:

Kriss:	3.2 kg	4.6 kg	5.1 kg	5.1 kg	8.2 kg
Sue:	4.4 kg	4.6 kg	5.2 kg	5.5 kg	7.1 kg
Mark:	5.0 kg	5.1 kg	5.1 kg	5.3 kg	6.1 kg
Ellie:	4.6 kg	4.7 kg	4.9 kg	5.2 kg	6.6 kg

Work out the mean weight for each person.

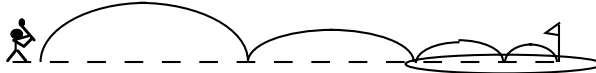
Who gets which prize ?

Ch 8: Mean golf scores

Section 4

6 correct = 2 stars
5 correct = 1 star

The first hole at the Ashlands golf course has a par of 4.



A good player would expect to take 4 strokes for this hole.

- Philip takes 9 strokes at the first hole.
This is 5 above par.
He puts down his score as +5.
(a) Mike takes 6 strokes. How will he write his score ?
(b) Bill takes 3 strokes. How will he write his score ?
- For the first nine holes in a golf match, Neil scores
+1 0 +1 -2 +3 -1 +4 -2 -1
where 0 indicates a par score.
Work out his mean par score. [Give it as a fraction.]
- In the last 9 holes, his mean average score was 1 above par.
(a) What was his total par score for the last nine holes ?
(b) What was his total par score for the 18 holes ?
- Work out his mean par score for the 18 holes. [Give it as a fraction.]

Did you know ?

The standard set for each hole on a golf course is known as the 'par' for the hole. The par score is the number of strokes it should take to get onto the green, plus 2 putts.

13-14 marks = 2 stars
10-12 marks = 1 star

Ch 9: Which firm pays the best wages ?

Section 4

Two small firms employ the same number of people.
Here is what each firm pays its employees each week.

Best Butties:	£175	£205	£205	£205	£205	£220
Super Sarnies:	£195	£195	£195	£195	£195	£255

- Work out the mean wage and range of wages for each firm. (4 marks)
- Which firm pays the best wages ? (2 marks)
- Each firm gave its mean wage to a newspaper as part of a survey.
(a) Is the mean wage a fair representation of the wages paid in Best Butties ?
Explain why you think it is or it isn't. (2 for answer and 2 for explanation)
(b) Is the mean wage a fair representation of the wages paid in Super Sarnies ?
Explain why you think it is or it isn't. (2 for answer and 2 for explanation)

5-6 correct = 1 star

Ch 10: Means and medians of grouped data

Goals (N)	Frequency (F) (no. of teams)	Totals N x F	Running total of F
0	1		1
1	4		5
2	12		
3	16		
4	7		
	40		

Section 4

Task 1: Complete the table and work out the mean number of goals.

Task 2: The median number is the $20\frac{1}{2}$ th number. Use the running total column to find the values of the 20th and 21st number and hence the median.

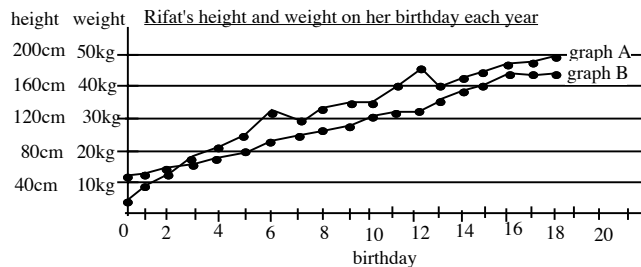
Task 3: Use this technique to work out the median values in the two tables in Section 5: D5.1.

6-7 correct = 1 star

Ch 11: Multiple graph

Section 7

These two graphs show Rifat's height and weight on her birthday each year. Unfortunately, it doesn't say which graph is which.



- Which graph is the graph for her weight ?
[Remember that height will not go down]
- How long (high?) was Rifat when she was born ?
- How heavy was she when she was born ?
- When did she grow fastest ?
- When did she lose weight ?
- Why is graph B flat between her 16th and 18th birthdays ?
- What do you think will happen to Rifat's height graph after her 21st birthday ?

Unit 10: Working with Data

Section 1: Interpreting tables and ... p315

D1.1: Information from pie charts

- Imports 2. \$740 million
- To indicate that there are more imports than exports.
- Manufactured goods
- (2) Oil and fuel (3) Vehicles and Transport equip.
- Foodstuffs and drinks
- (2) metal ores (3) Cotton, hides and oilseed
- Yes 9. No 10. Less
- Enough 12. Farming

D1.2: Two-way tables

- 20 or more 2. 0-9 3. 92% 4. 23%
- B

D1.3: Population pyramids

- More females 2. More females 3. 17%
- No - no males in the oldest age group
- True

Section 2: Constructing tables ... p319

D2.1: Scatter graphs

- A: icecream B: crisps C: hot drinks

Section 3: Constructing pie charts p315

D3.1: Recognising pie charts

- B 2. C 3. A 4. E 5. D

D3.2: Working out simple angles

- | |
|-----|
| 120 |
| 120 |
| 120 |
- | |
|----|
| 90 |
| 90 |
| 90 |
- | |
|-----|
| 90 |
| 90 |
| 180 |
- | |
|-----|
| 45 |
| 90 |
| 180 |
- | |
|-----|
| 90 |
| 90 |
| 180 |
- | |
|----|
| 90 |
| 90 |
| 90 |
- | |
|-----|
| 90 |
| 90 |
| 180 |

D3.3: Working out more difficult angles

- | |
|---------------|
| 36 |
| $360 \div 36$ |
| 10° |
| 200° |
| 100° |
| 60° |
- | |
|---------------|
| 18 |
| $360 \div 18$ |
| 20° |
| 200° |
| 160° |
- | |
|---------------|
| 18 |
| $360 \div 18$ |
| 20° |
| 300° |
| 60° |
- | |
|---------------|
| 10 |
| $360 \div 10$ |
| 36° |
| 108° |
| 108° |
| 144° |
- | |
|--------------|
| 6 |
| $360 \div 6$ |
| 60° |
| 180° |
| 120° |
| 60° |

D3.4: But what if the number doesn't divide into 360 ?

- Angles are: 114° , 70° , 18° , 158° (1 person = 8.8°)

Section 4: Calculating statistics 1 p324

D4.1: Measures of data

- A: 6 B: 7 C: -1 D: 2.25
- A: no mode B: 6 C: -5 & -2 D: No mode
- A: 6 B: 6.5 C: -2 D: 2.25
- A: 6 B: 6 C: 9 D: 0.3
- 3.2 6. -1 7. 8 8. 10

D4.2: Average test marks

- | | | | | |
|---------|----|----|----|----|
| English | 15 | 6 | 14 | 10 |
| Maths | 18 | 5 | 12 | 4 |
| Science | 17 | 7 | 12 | 9 |
| French | 16 | 10 | 17 | 4 |
| History | 14 | 4 | 13 | 8 |
- Maths - highest mean score
 - French - highest mean score
 - Yes 5. Yes 7. Amin 8. Josie
 - History 10. History 11. Sally - lowest ranges
 - Josie: 16 Amin 13.6 Sally 15.5 ; Josie

Section 5: Calculating statistics 2 p327

D5.1: Frequency tables for large amounts...

N	F	N x F
1	15	15
2	26	52
3	35	105
4	52	208
5	29	145
6	12	72
7	6	42
8	1	8
Totals	176	647

- 35 3. 12 4. 176
- 647 6. 7 7. 4
- $647 \div 176 = 3.67$ (to 2 dp)

D5.2: Stem and leaf

- (a)

3	4	4	6	7	7	8	9
4	2	2	3	4	6	9	
5	1	3					
- (b) 42 (c) 19 (d) 34, 37 and 42
- | | | | | | | |
|----|---|---|---|---|---|---|
| 22 | 6 | 8 | 9 | 9 | | |
| 23 | 1 | 3 | 4 | 8 | 9 | |
| 24 | 0 | 2 | 3 | 7 | 7 | 9 |
| 25 | 2 | 3 | 4 | 6 | 8 | 8 |
| 26 | 1 | 4 | 4 | 6 | 7 | 9 |
| 27 | 0 | 1 | | | | |
- (b) 15 (c) 8 (d) 24.9 & 4.5

Section 6: Continuous data p330

D6.1: What do you get ?

- ... 2. Not possible - your age changes all the time
- $1\frac{1}{2}$, 2, $2\frac{1}{2}$, $3\frac{1}{2}$, 4, $4\frac{1}{2}$, 5
- Not possible 5. 1 2 3 4 5 6
- Not possible

D6.2: Discrete or continuous data ?

- D 2. C 3. D 4. C 5. D 6. C
- D 8. C 9. D

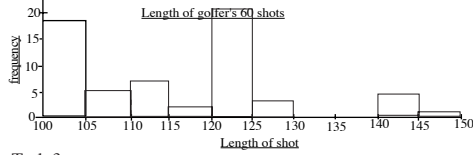
D6.3: Grouping continuous data

Task 1

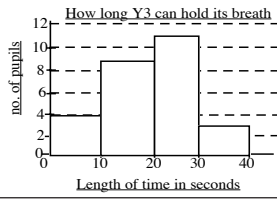
Length of shot Frequency

100	→	105	18
105	→	110	5
110	→	115	7
115	→	120	2
120	→	125	20
125	→	130	3
130	→	135	0
135	→	140	0
140	→	145	4
145	→	150	1

Task 2:



Task 3:



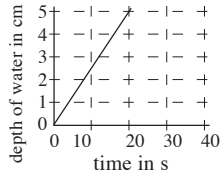
Section 7: Line graphs p333

D7.1: The temperature chart

- 18°C
- 11.00 and 1.30
- 12.30 – 1.00
- 20°C
- 9.00 – 9.30
- 1.30 – 2.00
- 9°C – because temperature does not change at a steady rate

D7.2: Water levels

- 5 cm
- Graph 2
- Yes – the data is continuous.



D7.3: Cooling curves

- Second graph is a similar shape but goes down faster.
Third graph is a similar shape but goes down more slowly.
- (a) water temperature drops rapidly as the frozen peas cool it down.
(b) water temperature rises as the pan is heated
(c) water stays at boiling point.

D7.4: What is happening here ?

A = 4 B = 3 C = 1 D = 2