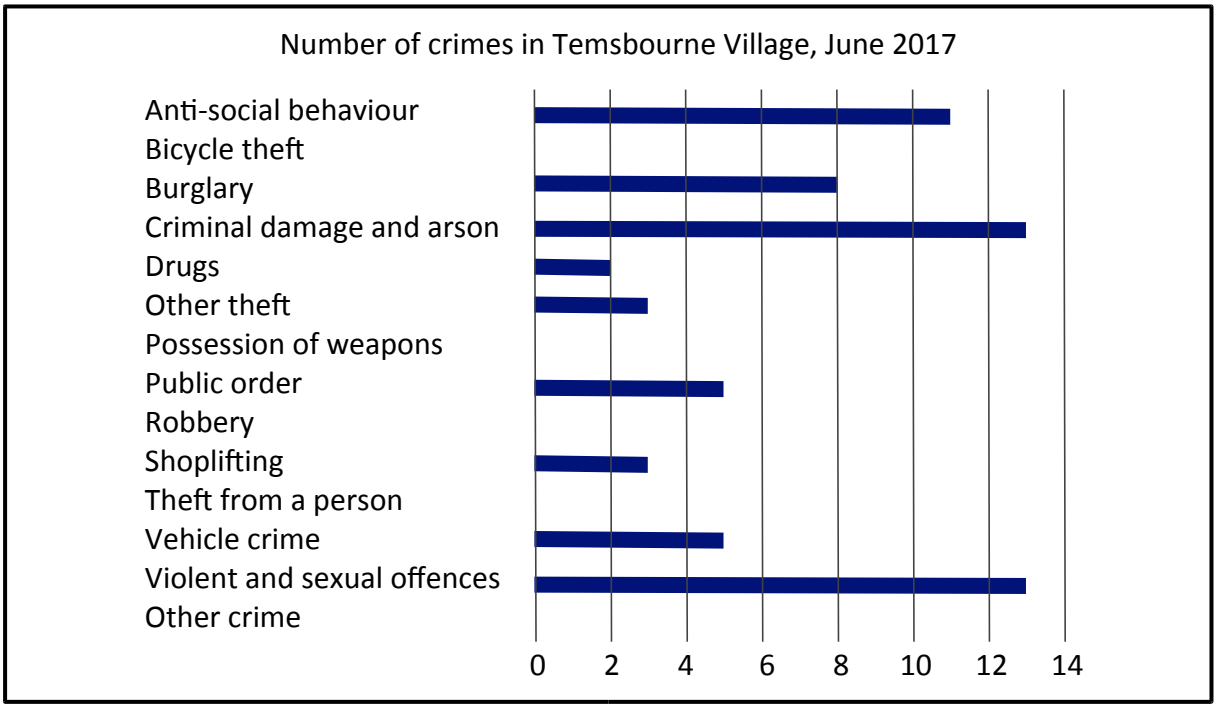
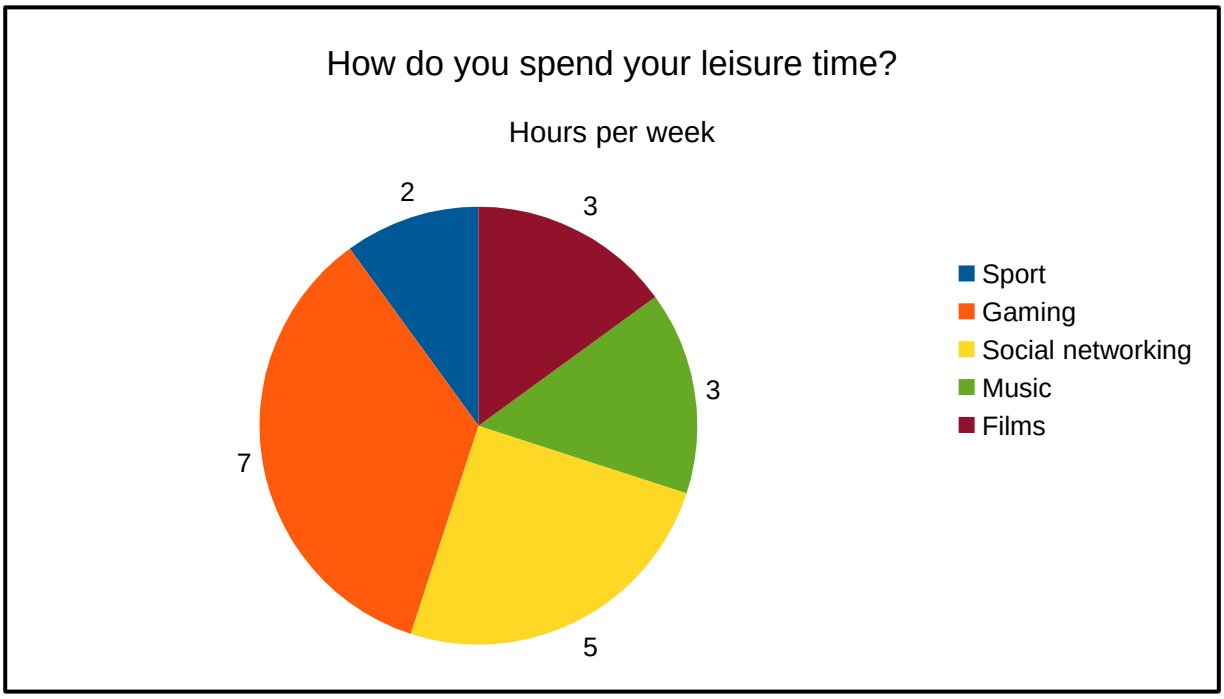
Can you interpret these diagrams?

1

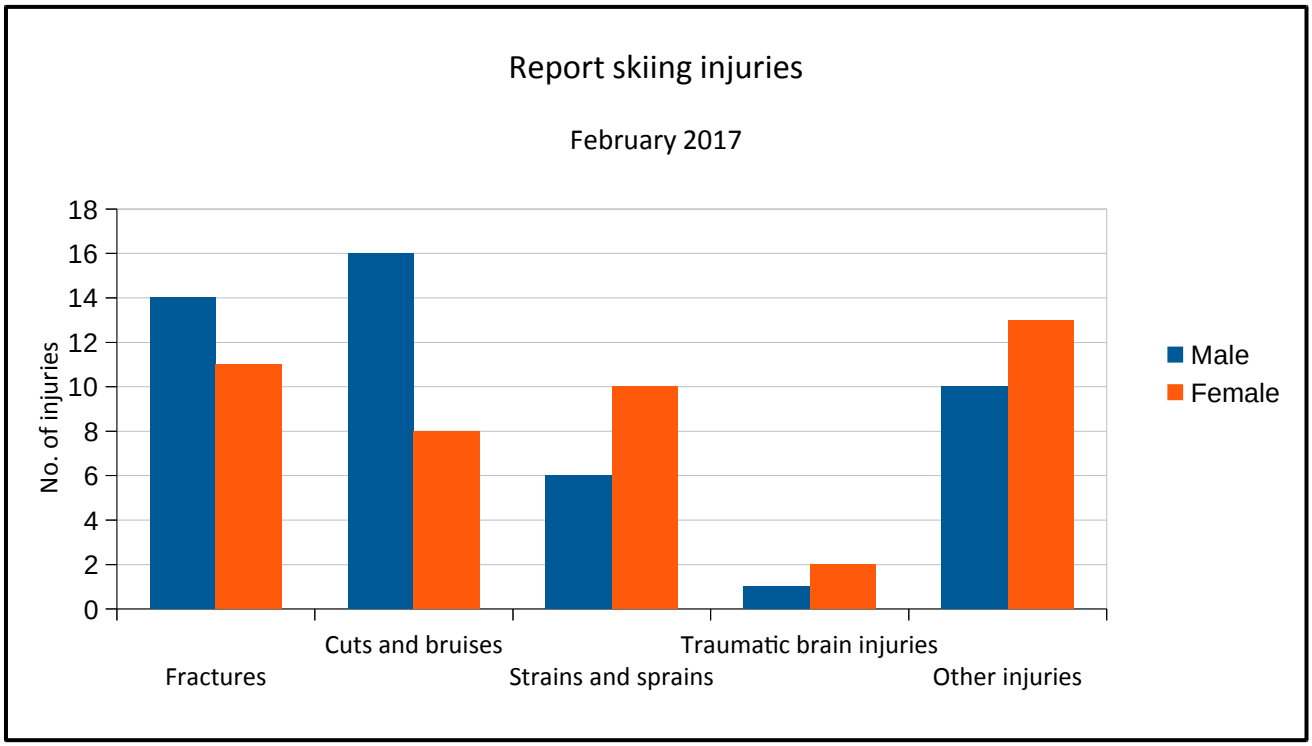


2

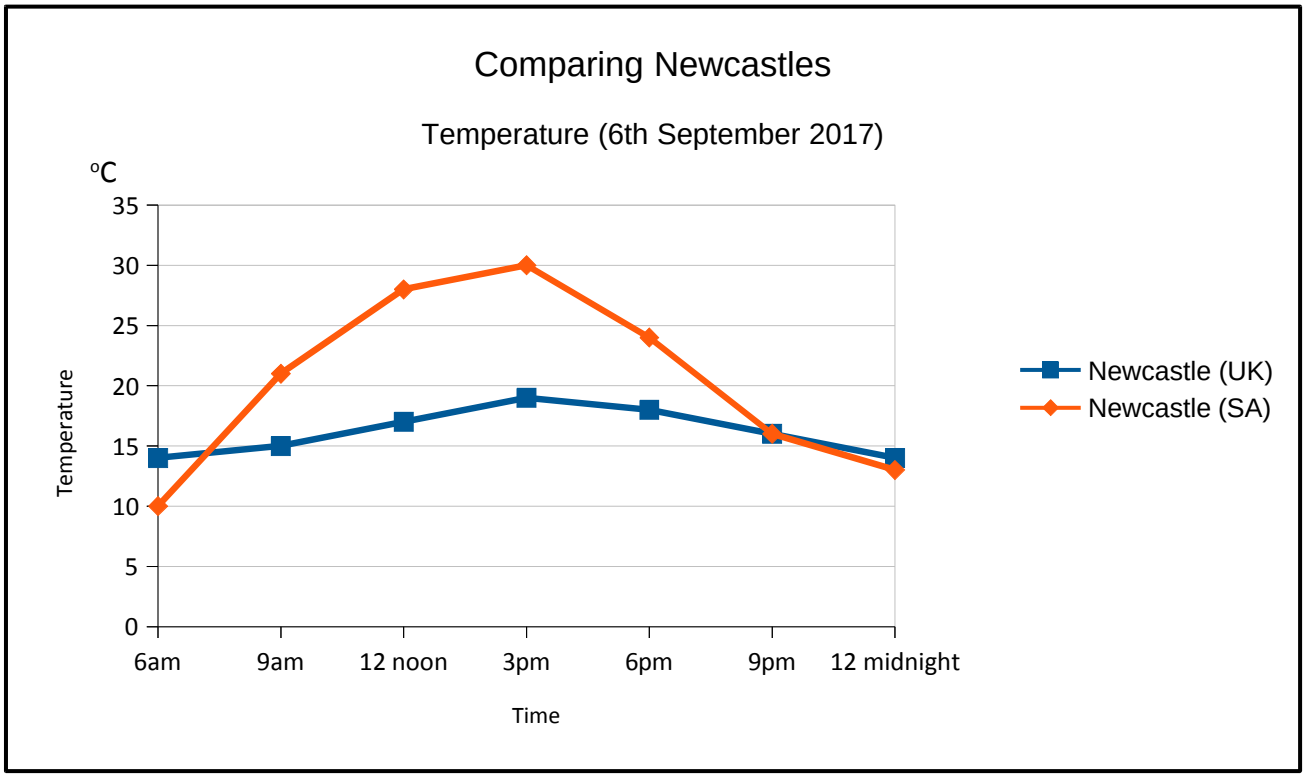


Can you interpret these diagrams?

3



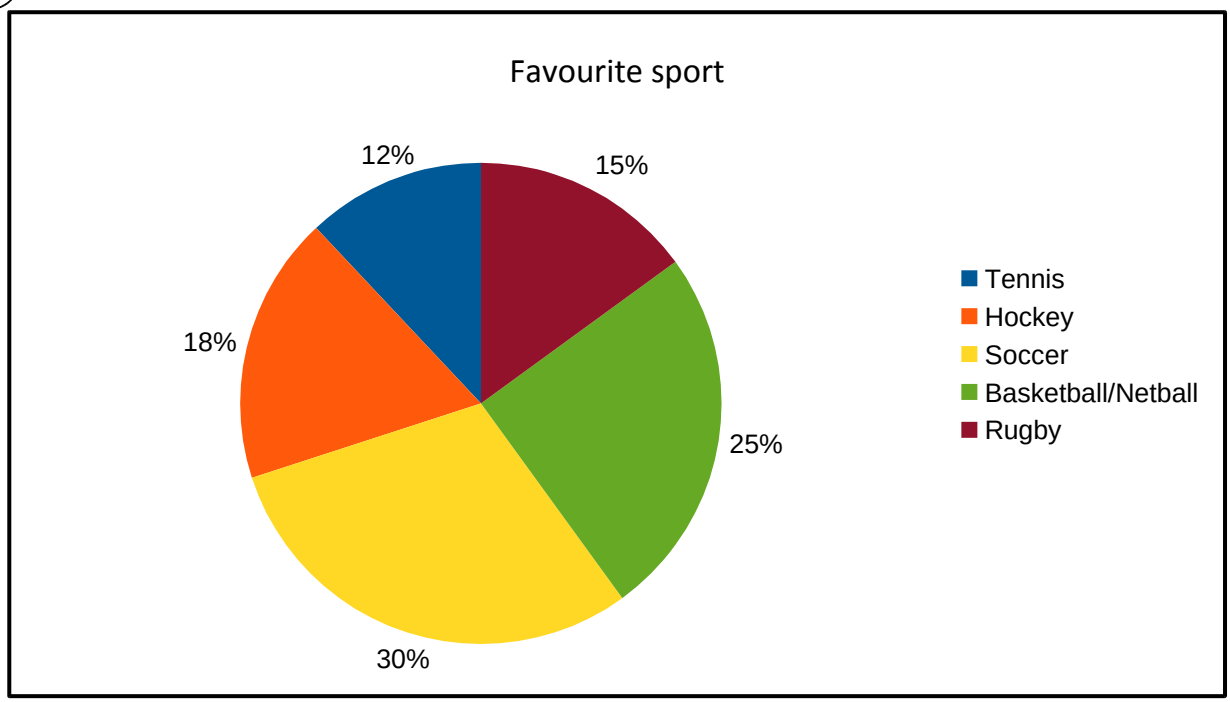
4



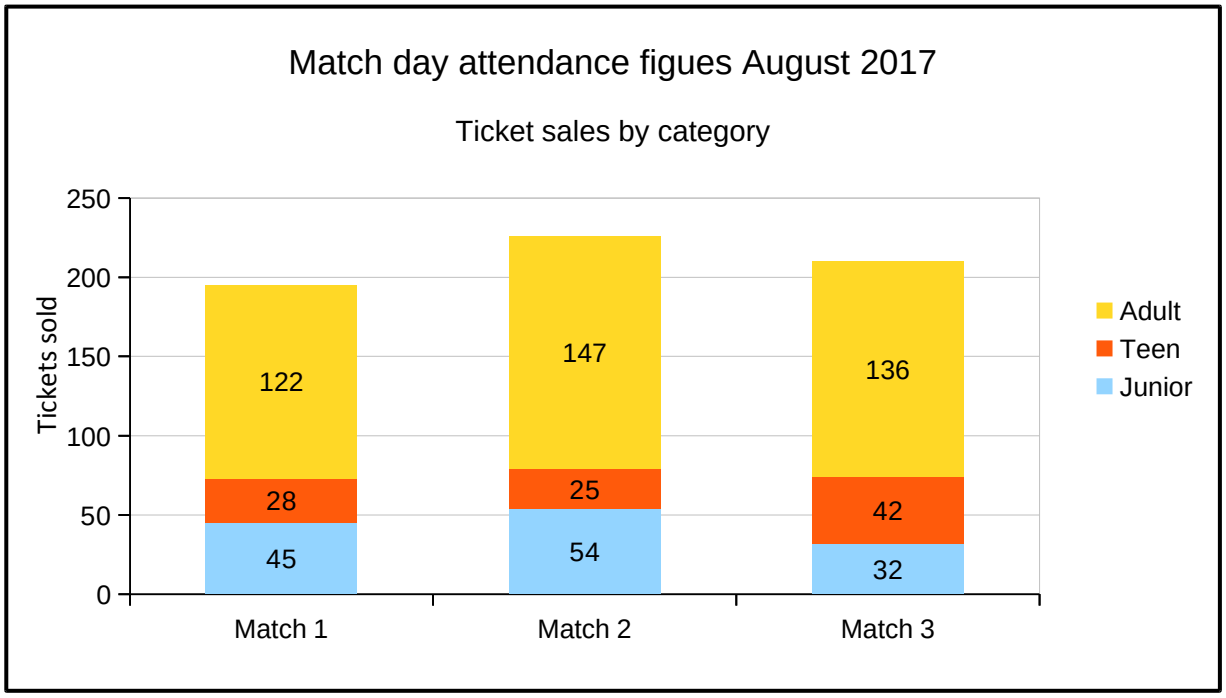
Statistical diagrams

Can you interpret these diagrams?

5



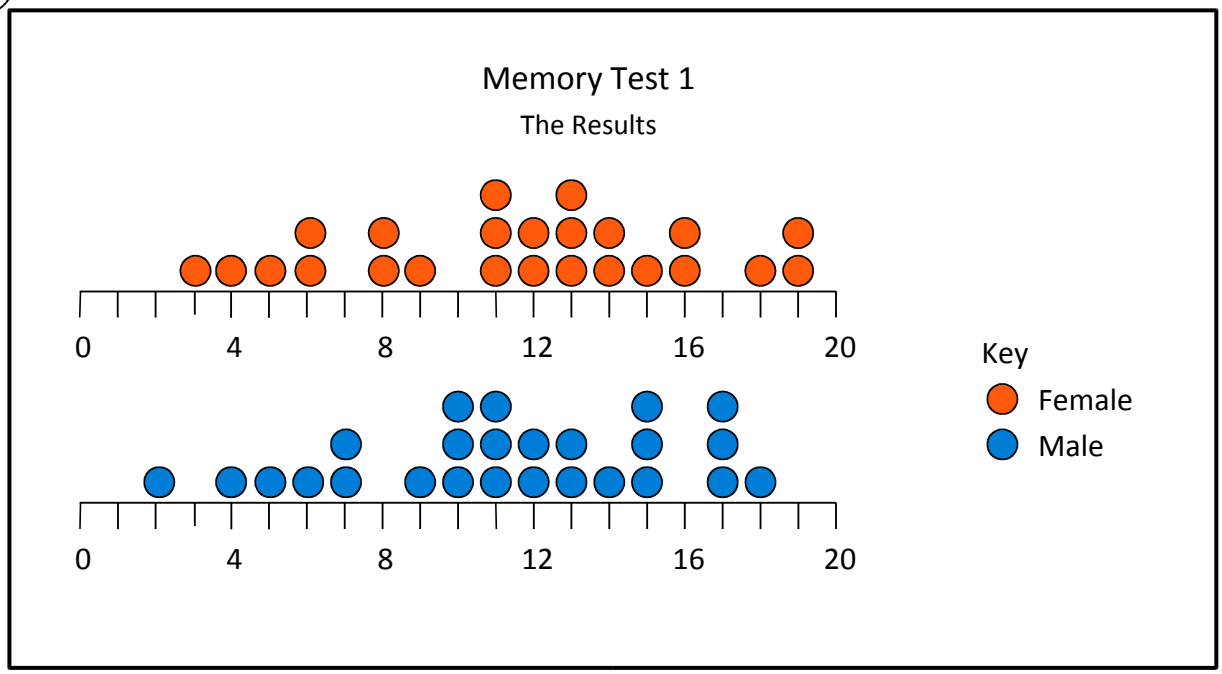
6



Statistical diagrams

Can you interpret these diagrams?

7



8

Memory Test 2

The Results

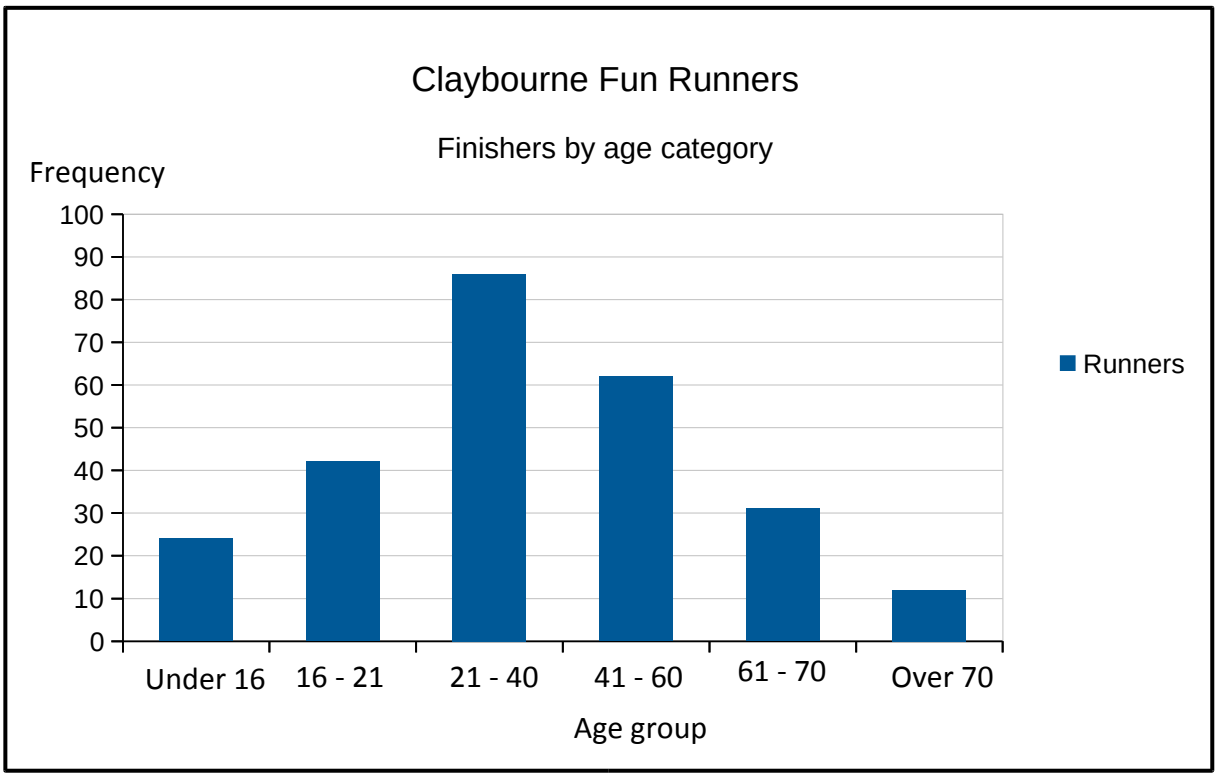
Female			Male	
(2)	7 5	0	8	(1)
(3)	4 3 1	1	0 3 4	(3)
(5)	9 9 8 6 5	1	5 5 6 6 7 9	(6)
(4)	4 4 2 1	2	0 2 2 4 4 4	(6)
(6)	7 7 6 6 5 5	2	5 6 8 8 9	(5)
(2)	2 1	3	1 3 4	(3)
(2)	8 6	3	5	(1)
Total	(24)			Total (25)

Key

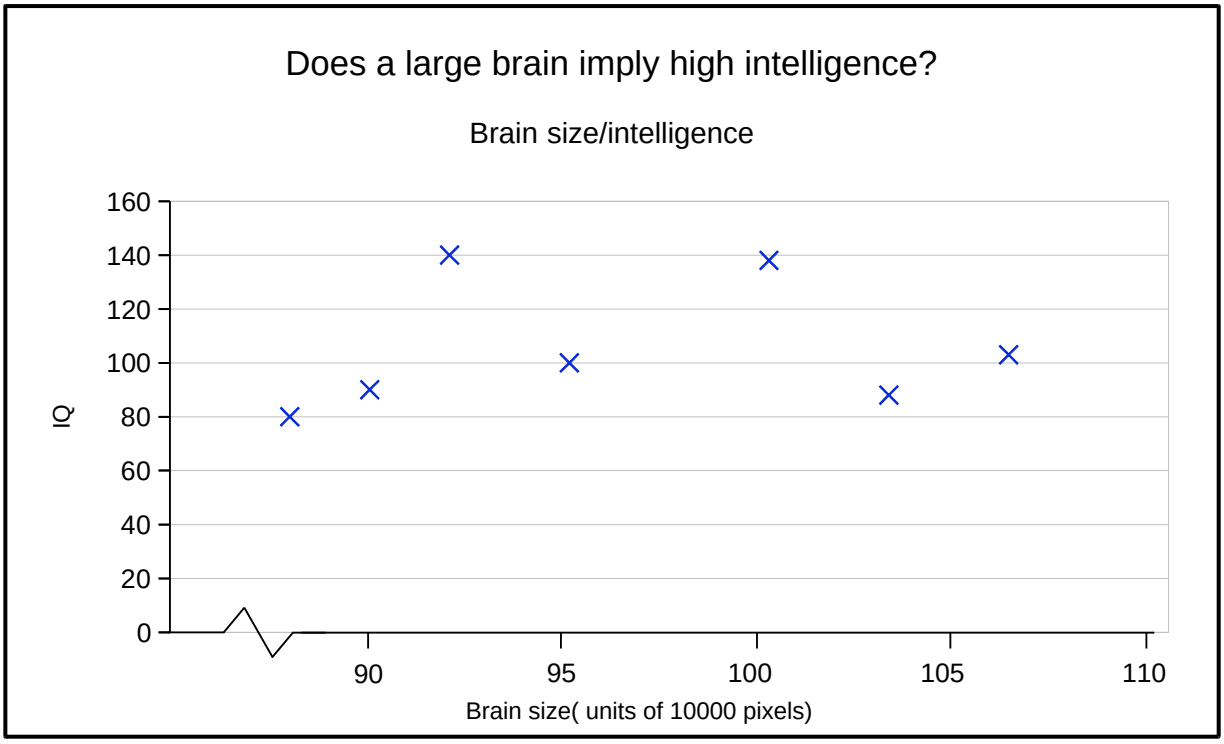
1|5 represents 15

Can you interpret these diagrams?

9

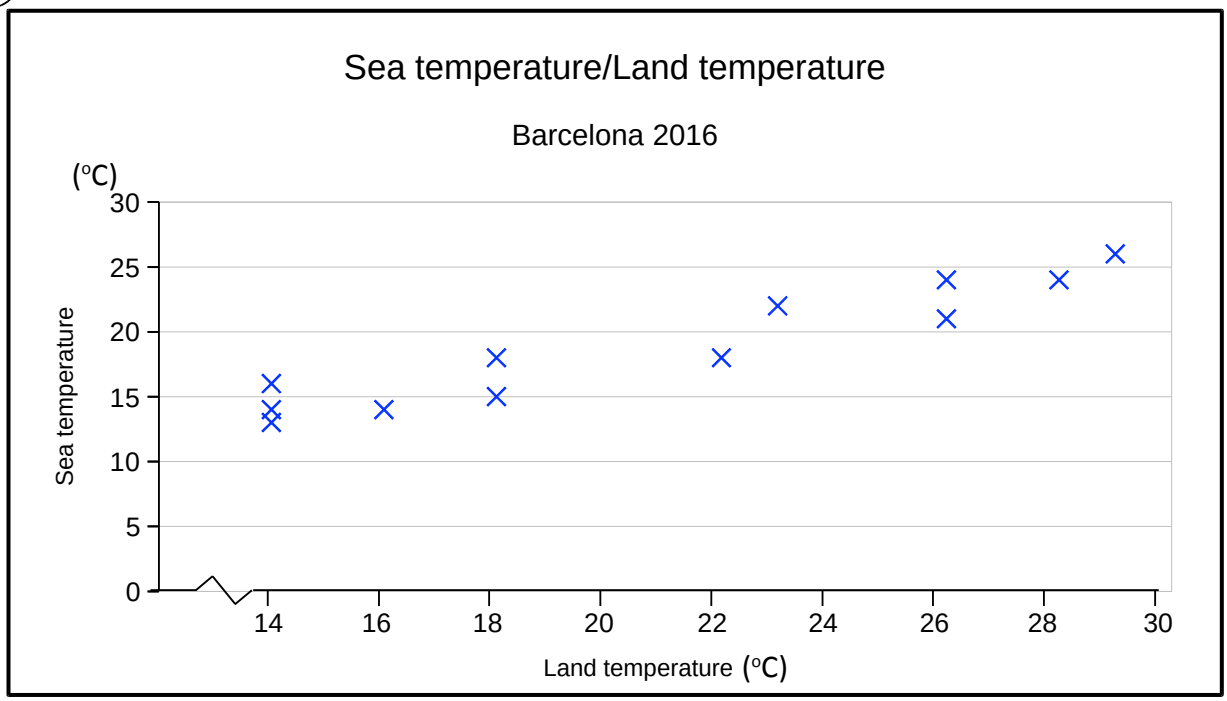


10



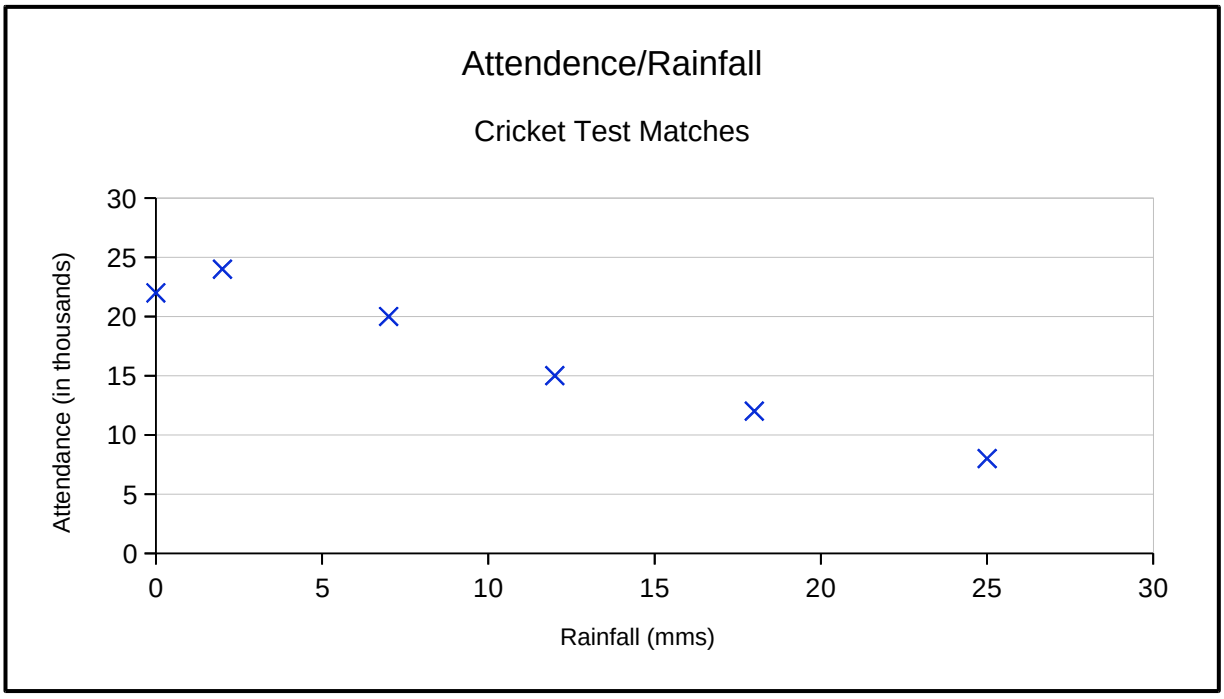
Can you interpret these diagrams?

11



100 105 110

12



When did it happen?

In each of the following questions you simply have decide which of the suggestions are correct.

Name	Group	ID
	Gender	

		A	B	C	D
1	When was John F. Kennedy assassinated?	1960	1963	1966	1969
2	When did Mrs May become Prime Minister?	2014	2015	2016	2017
3	When did the first man walk on the moon?	1960	1963	1966	1969
4	When did Elvis die?	1967	1977	1987	1997
5	When was the Battle of Hastings?	1966	1166	1572	1066
6	When did the first British policewoman go on duty?	1914	1924	1890	1953
7	When did the First World War end?	1938	1918	1914	1920
8	When did the '999' emergency phone line open?	1945	1947	1937	1930
9	When was the first Glastonbury music festival?	1970	1965	1973	1975
10	When did the first person go into space?	1951	1955	1961	1967
11	When did the BBC begin broadcasting?	1922	1952	1972	1902
12	When was the first Mr Men book published?	1951	1981	1941	1971
13	When did Guy Fawkes try to blow up Parliament?	1905	1605	1705	1805
14	When was Spam invented?	1937	1837	1931	1997
15	When was Britain's first motorway opened?	1960	1968	1950	1958
16	When was Prince Harry born?	1984	1985	1986	1992
17	When was KFC founded?	1920	1930	1940	1950
18	When did Shakespeare die?	1414	1616	1818	1732
19	When was the first printing press invented?	1560	1555	1550	1440
20	When was the first Women's World Cup?	1991	1992	1993	1994

Are girls better at “dates” than boys?



Sarah

Of course they are. My mum never forgets anything.

Well Grandad remembers when England won the soccer world cup – and that is ages ago.



Matthew



Alice

What we need to do is look some real data before we draw any conclusions.

1

Collect the data from the “When did it happen?” quiz and decide how to represent the girls and boys data in a statistical diagram.



Jon

We could use a stem and leaf plot.

Or we could draw two dot plots.



Amber

The raw data

9Z Scores

Girls scores:	Boys scores:
14 6 15 6 16	8 5 7 14 17
10 7 8 14 8	7 5 6 6 11
6 18 9 8	4 11 16 13 11 10

The sorted data

9Z Scores (sorted)

Girls scores:

6 6 6 7 8 8 8 9 10 14 14 15 16 18

Boys scores:

4 5 5 6 6 7 7 8 10 11 11 11 13 14 16 17

Representing the data

Are girls better at “dates” than boys?

When did it happen? - The Results

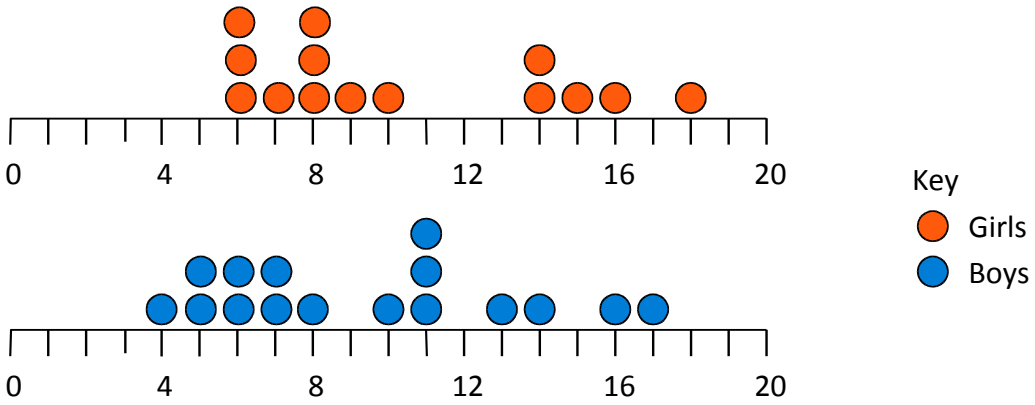
Girls				Boys	
		0	4		(1)
(8)	6 6 6 7 8 8 8 9	0	5 5 6 6 7 7 8		(3)
(3)	4 4 0	1	0 1 1 1 3 4		(6)
(3)	5 6 8	1	6 7		(6)
Total	(14)			Total	(16)

Key

1|2 represents 12

Are girls better at “dates” than boys?

When did it happen? - The Results



2

Look at your diagrams. How would you use these to answer the question, “Are girls better at dates than boys?” ?

Statistics 3a - Summarising data numerically

"But on average who did better?"

In the first part of this unit we focused on building up a picture of our data by representing it graphically. This is a good way of getting an impression on the spread of the data and drawing some initial conclusions.

In this next section we begin to "crunch the numbers" which means summarising the data numerically.

We begin by considering how to represent a set of data by a single number, a number that can be used as a representative for all of the data or one that "typifies" the data. This number is generally known as the **average value**.

But there are three different ways of measuring the "average value" of a dataset.

3

Do you remember the three different averages that you have already met? Can you explain what each one actually measures?



Evie

One type of average if the mode. The mode represents the ...

There is also the median. The median represents the ...



Matthew



Sarah

And then there is the mean. The mean represents the ….

There is also the range. What does that measure?



Jon

A reminder

When summarising quantitative data you have three different "averages" you might want to consider.

For example, consider this dataset: 8, 3, 4, 7, 6, 5, 5, 8, 11, 2, 7, 8, 9, 4, 6

Always sort the data in ascending order first: 2, 3, 4, 4, 5, 5, 6, 6, 7, 7, 8, 8, 8, 9, 11

The **mode** is the most common result – so the mode is 8.

The **median** is the middle data value when the data are put into ascending order.

In this case the median splits the 15 data values into 2 sets of 7 values. 7 values come before the median and 7 values come after the median.

2, 3, 4, 4, 5, 5, 6, 6, 7, 7, 8, 8, 8, 9, 11

In this case the median is 6.

The **mean** is found by "evening up" all of the data values. To calculate the mean, add up all of the data values, in this case 93, and dividing by the number of data values, in this case 15.The mean is then 93 ÷ 15 = 6.2

Statistics 3a - Summarising data numerically

A further reminder

At KS3 you need to familiar with three types of average that are used to "summarise" or "typify" a set of data.

For example, suppose the question is "How many texts do you receive in a day?".

You might have a "gut feeling" about the answer but it is much better statistically to collect some real data before trying to answer the question.

Alice decided to check the number of texts she received over a two week period; her dataset consists of 14 data values.

Here is Alice's dataset



Alice

Alice's dataset

The number of texts I received over the last 14 days was:

10, 14, 13, 12, 8, 13, 10, 8, 11, 5, 13, 5, 6, 11

I have sorted these into ascending order to make things easier to see.

5, 5, 6, 8, 8, 10, 10, 11, 11, 12, 13, 13, 13, 14

How can I summarise my data?



Evie

Evie's suggestion

The mode is the most common answer.

5, 5, 6, 8, 8, 10, 10, 11, 11, 12, 13, 13, 13, 14

So the mode is 13 texts per day.



Matthew

Matthew's suggestion

The median is the middle point in our sorted dataset.

In this case the dataset can be split into 2 equal groups of 7.

5, 5, 6, 8, 8, 10, 10, 11, 11, 12, 13, 13, 13, 14

So the median lies between the middle two entries

5, 5, 6, 8, 8, 10, 10, 11, 11, 12, 13, 13, 13, 14

And so the median is 10.5 texts per day.



Sarah

Sarah's suggestion

The mean represents "fair shares for all". The total number of texts is the sum of the 14 entries.

5+5+6+8+8+10+10+11+11+12+13+13+13+14 = 139

So to find the mean we share these out equally between the 14 days.

So the mean is 139÷14 = 9.9 texts per day.

4 Now look at your group's data for "Are girls better at dates than boys?". Summarise your data by finding the 3 different averages. Which average would you say is the most appropriate for this question?

Measuring spread



There is also the range. What does that measure?

Jon

5 Earlier Jon asked what the range measured. How would you answer his question?



Sarah

The range measures the spread of the data.

It is the difference between the largest and smallest values in the dataset.



Evie



Matthew

The formula for calculating the range is given by:

range = largest value – smallest value = maximum - minimum

Comparing datasets

In the programme for the final of the West Sussex volleyball cup between the Bognor Bears and the Selsey Pirates, the heights of the players of each team are given in centimetres

Player	Bognor Bears Height (cm)	Selsey Pirates Height (cm)
1	163	158
2	168	168
3	172	172
4	172	172
5	174	172
6	183	190

6 What measures would you use to summarise the heights of each team?



Amber

Amber's working

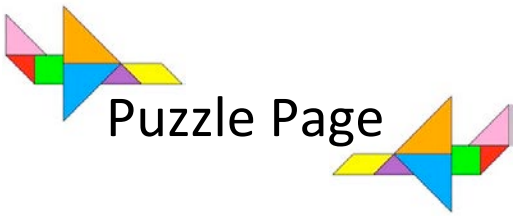
Firstly I am going to look at the different types of average.
The mode for each team is 172cm (most common height).
The median for each team is also 172cm (the middle of the results).
The sum of all of the heights is 1032cm for each team.
So the mean for each team is 1032÷6 = 172cm.
So "on average" the teams are identical in height.
But the range for Bognor is 183 – 163 = 20cms
And the range for Selsey is 190 – 158 = 32cms.
That means there is a greater variation in the heights of the Selsey team.
Their heights are more spread out.

Fitness check

There are five other teams in the West Sussex volleyball league. Although there are six players in each team, some teams have used substitutes throughout the tournament. The heights of each of their players that took part in the tournament are given in the table below.

Player	Chi Cheeters Height (cm)	LA Angels Height (cm)	Worthing Wolves Height (cm)	Horsham Hotspurs Height (cm)	Crawley Chasers Height (cm)
1	162	158	156	155	149
2	172	168	163	162	153
3	172	172	169	165	165
4	173	172	172	169	173
5	173	172	173	173	177
6	174	190	174	177	183
7	175		179	182	194
8	176		183	187	
9	179			189	

7 Summarise the data for each team. Compare and contrast their results.
Devise some sorting of ranking system for the teams based on height.



Puzzle Page

1. Find the mean, mode, median and range for each of these sets of data:

a) 1, 1, 2, 3, 3

b) 1, 1, 2, 3, 3, 3, 4, 7

c) 1, 2, 3, 4, 5

d) 0, 1, 2, 3, 4, 5

2. The mean score of 9Z in a science test was 21 out of 30. The total score for the 17 girls was 374. What was the total score for the 11 boys?

3. Find 4 positive integers that have a mean of 5. How many different sets can you find?

4. Find 4 positive integers that have a mean of 4 and a median of 4. How many different sets can you find?

5. Find 5 positive integers that have a median of 6, a mode of 6 and a range of 6. How many sets can you find?

6. Find 5 positive integers that have a mean of 7, a mode of 7, a median of 7 and a range of 7. How many different sets can you find?

7. An estate agent sold 4 houses with a mean price of £220K. He then sold 2 more houses with a mean price of £160K. What is the mean price of the 6 houses he sold?

8. The mean handspan of 3 pupils is 23.8cm. One of the pupils had a handspan of 24.6cm. What might the handspans of the other two pupils be?

9. There a six people in a family and their mean age is 18. What might their ages be?

10. The sum of 3 consecutive whole numbers is 120. List the three numbers.

11. The sum of 4 consecutive whole numbers is 122. List the four numbers.

12. The sum of six consecutive numbers is 117. List the six numbers.

13. The mean of five numbers is 16. One of the numbers is changed to 4. The mean of the five numbers is now 14. What was the value of the original number?

14. The mean mass of Keith, Dan and Eric is 46kg. Dan is 6kg heavier than Keith. Eric is 3kg heavier than Dan. Find the mass of each boy.

15. A class of 24 pupils took a 60-mark test. The mean score was 48. Is it possible that 18 of the pupils scored 42 or lower? Explain your thinking.

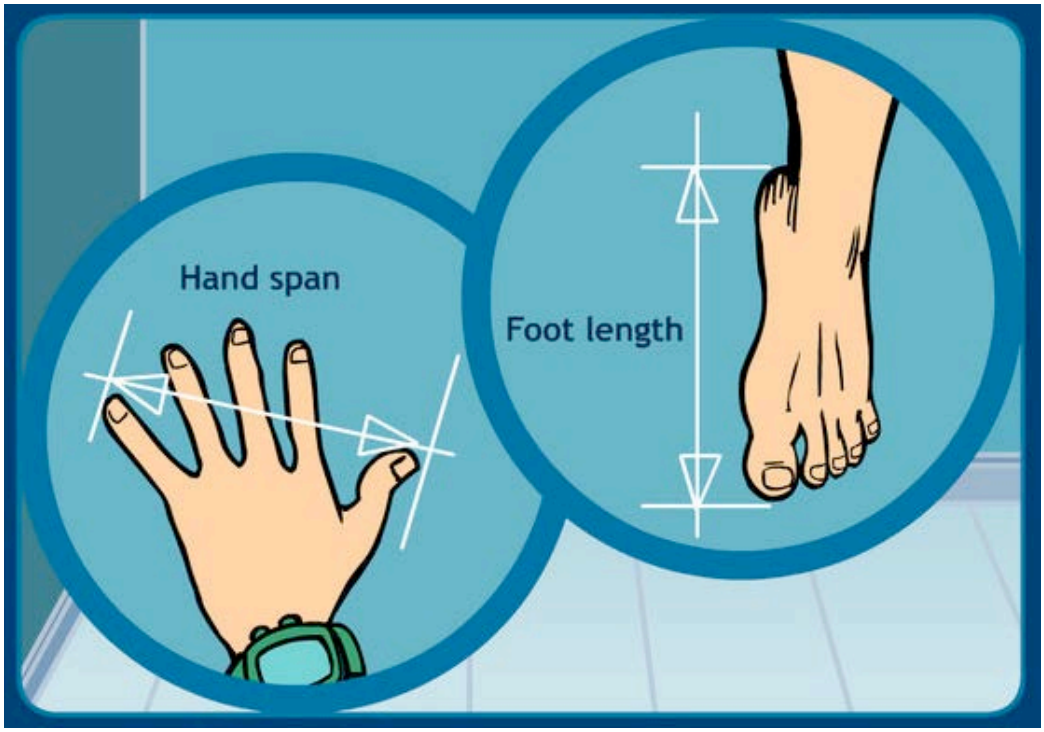
Do people with big hands have big feet?

Earlier you collected lots of data about your group. In this section we look to see if there is a connection between different variables.



Alice

I think people with big hands will also have big feet.



8 How can we check to see if Alice is correct in her thinking?



Matthew

We could draw a scatter graph of handspan and foot length and see if there a general pattern in the data.

We could see if the graph shows any correlation between handspan and foot length.



Evie

9 What do you expect the graph to look like?

Do people with big hands have big feet?

Collect up the data from the questionnaire that you filled in earlier.
You need the foot length and handspan data.
For your scatter graph it is probably easier to work in mm.

10 How do you convert 24.3cm to mm?



That's easy. There are 10mm in 1cm. So all you need to do is multiply by 10!
And so 24.3cm is 243mm

Alice

Choosing the range of values for your axes

Now that you have a record of all the data, you need to decide on the range of values for each of your axes. In this case there is little point starting at the origin.

For example, look at the data for the pupils in 8Z.

For handspan, the minimum value is 157mm and the maximum value 248mm.

So the handspan axis will need to cover 150mm to 250mm.

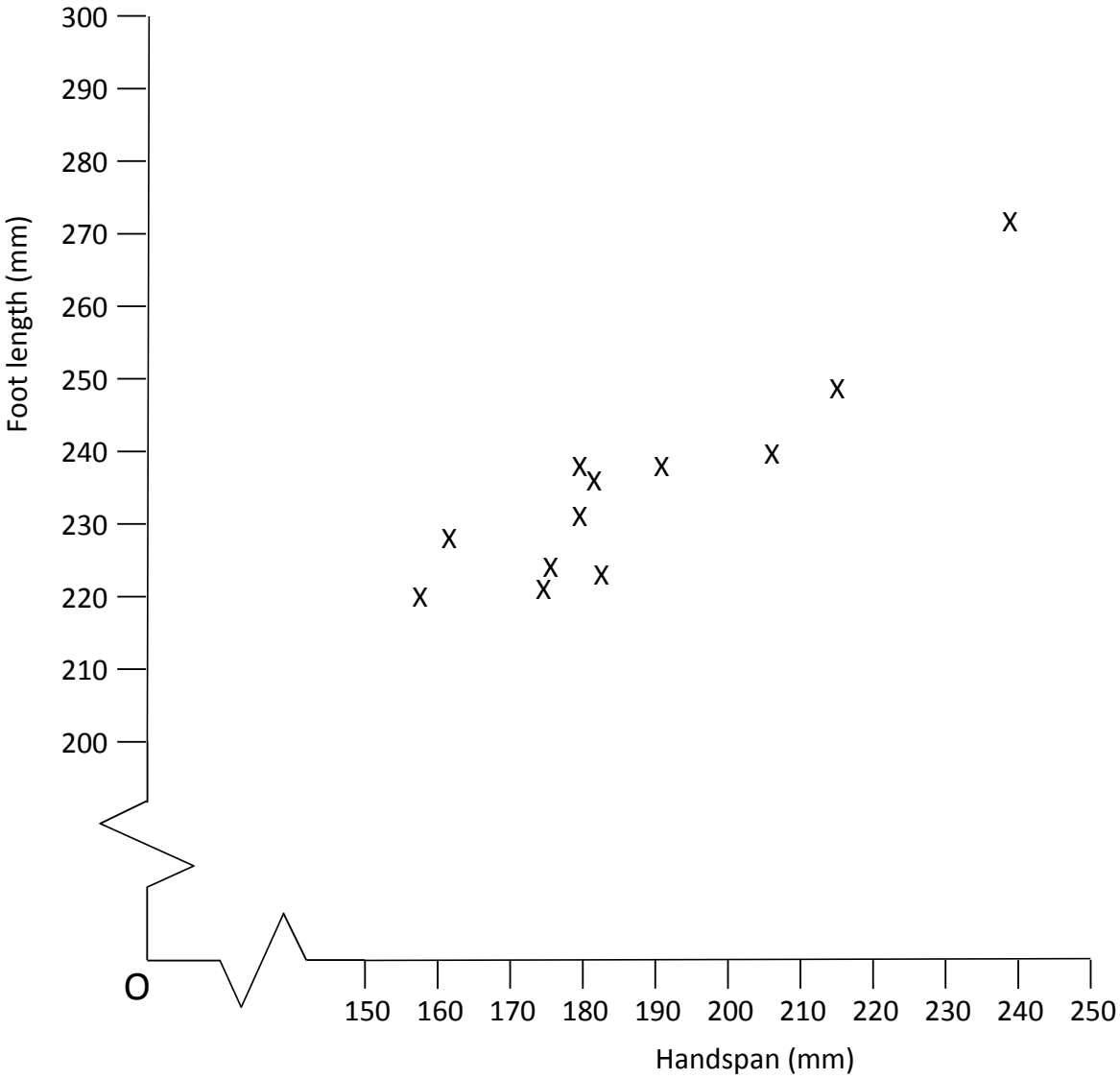
For foot length, the minimum length is 220mm and the maximum value is 271.

So the foot length axis will go from 210mm to 300mm.

8Z Data		
Pupil	Handspan (mm)	Foot length (mm)
A	179	232
B	192	238
C	174	222
D	175	225
E	179	238
F	157	220
G	214	248
H	161	228
I	181	237
J	205	239
K	182	224
L	238	271

Do people with big hands have big feet?

Drawing the axes and plotting the points



11 What does this scattergraph show you?



Evie

It shows you that as the handspan increases in size, so does the foot length.

The graph also shows that as handspan decreases so does the foot length.

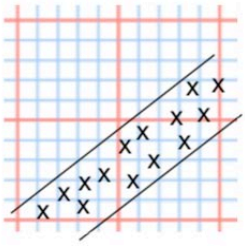


Jon

Statistics3a – Making connections

A reminder and some new terminology

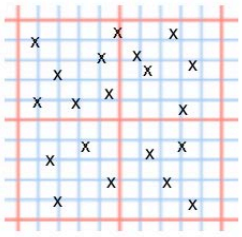
You can tell if there is a connection between the variables by looking at the shape of your scatter plot.



General going upwards.

Both variables increase together.

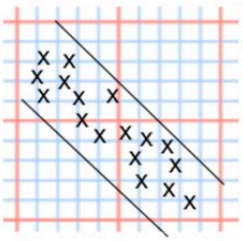
This is known as **positive correlation**



Generally scattered.

No relationship.

This means there is **no correlation**

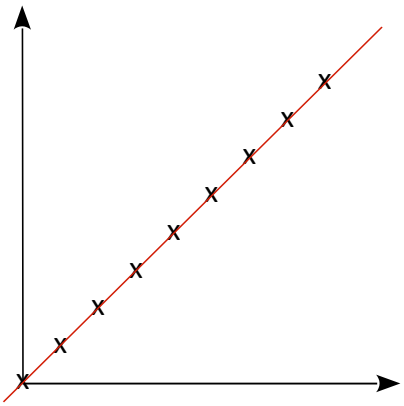


Generally going down.

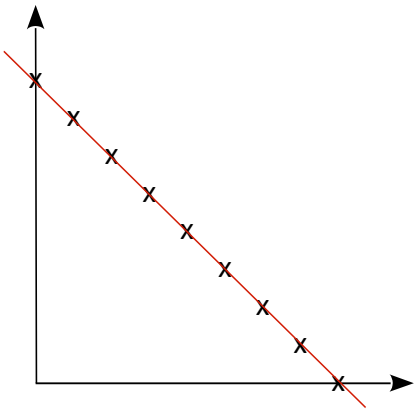
As one variable increases the other decreases.

This is known as **negative correlation**

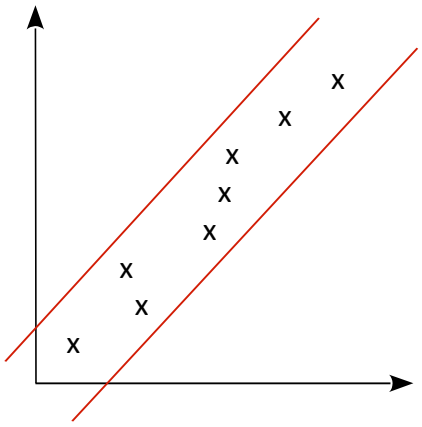
More terminology



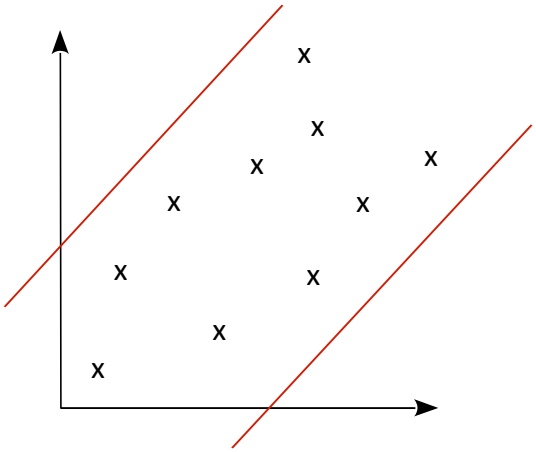
Perfect positive correlation
(Points in a perfect straight line - upwards)



Perfect negative correlation
(Points in a perfect straight line - downwards)



Strong positive correlation
(Points generally upwards, tightly grouped)



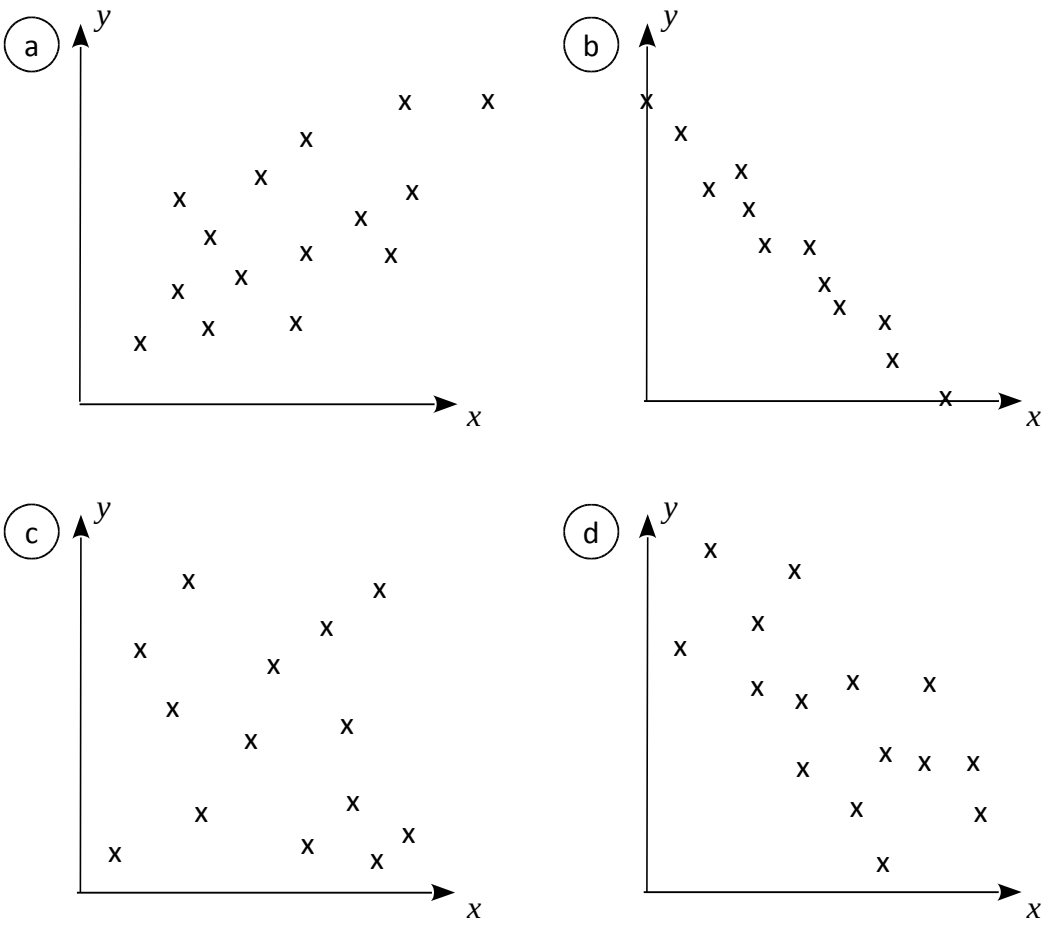
Weak positive correlation
(Points generally upwards, loosely grouped)

Statistics 3a – Making connections

Some examples

1. A student earns £5 per hour as a waiter.
   a) How much will he earn in a) 2 hours b) 5 hours c) 8 hours?
   b) If you plotted your results on a scatter graph, what would you expect to see?
   c) How would you describe the correlation shown on the graph?

2. What phrase best describes the correlation in each of these scatter graphs.



3. This table shows the amount of fuel left in the fuel tank and the distance covered in a journey.

Distance covered (km) (x - axis)	0	112	172	280	330	386	496	550
Fuel remaining (L) (y - axis)	60	50	44	32	26	19	9	4

   a) What correlation do you expect to see if you plot distance covered against fuel remaining?
   b) Plot a graph of your results and see if you were correct.

Statistics 3a – More questions

This table shows the maximum and minimum temperatures of two seaside towns in the UK for the first 14 days in July 2017.

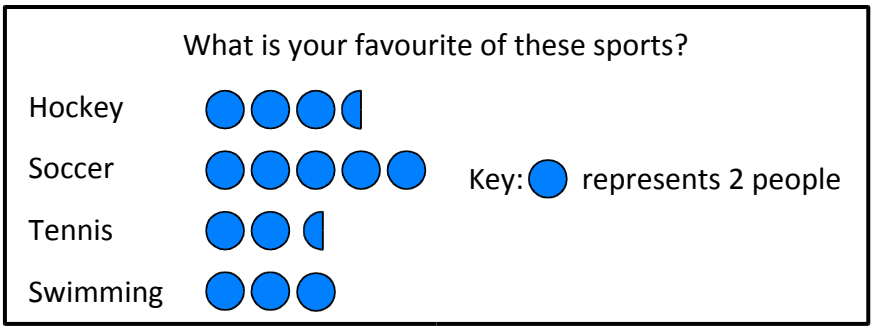
Bognor Regis	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Max °C	22	23	23	22	28	30	28	25	26	24	19	21	21	21
Min °C	13	14	13	11	12	15	15	16	16	14	12	13	13	13

Penzance	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Max °C	17	18	17	20	22	22	20	20	19	18	16	21	19	18
Min °C	12	13	13	13	12	13	13	16	14	13	14	15	13	15

1. Summarise the data for each town.
2. What does the summary data suggest?
3. Which average would you say best summarises the data? Explain your reasons.
4. Plot a scatter graph of maximum temperature (y-axis) against minimum temperature (x-axis) for each town.
5. What do these graphs tell you?
6. Plot a scatter graph of maximum temperature for Bognor Regis (y-axis) against maximum temperature for Penzance (x-axis).
7. What does this graph tell you?
8. Do the same for the minimum temperatures.
9. What does this graph tell you?

Statistics 3a Descriptive statistics – Mastery questions

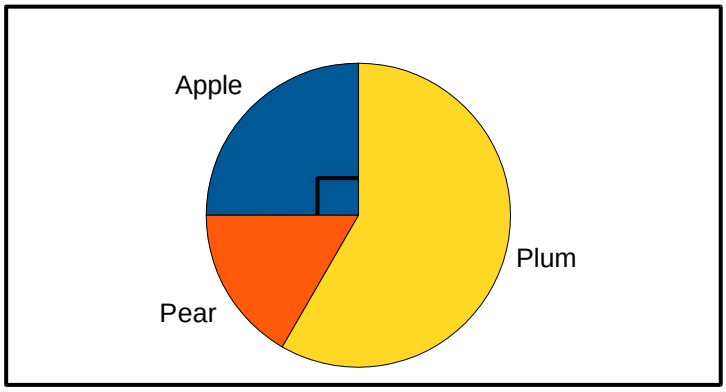
1. Look at this pictogram.



Which of the following statements is incorrect?

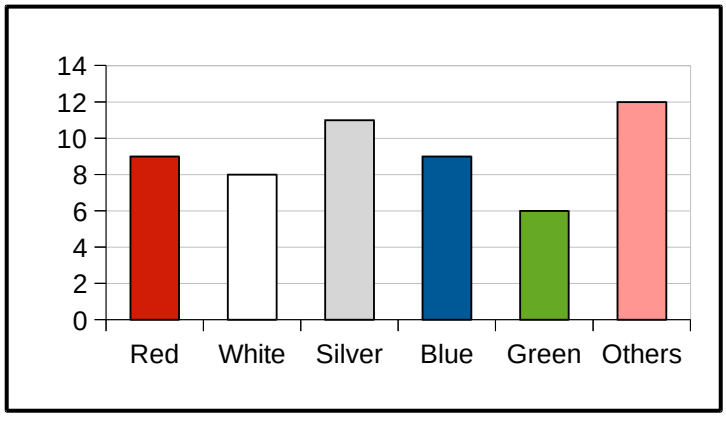
A	Soccer is the most popular sport	B	3 people chose swimming
C	Tennis is the least popular sport	D	7 people chose hockey

2. This pie chart shows the distribution of fruit trees in an orchard. 72 trees were planed. If $\frac{1}{6}$ of them are pear trees, how many plum trees are there?



A	B	C	D
12	18	42	45

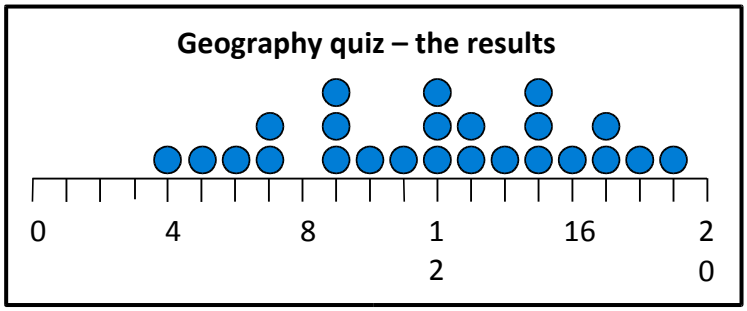
3. This bar chart shows the number of cars by colour in the car park yesterday. How many cars were in the car park?



A	B	C	D
6	12	44	55

Statistics 3a Mastery Questions

4. Look at this dotplot showing the scores in a geography quiz. How many pupils entered the quiz?



A	B	C	D
16	24	26	28

5. Look at this stem and leaf plot. What is the difference between the highest and the lowest scores?

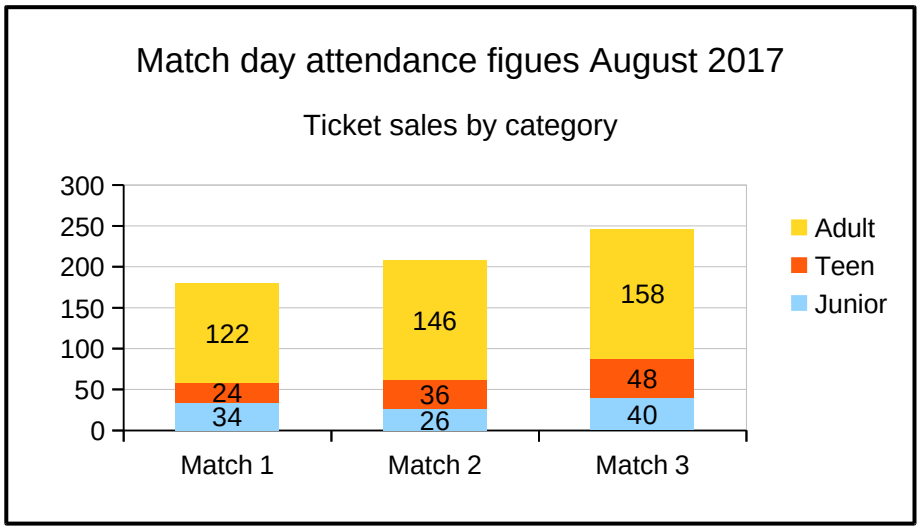
9Y Geography quiz - scores

0	1 4 4	(3)
0	6 7 8 9	(4)
1	0 0 0 0 1 2 2 3 3 4 4 4	(12)
1	5 5 6 6 6 6 7 7 9	(9)
	Count	(28)

Key 1|5 represents 15 correct

A	B	C	D
9	16	18	28

6. This stacked bar charts shows the sales of tickets for 3 hockey matches.

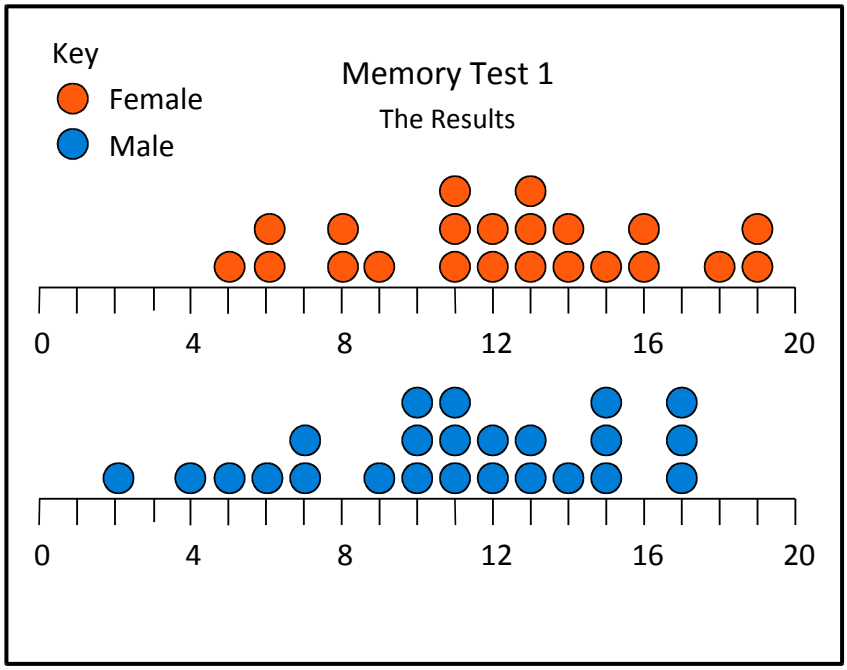


What is the difference in attendance between Match 3 and Match 1?

A	B	C	D
12	24	38	66

Statistics 3a Mastery Questions

7. These two dotplots show the results of a memory test for some pupils in Year 8. What is the difference between the lowest female score and the highest male score?



A	B	C	D
5	12	17	19

8. This back to back stem and leaf diagram shows the results of a second memory test for some pupils in Year 8. What is the sum of the 2nd highest female score and the 3rd highest male score?

Memory Test 2

The Results

Female			Male	
(2)	7 5	0	8	(1)
(3)	4 3 1	1	0 3 4 4 4	(5)
(5)	9 9 8 7 5	1	5 5 6 7 9	(5)
(4)	4 4 2 0	2	0 2 2 4 4 4	(6)
(6)	7 7 6 6 5 5	2	5 6 8 8	(4)
(2)	2 1	3	1 3 4	(3)
(2)	7 6	3	5	(1)
Total	(24)			Total (25)

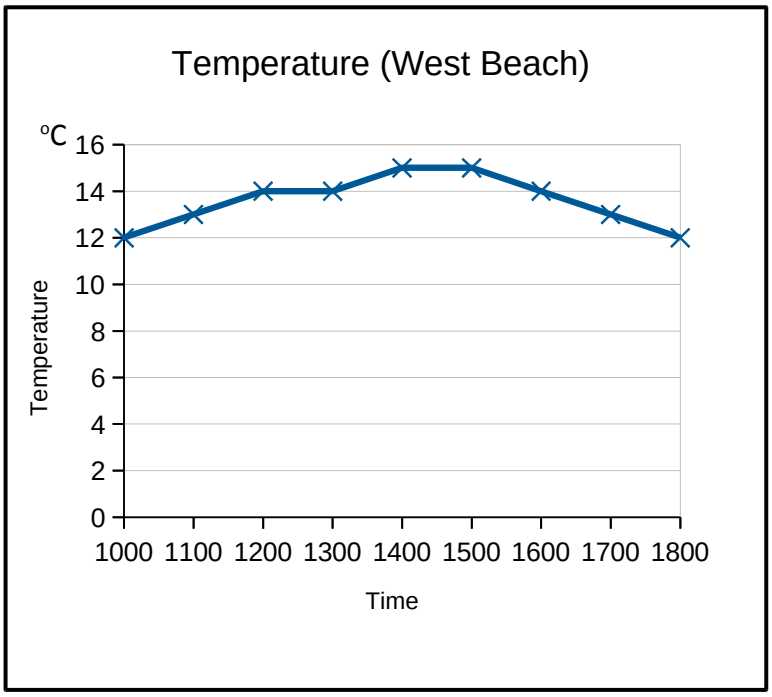
Key

1|5 represents 15

A	B	C	D
69	70	64	20

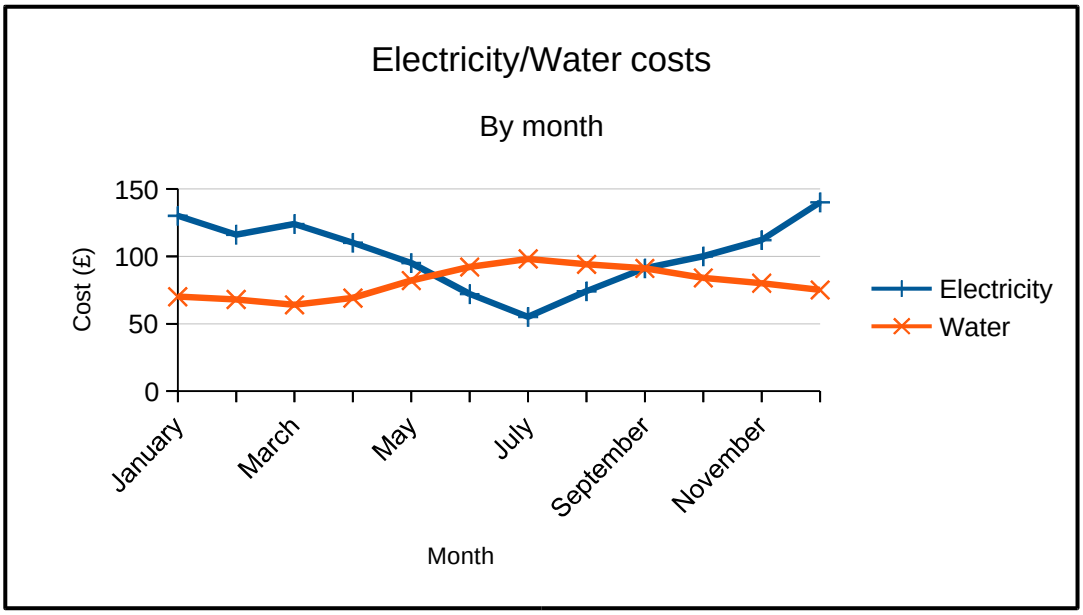
Statistics 3a Mastery Questions

9. This graph shows the temperature in a seaside town on a day in October. For how many hours was the temperature below 14°C?



A	B	C	D
4	5	6	7

10. These time series graphs shows a household's electricity and water costs over a year.

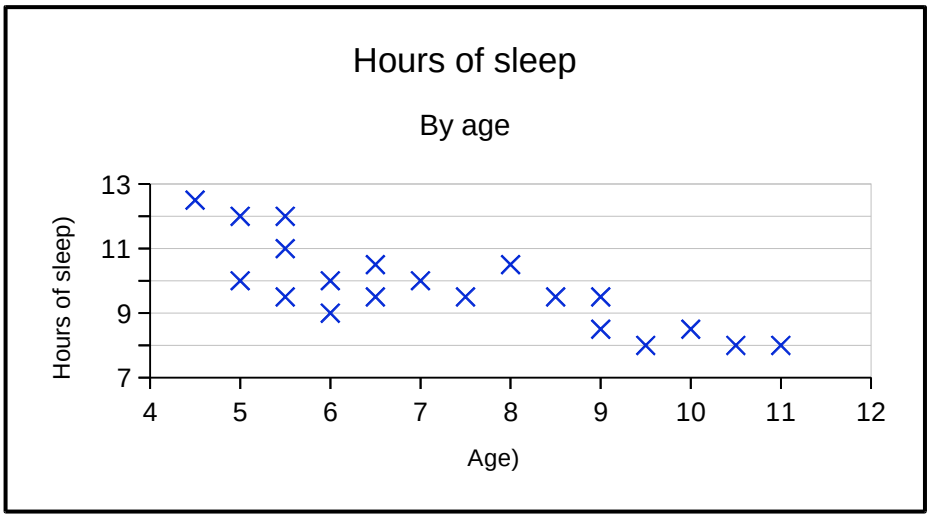


Which of these statements is false?

A	The electricity bill was most expensive in December.	B	From March to July the water bill increased.
C	The electricity bill is most expensive in the summer.	D	The water bill is most expensive in the summer.

Statistics 3a Mastery Questions

11. What phrase best describes the correlation shown below?



A	Positive correlation	B	Strong negative correlation
C	Weak negative correlation	D	No correlation

12. Which of these statements is an example of positive correlation?

A	Tall parents generally have tall children.	B	The more alcohol you drink, the shorter you life expectancy.
C	The shorter the race the faster you run.	D	The deeper you dive under the sea, the lower the temperature.

13. Five numbers have a mean of 22. The number 16 is added to the dataset. What is the new mean?

A	B	C	D
19	6	22	21

14. The mean of seven numbers is 32. What is the sum of the seven numbers?

A	B	C	D
39	224	25	214

Statistics 3a Mastery Questions

15. What is the mean minimum temperature for the week shown below?

Day	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
Min Temp.	–2.6°C	–1.6°C	–0.8°C	0°C	–0.6°C	0.5°C	0.2°C

A	B	C	D
–6.3°C	–0.9°C	–4.9°C	–0.7°C

16. What is the range in the minimum temperature for the data given Q15?

A	B	C	D
–2.4°C	–2.8°C	2.4°C	2.8°C

17. What is the median of this dataset?

2, 2, 2, 5, 7, 8, 9

A	B	C	D
2	5	6	7

18. What is the median of this dataset?

2, 2, 2, 5, 7, 8, 9,9

A	B	C	D
2	5	6	7

19. What is the median of this dataset?

7, 5, 8, 7, 6, 9, 9, 2, 2

A	B	C	D
2	5	6	7

20. The mean of three numbers is 17. Two of the numbers are 16. What is the third number?

A	B	C	D
16	17	18	19

Statistics 3a Mastery Questions

21. The London Eye is a big wheel with pods to carry passengers. It takes 30 minutes for the wheel to make a complete turn. This table shows the height of a pod above the ground as the wheel turns.

Time (mins)	0	5	10	15	20	25	30
Height (m)	0	30	100	130	100	30	0

Represent this data by a suitable line graph.

From your graph, estimate

a) how high the pod is after 8 minutes,

b) when the pod is 50m above the ground.

22. This table shows the times taken by 8 pupils to complete two logic puzzles. Plot a scatter graph of your results. What does your graph tell you?

Puzzle A	22	25	28	26	30	32	25	38	40
Puzzle B	45	43	43	37	39	28	22	23	17