

# Functional Skills Maths

## Level 2

Use statistical methods to investigate situations

v1.0

**Functional Skills Maths:**

Level 2

**Skill Standard:**

11

**Coverage and Range:**

Use statistical methods to investigate situations.

- Find the mean, median and mode and understand that each average is useful for different purposes.
- Use the range to describe the spread within a set of data, for example sales results.
- Use the average and range to compare two sets of data.<sup>1</sup>

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<sup>1</sup> QCA Functional Skills guidance: amplification of the standards June 2008 QCA/08/3700

## Explain the Skill

### Mean, Median and Mode

The mean, median and mode are all types of averages.

The mean of a set of data is the most widely used average. To find the mean you add up all the values and then divide by the total number of values.

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

These are the number of days it rained each month last year.

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Number of days it rained	11	13	14	15	11	12	10	8	9	13	15	13

To calculate the mean, add up all the values and then divide by the total number of values.

$$\text{Mean} = \frac{144}{12} = 12$$

So the mean number of days it rained last year was 12.

You can also find the mean when data is given in a frequency table.

The table shows the number of goals scored by the local football team in 12 matches.

Number of Goals	Frequency
0	2
1	5
2	3
3	1
4	1

The frequency table tells you that the team scored no goals at 2 matches, 1 goal at 5 matches, 2 goals at 3 matches, 3 goals at 1 match and 4 goals at 1 match. You can add another column to the table to show this working. The number of goals is represented by  $x$  and the frequency is represented by  $f$ .

$x$ (number of goals)	$f$ (frequency)	$fx$ (number of goals $\times$ frequency)
0	2	0
1	5	5
2	3	6
3	1	3
4	1	4
<b>Total</b>	<b>12</b>	<b>18</b>

The mean number of goals scored is  $\frac{18}{12} = 1.5$

Make sure your answer makes sense. If you needed to interpret this value you would say that the team scored either 1 or 2 goals at most matches.

The median of a set of data is the middle value when all the values have been put in numerical order.

Here is a set of data : 9, 15, 14, 7, 6, 13, 8

Put the data in numerical order : 6, 7, 8, 9, 13, 14, 15

The middle value is 9. So the median is 9.

If there are two values in the middle then you find the mean of these two values.

Here is set of data in order: 3, 4, 6, 7, 8, 10

There are two values in the middle 6 and 7. The median is found by working out the mean of these two values =  $6 + 7 = 13 \div 2 = 6.5$

So the median is 6.5

The mode is the value which appears most often in a set of data.

The test results for a group of students were 65%, 89%, 57%, 55%, 65%, 71%, 73%

The result that appears most often is 65%. So the mode is 65%.

Sometimes there can be more than 1 mode or no mode at all.

The group did another test and got the following results:

55%, 71%, 82%, 55%, 64%, 71%, 59%

The results which appear most often are 55% and 71% so the modes are 55% and 71%.

You can also find the median and the mode when data is given in a frequency table.

The table shows the number of correct answers given by people who answered a quiz. The quiz has five questions.

Number of Correct Answers	Frequency
0	2
1	1
2	4
3	5
4	2
5	1

There are 15 values.

The median is the  $\frac{(15 + 1)^{\text{th}}}{2}$  value = 8<sup>th</sup> value

The 8<sup>th</sup> value is in the category with 3 correct answers. The median is 3.

The mode is the number of correct answers with the highest frequency. The highest frequency is 5 so the mode is 3 correct answers.

**Practise the Skill**

- 1) The price of a litre of petrol was recorded at several garages.

107p	109p	111p	108p	112p	109p
108p	110p	107p	113p	109p	110p

- a) Work out the mean price. Give your answer to 1 decimal place.

\_\_\_\_\_ p

- b) Work out the median price.

\_\_\_\_\_ p

- c) Work out the modal price.

\_\_\_\_\_ p

- 2) Lucy went on holiday for 10 days. These are the temperatures for each day.

21°C	24°C	29°C	23°C	24°C
24°C	27°C	23°C	22°C	23°C

- a) Calculate the mean temperature.

\_\_\_\_\_ °C

- b) Calculate the median temperature.

\_\_\_\_\_ °C

- c) Calculate the modal temperature.

\_\_\_\_\_ °C and \_\_\_\_\_ °C

- 3) The table shows the exchange rate for one British pound to euros for 12 months.

€1.19	€1.15	€1.16	€1.17	€1.17	€1.15
€1.16	€1.18	€1.17	€1.19	€1.18	€1.20

- a) Calculate the mean rate. Give your answer to 2 decimal places.

€ \_\_\_\_\_

- b) Calculate the median rate.

€ \_\_\_\_\_

- c) Calculate the modal rate.

€ \_\_\_\_\_

- 4) The mean of three numbers is 70. If two of the numbers are 55 and 65, what is the third number?

\_\_\_\_\_

- 5) A café is open for six days a week. There was a mean number of 86 customers for five days. On the next day there were 122 customers. What is the mean number of customers over the six days?

\_\_\_\_\_

- 6) The table shows the ages of 21 students.

Age (years)	Number of students
16	7
17	8
18	5
19	1

- a) What is the mode of these ages?

\_\_\_\_\_ years

- b) What is the median of these ages?

\_\_\_\_\_ years

- c) Calculate the mean of these ages?

\_\_\_\_\_ years



## Explain the Skill

### Range

The range gives a measure of how spread out the values are in a set of data. The range is the difference between the highest and lowest values.

In a golf competition 8 players scored the following:

71	73	63	83
75	85	65	69

What is the range of scores?

Range = highest value – lowest value

Range =  $85 - 63 = 22$

So the range is 22.

## Using Averages and Range to Compare Two Sets of Data

You sometimes need to decide which average is the most suitable to use. The table below shows the advantages and disadvantages of each average.

Average	Advantage	Disadvantage
Mean	All the data is used	Very large or very small numbers can distort the result
Median	Very large or very small numbers don't affect it	Doesn't use all the data
Mode	Is not affected by extreme values and is the only average used to describe non-numerical data	Doesn't use all the data. There can be more than 1 mode or no mode

The **mean** is most commonly used when measuring temperatures, heartbeats per minute, goods produced and student's test grades.

The **median** can be used to find typical salaries or house prices as it isn't affected by extreme values.

The **mode** is most commonly used when you need to know popular sizes or colours for buying stock.

The **range** is used to describe the spread in the values, the bigger the range the more spread out the values are.

**Practise the Skill**

1) What is the range for the following set of numbers?

16    20    55    46    10    38    86    8    15

The range= \_\_\_\_\_

2) The table shows the mean monthly temperatures in Toronto last year.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
°C	-3	-3	1	7	14	16	21	21	18	11	5	-1

What is the range in temperatures?

\_\_\_\_\_ °C

3) The table below shows the heights of trees in two forests.

<b>Forest 1</b>	18.6m	16.8m	14.8m	18.4m	15.8m	17.7m	19.7m	21.3m	20.9m
<b>Forest 2</b>	21.6m	19.5m	28.7m	23.9m	29.4m	31.2m	28.7m	26.3m	19.8m

What is the difference in the range of tree heights in the two forests?

\_\_\_\_\_ m

- 4) Ten students with part-time jobs were asked how much they earned weekly.

£55	£45	£110	£35	£42
£40	£38	£62	£68	£57

- a) What is the range in the weekly earnings?

£ \_\_\_\_\_

- b) What is the median amount earned?

£ \_\_\_\_\_

- c) Is there a mode?

Circle your answer.

Yes / No

- d) What is the mean amount earned?

£ \_\_\_\_\_

- 5) Which average best describes the student's earnings? Circle your answer.

The mean, because this is the most common amount earned

The median, because the mean is distorted by a high value

The mode, because this shows the spread in earnings

- 6) Jenny works for a charity and is comparing the amounts donated over 6 months this year with the same time last year.

	<b>Mean</b>	<b>Range</b>
<b>Year 1</b>	£527	£328
<b>Year 2</b>	£572	£574

What does this tell Jenny about the amount donated in Year 1 compared to Year 2?  
Circle your answer.

More money was donated in Year 1 than Year 2

Less money was donated in Year 1 than Year 2

The amounts donated in Year 1 were more consistent than Year 2

The amounts donated in Year 1 were less consistent than Year 2

**Apply the Skill**

1) Jamie works in a hotel.

These are the weekly wages paid to the staff.

£245    £140    £525    £174    £195    £163    £140

a) What is the modal wage?

£ \_\_\_\_\_

b) What is the median wage?

£ \_\_\_\_\_

c) What is the range is wages?

£ \_\_\_\_\_

d) What is the mean wage?

£ \_\_\_\_\_

2) Which average best describes the wages?

**Circle your answer.**

Mean, because two people earn more than this

Mode, because this is the most common wage

Median, because the mean is distorted by a high wage

Range, because this shows the spread in wages

- 3) The manager is checking the results of the customer satisfaction surveys. The ones he has looked at have scores of 79%, 92%, 71% and 86%.

What score must be on the next survey to have a mean average of exactly 85% for the five surveys? \_\_\_\_\_ %

- 4) The hotel rates and the number of rooms occupied for one night are shown in the table below.

Room	Rate per night	Number of rooms Occupied
Double room	£120	26
Single room	£90	4
Superior single room	£100	0
Double room with view	£140	12
King room with view	£155	3

- a) What is the mean rate charged that night?

£ \_\_\_\_\_

- b) The mean number of guests on 5 nights is 90. When an extra night of guests is added the mean is 91.

What was the number of guests on the extra night?

\_\_\_\_\_

- 5) Jamie needs to order fruit for the breakfasts. He asks forty guests how many pieces of fruit they eat a day.

<b>Number of pieces of fruit</b>	0	1	2	3	4	5	6	7
<b>Number of people</b>	3	8	9	11	5	3	1	0

What is the modal number of pieces of fruit eaten by the guests?

\_\_\_\_\_

- 6) 20 boxes of apples have been delivered over several months. Jamie keeps a record of the number of apples in each box.

Complete the table and answer the following questions.

Number of apples (a)	Frequency (f)	af
28	2	56
29	4	
30		240
31	4	
32		64
Totals		

- a) What is the modal number of apples in a box?

\_\_\_\_\_

- b) What is the median number of apples in a box?

\_\_\_\_\_

- c) What is the mean number of apples in a box?

\_\_\_\_\_

- 7) Jamie can choose between two suppliers of eggs for the breakfasts.

Hoppy eggs have a mean weight of 69 g and a range of 8 g.

Farm Fresh eggs have a mean weight of 67 g and a range of 5 g.

If Jamie wants large eggs that are all about the same size which supplier should he use?

Circle your answer.

Hoppy Eggs

Farm Fresh



- 8) Jamie uses the bus to get to work. Brevi and Snappy are two bus companies that run buses on the same routes and he wants to compare their services.

The table shows the journey times for 7 routes on one particular day. It also shows the number of minutes late for the first bus on each route.

	<b>Brevi</b>	<b>Snappy</b>
	<b>Number of minutes late</b>	<b>Number of minutes late</b>
Route 1	0	0
Route 2	12	8
Route 3	5	9
Route 4	6	5
Route 5	10	0
Route 6	0	6
Route 7	9	0

- a) What is the range in the number of minutes late for both companies?

Brevi \_\_\_\_ mins

Snappy \_\_\_\_ mins

- b) What is the mean number of minutes late for both companies?

Brevi \_\_\_\_ mins

Snappy \_\_\_\_ mins

- c) Jamie thinks he should use Snappy because:

(Circle **all** the reasons you think are correct)

The range is lower so the times are more consistent

The mean is lower so buses are less minutes late

More Snappy buses run on time