

ON AVERAGE

Averages are a useful way of getting an overall picture. You work out one figure to represent all the data.

THE MEAN

Example

Janine wants to know how much milk her family drinks on average so that she can order the right amount from the milkman over a bank holiday weekend. She keeps a record for a week:

Saturday	6
Sunday	0
Monday	5
Tuesday	2
Wednesday	3
Thursday	3
Friday	4
<u>Total</u>	<u>23</u>

She adds them up to get the total and divides by the number of days.

$$23 \div 7 = 3.3$$

We are thinking about pints of milk which have to be bought in whole numbers, so the average amount that they use is 3 pints a day.

Notice that she wrote down 0 for Sunday when the milkman does not call, because she did not want to leave it out of her calculations. They still drink milk on Sunday!

This type of average is called the MEAN.

To find the mean:

Add the numbers and divide by the number of numbers in the set.

EXERCISE A

Find the mean averages of these sets of figures: **Check that your answer looks sensible.**

a. 4, 6, 8, 5, 2

b. 9, 3, 5, 7, 8,

c. 65, 78, 99, 64, 54, 77

d. 4.5, 5.6, 8.7, 7.8

e. 112, 126

f. 6.98, 7.55, 55.88

g. £12.00, £14.45, £ 6.65, £ 3.22

h. 2.1, 2.2, 2.2, 2.1, 2.2

j. In four weeks, Mike's pay packets contain £127, £185, £231, & £163.

What is his average weekly wage?



Sometimes you have to think more carefully about what number to divide by: Karen is a young mother who is thinking of going back into paid work. A friend tells her about a part-time job for which she would need a car, but she would only get petrol money for the miles she does for work. The family already has one car, which her husband uses for his work, so she decides to find the average cost of running that car to help her decide whether to go for the new job.

First of all, she collects all the figures for the last 12 months.

Loan repayments 12 @ £72.24	£866.88
Tax	£150.00
Insurance	£265.00
New clutch	£78.50
M.O.T.	£20.00
Exhaust	£49.50
Petrol for own use £10 per week	£520.00
Total	<u>£1,949.88</u>

She adds them up to work out the cost of running the car for the year.

To find the average cost of running the car per week, she divides by 52 because there are 52 weeks in a year.

$$1949.88 \div 52 = £37.50$$

(If she divided by 7, the number of items in the list, she would get the average cost of a bill.)

EXERCISE B

Here is a list of food items that a couple buy one month.

April 2nd	Bread	£0.50
April 2nd	Fruit and veg...	£2.34
April 3rd	Supermarket	£34.89
April 7th	Bread	£0.50
April 10th	Supermarket	£56.12
April 11th	Milk bill	£4.20
April 15th	Fruit and veg.	£5.12
April 16th	Bread	£0.56
April 17th	Supermarket	£12.90
April 20th	Meat	£4.24
April 24th	Supermarket	£25.88
April 25th	Milk bill	£4.20

a. What is their average weekly food bill?

b. Can you spot any patterns in their shopping habits?

THE MODE

The mode is the most common value in a list of figures.

Example

The months of the year have 31, 28, 30, 31, 31, 30, 31, 31, 30, 31, 30 & 31 days.

The most common number is 31, so 31 is the MODE



EXERCISE C

Find the mode of these sets of figures:

a. 4 5 5 7 7 7 8 9 9 10 12 12 12 12 13

b. 26 27 29 25 31 33 27 32 28 27 33

c. 3 5 1 6 2 5 4 8 1 5 2 5 7 2 1 5 4 3 6 9 4 1 6 7

d. The numbers of goals scored by 30 teams in a league are shown in this table.

goals	0	1	2	3	4	5
number of teams	8	9	5	4	2	2

What is the modal score?

THE MEDIAN

The MEDIAN is a different average that is used to reduce the unfair effect of very large or very small figures in a set.

This is particularly important when you are trying to get a fair overall picture.

Example

Wiggin's Sprocket factory is a small firm which has 7 employees.

The manager wants to get an average figure for sick leave taken last year.

Name	days sick	Name	days sick
George Smith	3	Janet Hardy	5
Sonar Ali	2	Mark White	55
Darren Young	0	Lynne Drew	3
Kevin Green	0		

If we work out the mean average, we get:

$$\text{Total days off: } 3+2+0+0+5+55+3 = 68$$

$$\text{mean} = 68 \div 7$$

$$= 9.7$$

The figure of 9.7 days does not give a very good overall picture of the workers' sick record. It is very distorted by the 55 days taken by Mark White when he was injured in an accident.

To get a fairer picture, we can line the figures up in order and pick the middle one.

0, 0, 2, 3, 3, 5, 55.



For a list of 7, the middle one is 3, (the 4th in the list).

A figure of 3 gives a much more representative picture of the number of days taken off sick by this group of workers.

If there is an even number of figures, there will not be a middle figure so you take a figure halfway between the middle two.

Look at this list of ten numbers, which have already been put in order,

7, 7, 9, 11, 14, 17, 25, 31, 56, 66



The middle two figures are 14 and 17.



We can find the halfway figure by adding them up and dividing by 2.
The median for that list is 15.5.

EXERCISE D

Put these sets of figures in order and then find the median;

- a. 56, 98, 45, 67, 84, 12, 10. b. 2, 5, 3, 2, 7, 4, 9.
c. 1.1, 3.2, 3.3, 2.3, 2.15, 2.65, 2.7. d. 6, 0, 9, 0, 4, 7.
e. 56mm, 55mm, 55mm, 55mm. f. £300, £270, £670, £342, £580.

g. The weekly wages at Wiggin's Sprocket factory are:

George Smith	£120.00	Janet Hardy	£163.00
Sonar Ali	£120.00	Mark White	£260.00
Darren Young	£112.00	Lynne Drew	£153.00
Kevin Green	£186.00	Mr. Wiggin	£780.00

Work out the mean average wage, the mode and the median wage.
If you were representing the workers when they ask for a rise, which average would you use?

MEAN FOR GROUPS OF DATA

Example

The numbers of children in 50 families (with at least one child) are:

Number of children	Number of families	children x families
1	3	3
2	18	36
3	12	36
4	9	36
5	5	25
6	2	12
7	1	7
Totals	50	155

Mean number of children per family = $\frac{\text{total number of children}}{\text{number of families}}$

$$= 155 \div 50$$

$$= 3.1$$

EXERCISE E

a. The numbers of goals scored by 30 teams in a league are shown in this table.

goals	0	1	2	3	4	5
number of teams	8	9	5	4	2	2

Calculate the mean number of goals per team.

