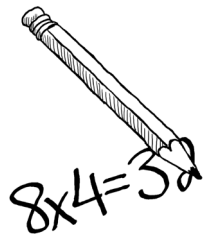


## Quiz 6

- 1) Which digit represents 'tens' in the following number: 1,364?
- 2) Which digit represents 'tens of thousands' in the following number: 27,345,962?
- 3) Which digit represents 'tenths' in the following number: 9.783?
- 4) Which digit represents 'millionths' in the following number: 1.23456789?
- 5) What is  $27 \times 100$ ?
- 6) What is  $36,275,000 \div 100$ ?
- 7) What is  $28.75 \times 1000$ ?
- 8) What is  $1.3825 \div 100$ ?

## Paperwork

When calculations are too complicated to do in your head (or on your fingers), we enter the realm of paper arithmetic. Normally, this means using column arithmetic, which is where having a good understanding of place value comes into its own. This is because column arithmetic needs us to line up all the units, tens, hundreds, thousands, etc. in the numbers we are working with.



## And Another Thing

To add two or more numbers using paper arithmetic, we put them in a tower with all the columns correctly aligned. It's then a case of doing the simple addition of the numbers in each column from right to left and putting the result at the bottom. For instance:

$$\begin{array}{r} 1342 \\ + 257 \\ \hline \end{array}$$

So first we add the  $7 + 2$  in the last column ( $=9$ ), then  $5 + 4$  in the next one along ( $=9$ ), then  $3 + 2$  ( $=5$ ) and, finally,  $1 + 0$  ( $=1$ ).

$$\begin{array}{r} 1342 \\ + 257 \\ \hline 1599 \end{array}$$

This works perfectly until the numbers in any column add up to more than 9. If this occurs, we have to start 'carrying'. All this means is that if you end up with a 'spare' digit, you move it along to the column to the left. Say you are adding  $169 + 87$ :

$$\begin{array}{r} 169 \\ + 87 \\ \hline \end{array}$$

Well,  $9 + 7 = 16$ , so we put 6 at the bottom of the column on the far right and carry the 1 (in reality, a value of ten) to the 'tens' column to its left. You can put the spare figure at the top of the column to remind you it needs to be added. Then we add the 8, the 6 and the spare 1. This gives us 15, so 5 goes at the bottom of the middle column and the spare 1 goes into the last column of the left, which when added to the 1 already there gives us 2. So our answer is 256:

## The Bargain Hunter's Guide to Percentages

Per cent derives from the Latin *per centum*, meaning per 100. So when you use percentages, you are expressing a number as a fraction of 100. If we talk about 5%, it could also be expressed as  $\frac{5}{100}$ ;  $70\% = \frac{70}{100}$  and so on.

Using percentages often makes things clearer than they might be if expressed by a vulgar fraction or a decimal. For instance, if a tax rate increases from 15% to 17.5%, that is much easier to understand than saying it has increased from three-twentieths to seven-fortieths.

In most cases, when calculating percentages it is normally in terms of a 'percentage of something else'. For instance, a sign in a shop that tells you a particular jacket is for sale at 15% off ('the percentage') is meaningless if we don't know the price ('the something else'). If the jacket costs £30, we can work out what 15% is with a bit of simple arithmetic:

$$\frac{15}{100} \times \frac{30}{1} = \frac{450}{100} = 4.5$$

So, 15% off equals £4.50 off the price tag. Your £30 jacket is now available for £25.50.

## Quiz 42

Here are five more sale items. In each case, how much is the reduction and what is the new price?

- 1) A pair of trousers that originally cost £40 is on sale at 10% off.  
Value of reduction \_\_\_\_\_ New Price \_\_\_\_\_
- 2) A computer that originally cost £560 is on sale at 25% off.  
Value of reduction \_\_\_\_\_ New Price \_\_\_\_\_
- 3) A pair of shoes that originally cost £120 is on sale at 18% off.  
Value of reduction \_\_\_\_\_ New Price \_\_\_\_\_
- 4) A dinner service with minor imperfections originally cost £750 but has been reduced by 60%.  
Value of reduction \_\_\_\_\_ New Price \_\_\_\_\_
- 5) A car that originally cost £10,250 is on sale at 20% off.  
Value of reduction \_\_\_\_\_ New Price \_\_\_\_\_

## Quiz 52

Below are five data sets. In each case, work out the mean, median and mode.

- 1) Height in cm of 5 respondents:  
155, 167, 176, 189, 210  
Mean = \_\_\_\_ Median = \_\_\_\_ Mode = \_\_\_\_
- 2) Hourly earnings in £ of 9 workers:  
6.70, 6.95, 7.20, 7.45, 7.45, 8.20, 8.60, 9.80, 11.40  
Mean = \_\_\_\_ Median = \_\_\_\_ Mode = \_\_\_\_
- 3) Age in whole years of 14 respondents:  
14, 18, 20, 20, 23, 27, 31, 35, 39, 43, 49, 56, 65, 74  
Mean = \_\_\_\_ Median = \_\_\_\_ Mode = \_\_\_\_
- 4) Length in minutes of 11 movies:  
97, 103, 110, 114, 116, 116, 119, 122, 124, 125, 129  
Mean = \_\_\_\_ Median = \_\_\_\_ Mode = \_\_\_\_
- 5) Exam results in per cent of 18 students:  
11, 24, 29, 33, 38, 43, 45, 45, 48, 51, 53, 53, 53, 56, 58, 60, 62, 65  
Mean = \_\_\_\_ Median = \_\_\_\_ Mode = \_\_\_\_

### Affairs of the Chart

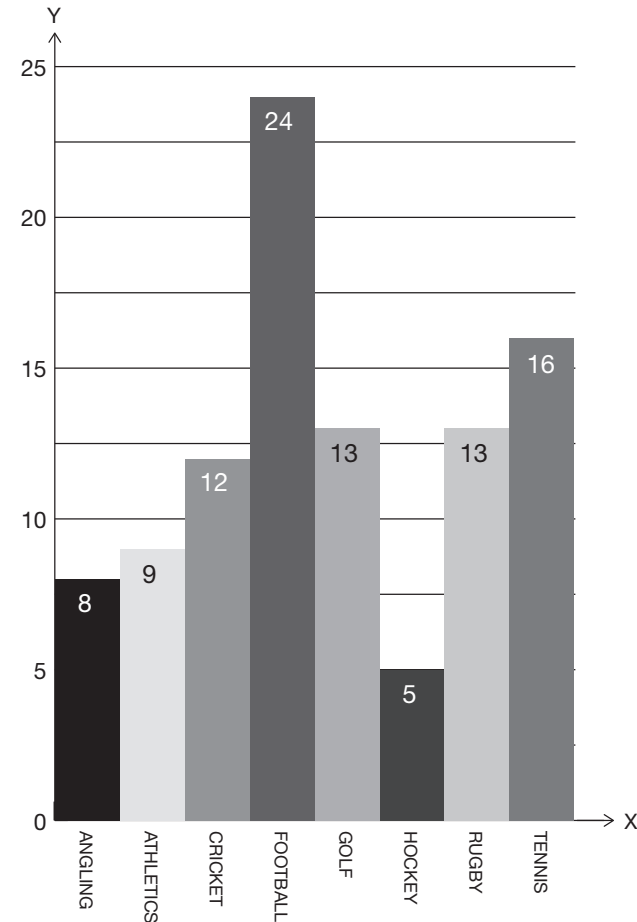
Filling pages with long strings of numbers can be problematic. So it is worth thinking about alternative means of presenting data. This is where we enter the realm of the chart and table.

## A Man Walks into a Bar Chart

Bar charts are great for expressing data so that you can quickly see relative proportions.

### Quiz 53

In the example below, 100 people were asked what their favourite sport is. What can you learn from the table?



## Into the Unknowns

Some equations have unknowns on both sides of the = sign. In such cases the aim is to balance the equation so there are no unknowns on one side. Just remember, what you do to one side, you must do to the other (and if there are brackets involved, you will need to expand them).

- *Let's look at the sum  $4 + 2a = 3a + 1$ . To get rid of the unknown on the left, we subtract  $2a$ , so must also do the same to the expression on the right. The equation is now  $4 = a + 1$ . This, you will quickly see, means that  $a = 4 - 1 = 3$ .*
- *In this example,  $3b + 16 = 4(b + 3)$ . If we expand the brackets, we end up with  $3b + 16 = 4b + 12$ . A further simplification reveals that  $16 = b + 12$ , so  $b = 16 - 12 = 4$ .*

### Quiz 70

Work out the value of the unknown in each of the following equations.

- 1)  $6a + 2 = 4a + 10$
- 2)  $12b - 5 = 10b + 9$
- 3)  $3c + 22 = 6c - 5$
- 4)  $2(d + 2) = 3d - 1$
- 5)  $e + 49 = 3(e + 1)$
- 6)  $3f + 2 = 4f + 4$
- 7)  $18 - g = -3g + 4$
- 8)  $4h - 5 = 3(h + 3)$

## Word Problems

In this exercise, derive algebraic equations from the word questions to solve the problem.

### Quiz 71

- 1) Add 10 years to my age and you get 45. How old am I?
- 2) 3 times my front door number is 126. What is my door number?
- 3) If you divide my father's age by 3 and add 14, you get 40. How old is my father?
- 4) If you take the average test score of the pupils in my maths class and add 5 to it, and then divide that figure by 3, you get 28. What was the average test score?
- 5) If you take the number of students in the class, multiply that figure by 3 and add 17, you get the same result as when you multiply the class size by 4 and take away 2. How many students are there in the class?

### X, Y & Z Factor

Factorizing is the process of making brackets, something done to make formulae easier to deal with or to help solve equations where there are unknowns with powers.

- *As we already know, a factor is a number that exactly multiplies into another number. So if we were to factorize  $14 + 21 = 35$ , we would end up with  $7(2 + 3) = 35$ . Of course, you would never do this in practice with simple numbers but it illustrates the process.*

## Access All Areas

Area is the amount of flat space something takes up. It is, if you like, an object's 'footprint'. Here are a few useful equations for calculating area.

- Working out the area of a square or a rectangle is as straightforward as it gets. Area ( $A$ ) = Width ( $W$ )  $\times$  Height ( $H$ ). So if we have a rectangle with a width of 10cm and a height of 7cm, its area is  $10 \times 7 = 70\text{cm}^2$ .
- The area of a triangle is exactly half the area of the imaginary rectangle into which it fits. This handy fact allows us to use the following equation:  $\text{Area} = \frac{1}{2} \times \text{Base} \times \text{Height}$ . Remember, though, that the height of a triangle is not the same as its longest side. The height is measured from the middle of the base to the tip of the triangle.
- With a parallelogram,  $\text{Area} = \text{Base} \times \text{Height}$  (though, again, remember that the height is not the same as the length of one side).
- For trapeziums, the equation is more complicated:  

$$\text{Area} = \frac{(a + b) \times \text{Height}}{2}$$
 In this equation,  $a$  and  $b$  are the two parallel lines in a trapezium.
- For a kite, imagine drawing two lines connecting opposing vertices. These are the diagonals of a kite. Thus  $\text{Area} = \frac{1}{2} \times \text{diagonal } a \times \text{diagonal } b$ .
- For all other polygons, remember that they can always be divided into triangles, rectangles or a combination of the two. It's then a case of working out the area of each sub-shape and adding the totals together.

## Quiz 85

Work out the area of each of the following shapes.

