Check-Up

3

Decimals and percentages

a) A primary school calculates the average (mean) National Curriculum level for the core subjects for their pupils at age 11 to be as follows: English, 4.3; mathematics, 4.195; science, 4.28. Arrange these in order from the lowest to the highest.

b) In a secondary school, the proportions of Year 9 pupils achieving level 5 or above in the Key Stage 3 tests last year were 0.76 for mathematics, 0.8 for science and 0.675 for English. Without using a calculator, express these proportions as percentages.

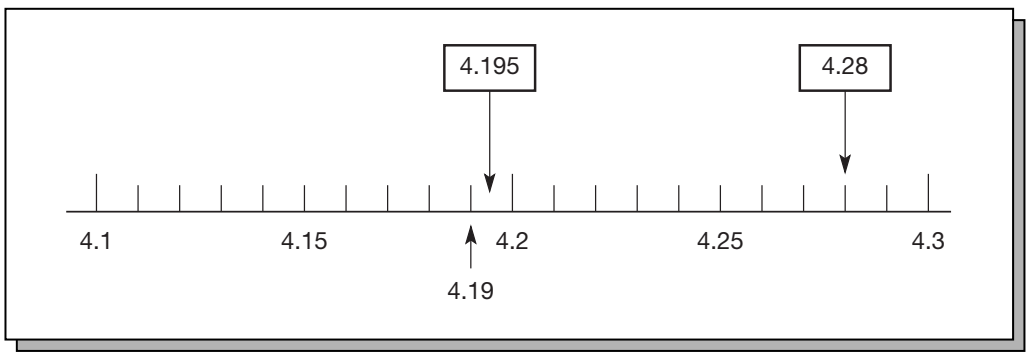
Answers to check-up 3

a) 4.195 (mathematics), 4.28 (science), 4.3 (English).

b) 76% for mathematics, 80% for science, 67.5% for English.

Discussion and explanation of check-up 3

(a) To compare a set of numbers written in decimal notation (such as, 4.3, 4.195, 4.28) it can be helpful to rewrite them (in your head) with the same number of figures after the decimal point. Since one of the numbers in this set has three figures after the decimal point, I might think of them as: 4.300, 4.195 and 4.280. This helps to put them in order: 4.195, 4.280, 4.300. The inclusion of extra zeros after the last figure after a decimal point does not change the value of the number. So, for example, 4.28 means 4 units, 2 tenths and 8 hundredths; and 4.280 means 4 units, 2 tenths, 8 hundredths and no thousands. These are clearly the same. Note that you can mislead yourself by thinking that 4.28 is smaller than 4.195, for example, because 28 is smaller than 195. The misunderstanding here is not to realise that the 28 means '28 hundredths', whereas the 195 means '195 thousandths'. It is also helful to think of the position of these numbers on a number-line diagram, as below. Notice that 4.28 comes between 4.2 and 4.3, and that 4.195 comes between 4.19 and 4.20 (which is also written as 4.2).



(b) The decimal number 0.76 means 7 tenths and 6 hundredths, or 70 hundredths + 6 hundredths, which is 76 hundredths. Another way of writing 76 hundredths is 76%. So, it is really very easy to convert a decimal number with

two figures after the decimal point to a percentage, and *vice versa*: 0.76 = 76%, 0.57 = 57%, 0.40 = 40%, 0.04 = 4%, and so on.

If there is just one figure after the decimal point, then just mentally include an extra zero. For example, 0.8 = 0.80 = 80%. Similarly, 0.2 = 20%, 0.4 = 40% and so on. If there are more than two figures after the decimal point, because it's the first two that tell you how many hundredths you have, you move them so they are in front of the decimal point, as follows: 0.675 = 67.5%. Here are some other examples: 0.045 = 04.5% = 4.5%, 0.1234 = 12.34%, 0.9005 = 90.05%.

Sometimes percentages greater than 100% are used. These can also be written as decimals. Here are some examples: 125% = 1.25, 117.5% = 1.175, 250% = 2.5.

Summary of key ideas

- To compare a set of numbers written in decimal notation it can be helpful to rewrite them with the same number of figures after the decimal point.
- It is helpful to visualise numbers written in decimal notation in terms of their position on a number line.
- To change a decimal number to a percentage, move the digits two places to the left, relative to the decimal point; for example, 0.46 = 46%, 0.175 = 17.5%
- To change a percentage to a decimal number, move the digits two places to the right, relative to the decimal point; for example, 99% = 0.99, 150% = 1.50 or 1.5.

Further practice

3.1 A pupil labels some points on a number line in order, as follows: 1.7, 1.8, 1.9, 1.10, … what is the error here?

3.2 A school's target is that the proportion of pupils absent each day should be less than 0.08. On which of the following days do they *not* achieve the target? The numbers in brackets are the proportions of pupils absent.

Monday (0.075), Tuesday (0.1), Wednesday (0.09), Thursday (0.079), Friday (0.009)

3.3 Without using a calculator, write the proportions given in the previous question as percentages.