

Check-Up

26

Multiplication with decimals

Do not use a calculator.

- a) The rate for exchanging Japanese currency to British is 0.0056 pounds sterling per yen. Multiply 0.0056 by 4000 to find the equivalent in British pounds of 4000 Japanese yen.
- b) A sheet of A4 paper is approximately 0.3 metres long and 0.21 metres wide. Multiply the length by the width to find the area in square metres.

Answer to check-up 26

- a) £22.40 ($4000 \times 0.0056 = 22.4$).
- b) 0.063 square metres ($0.3 \times 0.21 = 0.063$).

Discussion and explanation of check-up 26

Yes, I know you wouldn't do (a) like this. Neither would I. Personally, I would mentally multiply the 0.0056 by 10 000, to get £56 for 10 000 yen. So, that's £5.60 for 1000 yen, and, multiplying by 4, £22.40 for 4000 yen. But let's see how you get to the same answer if you think of the numbers involved as pure decimals.

We require 4000×0.0056 . That's $(4 \times 1000) \times 0.0056 = 4 \times (1000 \times 0.0056)$. When we multiply by 1000 the figures move three places to the left, giving 4×5.6 . Because this is between $4 \times 5 (= 20)$ and $4 \times 6 (= 24)$, you will probably be fairly confident that the answer to this multiplication is 22.4, rather than 2.24 or 224. So, when multiplying by decimals we can often just use our sense of how large the result should be to decide where the decimal point goes in the answer.

But when you come to 0.3×0.21 , you may be unsure as to whether the answer should be 0.63, 0.063 or even 0.0063. The simplest way of multiplying decimals like this is to change each number into a whole number, by multiplying by 10 as many times as necessary, do the multiplication, and then divide by 10 as many times as you previously multiplied by 10. I'll explain ...

$0.3 \rightarrow 3$, by multiplying by 10

$0.21 \rightarrow 21$, by multiplying by 10 and multiplying by 10 again

Altogether we have multiplied by 10 three times

Then $3 \times 21 = 63$, but this answer must now be divided by 10 three times
 $\rightarrow 0.063$

Remember that dividing by 10 moves the figures one place to the right.

In practice, you can carry out this procedure by counting how many figures there are altogether after the decimal point in the numbers being multiplied, and then put the decimal point in the place that produces the same number of figures after the point in the answer. For example, for 0.05×0.013 , we note

that there are five figures in total after the decimal points. Then calculate $5 \times 13 = 65$ and just put the decimal point where it gives five figures after the point in the answer, putting in zeros where necessary: 0.00065.

Summary of key ideas

- ◆ Multiplying by 10, 100 or 1000 moves the figures one, two or three places respectively to the left in relation to the decimal point.
- ◆ Dividing by 10, 100 or 1000 moves the figures one, two or three places respectively to the right in relation to the decimal point.
- ◆ To multiply numbers involving decimals (e.g. 0.04×1.2)
 - get rid of the decimal points by multiplying each number by 10 as many times as necessary ($0.04 \rightarrow 4$, $1.2 \rightarrow 12$, multiplying by 10 three times in total)
 - then multiply together the resulting whole numbers ($4 \times 12 = 48$)
 - finally divide the answer by 10 as many times as the numbers were multiplied by 10 altogether ($48 \rightarrow 0.048$, dividing by 10 three times).
- ◆ Note that the number of figures after the decimal points altogether in the numbers being multiplied is the same as the number you need after the point in the answer.
- ◆ Also be guided by the expected size of the answer (e.g. 4.1×0.5 should be about 2).

Further practice

Do not use a calculator.

26.1 Find the value of $0.1 \times 0.2 \times 0.3 \times 0.4 \times 0.5$.

26.2 Expressed as a decimal, the proportion of pupils on free school meals in one school is 0.12. Of these pupils, the proportion who come from homes with no adults in employment is found to be 0.6. As a decimal, what proportion of pupils in the school are on FSM and are from homes with no adults in employment?

26.3 Rewrite and answer question 26.2 using percentages.

26.4 The A4 \rightarrow A5 setting on the school photocopier reduces both the length and the width of the original by a scale factor of 0.71. By multiplying 0.71 by 0.71, find by what factor the area is reduced.