Part 4: Multiplication by a 2-digit Whole Number	2 sessions

Objectives

- Multiply a decimal number by a 2-digit whole number.
- Estimate the product in multiplication of decimal numbers.

Materials

- Number discs (discs with 0.001, 0.01, 0.1, 1, 10, and 100 written on them)

Homework

- Workbook Exercise 10
- Workbook Exercise 11

Notes

In *Primary Mathematics 4A*, students learned to multiply a whole number by a 2-digit whole number. This was reviewed in *Primary Mathematics 5A*. Here, the skill is extended to multiplication of a decimal number by a 2 digit whole number.

Multiplication by 2 digit numbers is done in three steps — multiplying by the tens, then multiplying by the ones, and then adding the products. The problem can be written vertically so that the places can be aligned, which makes it easier to keep correct track of the place values. While the 0 resulting from multiplying by the tens digit can be left out, encourage students to include it.

$$
\begin{aligned}
567 \times 52 &= (567 \times 50) + (567 \times 2) \\
&= (567 \times 5 \times 10) + (567 \times 2) \\
&= (2835 \times 10) + 1134 \\
&= 28{,}350 + 1134 \\
&= 29{,}484
\end{aligned}
$$

$$
\begin{array}{r}
567 \\
\times \quad 52 \\
\hline
1134 \quad = 567 \times 2 \\
28350 \quad = 567 \times 50 \\
\hline
29484
\end{array}
$$

Note that when multiplying in the vertical format, by tradition we multiply first by the ones and then by the tens. This helps students align their columns correctly by placing a 0 below the ones to indicate that the answer is tens. 5 *tens* × 567 = 2835 *tens*

Multiplication of a decimal number by a 2-digit whole number is a similar process. Traditionally, the decimal is not written into the partial products, but instead is put in place into the answer, which is the sum of the partial products.

$$
\begin{aligned}
5.67 \times 52 &= (5.67 \times 50) + (5.67 \times 2) \\
&= (5.67 \times 5 \times 10) + (5.67 \times 2) \\
&= (28.35 \times 10) + 11.34 \\
&= 283.50 + 11.34 \\
&= 294.84
\end{aligned}
$$

$$
\begin{array}{r}
5.67 \\
\times \quad 52 \\
\hline
1134 \quad = 5.67 \times 2 \\
28350 \quad = 5.67 \times 50 \\
\hline
294.84
\end{array}
$$

As a check, students should estimate answers in advance of carrying out calculations. This is especially important for multiplication or division problems, where careless digit alignment often causes place value error.

$$5.67 \times 52 \approx 6 \times 50 = 300$$

Activity 1.4a   **Multiply a decimal number by a 2-digit number**

1. Discuss multiplying a decimal number by a 2-digit whole number.
   - Write a relatively simple multiplication problem of a decimal number by a 2-digit whole number, such as 2.2×21.

     $$2.2 \times 21 \approx 2 \times 20 = 40$$

   - Have students estimate the answer. They should round both numbers so that each has only one non-zero digit.
   - Next, show students that we can split 21 into tens and ones and multiply each part by 2.2.

     $$2.2 \times 21 = (2.2 \times 20) + (2.2 \times 1)$$
     $$= 44 + 2.2$$
     $$= 46.2$$

   - Show the same problem worked vertically, multiplying first the ones and then the tens.

     $$\begin{array}{r} 2.2 \\ \times\ \underline{21} \\ 2.2 \\ \underline{44.0} \\ 46.2 \end{array}$$

   - Point out that when multiplying by the ten, $(2.2 \times 2$ tens$)$ the product is one place value more over to the left than it would be when multiplying by 2. Put a 0 in the ones place to keep track of where the digits should go.

   - Because one factor is actually a tenth of 22, the final product will also be a tenth of 22×21. We can work the problem the same way as if we were multiplying 22×21, and write in the decimal point at the end, into the answer. Tell them that this is the traditional way of showing the calculation.

     $$\begin{array}{r} 2.2 \\ \times\ \underline{21} \\ 22 \\ \underline{44} \\ 46.2 \end{array}$$

   - Point out that if we do not align the digits correctly in the multiplication process, the result will differ from the estimate in place value. Estimating the answer helps catch such errors.

     $$\begin{array}{r} 2.2 \\ \times\ \underline{21} \\ 22 \\ \underline{44} \\ 6.6 \end{array} \quad \times$$

   - Repeat with a number where multiplying by the ones will lead to a 0 in the lowest place value, such as 2.22×25. Have students estimate the answer before carrying out the calculations.

     $$2.22 \times 25 \approx 2 \times 30 = 60$$

     $$2.22 \times 25$$
     $$= (2.22 \times 20) + (2.22 \times 5)$$
     $$= (2.22 \times 2 \times 10) + (2.22 \times 5)$$
     $$= (4.44 \times 10) + 11.10$$
     $$= 44.4 + 11.1$$
     $$= 55.5$$

   - The answer has a 0 at the end in the hundredths place. Customarily this final 0 can be left off as it does not change the value of the number. $55.5 = 55.50$

   - Estimating the answer first will warn us if we then make a mistake with place value in the calculation.

     $$\begin{array}{r} 2.22 \\ \times\ \underline{25} \\ 11.10 \leftarrow 2.22 \times 5 \\ \underline{44.40} \leftarrow 2.22 \times 20 \\ 55.50 \end{array}$$

   - Discuss the problems in the **textbook, p. 16**. The second problem is done the same way as the first, and then the decimal point is put in. Estimating first helps us to know we have aligned the digits correctly and put the decimal point in the correct place.

Activity 5.1a   **Line graphs**

1. Introduce line graphs.
   - Remind students that graphs are a way of presenting data. They have seen bar graphs before. You may want to review some of the material from unit 4 in *Primary Mathematics 4A*.
   - Copy the table on **p. 51 of the textbook** onto the board.
   - Tell students that this data comes from a swimming pool in Singapore.
   - Distribute copies of p. 66 of this guide to the students.
   - Guide students in drawing a bar graph for the data in the table, making each bar two columns wide.
   - Discuss the bar graph.
     o Each bar shows the attendance for one particular month.
     o Point out that every second horizontal line is labeled in thousands, so each line across marks 500 people. This is the scale of the graph.
   - Tell students that besides a bar graph, there is another way to graph data, called a line graph.
   - Have students draw a dot in the middle of the top of each bar. That one dot, by itself, actually indicates the same information as the bar. It marks the intersection of the vertical line, indicating the month, and the horizontal line, giving the attendance.
   - Have students connect the dots with a line.
   - Have them compare their graphs to the graph on **p. 51 of the textbook**.
   - The dots, which are the data points showing us the data that was collected, are connected by straight lines, drawn from one point to the next. This type of graph is called a line graph.
   - Discuss why a line graph might be useful.
     o Each bar of a bar graph represents an equivalent data point on the line graph. The bar graph makes the value of each bar easy to find. The value of a particular data point in the line graph is a little harder to find, but the lines which connect the points emphasize the relationship between adjacent data points.