Chapter 2 – Multiplication

Objectives

- Multiply decimal numbers by a 1-digit whole number.
- Use estimation to check reasonableness of answers.
- Solve word problems involving multiplication of decimal numbers.

Material

- Place-value discs (0.01, 0.1, 1, 10, and 100)
- Place-value chart
- Mental Math 15-16 (appendix pp. a5-a6)

Notes

In *Primary Mathematics* 2A, students learned the standard algorithm for multiplying a whole number by a 1-digit whole number. In *Primary Mathematics* 3B, they learned to multiply money in dollars and cents by a 1-digit whole number by converting the money to cents, multiplying, and converting back to dollars and cents.

In this chapter, the standard algorithm will be extended to 1-place and 2-place decimals.

When writing addition or subtraction problems in vertical format, it is important to always align the digits according to their place value. In multiplication, however, we do not align digits for the two factors, since we need to multiply the single digit with the value in each place value. While it is possible to represent 6.14 x 3 in either of the two ways shown on the right, only the second way will be used. In *Primary Mathematics* 5A, students will learn how to multiply a decimal by a whole number greater than 10 or another decimal, without regard to the decimal point when performing the actual multiplication, and then place the decimal point correctly in the final answer.

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    6 . 1 4
x   3
 1 8 . 4 2

    6 . 1 4
x         3
 1 8 . 4 2
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As with addition and subtraction, always use the place values when discussing the process. 0.6 x 5 is “six tenths times five equals 30 tenths or 3 ones,” not “six times five is three.”

Students will be asked to estimate their answer in order to check if their answer is reasonable. For multiplication, your student can round the decimal to one non-zero digit, e.g. 27.9 x 3 can be estimated by using 30 x 3 = 90 and 0.279 x 3 can be estimated using 0.3 x 3 = 0.9.

In this chapter, your student will be solving 2-step word problems that involve multiplying decimals. In *Primary Mathematics* 3A students learned how to use the part-whole and comparison models to solve word problems involving multiplication. The drawing in Task 18 on p. 55 is an example of a part-whole model, and the one in Task 19 on the same page is an example of a comparison model. Modeling is used, but not re-taught here. Use the models during lessons, and have your student draw them when doing the tasks, but use your discretion in requiring them for independent work. Do not insist your student follow a prescribed set of steps in drawing the models, since unless they learn to solve these problems logically and develop problem-solving skills that don’t rely on following a set of steps, they will have difficulty in *Primary Mathematics* 5A.

(6) Solve word problems

Discussion

Tasks 23-26, pp. 65-66

Discuss these problems with your student.

23: The drawing helps us put the information into a picture and come up with a method to solve the problem. We are given a whole and equal parts and have to find the value in two equal parts. So this involves both division (to find the value of one part) and multiplication (to then find the value of two parts). Point out that in many problems that are complex enough where a diagram like this is useful, we will often have to first find the value of 1 unit before being able to find the answer to the problem.

23. 5 units = $8
    1 unit = $8 ÷ 5 = $1.60
    2 units = $1.60 x 2 = **$3.20**

24. 3 units = $5.40
    1 unit = $5.40 ÷ 3 = $1.80
    2 units = $5.40 – $1.80 = **$3.60**
    (Or: 2 units = $1.80 x 2 = $3.60)
    $**3.60**

25. 5 units = 5 gal – 0.25 = 4.75 gal
    1 unit = 4.75 gal ÷ 5 = **0.95 gal**
    0.95 gal

26. 5.4 ÷ 5 = **1.08**
    1.08 kg

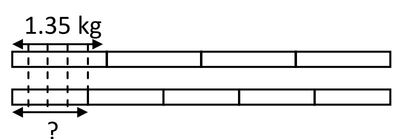
24: Since we are told how many times more Taylor has than Bonita, two quantities are being compared, so we can draw a comparison model. Again, to answer the problem we first need to find the value of 1 unit.

25: This model shows a combination of a part-whole model for addition and subtraction (unequal units, one unit is the amount in the bottles and the other is the left-over amount) and a part-whole model for multiplication (the amount in the bottles is divided into 5 equal units). We have to find the value of one part by subtraction before we can find the value of 1 unit using division.

26: Ask your student why the solution shows multiplication as the first step. She may not need a model for this problem. If she does, one possibility is to draw two bars of equal length to represent the flour in the bags and in the cake. One bar has 4 units and the other 5.

You may want to show an alternative solution, since in more complex problems your student will encounter later he may have to make equal units between two equal bars such as this. If the unit in the bar with 4 equal units is divided into fifths, and that in the bar with 5 equal units is divided into fourths, there are now equal sized units in both bars. Each bag of flour is now represented by 5 units and each cake by 4 units.

26. (alternative solution)



5 units = 1.35 kg
1 unit = 1.35 kg ÷ 5 = 0.27 kg
1.35 kg – 0.27 kg = 1.08 kg
She used 1.08 kg of flour for each cake.

Practice

You can have your student do some of the word problems from the practices on the next three pages in the textbook as part of the lesson.

Workbook

Exercise 20, pp. 74-76 (answers p. 64)

(7) Practice

Practice

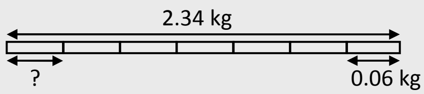
Practice D, p. 67

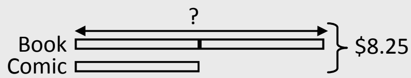
Reinforcement

Extra Practice, Unit 7, Exercise 3, pp. 125-130

Enrichment

Mental Math 18

1. (a) 32.8 (b) 15.87 (c) 26.32
2. (a) \$0.90 (b) \$16.20 (c) \$30.60
3. (a) 3.2 (b) 0.42 (c) 1.36
4. (a) \$0.15 (b) \$0.60 (c) \$0.85
5. (a) 36; 39.24 (b) 30; 31.5 (c) 14; 13.58
6. (a) 3; 2.95 (b) 4; 3.99 (c) 9; 8.76
7. 4 bottles: 6 qt
   Amount in each bottle = 6 qt ÷ 4 = **1.5 qt**
   There were 1.5 qt in each bottle.
8. 1 liter: 1.25 kg
   6 liters: 1.25 kg x 6 = **7.5 kg**
   6 liters of gas weigh 7.5 kg.
9. 5 pieces: 6.75 yd
   1 piece: 6.75 yd ÷ 5 = **1.35 yd**
   Each piece is 1.35 yd long.
10. 1 pot hanger: \$3 + \$1.40 = \$4.40
    4 pot hangers: \$4.40 x 4 = **\$17.60**
    It will cost him \$17.60 to make 4 pot holders.
11. 

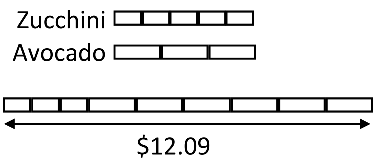
    (2.34 kg – 0.06 kg) ÷ 6 = 2.28 kg ÷ 6 = **0.38 kg**
    One bar weighs 0.38 kg.
12. 

    3 units = \$8.25
    1 unit = \$8.25 ÷ 3 = \$2.75
    2 units = \$2.75 x 2 = **\$5.50**
    or \$8.25 – \$2.75 = \$5.50
    The book costs \$5.50.

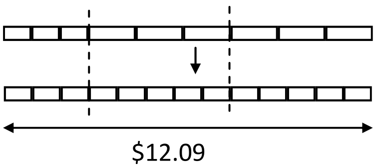
See if your student can solve the following problem.

⇒ 5 zucchini cost as much as 3 avocados. If 3 zucchini and 6 avocados cost \$12.09, how much more does each avocado cost than each zucchini? (All avocados cost the same and all zucchini cost the same.)

⇒ Start with some diagrams:



We can solve this problem using replacement. In this case, we can replace each set of 3 avocados with 5 zucchini. Then we can find the cost of one zucchini. Since 5 zucchini cost the same a 3 avocados, we can then find the cost of 1 avocado.



13 zucchini = \$12.09
1 zucchini = \$12.09 ÷ 13 = \$0.93
5 zucchini = \$0.93 x 5 = \$4.65
3 avocados = \$4.65
1 avocado = \$4.65 ÷ 3 = \$1.55
\$1.55 – \$0.93 = \$0.62

An avocado costs \$0.62 more than a zucchini.