Teacher Package

Mathematics Exemplar Task
Grade 6 – Number Sense and Numeration

Teacher Package

Title: What's the Question?

Time requirements: 160–200 minutes (total)
- 40–50 minutes for the pre-task
- three periods of 40–50 minutes each for the exemplar task

Description of the Task

This task requires students to:
- use base-ten blocks to investigate many tasks involving the multiplication of decimals;
- add decimals in finding all the rectangles with a given perimeter, and multiply decimals in finding the area of the rectangles discovered.

Students will work with base-ten blocks to find as many instances as possible of a decimal number and a whole number that, when multiplied, give a specified product. They will show their work and explain how they found their solutions. Then students will discover whether any products can be found in only one way or in only two ways (and justify their thinking), and whether any product can be found in four ways (and explain the process they used). Finally, students will draw as many rectangles as possible with a perimeter of 12.8 cm, one dimension being a whole number and the other dimension being no less than 1 cm, and will find the areas of the rectangles drawn.

Expectations Addressed in the Exemplar Task

Note that the codes that follow the expectations are from the Ministry of Education's *Curriculum Unit Planner* (CD-ROM).

Students will:

1. select and perform computation techniques appropriate to specific problems involving unlike denominations in fractions and the multiplication and division of decimals, and determine whether the results are reasonable (6m7);
2. solve and explain multi-step problems using the multiplication and division of decimals and percents (6m8);
3. justify and verify the method chosen for calculations with whole numbers, fractions, decimals, and percents (6m9);

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4. represent the place value of whole numbers and decimals from 0.001 to 1 000 000 using concrete materials, drawings, and symbols (6m14);
5. explain processes and solutions with fractions and decimals using mathematical language (6m19);
6. multiply and divide numbers using concrete materials, drawings, and symbols (6m31);
7. multiply and divide decimal numbers to thousandths by a one-digit whole number (6m37).

Teacher Instructions

Prior Knowledge and Skills Required

To complete this task, students should have some knowledge or skills related to the following:
- using base-ten materials to add, subtract, multiply, and divide
- representing and exploring the relationships between fractions and decimals
- applying the formulas for perimeter and area

The Rubric*

The rubric provided with this exemplar task is to be used to assess students' work. The rubric is based on the achievement chart given on page 9 of *The Ontario Curriculum, Grades 1–8: Mathematics, 1997*.

Before asking students to do the task outlined in this package, review with them the concept of a rubric. Rephrase the rubric so that students can understand the different levels of achievement.

Accommodations

Accommodations that are normally provided in the regular classroom for students with special needs should be provided in the administration of the exemplar task.

Materials and Resources Required

Before attempting the tasks, students should be provided with the following materials:
- a copy of the Student Package (see Appendix 1) for each student
- base-ten blocks

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**The rubric is reproduced on page 14 of this document.*

Task Instructions

Introductory Activities

The pre-tasks are designed to review and reinforce the skills and concepts that students will be using in the exemplar task and to model strategies useful in completing the task.

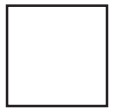
Multiplication of Decimals Using Base-ten Blocks: Notes for the Teacher

The following examples model how to use base-ten blocks to deepen students' understanding of decimals and to show what happens when students perform multiplication with decimals. In the exemplar task, students will be using base-ten blocks to perform the reverse of the multiplication process, that is, they will find the numbers, which, when multiplied, result in a given decimal product.

Please note: *The figures of base-ten blocks that appear in this package have not been drawn to scale, owing to spatial constraints. Figures and models that are presented to students should, however, be proportional.*

The example that follows illustrates question (a) of the pre-task.

The flat base-ten block has a value of 1.



A long base-ten block has a value of $1/10$ or 0.1.

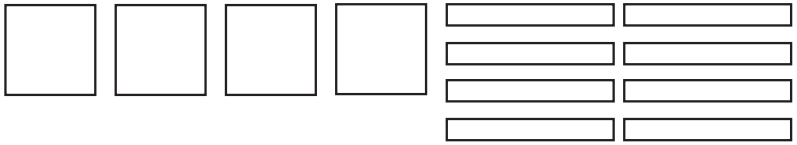
A small base-ten block has a value of $1/100$ or 0.01.

Example

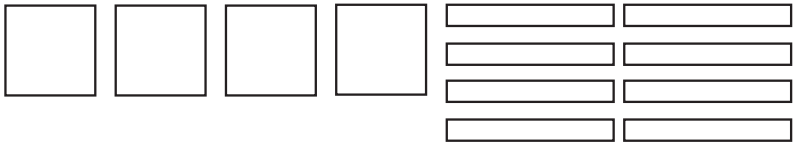
We can illustrate the following operation with base-ten blocks.

4.8 x 2

This can be shown with the base-ten blocks as two groups of 4.8:

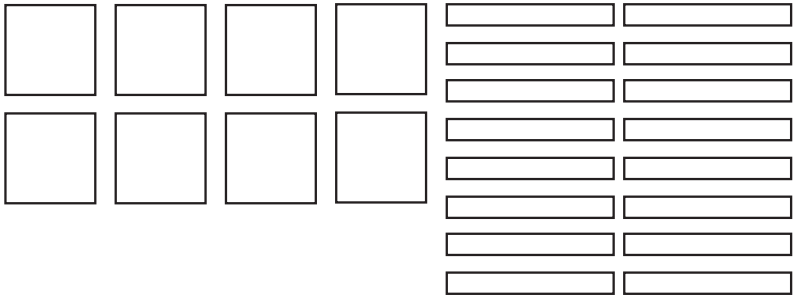


4.8



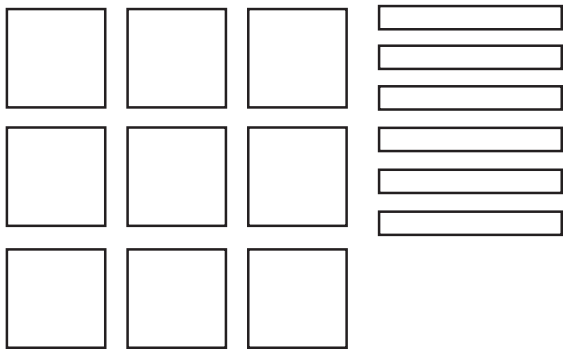
4.8

By combining the two groups – two groups of 4.8 – we get:



We now proceed by exchanging 10 long (0.1) blocks for one flat (1.0), just as we would do if there were no decimals involved (exchanging ten ones for one ten or ten tens for one hundred or ten hundreds for one thousand).

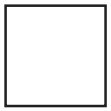
The answer would be 9.6, as shown below:



Pre-task: Multiplying a Decimal by a Whole Number

Present to the class the following information, both orally and visually:

The flat base-ten block has a value of 1.



The long base-ten block has a value of $\frac{1}{10}$ or 0.1.

The small base-ten block has a value of $\frac{1}{100}$ or 0.01.

Ask: "How would you use the base-ten blocks to solve each of the following?" Have students work together as a whole class.

a) 4.8 x 2 b) 7.3 x 8 c) 3.1 x 7
d) 7.34 x 7 e) 8.12 x 3

Share as a whole class the methods used and why they worked. Record the methods used on chart paper, the chalkboard, or an overhead and then discuss. Make up more questions and have students work in pairs or small groups to solve them and to explain the processes they used.

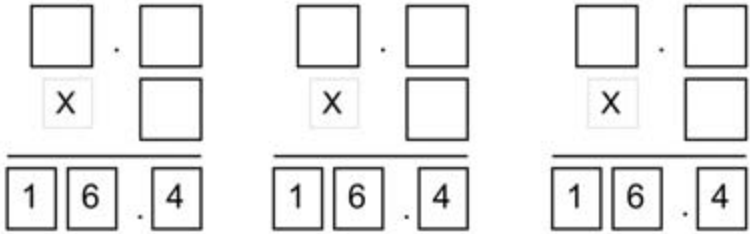
Exemplar Task

1. Distribute a copy of the Student Package to each student.
2. Tell students that they are to work independently to complete the assigned tasks and that it is essential that they use the base-ten blocks. (If you have an insufficient quantity of base-ten blocks, you may have to have groups of students work on the task at different times.)
3. Remind students about the rubric and make sure that each student has a copy.
4. The problem that the students will solve independently is provided in the worksheets in Appendix 1.

Appendix 1: Student Worksheets

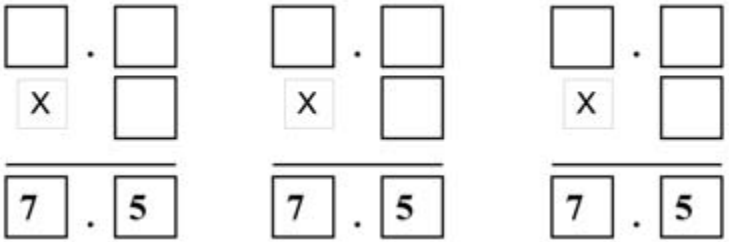
Jasmine and Luciano discovered some ancient mathematical problems where only the products could be seen. They wondered if it was possible to use the clues they had been given to figure out the original questions. For each of the following questions use base-ten blocks.

1. Find the numbers that, when multiplied, give the products shown.
   Use the blank space to show your work and to show any other combinations that would give you the same product.
   [Note: Do not put more than one digit inside a box.]



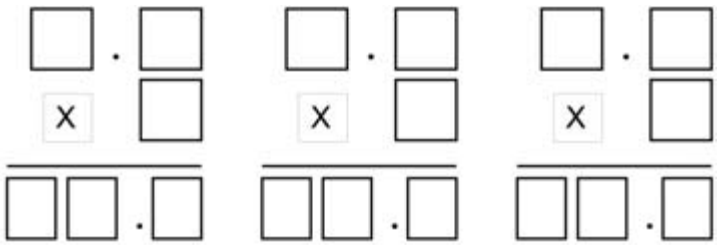
2. Explain what you did to find your solutions.

3. Here is another problem Luciano and Jasmine found.
   Use this information to find the numbers that, when multiplied, give the products shown.
   Use the blank space to show your work and to show any other combinations that would give you the same product.



4. Do you think some products can only be found in **one way**? Give reasons to justify your thinking.

   (You don't have to use all of the boxes in the product.)



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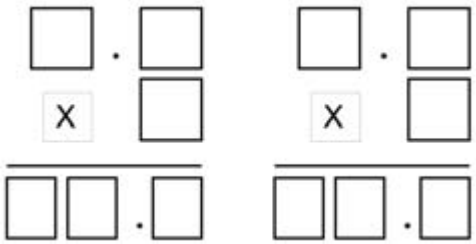
5. Is it possible to find a product that can only be found in **two ways**? Investigate showing all your work in the space below.
   (You don't have to use all of the boxes in the product.)



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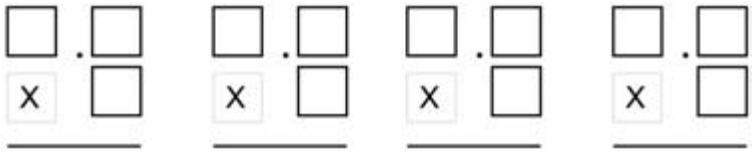
6. Jasmine and Luciano's classmates began to wonder if they could find a product that could be written in **four different ways** using the template shown below.

   a) Use the template below to investigate the question.
   [Note: Do not put more than one digit inside a box.]



b) Explain how you found the answer to this question.

7. a) Draw as many rectangles as you can with a perimeter of 12.8 cm.
   Draw the rectangles in such a way that one of the dimensions is always a whole number and the other dimension is not shorter than 1 unit.

   b) Find the areas of the rectangles you have drawn.
   What are some of the things you notice?