Multiplying with Base Ten Blocks

GOAL

Represent the products of two-digit numbers.

Rebecca is making a chart to record information about the 23 students in her class for her address book.

The chart has 23 rows of 11 cells.

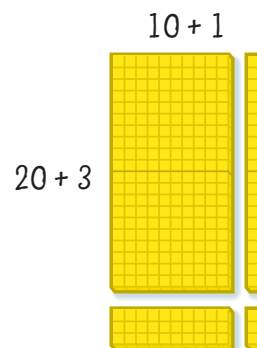| Given name	Family name	E-mail address
Brandon	Hughes	brandon@home.com
Jay	Lebeau	jay@home.com
Ami	Jin	ami@home.com

How many cells are in Rebecca's chart?

Rebecca's Solution

I'll use base ten blocks to calculate the number of cells.

• **Step 1** I'll model an array of 23 rows of 11 squares. To use the fewest blocks, I'll think of 23 as $20 + 3$ and 11 as $10 + 1$.

$10 + 1$

$20 + 3$

- **Step 2** The size of each part of the array is the product of the number of rows and columns.

$20 \times 10 = 200$
$20 \times 1 = 20$
$3 \times 10 = 30$
$3 \times 1 = 3$

- **Step 3** I'll add the four products to get the total product.

$$
\begin{array}{r}
11 \\
\times\, 23 \\
\hline
200 \quad (20 \times 10) \\
20 \quad (20 \times 1) \\
30 \quad (3 \times 10) \\
+\quad 3 \quad (3 \times 1) \\
\hline
253
\end{array}
$$

There are 253 cells in my chart.

Reflecting

A. Why might Rebecca have recorded her work like this?

$$
\begin{array}{r}
11 \\
\times\, 23 \\
\hline
23 \quad (23 \times 1) \\
+\, 230 \quad (23 \times 10) \\
\hline
253
\end{array}
$$

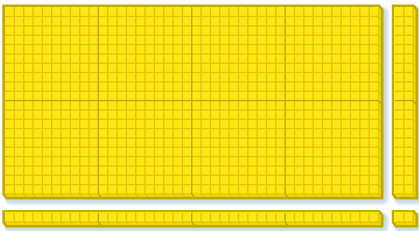**B.** Why did it make sense for Rebecca to build an array using the four parts she chose?

Checking

1. Calculate the number of cells in a chart with 15 rows of 22 cells. Use base ten blocks. Show the products of the parts that make up the total product.
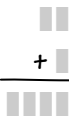
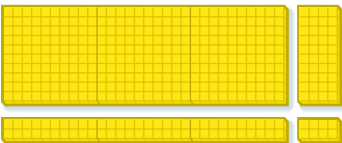**2.** Write the products of the four parts you would see if you modelled 17 × 25 using base ten blocks.

Practising

3. Calculate the number of cells in each chart.
    a) 16 rows of 12 cells
    b) 18 rows of 22 cells

4. Copy and complete the multiplication for each base ten model.

    a)

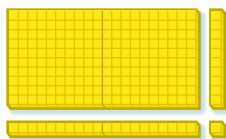$$\begin{array}{r} 42 \\ \times\, 21 \\ \hline 800 \\ 40 \\ \end{array}$$

$$+ \quad\quad\;$$

    b)

$$\begin{array}{r} 34 \\ \times\, 12 \\ \hline \end{array}$$

$$+ \quad\quad\;$$

5. a) What multiplication do these base ten blocks show?

    b) Calculate the product.

6. Calculate the number of squares in each array.
    a) 12 by 12   **b)** 11 by 22

7. Calculate, using a sketch of base ten blocks. Then estimate to see if each answer is reasonable.
    a) $13 \times 22 = e$ **c)** $25 \times 14 = g$
    b) $f = 18 \times 19$ **d)** $h = 31 \times 19$

8. The floor of a hall has 12 rows of 14 tiles. How many tiles cover the floor? Explain your thinking.

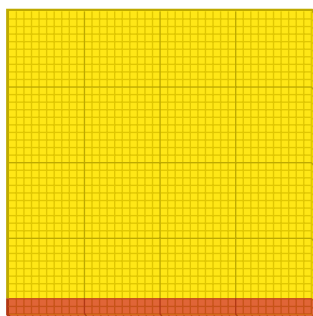**9.** Sketch a base ten block model for each calculation. Calculate each product.
   a) 21×28
   b) 27×22
   c) 16×25
   d) 15×23

10. Jessica exercised 25 min each day in March. For how many minutes, in total, did she exercise in March? Show your work.

MARCH						
Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

11. Ami multiplied 40 by 38 using this array.

   a) Why do you think Ami started with a 40×40 array?
   b) What did she subtract from 40×40 to calculate 38×40?
   c) Why might she have written her calculation as $38 \times 40 = (40 \times 40) - (2 \times 40)$?
   d) Complete Ami's work to calculate the product.

12. a) Create a problem that can be solved by multiplying two-digit numbers.
   b) Solve your problem.
   c) Explain how you know that your answer is reasonable.

13. Describe two strategies for multiplying 39×59.