

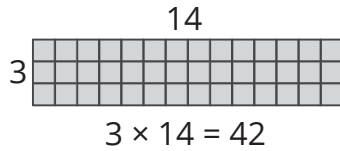
Dear parent or guardian: This is a summary of the key ideas your child is learning in mathematics. You can use this summary as background as you support your child's work.

3 Modelling Multiplication of Two-Digit Numbers

Modelling a Multiplication Calculation as the Area of a Rectangle

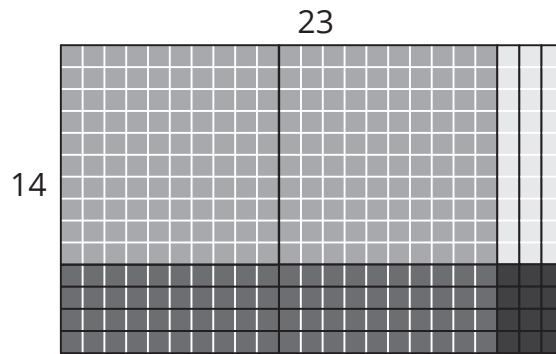
You can solve any multiplication calculation by thinking of the product as the area of a rectangle with the factors as its dimensions. This strategy works for small numbers and large ones.

For example, the product of 3×14 is the same as the area of a 3-by-14 rectangle.



The product of 14×23 is the same as the area of a 14-by-23 rectangle.

Instead of using all ones blocks to model the rectangle, you can use hundreds, tens, and ones blocks.



The area is 2 hundreds + 8 tens + 3 tens + 12 ones
 $= 200 + 80 + 30 + 12$
 $= 322$

In any two-digit multiplication, when neither factor is a multiple of 10, there will be four parts to the model. The parts are related to the number of tens and ones in the factors.

Modelling a Multiplication Calculation as the Area of a Rectangle (continued)

In the base ten block model of 14×23 :

- The number of hundreds blocks comes from multiplying the tens

$$10 \times 20 = 200, \text{ or } 2 \text{ hundreds}$$

- The number of ones comes from multiplying the ones

$$4 \times 3 = 12, \text{ or } 12 \text{ ones}$$

- The number of horizontal tens blocks comes from multiplying 4 ones by 2 tens

$$4 \times 20 = 80, \text{ or } 8 \text{ tens}$$

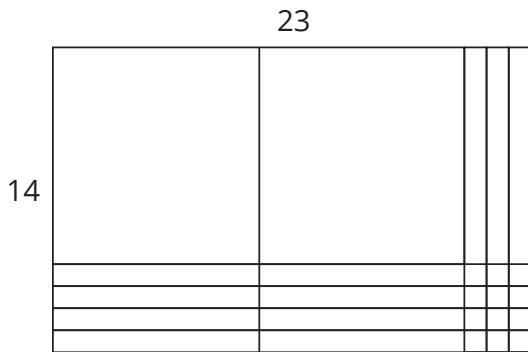
- The number of vertical tens blocks comes from multiplying 1 ten by 3 ones

$$10 \times 3 = 30, \text{ or } 3 \text{ tens}$$

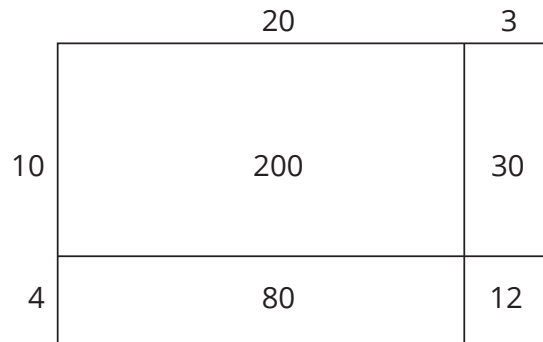
Recording the Multiplication

There are many ways to record a rectangle model.

For example, below are two models you could sketch for the base ten block model of 14×23 .



This sketch shows the 14-by-23 rectangle and all the blocks.



This sketch shows how the length and width have been broken up ($14 = 10 + 4$ and $23 = 20 + 3$) and the resulting four parts of the rectangle.

The proportions of the rectangles do not need to be exact. These are simple sketches for recording the important aspects of the model.

Estimating to Check Products

Estimating continues to be an essential part of any calculation to check the reasonableness of the answer.

There are many ways to estimate a product. It can be done before or after the calculation.

For example, 32×28 is about $30 \times 30 = 3 \times 3$ hundreds, or 900.

14×49 is about half of $14 \times 100 = 1400$, and half of 1400 is 700.

24×26 is about halfway between $20 \times 20 = 400$ and $30 \times 30 = 900$. That's about 650.

Notes

Conventional numeric procedures are introduced in the next lesson. This lesson focuses on modelling so that students can make sense of the symbolic process and recording.

Definitions

area: the amount of space in a 2-D shape; the number of 2-D units that cover a space; for example, a rectangle that is 2 units by 3 units has an area of 6 square units

dimension: a measurement of a 2-D or 3-D shape, such as length, width, or height; for example, a rectangle might have the dimensions 4 cm (width) and 5 cm (length)

factor: one of the numbers you multiply in a multiplication sentence; for example, in $2 \times 5 = 10$, 2 and 5 are factors

product: the result of multiplying; for example, in $3 \times 4 = 12$, 12 is the product