An *algorithm* is a set of steps used for solving a particular type of problem.

There are many different algorithms used to compute a product. These are three of our favorites.



EXAMPLE Compute 3×456.

The Distributive Property:

First, split 456 into 400+50+6. Distribute the 3 to the 400, to the 50, and to the 6.

$$3 \times 456 = 3 \times (400 + 50 + 6)$$

= $(3 \times 400) + (3 \times 50) + (3 \times 6)$
= $1,200 + 150 + 18$
= $1,368$

The Area Model: Find the area of a rectangle.

	400	50	6	1,200
	4 000	4=0	4.0	150
3	1,200	150	18	<u>+ 18</u>
				1,368

The Multiplication Algorithm:

Stack the two numbers as shown below, lining up the units digits.

Remember that the 5 in 456 stands for 5 tens (50), and the 4 in 456 stands for 4 hundreds (400).

Distributing the 3 gives three *partial products*: $3 \times 6 = 18$, $3 \times 50 = 150$, and $3 \times 400 = 1,200$. Stack the partial products so that the ones, tens, and hundreds digits line up, as shown below.

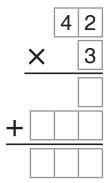
Finally, add the three partial products:

Look carefully at all three methods above. At the end of each, we add 18+150+1,200 to get 1,368. Each method gives a different way of organizing the same computations using the distributive property.

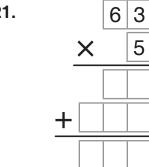
PRACTICE

Fill in the blanks in each computation below to find the product using the multiplication algorithm from the previous page.

20.



21.



22.

	1	5	4
	×		8
+			

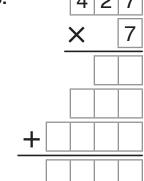
23

3.			2	3	9
		•	X		6
		_			
	+				

24.

		7	5	0
		×		5
	_			
+				

25.

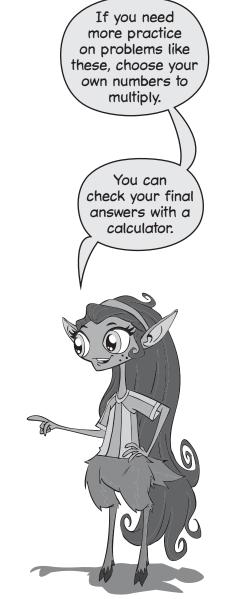


The Multiplication Algorithm

PRACTICE

Use the multiplication algorithm to find each product below. You will need to organize the work on your own. Be careful to line up the digits correctly.

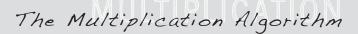
You can find more multiplication problems for practice at BeastAcademy.com.



Each product below is missing some information.

EXAMPLE

We can use
the given digits
in each problem
to fill in all of the
missing digits in
each product!

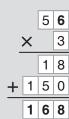


Fill each empty box on the right with the correct digit to complete the product.

The first partial product is 18. Since $3 \times 6 = 18$, the missing digit of the top number must be 6.

Then, we add the two partial products to get 18+150=168.

The complete diagram for the computation is shown to the right.



5

X

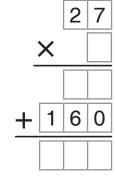
3

PRACTICE

Fill each empty box with the correct digit to complete each product.

32.

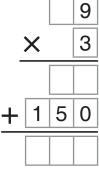
33.



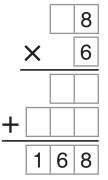
34.

	8	
×		4
	2	4
-		

35.



36.



37. ★

