

Multiply by 12's

Overview: Do you think you'll need to know how to multiply by 12 or 11 more? Think of it this way: How often do you need to figure out how many dozen you need of something? It comes up a lot more than needing to know how many batches of 11, doesn't it? That's because of the way we've decided to group things mathematically as a society.



Here's why: We picked 12 based on how we used to count on our fingers using the "finger segment" system. If you look at your hands, you'll notice that your index finger has three segments to it. So do your middle finger, ring finger, and pinkie. Since you have four fingers, you actually have 12 sections for counting with (we're not including your thumb, which is the pointer... your thumb rests on the section you're currently on). When your thumb touches the tip of your index finger, that means "1." When your thumb touches the middle segment, that's "2," and the base segment is "3." The tip of your middle finger is "4," and so on. That's how we came to use the 12-in-a-batch system.

If you're wondering why we didn't use the 24-in-a-batch system (because you have two hands), that's because one hand was for 1-12 and the second hand indicated the number of batches of 12. So if your left hand has your thumb on the ring finger's base segment (9) and your right hand has the thumb touching the index finger's middle segment (2 complete batches of 12, or 2×12), the number you counted to is: $24 + 9 = 33$.

Fortunately we now have calculators and a base-10 system, so this whole thing worked out well. But still the number 12 persists! So this is a very useful skill to have at your fingertips. It's very similar to the shortcut used when multiplying by 11, but it also involves some doubling. You'll find this is a really cool (and FAST) way to multiply by 12. And it's a lot faster than using the Babylonian finger-segment system. Try some problems on your own and check your work with a calculator.

Materials

- Pencil
- Paper

Activity: If you skipped over multiplying by 11's, stop and do it now. You'll find learning how to multiply by 12 builds on how you multiply by 11, and makes this lesson a whole lot easier to master.

Let's figure out $564 \times 12 = ?$

First, how many digits do you expect your answer to be? If you pretend the 12 is a 10, do you see how you get a four-digit answer? It's important to have an idea about how big of a number your answer should be before you start, so you can check or adjust your final answer before you finish.

To do this trick, we need the 564 to be a four-digit number, not a three-digit number (you'll see why in a moment). So put a zero at the front of the number, making it 0564.

Starting at the right side of the number, we double the 4: $(4 \times 2) = 8$. This is the ones digit for your answer.

8

Now double 6 and add the 4 from the ones place to your answer: $(6 \times 2) + 4 = 16$. The 6 is the tens digit for your answer. We will carry the 1 from the 16 to the hundreds place.

68

Your next step is to double the 5 and add 6. Don't forget to also add the 1 that carried over to get: $(5 \times 2) + 6 + 1 = 17$. Write the 7 for the hundreds digit and carry the 1 to the next digit over.

768

Now you'll see why we needed the zero at the front of the number. Double the 0 (that's easy), and add 5 and 1 (carried from the previous step): $(0 \times 2) + 5 + 1 = 6$. This is the thousands digit. And we are also happy our answer has four digits!

6,768

$$564 \times 12 = \underline{6,768}$$

If you're wondering if it might have been easier to just do the multiplication in the traditional way, remember that this is the first time you're doing this, so you can expect it to take longer than usual. With a little practice, you'll be able to multiply these numbers quickly in your head. When you get really good at this, you can do it starting at the front of the number because you'll be able to see when and if there are any "carries" in the problem.

Let's try another one so you can get good at this trick. $382 \times 12 = ?$

How many digits do you expect to have?

If you said four, you're right!

So first, put zero at the front: 0382

The first calculation you need to do is double the 2 to get the ones place digit: $(2 \times 2) = 4$

4

Next, double the tens digit and add the 8 and 2: $(8 \times 2) + 2 = 18$. Write the 8 for the tens digit.

84

Now double the hundreds digit 3 and add 8. Don't forget the carried 1. $(3 \times 2) + 8 + 1 = 15$. Write 5 for the hundreds digit and carry the 1.

584

Finally, double the 0 and add 3 and the carried 1 to get: $(0 \times 2) + 3 + 1 = 4$

4,584

$$382 \times 12 = \underline{4,584}$$

Now, it's your turn! Work out the exercises below. (You'll find answers at the back of this book.)

Exercises

1. 11×543

2. 12×45

3. 12×326

4. 12×769

5. 12×1345

6. 12×3461

7. 12×7532

8. 12×8989

9. 12×9999

10. 12×98749

Answers to Exercises: Multiply by 12's

1. 5,973
2. 540
3. 3,912
4. 9,228
5. 16,140
6. 41,532
7. 90,384
8. 107,868
9. 119,988
10. 1,184,988