The Magic of 11's

Overview: Here's our first lesson. It is so easy that one night, I wound up showing it to everyone in the pizza restaurant. Well, everyone who would listen, anyway. We were scribbling down the answers right on the pizza boxes with such excitement that I couldn't help it – I started laughing right out loud about how excited everyone was about math … especially on a Saturday night.

When you do this calculation in front of friends or family, it's more impressive if you hand a calculator out first to an unsuspecting friend, letting them know that you are "testing to see if the calculator is working right," Ask for a two-digit number and have them check the calculator's answer against yours.

Materials

- Pencil
- Paper

Activity
We're going to be able to multiply any two digit number by 11 magically in our head. At first, you'll want to use a paper and pencil, but you'll soon feel confident enough to do the entire calculation completely in your head. Here's the deal:

Let's figure out this one: 11 x 23 = ?

Take the 2 and 3 and spread them apart, so it looks like this: 2☐3
(That little box means "space", where you'll be placing a digit in a moment.)

Now add 2 + 3. Did you get 5?

Put the "5" in the box to get your answer: 11 x 23 = 253!

That's it! How cool is that?

Let's try another one: 11 x 45 = ?

First spread apart the 4 and 5, then add 4 + 5 to get 9.

Now put 9 between 4 and 5 to get 11 x 45 =495!

How about this one: 11 x 86 = ?

Spread apart the 8 and 6 like this: 8☐6

Now add 8 + 6 to get 14. But wait a second… is the answer 8146? That doesn't sound right, because the answer has to be a three-digit number, not four! So here's how to handle it: place the 4 in the box, and carry the 1 to the 8 and add it to make 9.

So 11 x 86 = 946!

What do you think is going to happen once you show this to your friends? If they're like *my* friends, then they're going to ask you to do the biggest two-digit number you can think of. So let's so that one right now:

What is 11 x 99?

The first step looks like this: 9☐9

Since 9 + 9 = 18, write the 8 in the box and carry the "1" and add it to the first 9 to get 10.

Your final answer is 11 x 99 = 1,089!

Let's try one last example: What is 11 x 78?

The first step looks like this: 7☐8

Add 7 + 8 to get 15, and write the "5" in the box. Where does that "1" go from the 15? Add it to 7 to get 8.

11 x 78 = 858!

Now it's your turn! Work out the exercises below.

Exercises

1. 11 x 11
2. 11 x 27
3. 11 x 43
4. 11 x 49
5. 11 x 50
6. 11 x 67
7. 11 x 79
8. 11 x 89
9. 11 x 92
10. 11 x 96

Going Further:

What is 11 x 213?

Before we start, how many digits do you expect your answer to have? If you pretend the 11 is a 10 and multiply the 213 by 10, we get a four-digit number. That tells us that our answer must have four digits.

Your first task is to space the first and last digits apart, this time with two spaces between them like this: 2 ☐☐3

Now we tackle this problem the same way we did the two-digit multiplication of 11's. The digit for the right box is found by adding the tens and ones together: 1 + 3 = 4. Now we have: 2 ☐4 3

The digit for the left box is found by adding the hundreds and the tens together: 2 + 1 = 3.

We get: 11 x 213 = 2,343

Let's try another! Can you figure out 11 x 124 = ?

First, spread apart the first and last digit, and add your two boxes like this: 1□□4

The digit for the right box is found by adding the tens and ones digits together: 2 + 4 = 6 which makes it: 1□64

You can figure out the digit for the left box by adding the digits from the hundreds and the tens together like this: 1 + 2 = 3.

Now we get the final answer of: 11 x 124 = 1364

Do you think you can figure out 11 x 444 without writing anything down? Try it now before turning the page.

If we were doing this on paper, first we'd write out 4□□4

The right box's digit is found by adding the tens and ones digits together: 4 + 4 = 8 to make 4□84

The digit in the left box is found by adding the hundreds and tens together: 4 + 4 = 8

Did you get 11 x 444 = 4884? Great!

Let's try a slightly harder one: 11 x 456 = ?

First, write the first and last digit out like this: 4□□6

The digit in the right box is found by adding the tens and ones digits together, which is: 5 + 6 = 11. But oh, no! We can't put two digits in a box, remember? So what can we do?

Simple! Place the ones digit (1) in the box and carry the tens digit (which also happens to be a 1) one place up, like this: 4□16

The left box's digit is found by adding not only the hundreds and tens together, but also that carried over 1 to get: 4 + 5 + 1 = 10. Uh-oh! Another two-digit answer.

So we have to carry the 1 one spot to the left and leave the zero in the left box. Adding the 1 to the hundreds digit gives 4 + 1 = 5, so your final answer is:

Therefore, 11 x 456 =5,016 (Whew!)

Now let's figure this one out: 11 x 789 = ?

First write 7☐☐ 9

The digit for the right box is found by adding 8 + 9 = 17. Place the 7 in the right box and carry 1 to the left box. Just put a little tick mark above the box so you can remember it's there.

The left box's digit is found by adding 7 + 8 + 1 (carried forward) = 16. Put the 6 in the left box.

Add the 1 to the 7 to get 8.

Final answer: 11 x 789 = 8,679 *Ta-daa!*

Of course, once the word gets out that you are an absolute genius when it comes to multiplying three-digit numbers by 11, some big kid is going to challenge you with this one, so why not do it now?

See if you can figure out 11 x 999 before reading further…

Did you get 10,989?

Here are the steps…

First write (or think): 9☐☐ 9

Now the digit for the right box is found by adding the ones and tens digits together: 9 + 9 = 18. Write the 8 in the right box and carry the one 1 to the left box: 9☐ 89

The digit for the left box is found by adding together the hundreds and tens together (which happens to all be the same number in this problem, but try to keep it straight): 9 + 9 = 18 + 1 (carried forward) = 19. Write 9 in the left box.

The 1 is carried over to the leftmost digit (in the thousands place) and added to the 9 to get 10.

11 x 999 = 10,989!

Now it's your turn! Work out the exercises below.

Exercises

1. 11 x 163
2. 11 x 235
3. 11 x 345
4. 11 x 479
5. 11 x 659
6. 11 x 748
7. 11 x 997
8. 11 x 982
9. 11 x 873
10. 11 x 769