How to Square Bigger Numbers

Overview: Squaring three-digit numbers is one of the most impressive mental math calculations, and it doesn't take a whole lot of effort after you've mastered two-digit numbers. It's like the difference between juggling three balls and five balls. Most folks (with a bit of practice) can juggle three balls. Five objects, however, is a whole other story (and *WOW* factor).

Once you get the hang of squaring two-digit numbers, three-digit numbers aren't so hard, but you have to keep track as you go along. Don't get discouraged if you feel a little lost. It's just like anything you try for the first time. When you're new at something, in the beginning you aren't very good at it. But with practice, these steps will become second nature and you'll be able to impress your friends, relatives, *and* math teachers.

Materials

- Pencil
- Paper

Activity: Make sure you're comfortable with squaring two-digit numbers before attempting this!

We're going to use a nifty little formula that works well for mental calculations.

$$A^2 = (A + d)(A - d) + d^2$$

What is 49^2 = ?

We're going to find an easier number that's close to 49 to work with. How about 50?

So *A* = the original number, and *d* is the distance from the original number to the "easier" number.

For our example, d = 50 – 49 = 1.

(A + d) = 50

(A – d) = 48

$d^2 = 1$

So now the problem becomes: 50 x 48 + 1

Let's work with this a little: What is 5 x 48? Multiply from left to right to get 240. (5 x 4 = 20, and 5 x 8 = 40, and when you add a zero to the end of the 20 (because it's in the tens place), you get the easy problem of 200 + 40 = 240.)

It's a simple step to finish the problem: 5 x 48 = 240, but remember it was 50 x 48, so add a zero to 240 to get 2,400. The last step is to add the d^2 term to get $49^2 = 2{,}401$.

Try solving this one before turning the page: $86^2 = ?$

I picked the "easy" number to be 90 (although you could have also picked 100). So for me, d = 4.

Using the formula, we have:

(A + d) = (86 + 4) = 90

(A - d) = (86 – 4) = 82

$d^2 = 16$

Multiply 90 x 82 like this: Start with 9 x 82 = (9 x 8) x 10 + 18 =720 + 18 = 738.

Adjust it so that it's 90 x 82 = 7,380 and add the $d^2 = 16$ term to get the final answer: 7,396.

$86^2 = 7{,}396$!

What is $186^2 = ?$

There are two good choices for "easy" numbers to choose: 200 and 100. I'll pick 100 (both will give you the same answer).

If we use 100, then d = distance between the two numbers: 186 – 100 = 86.

(A + d) = (186 + 86) = 272 (use the addition trick we've covered in a previous lesson)

(A - d) = (186 – 86) = 100

$d^2 = 862$, which we already figured out to be 7,396.

Now we'll figure out 272 x 100 = 27,200.

If we hadn't already known the solution to 86^2, you can do it quickly now using the simpler version of squaring two-digit numbers.

$186^2 = 27{,}200 + 7{,}396 = 34{,}596$

$186^2 = 34{,}596$!

What is $936^2 = ?$

Try to work this out in the space below before turning the page!

I'm going to pick the "easy" number be 900, so d = 36.

What is 36^2? Well, remember you can multiply the 3 x 6 = 18, double it to get 36, and add a zero for 360. Now work with squaring the 3 to get 09, and the 6 to get 36 and smoosh them together to get 0936. Add 0936 to 360 to get $36^2 = 1{,}296$.

(A + d) = (936 + 36) = 972

(A – d) = (936 – 36) = 900

$d^2 = 1{,}296$

Now multiply 900 x 972 like this: 9 x 972 =? (Do your multiplication from left to right!) 9 x 972 = 8,748. Add two zeros to the end, since we're multiplying by 900 and not just 9 to get: 874,800 and add the $d^2 = 1{,}296$ term.

Before you add the $d^2 = 1{,}296$ term, look at it carefully. Do you notice how 1,296 is really close to 1,300?

So try adding it like this:

874,800 + 1,300 - 4 = 876,096

Therefore $936^2 = 876{,}096$!

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

Exercises

1. 93^2
2. 193^2
3. 979^2
4. 249^2
5. 415^2
6. 84^2
7. 573^2
8. 333^2
9. 757^2
10. 696^2

Answers to Exercises: How to square bigger numbers

1. 8,649
2. 37,249
3. 958,441
4. 62,001
5. 172,225
6. 7,056
7. 328,329
8. 110,889
9. 573,049
10. 484,416