

How to Multiply Two Numbers in the 20's, 30's, 40's etc

On November 14th I wrote about a trick for multiplying any two numbers in the teens. It went like this:

I take one of the numbers and add on the unit's digit from the other number. It doesn't matter which number I choose, $17 + 4 = 21$ and $14 + 7 = 21$, I get the same answer either way.

Now I attach a "0" to this answer to get 210.

I multiply the two units digits 4×7 to get 28, and add this on to 210 to get the answer 238.

Now, for today, I will extend this to two numbers in the 20's, 30's, 40's etc. And, of course, I will add the proof of why it works.

How to multiply two numbers in the twenties like 27 x 24.

I take one of the numbers and add on the unit's digit from the other number. It doesn't matter which number I choose, $27 + 4 = 31$ and $24 + 7 = 31$, I get the same answer either way.

Now I **double** this and then attach a "0" to this answer to get 31 doubled = 62 and attach a "0" to get 620.

I multiply the two units digits 4×7 to get 28, and add this on to 620 to get the answer 648.

Here is the proof:

Each number in the twenty's can be written as $(20 + a)(20 + b)$. So in our example $a = 7$ and $b = 4$

Multiplying out, I get $400 + 20a + 20b + ab$, now factor out a 20 from each of the first 3 terms:

$20(20 + a + b) + ab$, and write the lead 20 as 2×10 and we get:

$2 \times 10(20 + a + b) + ab$, and now let's observe. Inside the bracket I have $(20 + a + b)$, so that is the first number with the one's digit of the second number added, or I have $(20 + b + a)$ which is the second number with the one's digit of the first number added. I then **double** this " $2 \times$ " and multiply by 10 by attaching a "0". Finally I add on " ab ", which is the product of the units' digits of each number.

How to multiply two numbers in the 30's like 36 x 32.

I take one of the numbers and add on the unit's digit from the other number. It doesn't matter which number I choose, $36 + 2 = 38$ and $32 + 6 = 38$, I get the same answer either way.

Now I **triple** this and then attach a "0" to this answer to get 38 tripled = 114 and attach a "0" to get 1140.

I multiply the two units digits 6×2 to get 12, and add this on to 1140 to get the answer 1152.

Here is the proof:

Each number in the twenty's can be written as $(30 + a)(30 + b)$. So in our example $a = 6$ and $b = 2$

Multiplying out, I get $900 + 30a + 30b + ab$, now factor out a 30 from each of the first 3 terms:

$30(30 + a + b) + ab$, and write the lead 30 as 3×10 and we get:

$3 \times 10(20 + a + b) + ab$, and now you can see where this is going. The proofs are the same, the only thing that will change each time is do I multiply by 2 or 3 or 4 or 5, etc.

Experiment with this, try: 48×43 , 59×54 , 62×67 and so on.