

It Was the Best of TIMES...

My *LITTLE* Book of **big** Multiplication Tricks

Mike McCabe

The Quick Response (QR) Code

1. You will need to download an app from your smartphone.
2. Once you have it downloaded, follow the instructions on your phone. Just scan the QR code and the link should appear on the smartphone.
3. Apps that you may consider are:

iPhone	Scan (Free), Quickmark (\$1), Optiscan (\$2)
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Multiplying by 2

Multiplying by 2 is the simplest concept of “**doubling**”. Students come to multiplying with an understanding of doubling. They have played clapping games, skipping games, they know rhymes and songs that reinforce these concepts. This is also the basis for a number of the strategies such as multiplying by 4 and 8).

What should be reinforced:

When the doubling requires “regrouping”, the students tend to have more difficulty i.e., $16 \times 2 = ?$. We can assist students by providing more than one strategy (apart from the traditional method). We can have students say:

Example:

Distributive:

$$(10 \times 2) + (6 \times 2) =$$
$$20 + 12 = 32$$

Or... Using more common facts

$$(15 \times 2) + 2 =$$
$$30 + 2 = 32$$

We can also reinforce the common doubles (such as $16 \times 2 = 32$ and $48 \times 2 = 96$) through repetition and the strategy mentioned above, namely, **distributive**:

$$48 \times 2 = (40 \times 2) + (8 \times 2).$$

Practice:

	9x2	27x2	132x2
First strategy used (memory, distributive, using simpler facts, other...)			
Second strategy used (memory, distributive, using simpler facts, other...)			

Doubling and Halving

This strategy is used when multiplying numbers. It is done by halving one number and doubling another number and is especially good for circumstances when the half of a number is easily recognized.

Example #1: $42 \times 50 =$

Steps:

- A. Take the two numbers you are multiplying (e.g. 42×50)
- B. Think one-half of 42 is 21, and
- C. Think 50 doubled is 100.
- D. Now multiply the two new numbers. Therefore, 21×100 is 2,100.

Example #2: $4.5 \times 2.2 =$

- A. Think double 4.5 to get 9
- B. Think one-half of 2.2 is 1.1.
- C. Now multiply the two new numbers. Therefore $9 \times 1.1 = 9.9$

Practice

Steps	36 x 4	22 x 35
A. Take the two numbers you are multiplying B. Double one of the numbers and half the other one. C. Now multiply the two new numbers.		

How it Works: Because we are doing opposite things to the two numbers (doubling one and halving the other), it keeps the question essentially the same. All we are doing is manipulating the numbers to find numbers that are easier to work with mentally and on paper.

Multiplying by 3

(Are these numbers multiples of 3?)

Steps:

Add all up all the digits of the product until you have a single digit (This is called the **digit sum**). If that number is divisible by 3, so is the original number.

Example #1: **8787 ÷ 3 = ?**

$$8 + 7 + 8 + 7 = 30$$

$$3 + 0 = 3$$

3 is divisible by 3, therefore 8787 is also divisible by 3

Example #2: **360745 ÷ 3 = ?**

$$3 + 6 + 0 + 7 + 4 + 5 = 25$$

$$2 + 5 = 7$$

7 is not divisible by 3, therefore 360745 is not divisible by 3 either

Example #3: **2340 ÷ 3 = ?**

$$2 + 3 + 4 + 0 = 9$$

9 is divisible by 3, therefore 2340 is also divisible by 3

Practice:

Are these numbers multiples of 3?

	26	4536	235963
Add digit sum...			
Is the digit sum a multiple of three?			

Multiplying by 4

When multiplying by 4, it simply means multiply by 2 and then multiply by 2 again or double, double (The Tim Horton's strategy). Whenever we multiply by 4 take the number and double it, then double it again.

Example #1: $16 \times 4 =$

Double 16 = 32

Double 32 = 64

Example#2: $215 \times 4 =$

Double 215 = 430

Double 430 = 860

Example # 3: $1546 \times 4 =$

Double 1546 =

$(2 \times 1000) + (2 \times 500) + (2 \times 40) + (2 \times 6) =$

(distributive property)

Practice:

	26 x 4	123 x 4	532x 4
Double			
Double again (Did you use the distributive property?)			

Multiply by 5

To multiply by 5, you must understand that multiplying by 5 is the same as multiplying by 10 and dividing by 2.

$$10 \div 2 = 5 \quad \text{or} \quad \div 2 \times 10 = 5$$

Example #1: **88 x 5 =**

Steps:

These steps can be done in reverse order depending upon the question = communicative property.

- A. Divide the number by two \rightarrow $88 \div 2 = 44$
- B. Multiply by 10 \rightarrow $44 \times 10 = 440$

Example #2: **25 x 5 =**

Steps:

Steps are reversed from above.

- A. Multiply by 10 \rightarrow $25 \times 10 = 250.$
- B. Divide the number by two \rightarrow $250 \div 2 = 125$

Practice:

	28×5	123×5	484×5
$\times 10$ $\div 2$ (or you could do these in reverse order)			

Multiplying an Even Number by 6

This trick only works for multiplying 6 by **even** numbers.
See **note** below for odd numbers

Example #1: $6 \times 8 =$

Steps:

A. Take the second number in the equation (8) and move it to the one's column.

$$6 \times 8 = _ _ 8$$

B. Half the second number in the equation ($8 \div 2 = 4$) and move it to the ten's column

$$6 \times 8 = 48$$

Example #2: $6 \times 24 =$

Steps:

A. Take the ones column from the second number in the equation (that's the 4 from 24) and move it to the one's column

$$6 \times 24 = _ _ 4$$

A. Half the second number in the equation ($24 \div 2 = 12$) and move it to the ten's column BUT you must add the 2 that is already in the tens column. Therefore, $12 + 2 = 14$

$$6 \times 24 = 144$$

Note: To use an odd multiple of 6, i.e., 6×25 , all you have to do is 6×24 then add 6.

Practice:

	6 x 6	32 x 6	84 x 6
Write down the number you are multiplying by (if it is greater than 10, regroup the 10's column)			
Take half of the number you just wrote down and put it in the tens column (add the regrouped number to this)			

Multiplying by 8

$$8 = 2 \times 2 \times 2$$

When multiplying by 8, it simply means double, double, double. Whenever we multiply by 8 take the number, double it, double it again then double it again.

Example #1: **9 x 8 =**

double 9 = 18

double 18 = 36

double 36 = 72

As with the **x4**, you will need practice with some common double facts. This can be learned using distributive properties.

Example #2: **16 x 8 =**

double 16 = 32

double 32 = 64

double 64 = (60 x 2) + (4 x 2)

 = 120 + 8

 = 128

Practice:

	24 x 8	103 x 8	431x 8
Double			
Double again (Did you use distributive property?)			
Double again (Did you use distributive property?)			

Multiplying by 9

Multiplying by 9s provides so many opportunities for recognizing patterns.



Pattern #1

When you add the digit sum of any multiple of 9, it **always** equals 9. So...

= 09	= 9
= 18	= 9
= 27	= 9
= 36	= 9
= 45	= 9
= 54	= 9
= 63	= 9
= 72	= 9
= 81	= 9
= 90	= 9

Example #1

$$123 \times 9 = 1107 \quad \boxed{1+1+0+7} + 7 = 9$$

Example # 2

$$3245 \times 9 = 29,205 \quad \boxed{2+9+2+0+5} + 2 + 0 + 5 = 18, \\ \text{and } 1 + 8 = 9$$

Practice:

	16 x 9	103 x 9	431 x 9
Multiply			
Find the product sum			
Is the number a multiple of nine?			

Multiplying by 9

Pattern #2

When you multiply a single digit by 9, simply write a number that is one less than the number you are multiplying

by 9; i.e. $8 \times 9 = 7?$ (because 7 is one less than 8).

Now add whatever you need to the 7 to make a total of 9.

$$\text{i.e. } 7 + ? = 9$$

$$7 + \mathbf{2} = 9$$

$$\text{Therefore, } 8 \times 9 = 72$$

$$1 \times 9 = 09$$

$$2 \times 9 = 18$$

$$3 \times 9 = 27$$

$$4 \times 9 = 36$$

$$5 \times 9 = 45$$

$$6 \times 9 = 54$$

$$7 \times 9 = 63$$

$$8 \times 9 = 72$$

$$9 \times 9 = 81$$

$$10 \times 9 = 90$$

Multiplying by 9 Using Finger Tricks

Because we need a digit sum of 9 when multiplying by 9, we can use our fingers.

Steps:

1. Hold your two hands in front of you so you are looking at the back of your hands and your thumbs are touching. Counting from left to right, number your fingers 1,2,3,...10.

2. When you multiply, 3×9 , fold down digit 3 (that should be your left middle finger- see diagram below).



3. Count the number of fingers to the left of the downed finger. This is your 10's column. In this case you should have 2 in the tens column = 2_.
4. Now count the fingers to the right of the downed finger. This is your ones column. In this case you should have 7 in the ones column = 27

Practice:

	Tens Column (Number of fingers to the left of the downed finger)	Ones Column (Number of fingers to the right of the downed finger)
$4 \times 9 =$		
$7 \times 9 =$		

Fun Trick

Here's a trick you can do using your "x 9" facts.

Steps:

- A. Choose a number between 1 and 10 (let's choose 7)
- B. Multiply that number by nine ($9 \times 7 = 63$)
- C. Add the two digits of your number ($63 = 6+3= 9$)
- D. Subtract five ($9 - 5 = 4$)
- E. Find the corresponding letter of the alphabet (A=1; B=2; C=3; D=4...)
- F. Think of a country that begins with that letter. (most people choose Denmark)
- G. Think of an animal that begins with the second letter of the country (most people choose Elephant)
- H. Think of the colour of the animal (grey)

Once your friends are finished, tell them that :

GREY ELEPHANTS DO NOT LIVE IN DENMARK!

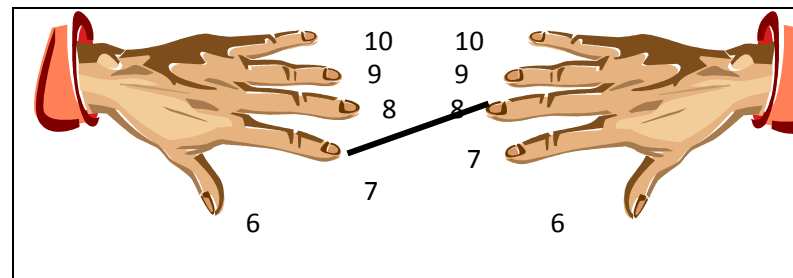
Multiplying Single Digits Finger Tricks (Dactylonomy)

This strategy could be used for multiplying from 6×6 to 10×10 . Please see accompanying diagram below.

KEEP THUMBS AT THE POINTED DOWNWARD FOR ALL CALCULATIONS.

Steps:

- A. Number thumbs = 6,
Index fingers = 7,
Tommy Tall = 8,
Ring man = 9
Pinkie = 10...
- B. Put digits together for question, ex., 7×8 , touch index finger on one hand to Tommy tall on the other hand (see line connecting the two below).
- C. For the tens column:
Count the two touching fingers and any finger below them. this example = 5_
- D. For the ones column:
Multiply the number of fingers above the touching fingers on the left hand x the number of fingers above the touching fingers on the right hand. In this example,
 $3 \times 2 = 6$ Therefore, $7 \times 8 = 56$



Practice

Steps	9 x 6 =	6 x 7 =
<p>Touch the two fingers together (remember, thumbs at the bottom)</p> <p>Tens Column: (Count the number of fingers touching and below the touching fingers)</p> <p>Ones Column: (Multiply the fingers above the touching fingers)</p>		

Multiplying by 11

You can use this to understand how to separate concepts. This can expand and be used for multiplying, ex., 11 X 378976 etc.

Steps:

A. Single digit answer

Ex. 1

$$11 \times 72 = (\text{separate } 7 \underline{\quad} 2)$$

Hundreds ↗ ↘ Ones

B. Now add the numbers that are beside each other.

$$7 + 2 = 9 \leftarrow \text{tens}$$



$$11 \times 72 = 792$$

Ex 2.

$$11 \times 5432 = 5 \underline{\quad} \underline{\quad} \underline{\quad} 2$$

Now add the numbers that are beside each other.

$$4 + 5 = 9$$

$$3 + 4 = 7$$

$$2 + 3 = 5$$

Therefore the answer is 5972

Regrouping

$$11 \times 77 = (\text{separate } 7 \underline{\quad} 7)$$

Hundreds ↗ ↘ Ones

$$(7 + 7) = 14 \text{ (regroup)}$$

(add the 1 to hundreds) ↗ ↘ (tens)

$$11 \times 77 = (7 + 1) 4 7$$

$$11 \times 77 = 847$$

12 x Tables:

Using Equivalent Fractions to $\frac{1}{2}$

Steps:

- When multiplying a number by 12, take the number that you are multiplying (ex. 8) and find its equivalent fraction to $\frac{1}{2}$ (ex.. $\frac{8}{16}$).
- Add the numerator to the tens column of the denominator($8 + 1 = 9$).
- The answer in Step B. becomes the tens column and The ones in the denominator becomes the ones column.(= 96).

Therefore, $12 \times 8 = \frac{8}{16} = 8 + 1 = 9$, followed by 6.

$$12 \times 8 = 96$$

This can be used with three-digit denominators or numerators as well.

Examples:

$$12 \times 3 = \frac{3}{6} = 36$$

$$12 \times 6 = \frac{6}{12} = 72 \text{ (add the 6 \& 1)}$$

$$12 \times 7 = \frac{7}{14} = 84 \text{ (add the 7 \& 1)}$$

$$12 \times 11 = \frac{11}{22} = 132$$

$$12 \times 12 = \frac{12}{24} = 144$$

$$12 \times 31 = \frac{31}{62} = 372 \text{ (add the 31 \& 6)}$$

$$12 \times 47 = \frac{47}{94} = 564$$

$$12 \times 70 = \frac{70}{140} = 840 \text{ (add the 70 \& 14)}$$

Practice

	$11 \times 36 =$	$11 \times 4532 =$	$11 \times 4785 =$
Separate the first and last digit			
Now add the numbers that are beside each other. (remember to regroup if necessary)			
Write the final answer			

Practice

Steps	12 x 36	12 x 45	12 x 150
A. Find an equivalent fraction to $\frac{1}{2}$ using the number you are multiplying as the numerator.			
B. Add the numerator to the tens column of the denominator.			
C. The answer in Step B. becomes the tens column and the ones in the denominator becomes the ones column.			
D. Write the final answer			

Multiplying two numbers between 11 and 19

Example #1: $19 \times 13 =$

Steps:

A. Write the larger of the two numbers above the smaller number.

$$\begin{array}{r} 19 \\ \times 13 \\ \hline \end{array}$$

B. Add the larger number to the ones column of the smaller number. Multiply this sum by 10 (add a zero).

$$19 + 3 = 22$$

$$22 \times 10 = 220$$

C. Next, multiply the two numbers in the ones column of the original question.


$$9 \times 3 = 27$$

D. Add the solution of Step B to the solution found in Step C. This number is the answer to your original multiplication question.

$$220 + 27 = 247$$

Practice:

<p>Steps:</p> <p>A. Write the larger of the two numbers above the smaller number.</p> <p>B. Add the larger number to the ones column of the smaller number. Multiply this sum by 10 (add a zero).</p> <p>C. Next, multiply the two numbers in the ones column of the original question.</p> <p>D. Add the solution of Step B to the solution found in Step C. This number is the answer to your original multiplication question.</p>	<p>18 x 14 =</p>	<p>15 x 12 =</p>
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<p>Multiplying Two-Digit Numbers Where the Tens Digits are the Same and the Ones Digits Have a Sum of Ten</p>	
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Example #1: **42 x 48 =**
 (tens digits are the same and the ones add to ten)

Steps:

- A. Multiply the number in the tens column by the next consecutive number (in the example above, $4 \times 5 = 20$). That makes the first two digits of your answer. 20__
- B. Check to make sure that the digits in the ones column, when added together, have a sum of 10 ($2 + 8 = 10$). Then multiply those two numbers together ($2 \times 8 = 16$).
 - This makes the last two digits of your answer.
 - $42 \times 48 = 2016$

Answer: $42 \times 48 = 2016$

Example #2: **64 x 66 =**

Steps:

- A. $6 + 1 = 7$. Therefore $6 \times 7 = 42$
- B. $6 + 4 = 10$. Therefore $6 \times 4 = 24$
- C. Answer: 4224

Practice

Steps	$27 \times 23 =$	$75 \times 75 =$
<p>A. Multiply the number in the tens column by the next consecutive number. That makes the first two digits of your answer.</p> <p>D. Check to make sure that the digits in the ones column, when added together, have a sum of 10 Then multiply those two numbers together.</p> <p>E. This makes the last two digits of your answer.</p>		

Multiplying Two-Digit Numbers that End in 1

Steps:

- A. Multiply the digits in the "tens" column together.
- B. Add a 0 (multiply by 10) after the product obtained in Step A.
- C. Add the digits in the "tens" columns together.
- D. Add the sum of the number obtained in Step C. to the number found in Step B.
- E. Put on a one (1) in the ones column.

Example #1: **$61 \times 51 =$**

- A. $6 \times 5 = 30$
- B. 300
- C. $6 + 5 = 11$
- D. $300 + 11 = 311$
- E. 3111

Example #2: **$41 \times 81 =$**

- A. $4 \times 8 = 32$
- B. 320
- C. $4 + 8 = 12$
- D. $320 + 12 = 332$
- E. 3321

Practice

Steps	$91 \times 31 =$	$71 \times 71 =$
<p>A. Multiply the digits in the "tens" column together.</p> <p>B. Add a 0 (multiply by 10) after the product obtained in Step A.</p> <p>C. Add the digits in the "tens" columns together.</p> <p>D. Add the sum of the number obtained in Step C. to the number found in Step B.</p> <p>E. Put on a one (1) in the ones column.</p>		

Multiplying Two-Digit and Three-Digit Numbers by $7 \times 11 \times 13!$

This trick makes you look like your brain is a mega calculator! (And it is!)

Three Digit Numbers:

- A. Ask a friend to write down ANY three digit number (e.g. 231 or 884)
- B. Ask them to multiply the number $\times 7 \times 11 \times 13$ (e.g. $231 \times 7 \times 11 \times 13$)
- C. All you do is write out the beginning number twice! So 231 will become 231231 and 884 will become 884884.

Two Digit Numbers:

- A. Ask a friend to write down ANY two digit number(e.g. 52 or 21)
- B. Ask them to multiply: number $\times 7 \times 11 \times 13$ (e.g. $52 \times 7 \times 11 \times 13$)
- C. All you do is write out the starting number twice with a 0 in between! So 52 will become 52052 and 21 will become 21021.

Practice

Steps	435	28
A. Ask a friend to write down ANY three digit (or two digit) number		
B. Ask them to multiply the number x 7 x 11 x 13		
C. All you do is write out the beginning number twice! (For the two digit number write out the starting number twice with a 0 in between)		

Difference of Squares

Soon, in algebra, you will be introduced to the “Difference of Squares”. It is described in short form below.



Steps:

- Recognize two numbers that you are multiplying have a middle number, ex., 9×7 , (the middle number is 8). Or 24×26 , the middle number is 25.
- Take the middle number and multiply it by itself ex., 8^2 or 25^2
- Subtract 1 from the answer.

Example #1: $11 \times 13 =$

Steps

- 12 is the middle number.
- $12 \times 12 = 144$
- $144 - 1 = 143$. Therefore, $11 \times 13 = 143$

Example #2: $199 \times 201 =$

Steps

- 200 is the middle number.
- $200 \times 200 = 40\,000$
- $40\,000 - 1 = 39\,999$

Practice

Steps	$8 \times 6 =$	99×101
<p>A. Recognize two numbers that you are multiplying have a middle number.</p> <p>B. Take the middle number and multiply it by itself.</p> <p>C. Subtract 1 from the answer in step B.</p>		=