

# Marvelous Math Tricks

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## Krypto

Challenging card game available from Dale Seymour Publications, P.O. Box 10888, Palo Alto, CA 94303-0879. Telephone 800-872-1100

## Math Facts in Five Minutes a Day

### Adding by Endings

Use this technique with column addition. You will need a red pen. Begin adding each column from top to bottom. Whenever you reach a two-digit sum, make a red dot for the ten and keep the ending (the ones) in your mind. At the bottom of the column, write down the number left in your head and count the dots for the number to carry.

### Casting 9's

Use to check addition, subtraction, multiplication and division. Directions in handout.

### Gelosia Multiplication

Challenge children to do *big* multiplication problems. Directions in handout.

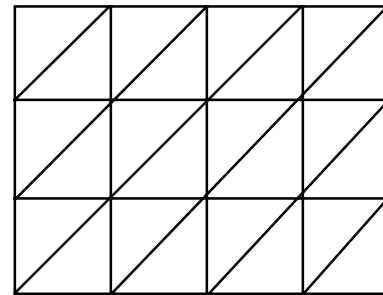
Add by endings:

$$\begin{array}{r} 35,263 \\ 82,914 \\ 74,635 \\ 65,033 \\ 91,943 \\ 28,602 \\ \hline +15,355 \end{array}$$

Cast 9's for practice:

$$\begin{array}{r} 47 \quad \_ \\ 255 \quad \_ \\ 819 \quad \_ \\ 3,212 \quad \_ \\ 4,531 \quad \_ \\ 9,306 \quad \_ \\ 38,267 \quad \_ \\ 846,787 \quad \_ \end{array}$$

Multiply with Gelosia method:  
4,265 x 921



Cast 9's to check:

$$\begin{array}{r} 468 \\ +327 \\ \hline 795 \end{array}$$

$$\begin{array}{r} 833 \\ \times 532 \\ \hline 443,156 \end{array}$$

$$\begin{array}{r} 692 \\ -325 \\ \hline 367 \end{array}$$

$$\begin{array}{r} 1,243 \\ -746 \\ \hline 497 \end{array}$$

$$\begin{array}{r} 483 \\ 75 \overline{)36,225} \end{array}$$

## Gelosia Multiplication

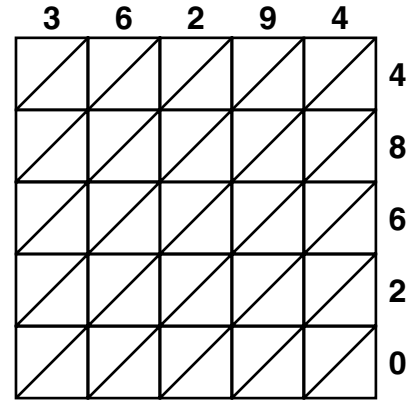
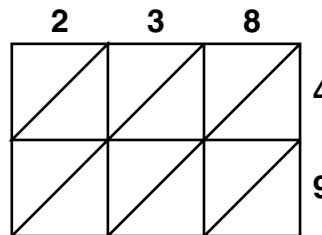
The Gelosia method of multiplication predates the common algorithm. It is useful for doing very large multiplication problems. Students who can multiply large numbers feel quite confident to solve the smaller problems usually required of them. This handout will demonstrate the use of the Gelosia method to solve the following two problems:

$$\begin{array}{r} 238 \\ \times 49 \\ \hline 11,662 \end{array}$$

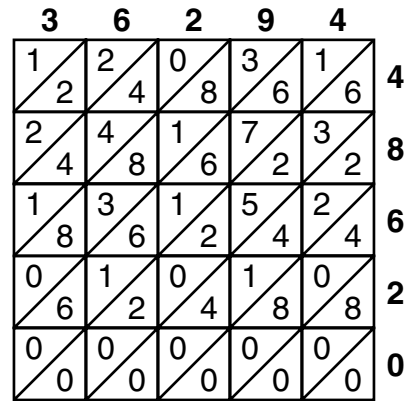
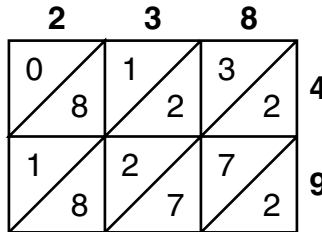
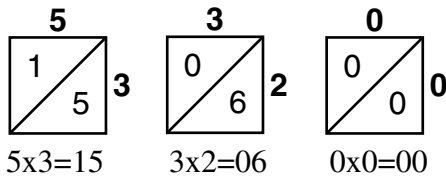
$$\begin{array}{r} 36,294 \\ \times 48,620 \\ \hline 1,764,614,280 \end{array}$$

multiplicand  
multiplier  
product (answer)

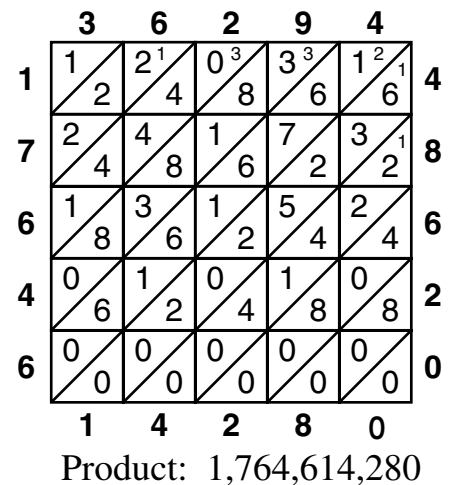
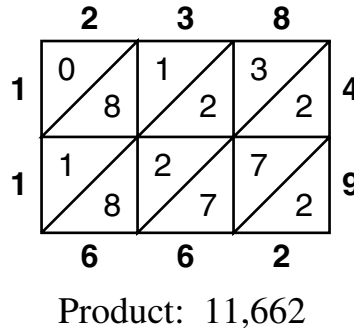
**Step 1:** Using half-inch graph paper, make a grid with a square for each digit in the multiplicand across the top and a square for each digit in the multiplier down the right. Use a ruler to draw diagonal lines inside the grid as shown.



**Step 2:** Fill in the grid with answers to each set of facts as shown. Tens go in the top half of the box, units in the bottom.



**Step 3:** Add the columns diagonally (add by endings) and write the sum of each column below or beside where the column ends. Carry tens to the next column. Then copy the product, starting at the top left and going around the bottom as shown. Add commas and check by casting 9's.



## *Casting Nines*

**C**asting nines is a method of checking the accuracy of math calculations in addition, subtraction, multiplication and division. It is a “quick check” which flags wrong answers. A great many mistakes in calculation are the result of careless errors and people’s reluctance to spend time checking their work. Casting nines is quick and easy, once mastered, and many students consider it a game. In many cases, students who learn and apply this technique will get better grades and have more fun in math. When teachers don’t have to deal with careless errors, it is possible to move on more quickly to new math concepts. **Warning:** This checking method has a limitation. It can occasionally fail to flag a wrong answer. This happens when a zero is added or left out, when there is a transposition such as 3,528 instead of 3,582, and in a few other cases.

To cast nines from a number, add the digits:

$$17 \quad 1 + 7 = 8 \quad 8 \text{ is the result of casting the nines.}$$

If the sum of the digits is nine, cast (throw away) the nine. It becomes a zero.

$$36 \quad 3 + 6 = 9 \quad 9 - 9 = 0 \quad 0 \text{ is the result of casting the nines.}$$

If the sum of the digits is more than nine, cast the nines. You will *always* end up with just one digit when this is completed: 0, 1, 2, 3, 4, 5, 6, 7, or 8.

$$28 \quad 2 + 8 = 10 \quad 10 - 9 = 1 \quad 1 \text{ is the result of casting the nines}$$

Instead of *subtracting* the nine from a two-digit number as shown above, you may *add* the two digits. The result is the same.

$$28 \quad 2 + 8 = 10 \quad 1 + 0 = 1 \quad 1 \text{ is the result of casting the nines}$$

Here is an example of casting nines from a large number:

$$\begin{aligned} 5,628 & \quad 5 + 6 = 11, 1 + 1 \text{ (from the 11)} = 2 \\ & \quad 2 \text{ (from the 5 + 6)} + 2 \text{ (the next digit in 5,628)} = 4 \\ & \quad 4 \text{ (from the 2 + 2 above)} + 8 \text{ (next digit)} = 12, 1 + 2 \text{ (from 12)} = 3 \\ & \quad 3 \text{ is the result of casting nines from 5,628} \end{aligned}$$

To speed up casting nines from large numbers, look for and lightly cross out nines or combinations which equal nine. Add the remaining digits. For example:

$$\begin{aligned} & \underline{5,629,384,272} \\ & \underline{5,629,384,272} \quad \text{Cross out any nines.} \\ & \underline{5,629,384,272} \quad \text{Cross out any combinations which make 9: } 5+2+2, 6+3, 7+2 \end{aligned}$$

Then add any digits still not crossed out:  $8 + 4 = 12$ ,  $1 + 2$  (from the 12) = 3

3 is the result of casting nines from 5,629,384,272.

Once you are able to cast nines from any number, use it to check problems as shown on the following page.

### Checking Addition

Cast nines from both addends and add the one-digit results for the “check number” (circled). Cast nines from the sum. The results must match or the answer is wrong.

addend	<b>38</b>	cast nines from 38: $3 + 8 = 11$ , $1 + 1 =$	<b>2</b>
addend	<b>+76</b>	cast nines from 76: $7 + 6 = 13$ , $1 + 3 =$	<b>+4</b>
sum	<b>114</b>	add the two digits to get check number	<b>(6)</b>

Then cast nines from the sum, 114:  $1 + 1 = 2 + 4 = 6$ . This must match the check number. If there is no match, thoroughly check the problem to locate and fix the error.

### Checking Multiplication

Cast nines from the multiplicand and the multiplier and multiply the one-digit results for the “check number” (circled). Cast nines from the product. The results must match.

multiplicand	<b>78</b>	cast nines from 78: $7 + 8 = 15$ , $1 + 5 =$	<b>6</b>
multiplier	<b>x 8</b>	cast nines from 8 (no nines to cast) =	<b>x 8</b>
product	<b>624</b>	multiply the two digits	<b>48</b>

Cast nines from the 48 to get the 1-digit check number:  $4 + 8 = 12$ ,  $1 + 2 =$  **(3)**

Then cast nines from the product, 624:  $6 + 2 = 8 + 4 = 12$ ,  $1 + 2$  (from the 12) = **3**

### Checking Subtraction

Cast nines from the minuend and the subtrahend. Subtract for the “check number” (circled). Cast nines from the difference. The result must equal the check number.

minuend	<b>53</b>	cast nines from 53: $5 + 3 =$	<b>8</b>
subtrahend	<b>-38</b>	cast nines from 38: $3 + 8 = 11$ , $1 + 1 =$	<b>-2</b>
difference	<b>15</b>	subtract the two digits to get check number	<b>(6)</b>

Then cast nines from the difference, 15:  $1 + 5 = 6$ . This must match the check number.

In subtraction, the one-digit result on the bottom (subtrahend) may be larger than that on the top (minuend). If this occurs, add a nine to the minuend so subtraction is possible, as shown below. Continue as described above.

minuend	<b>93</b>	cast nines from 93:	<b>3 + 9 = 12</b>
subtrahend	<b>-44</b>	cast nines from 44: $4 + 4 =$	<b>-8      -8</b>
difference	<b>49</b>	subtract the two digits for check number	can't do <b>(4)</b>

### Checking Division

Cast nines from the dividend to get the “check number” (circled). Cast nines from the quotient. Cast nines from the divisor. Cast nines from the remainder. Multiply the one-digit results as is done normally in checking division: quotient times divisor plus remainder. The result must equal the check number.

Cast 9's from dividend, 89, for **(8)**, the check number.

quotient	<b>14 r5</b>	remainder	quotient 14, $1 + 4 = 5$ times divisor <b>6</b> = 30 ( $3 + 0 = 3$ )
divisor	<b>6 ) 89</b>	dividend	plus remainder <b>5 = 8</b> . This matches check number.