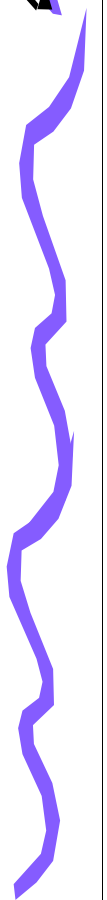


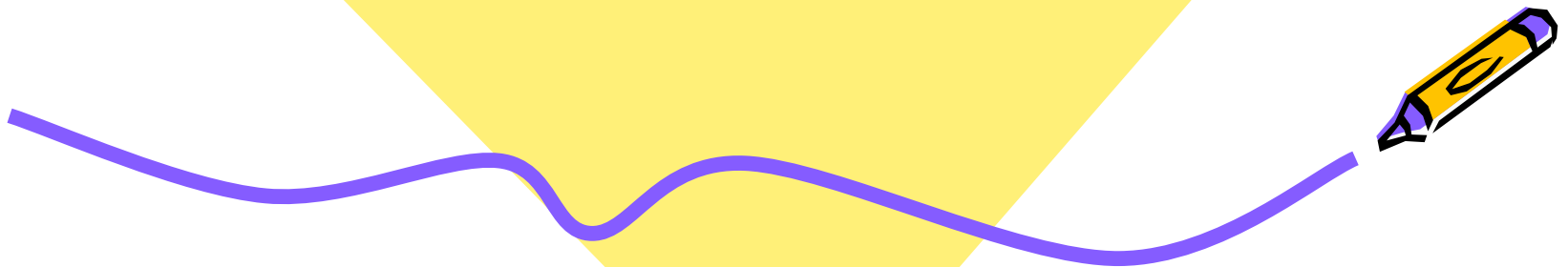
# Everyday Math Algorithms



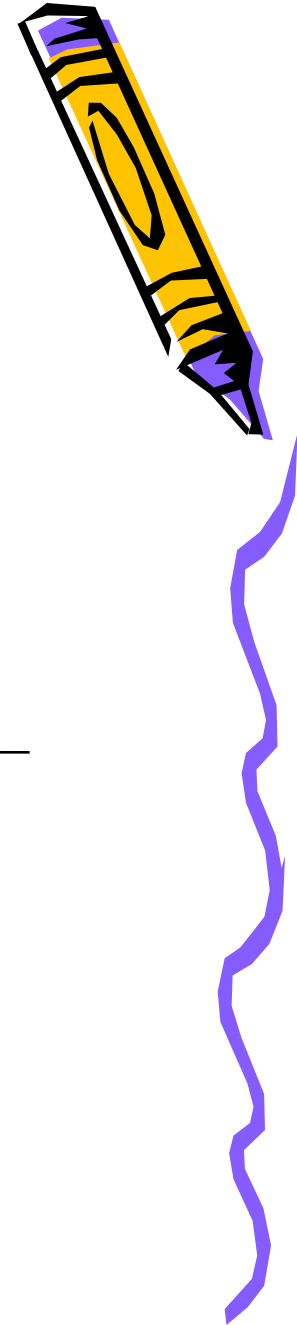


# Partial Sums

An Addition Algorithm



# Partial Sums



$$\begin{array}{r} 287 \\ + 625 \\ \hline 800 \\ 100 \\ + 12 \\ \hline 912 \end{array}$$

Add the **hundreds** (200 + 600) →

Add the **tens** (80 + 20) →

Add the **ones** (7 + 5) →

Add the **partial sums** (800 + 100 + 12) →



# Partial Sums



$$\begin{array}{r} 345 \\ + 679 \\ \hline 900 \\ 110 \\ + 14 \\ \hline 1024 \end{array}$$

Add the **hundreds** ( $300 + 600$ ) →

Add the **tens** ( $40 + 70$ ) →

Add the **ones** ( $5 + 9$ ) →

Add the **partial sums** ( $900 + 110 + 14$ ) →



# Partial Sums



$$\begin{array}{r} 489 \\ + 213 \\ \hline 600 \\ 90 \\ + 12 \\ \hline 702 \end{array}$$

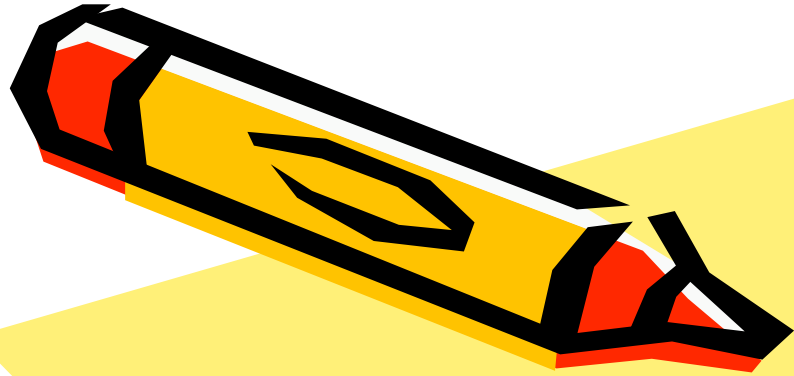
Add the **hundreds** ( $400 + 200$ ) →

Add the **tens** ( $80 + 10$ ) →

Add the **ones** ( $9 + 3$ ) →

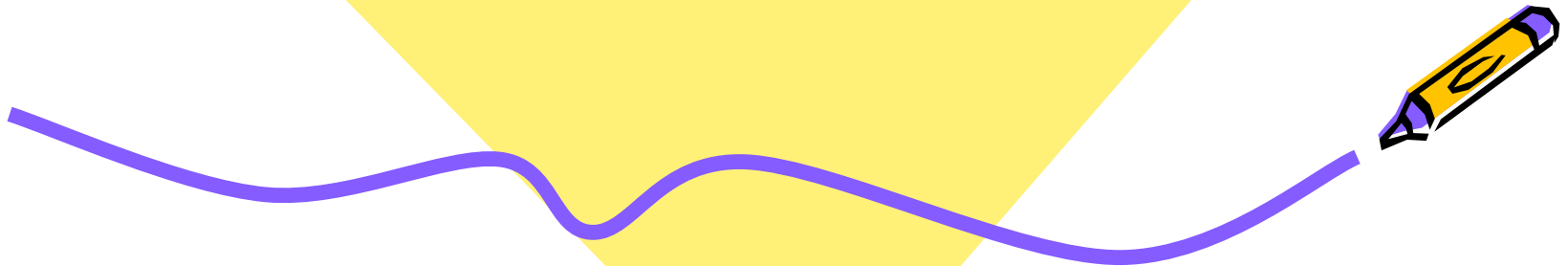
Add the **partial sums** ( $600 + 90 + 12$ ) →





# Counting Up/ Hill Method

A Subtraction Algorithm



# Counting Up/Hill Method

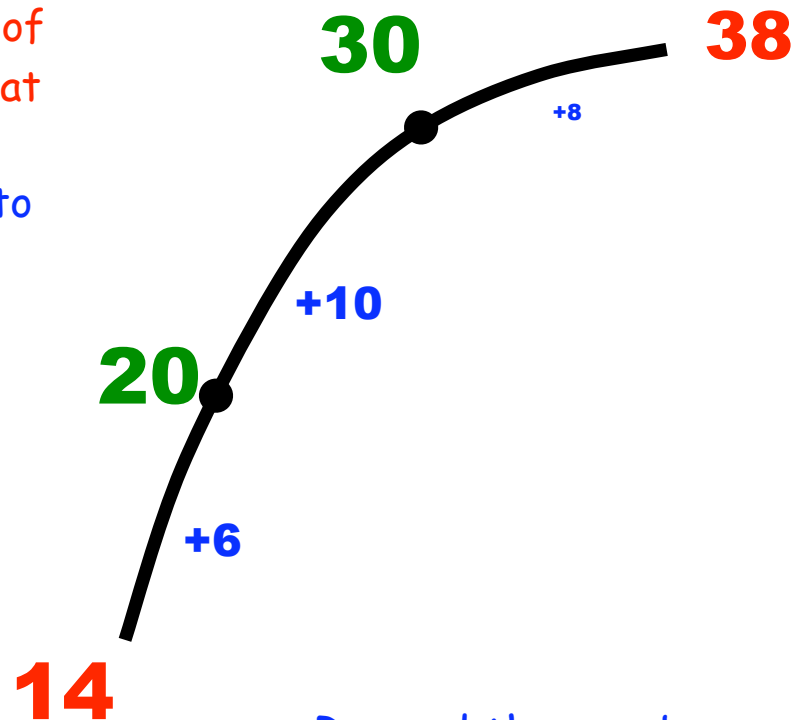
$$38 - 14 = 24$$

1. Place the smaller number at the bottom of the hill and the larger at the top.

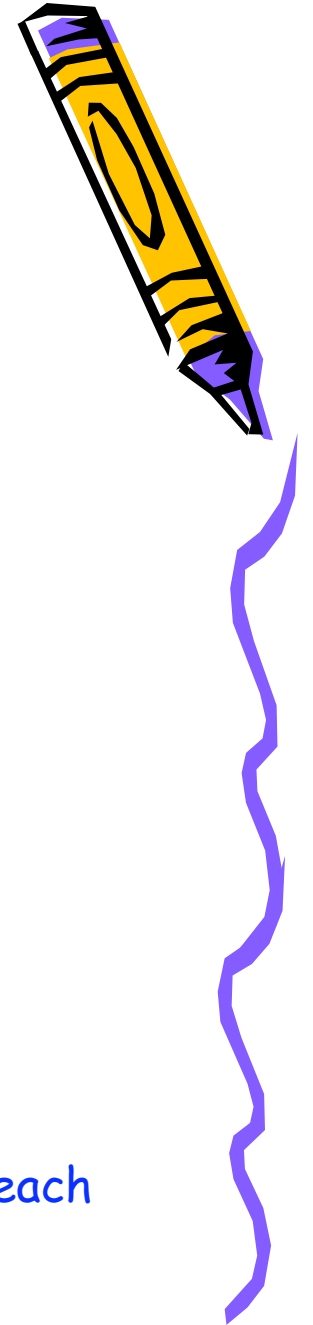
2. Start with 14, add to the next friendly number. ( $14 + 6 = 20$ )

3. Start with 20, add to the next friendly number. ( $20 + 10 = 30$ )

4. Start with 30, add to get 38. ( $30 + 8 = 38$ )



Record the numbers added at each interval: ( $6 + 10 + 8 = 24$ )



# Counting Up/Hill Method

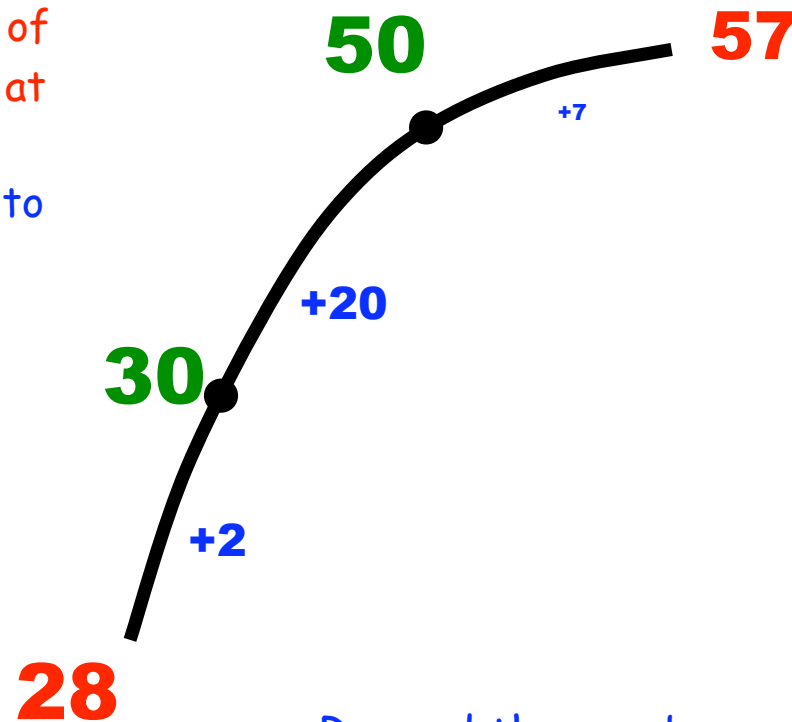
$$57 - 28 = 29$$

1. Place the smaller number at the bottom of the hill and the larger at the top.

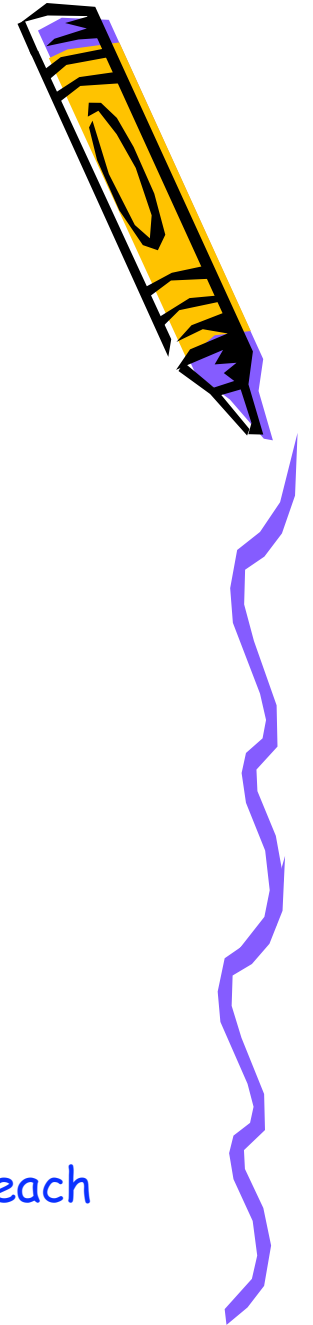
2. Start with 28, add to the next friendly number. ( $28 + 2 = 30$ )

3. Start with 30, add to the next friendly number. ( $30 + 20 = 50$ )

4. Start with 50, add to get 57. ( $50 + 7 = 57$ )



Record the numbers added at each interval:  $(2 + 20 + 7 = 29)$



# Counting Up/Hill Method

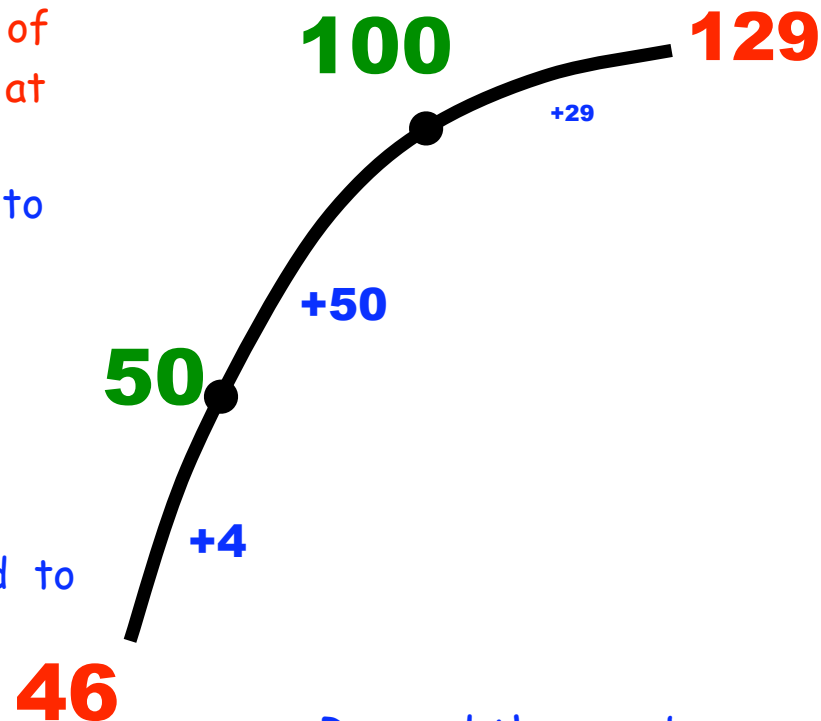
$$129 - 46 = 83$$

1. Place the smaller number at the bottom of the hill and the larger at the top.

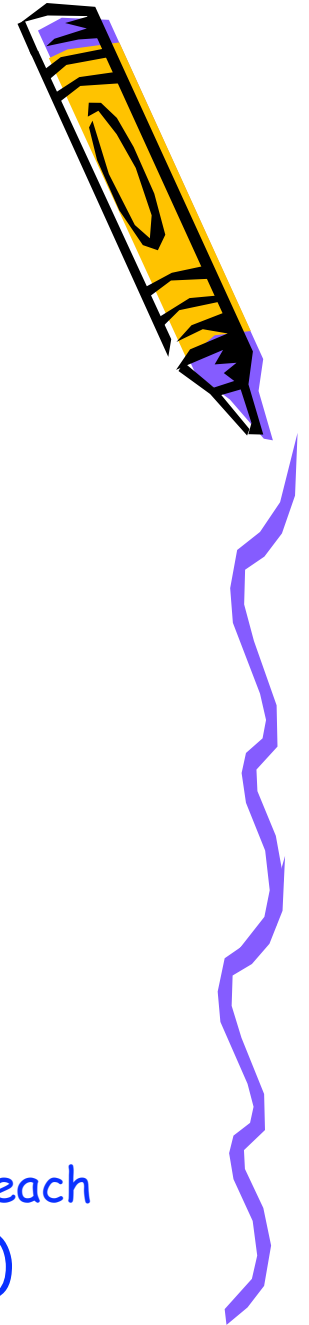
2. Start with 46, add to the next friendly number. ( $46 + 4 = 50$ )

3. Start with 50, add to the next friendly number. ( $50 + 50 = 100$ )

4. Start with 100, add to get 129. ( $100 + 29 = 129$ )



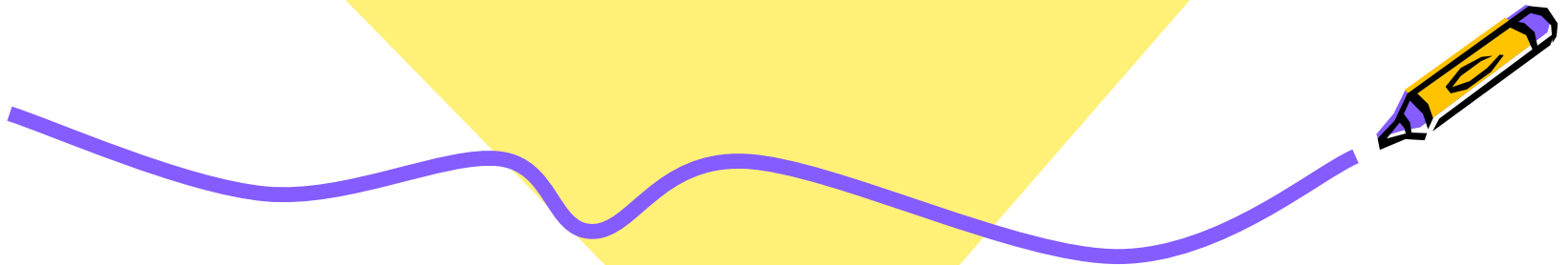
Record the numbers added at each interval:  $(4 + 50 + 29 = 83)$





# Trade First

(Subtraction algorithm)



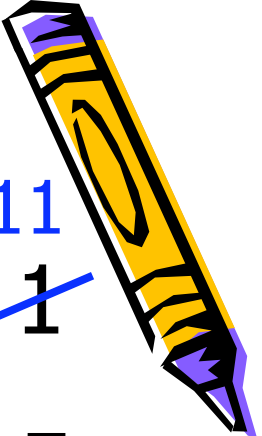
# Trade First

1. The first step is to determine whether any trade is required. If a trade is required, the trade is carried out first.

2. To make the 1 in the ones column larger than the 5, borrow 1 ten from the 3 in the tens column. The 1 becomes an 11 and the 3 in the tens column becomes 2.

3. To make the 2 in the tens column larger than the 8 in the tens column, borrow 1 hundred from the 8. The 2 in the tens column becomes 12 and the 8 in the hundreds column becomes 7.

4. Now subtract column by column in any order.


$$\begin{array}{r} 7 \\ \cancel{8} \\ - 4 \\ \hline 3 \end{array} \quad \begin{array}{r} 12 \\ \cancel{2} \\ \cancel{3} \\ 8 \end{array} \quad \begin{array}{r} 11 \\ \cancel{1} \\ 5 \end{array}$$
$$\begin{array}{r} 3 \\ 4 \\ 6 \end{array}$$




# Trade First

1. The first step is to determine whether any trade is required. If a trade is required, the trade is carried out first.

2. To make the 4 in the ones column larger than the 5, borrow 1 ten from the 2 in the tens column. The 4 becomes an 14 and the 2 in the tens column becomes 1.

3. To make the 1 in the tens column larger than the 7 in the tens column, borrow 1 hundred from the 9. The 1 in the tens column becomes 11 and the 9 in the hundreds column becomes 8.

4. Now subtract column by column in any order.


$$\begin{array}{r} 8 \\ \cancel{9} \\ - 3 \\ \hline 5 \end{array} \quad \begin{array}{r} 11 \\ \cancel{1} \\ \cancel{2} \\ 7 \end{array} \quad \begin{array}{r} 14 \\ \cancel{4} \\ 5 \end{array}$$

The diagram shows three vertical subtraction problems. The first problem is 8 minus 3, with a horizontal line under the 3, and the result 5 below. The second problem is 11 minus 2, with a horizontal line under the 2, and the result 4 below. The third problem is 14 minus 5, with a horizontal line under the 5, and the result 9 below. In all three problems, the top number is crossed out with a diagonal line. The numbers 5, 4, and 9 are written in purple below their respective problems.



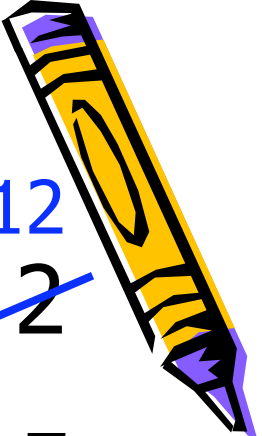
# Trade First

1. The first step is to determine whether any trade is required. If a trade is required, the trade is carried out first.

2. To make the 2 in the ones column larger than the 5, borrow 1 ten from the 1 in the tens column. The 2 becomes an 12 and the 1 in the tens column becomes 0.

3. To make the 0 in the tens column larger than the 9 in the tens column, borrow 1 hundred from the 7. The 0 in the tens column becomes 10 and the 7 in the hundreds column becomes 6.

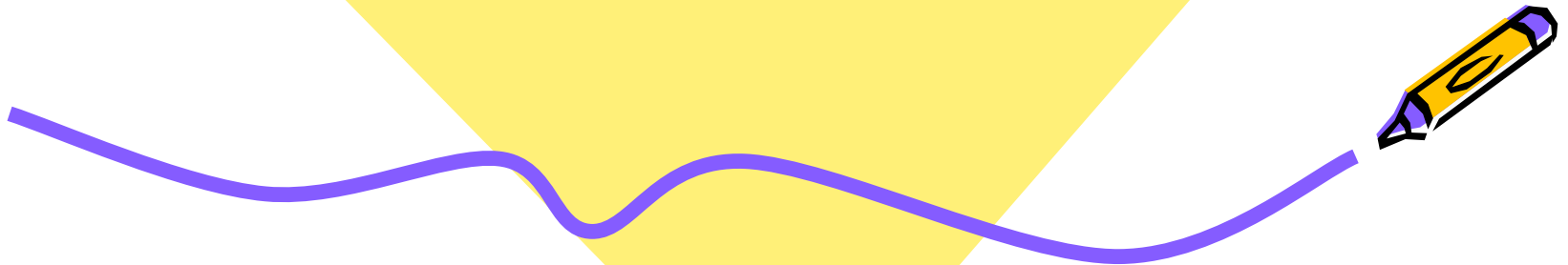
4. Now subtract column by column in any order.


$$\begin{array}{r} 6 & 10 & 12 \\ \cancel{7} & \cancel{0} & \cancel{2} \\ - 4 & 9 & 5 \\ \hline 2 & 1 & 7 \end{array}$$





# Partial Product (Multiplication Algorithm)



# Partial Product

When multiplying by "Partial Products," you must first multiply parts of these numbers, then you add all of the results to find the answer.

Multiply  $20 \times 60$  (tens by tens)

Multiply  $60 \times 7$  (tens by ones)

Multiply  $4 \times 20$  (ones by tens)

Multiply  $7 \times 4$  (ones by ones)

Add the results

$$\begin{array}{r} 27 \text{ (20+7)} \\ \times 64 \text{ (60+4)} \\ \hline \end{array}$$

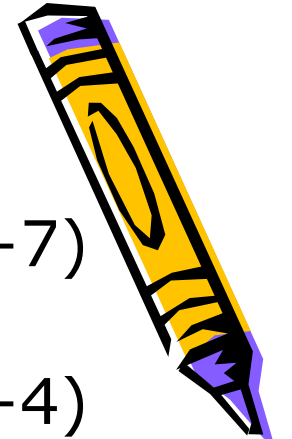
$$1,200$$

$$420$$

$$80$$

$$+ 28$$

$$\hline 1,728$$



# Partial Product

When multiplying by "Partial Products," you must first multiply parts of these numbers, then you add all of the results to find the answer.

Multiply  $40 \times 50$  (tens by tens)

Multiply  $50 \times 8$  (tens by ones)

Multiply  $3 \times 40$  (ones by tens)

Multiply  $8 \times 3$  (ones by ones)

Add the results

$$\begin{array}{r} 48 \text{ (40+8)} \\ \times 53 \text{ (50+3)} \\ \hline \end{array}$$

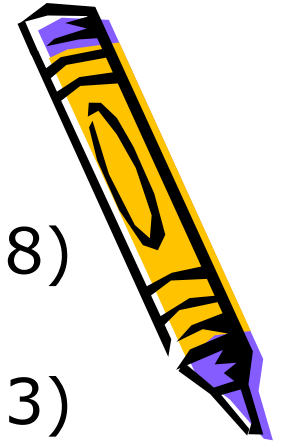
2,000

400

120

+ 24

2,544



# Partial Product

When multiplying by "Partial Products," you must first multiply parts of these numbers, then you add all of the results to find the answer.

Multiply  $60 \times 50$  (tens by tens)

Multiply  $50 \times 9$  (tens by ones)

Multiply  $8 \times 60$  (ones by tens)

Multiply  $9 \times 8$  (ones by ones)

Add the results

$$\begin{array}{r} 69 \text{ (60+9)} \\ \times 58 \text{ (50+8)} \\ \hline \end{array}$$

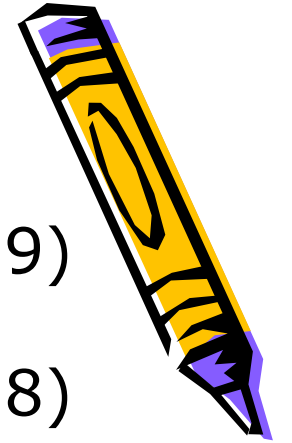
3,000

450

480

+ 72

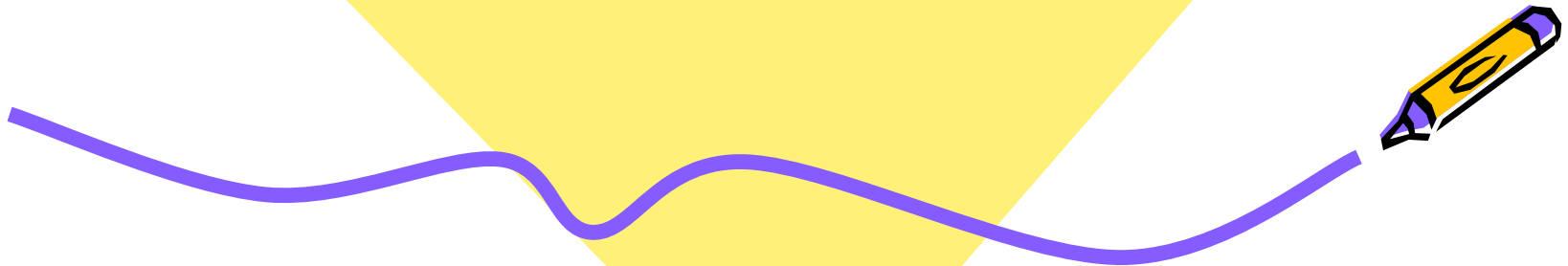
4,002





# Partial Quotients

(Division Algorithm)



# Partial Quotient

Start “Partial Quotient” division by estimating your answer. Check by multiplying and subtraction. The better your estimate, the fewer the steps you will have.

1. Estimate how many 9's are in 876. (90)

2. Estimate how many 9's are in 66. (7)

3. Because 3 is less than 9, you have finished dividing and you now need to add the estimates to get your answer and the 3 left over is your remainder.

**97 R3**

$$\begin{array}{r} 9 \overline{) 876} \\ \underline{- 810} \\ 66 \\ \underline{- 63} \\ 3 \end{array}$$

Subtract  $90 \times 9 = 810$  (1<sup>st</sup> estimate)

Subtract  $7 \times 9 = 63$  (2<sup>nd</sup> estimate)

**97** (Add the estimates)



# Partial Quotient

Start “Partial Quotient” division by estimating your answer. Check by multiplying and subtraction. The better your estimate, the fewer the steps you will have.

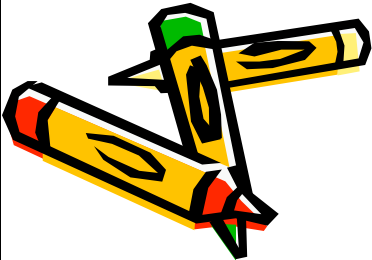


1. Estimate how many 8's are in 395. (40)

2. Estimate how many 8's are in 75. (9)

3. Because 3 is less than 8, you have finished dividing and you now need to add the estimates to get your answer and the 3 left over is your remainder.

$$\begin{array}{r} \text{49 R3} \\ 8 \overline{) 395} \\ \text{Subtract } - 320 \\ \hline 75 \\ \text{Subtract } - 72 \\ \hline 3 \end{array} \quad \begin{array}{l} 40 \times 8 = 320 \quad (1^{\text{st}} \text{ estimate}) \\ 9 \times 8 = 72 \quad (2^{\text{nd}} \text{ estimate}) \\ \hline \underline{49} \quad (\text{Add the estimates}) \end{array}$$



# Partial Quotient

Start “Partial Quotient” division by estimating your answer. Check by multiplying and subtraction. The better your estimate, the fewer the steps you will have.



1. Estimate how many 6's are in 577. (90)

2. Estimate how many 6's are in 37. (6)

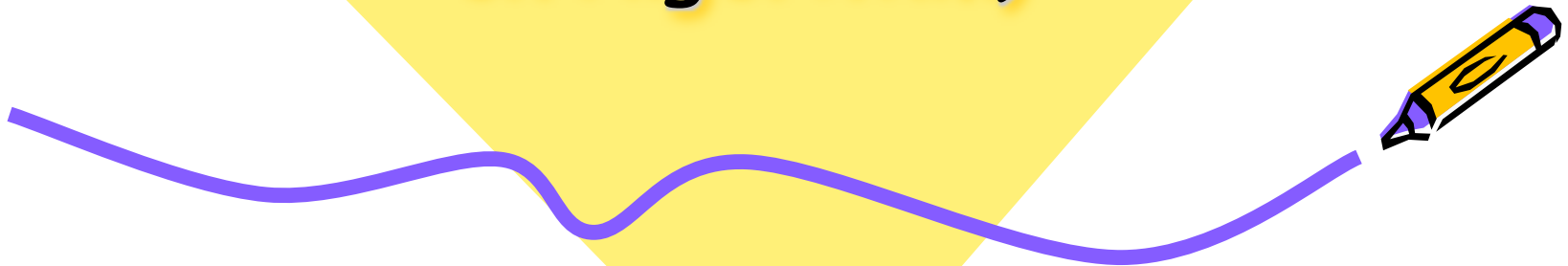
3. Because 1 is less than 6, you have finished dividing and you now need to add the estimates to get your answer and the 1 left over is your remainder.

$$\begin{array}{r} \mathbf{96 \text{ R}1} \\ \hline 6 \overline{) 577} \\ \text{Subtract } - \mathbf{540} \\ \hline 37 \\ \text{Subtract } - \mathbf{36} \\ \hline 1 \end{array} \quad \begin{array}{l} \underline{90} \times 6 = 540 \quad (1^{\text{st}} \text{ estimate}) \\ \underline{6} \times 6 = 36 \quad (2^{\text{nd}} \text{ estimate}) \\ \hline \mathbf{96} \quad (\text{Add the estimates}) \end{array}$$





"Lattice" (Multiplicati  
on Algorithm)



# Solve:

$$197 \times 23 =$$

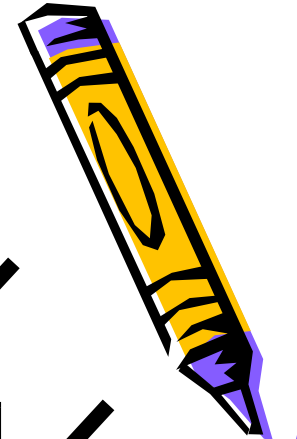
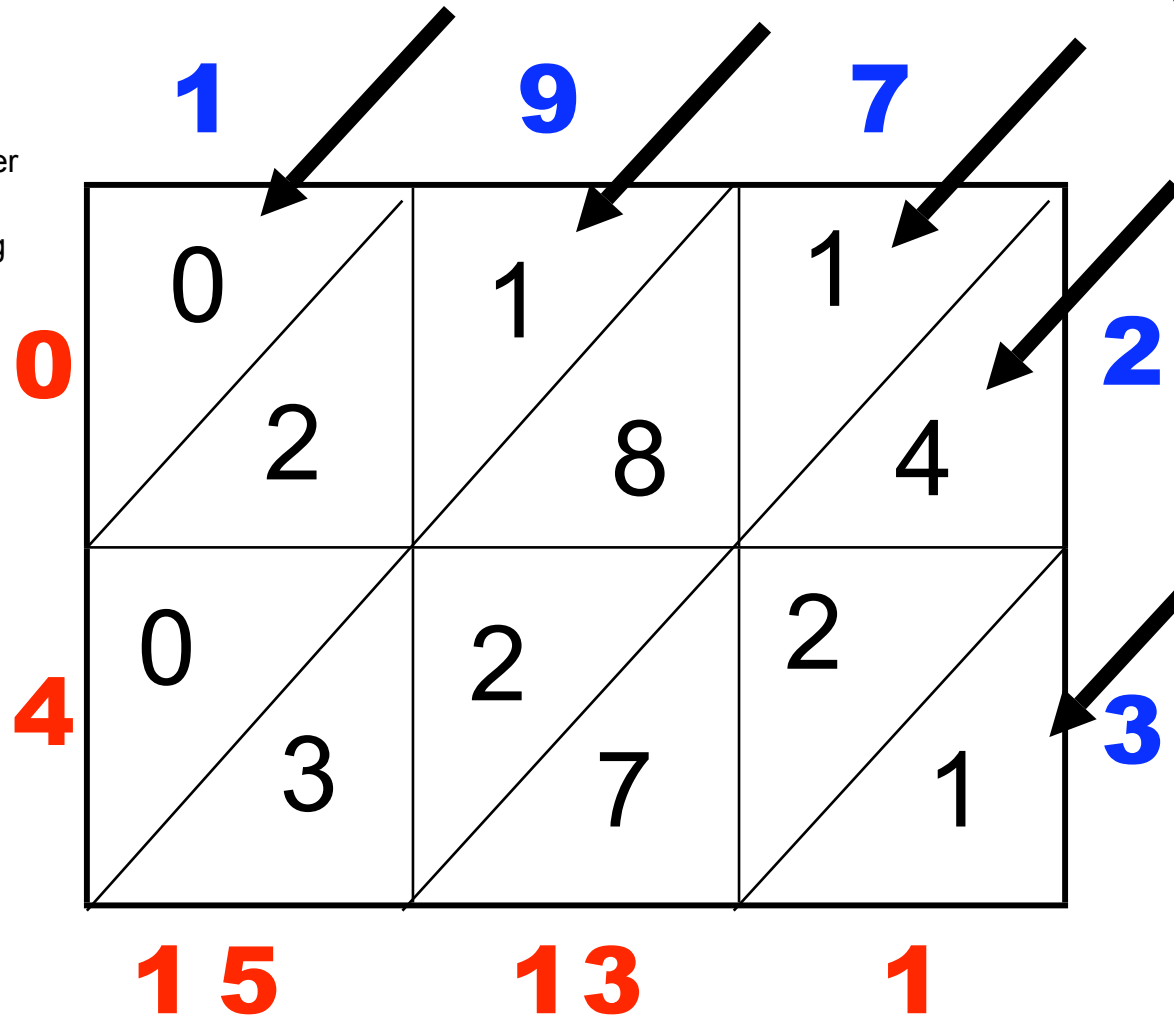
1. Create a 3 by 2 grid. Copy the 3 digit number across the top of the grid, one number per square.

Copy the 2 digit number along the right side of the grid, one number per square.

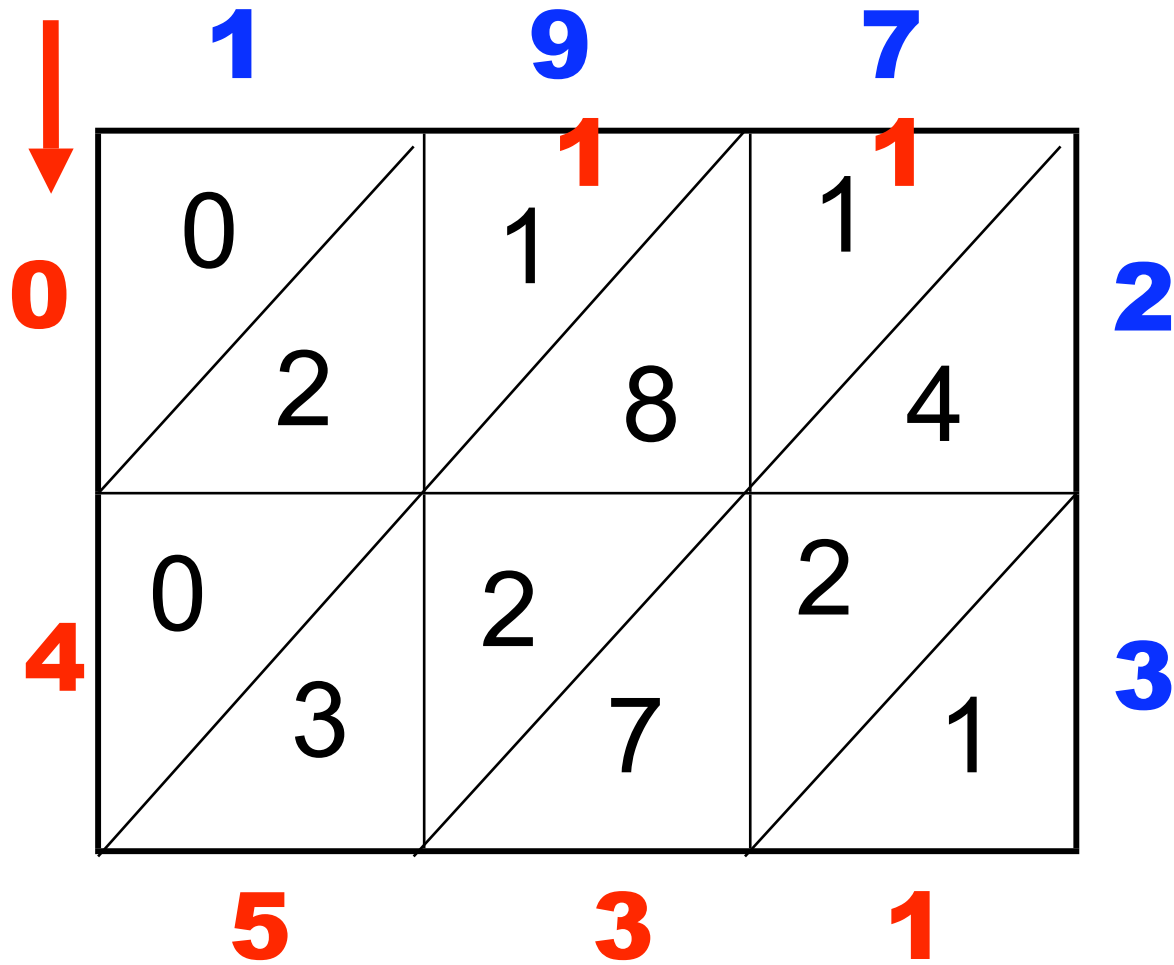
2. Draw diagonals across the cells.

3. Multiply each digit in the top factor by each digit in the side factor. Record each answer in its own cell, placing the tens digit in the upper half of the cell and the ones digit in the bottom half of the cell.

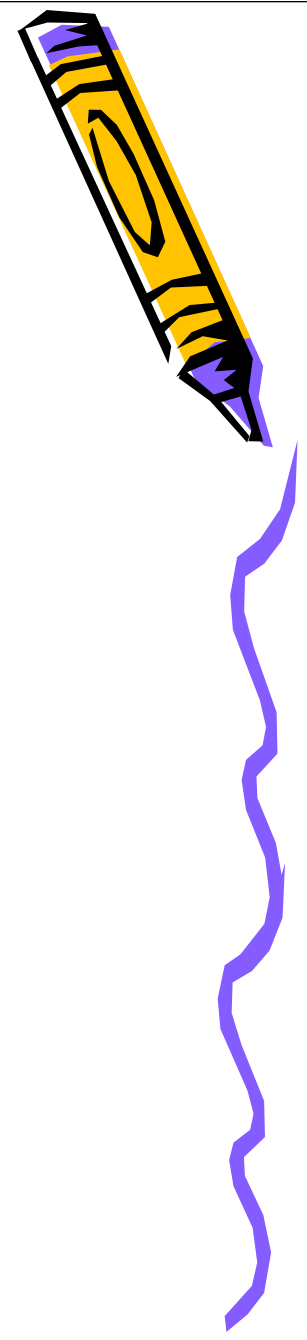
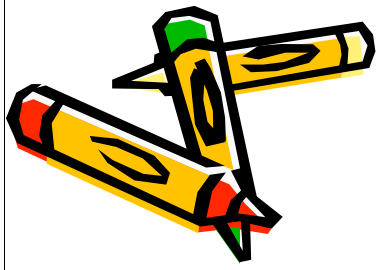
4. Add along each diagonal and record any regroupings in the next diagonal



**Answer**



**197 x 23 = 4531**



# Solve:

$$169 \times 35 =$$

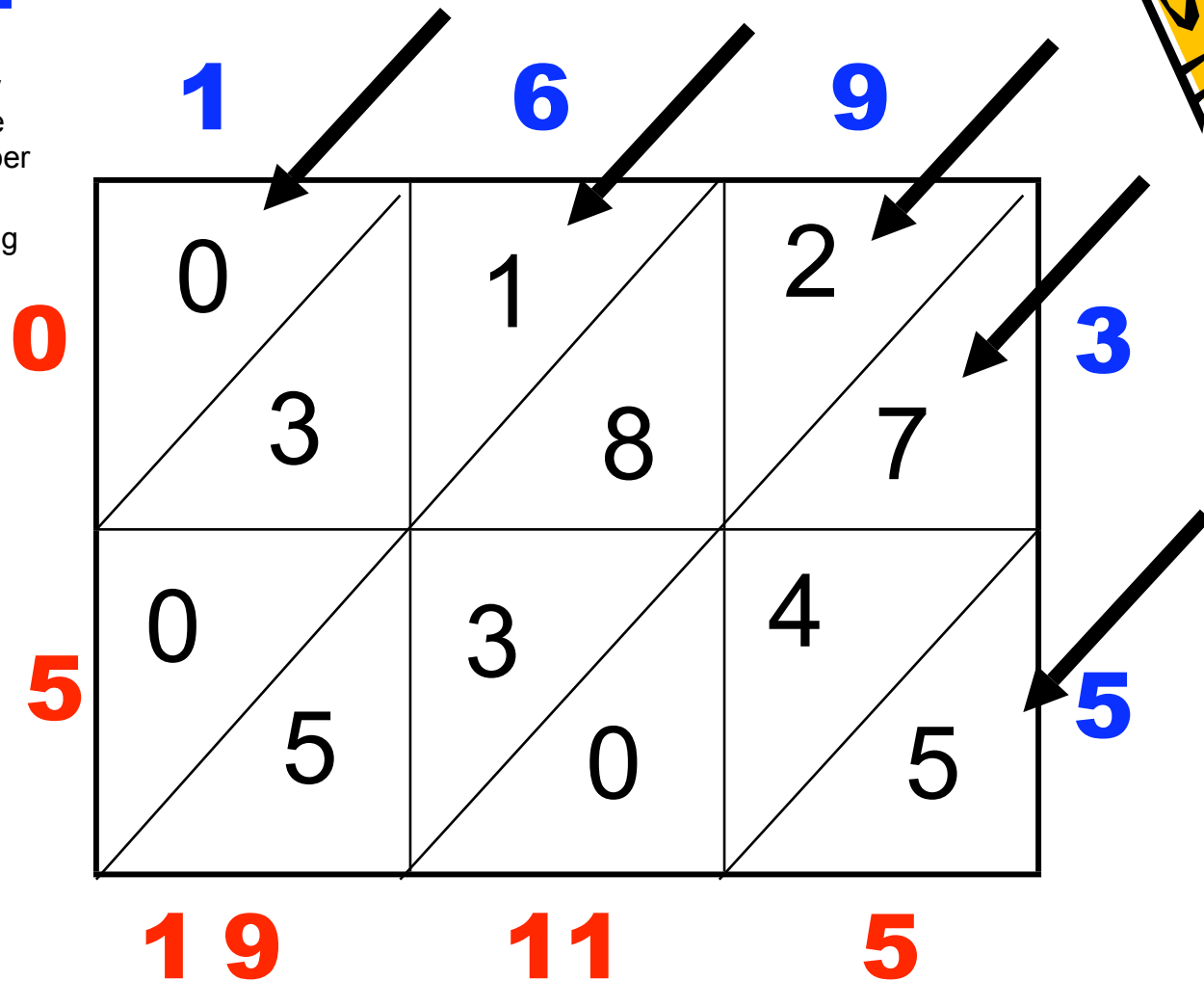
1. Create a 3 by 2 grid. Copy the 3 digit number across the top of the grid, one number per square.

Copy the 2 digit number along the right side of the grid, one number per square.

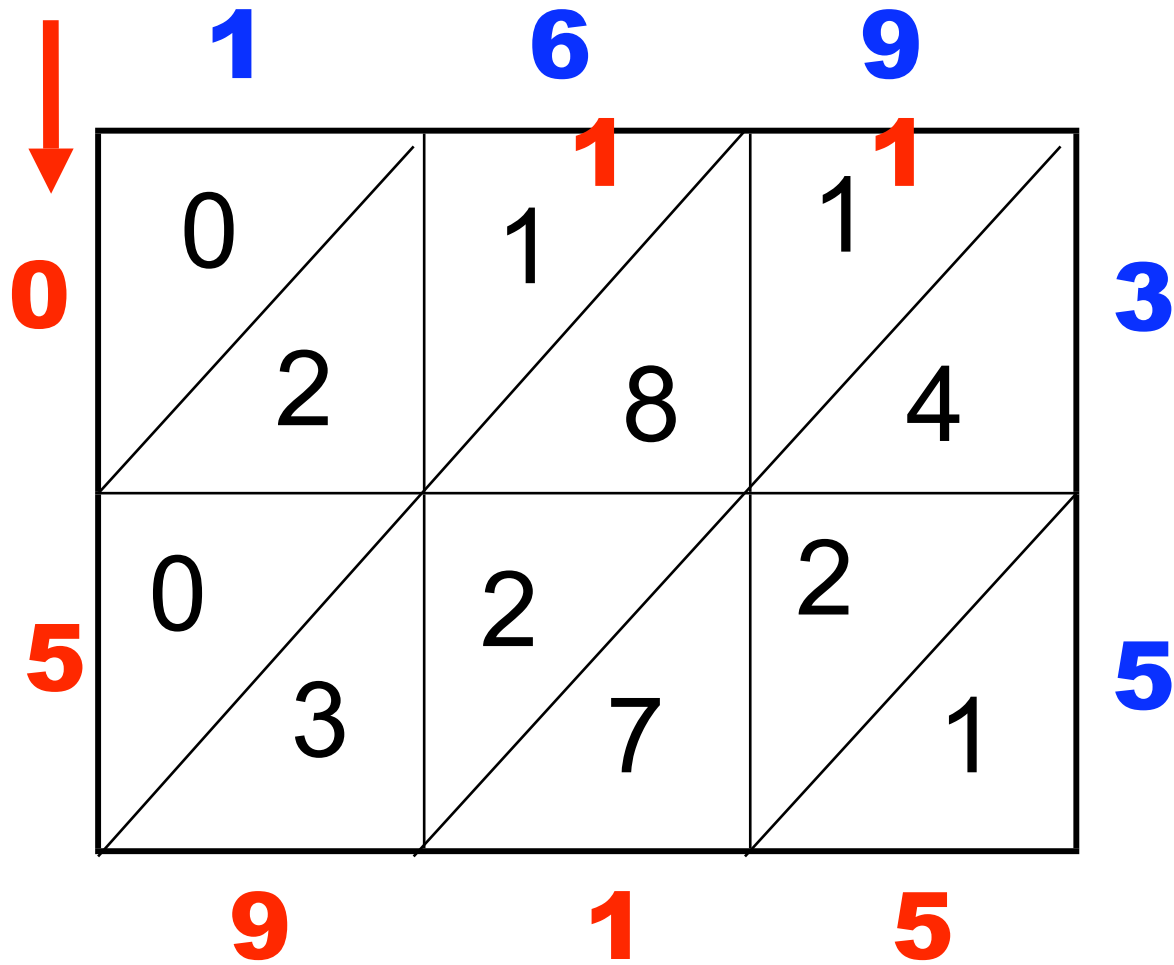
2. Draw diagonals across the cells.

3. Multiply each digit in the top factor by each digit in the side factor. Record each answer in its own cell, placing the tens digit in the upper half of the cell and the ones digit in the bottom half of the cell.

4. Add along each diagonal and record any regroupings in the next diagonal



**Answer**



**169 x 35 = 5915**

