Everyday Math Algorithms

Partial Sums

An Addition Algorithm

Partial Sums

$$\begin{array}{r} 287 \\ +\ 625 \\ \hline \end{array}$$

Add the hundreds (200 + 600) → 800

Add the tens (80 +20) → 100

Add the ones (7 + 5) → + 12

Add the partial sums (800 + 100 + 12) → 912

Partial Sums

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

Add the hundreds (300 + 600) → 900

Add the tens (40 +70) → 110

Add the ones (5 + 9) → + 14

Add the partial sums (900 + 110 + 14) → 1024

Partial Sums

$$\begin{array}{r} 489 \\ +\ 213 \\ \hline \end{array}$$

Add the hundreds (400 + 200) → 600

Add the tens (80 +10) → 90

Add the ones (9 + 3) → + 12

Add the partial sums (600 + 90 + 12) → 702

Counting Up/ Hill Method

A Subtraction Algorithm

Counting Up/Hill Method

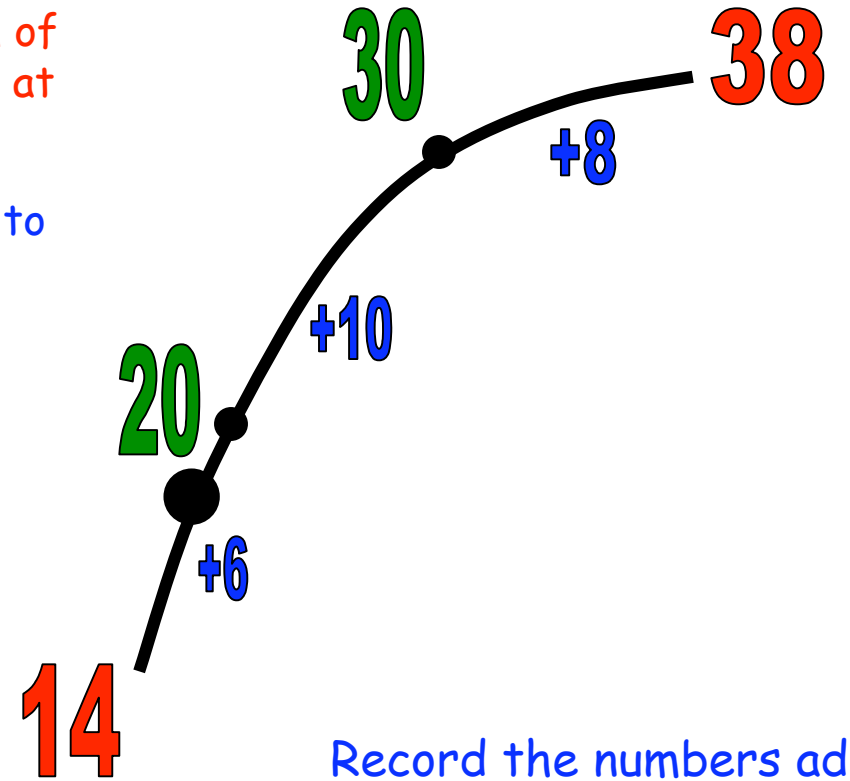
38-14= 24

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)

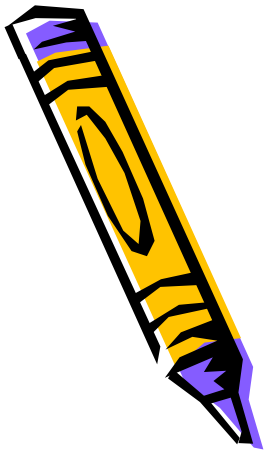
3. Start with 20, add to the next friendly number. (20+10=30)

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



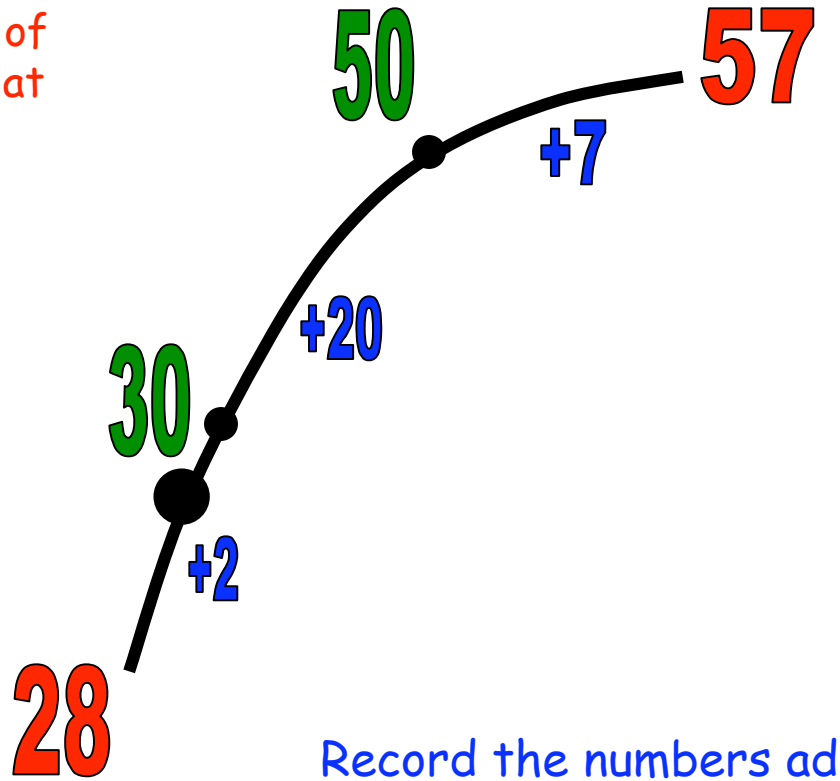
57-28=29

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

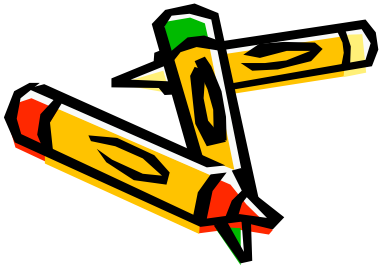
2. Start with 28, add to the next friendly number. (28+2=30)

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

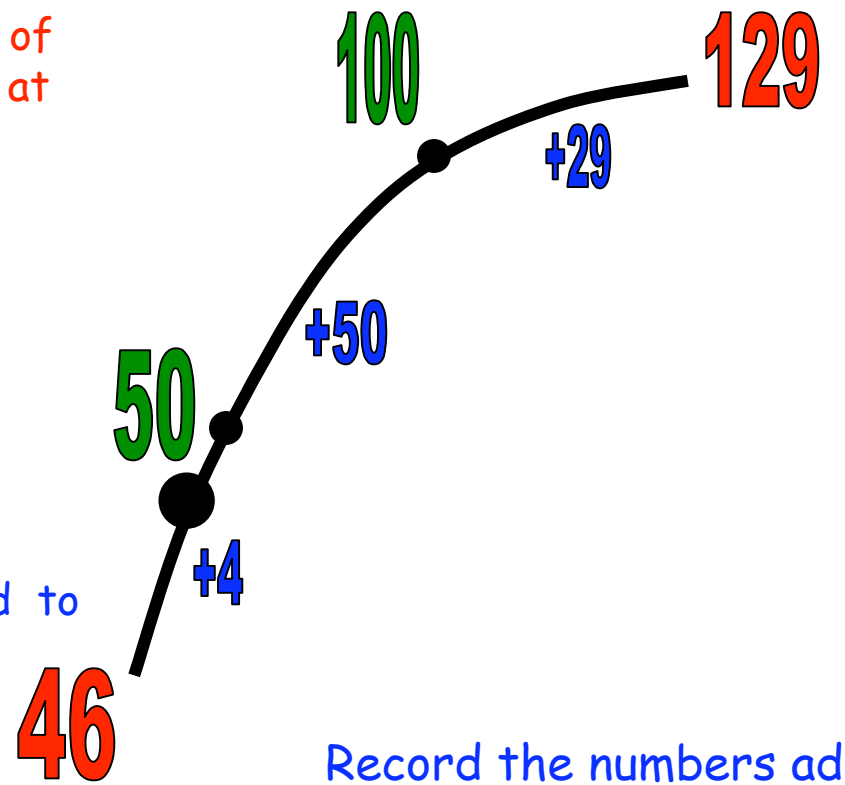
129-46=83

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

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

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.

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.

8	11	14
~~9~~	~~1~~ 2	~~4~~
- 3	7	5
5	4	9

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.

6	10	12
~~7~~	~~0~~ ~~1~~	~~2~~
- 4	9	5
2	1	7

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 X 60 (tens by tens)

Multiply 60 X 7 (tens by ones)

Multiply 4 X 20 (ones by tens)

Multiply 7 X 4 (ones by ones)

Add the results

$$
\begin{array}{rl}
27 & (20+7) \\
\times\ 64 & (60+4) \\
\hline
1{,}200 & \\
420 & \\
80 & \\
+\ \ 28 & \\
\hline
1{,}728 &
\end{array}
$$

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 X 50 (tens by tens)

Multiply 50 X 8 (tens by ones)

Multiply 3 X 40 (ones by tens)

Multiply 8 X 3 (ones by ones)

Add the results

$$
\begin{array}{rl}
48 & (40+8) \\
\times\ 53 & (50+3) \\
\hline
2{,}000 & \\
400 & \\
120 & \\
+\ \ 24 & \\
\hline
2{,}544 &
\end{array}
$$

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.

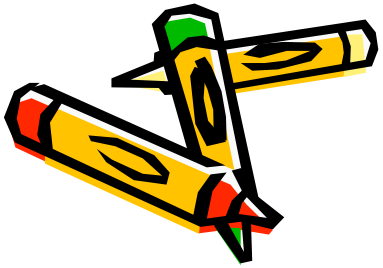
Multiply 60 X 50 (tens by tens)

Multiply 50 X 9 (tens by ones)

Multiply 8 X 60 (ones by tens)

Multiply 9 X 8 (ones by ones)

Add the results



$$
\begin{array}{r}
69 \ (60+9) \\
\times\ 58 \ (50+8) \\
\hline
3{,}000 \\
450 \\
480 \\
+\ \ 72 \\
\hline
4{,}002
\end{array}
$$

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.

97 R3

9) 876

Subtract - 810 — 90 x 9 =810 (1st estimate)

66

Subtract - 63 — 7 x 9 =63 (2nd estimate)

3 — 97 (Add the estimates)

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.

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.

49 R3

8)	395	
Subtract	- 320	40 x 8 =320 (1st estimate)
	75	
Subtract	- 72	9 x 8 =72 (2nd estimate)
	3	49 (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 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.

96 R1

6) 577

Subtract - 540 — 90 x 6 =540 (1st estimate)

37

Subtract - 36 — 6 x 6 =36 (2nd estimate)

1 — 96 (Add the estimates)

"Lattice"

(Multiplication Algorithm)

Solve:

197 x 23 =

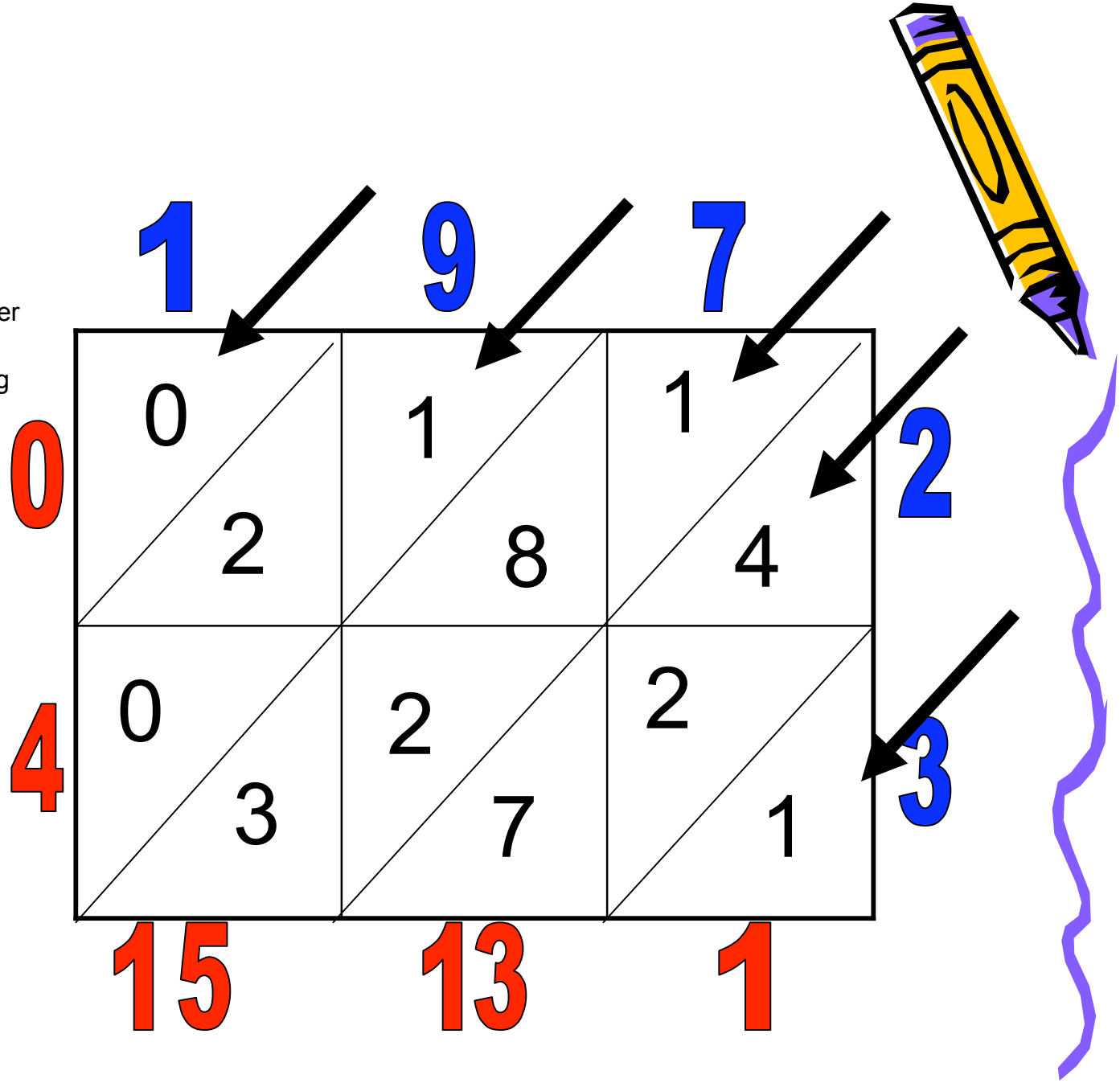
1. Create a 3 by 2 grid. Copy the 3 digit number across the top of the grid, one number per square.

   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

	1	9	7	
		1	1	
0	0 / 2	1 / 8	1 / 4	2
4	0 / 3	2 / 7	2 / 1	3
	5	3	1	

197 x 23 = 4531

Solve:

169 x 35 =

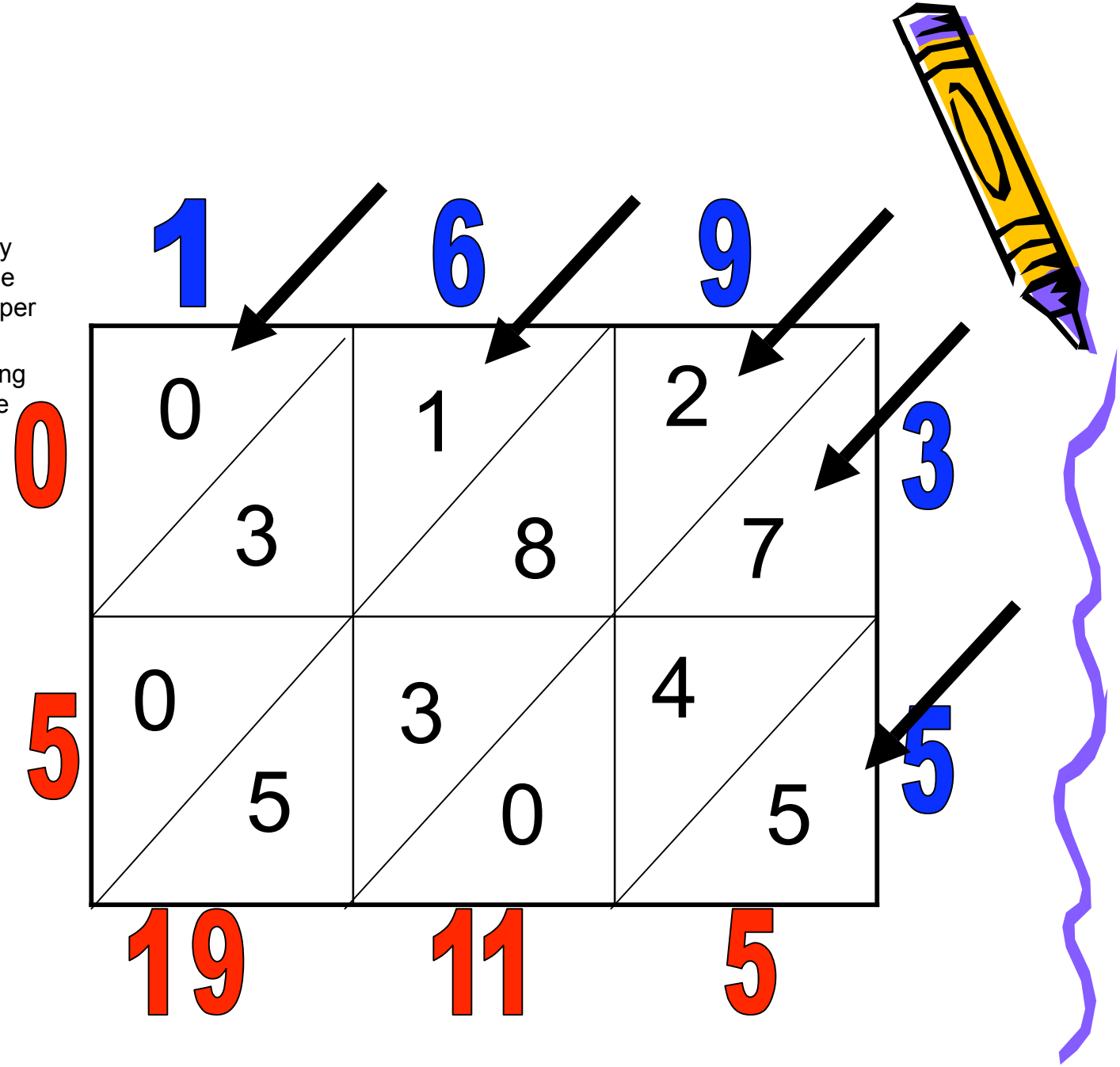
1. Create a 3 by 2 grid. Copy the 3 digit number across the top of the grid, one number per square.

   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

	1	6	9	
		1	1	
0	0 / 2	1 / 8	1 / 4	3
5	0 / 3	2 / 7	2 / 1	5
	9	1	5	

169 x 35 = 5915