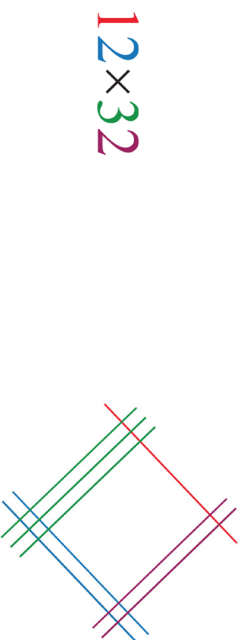
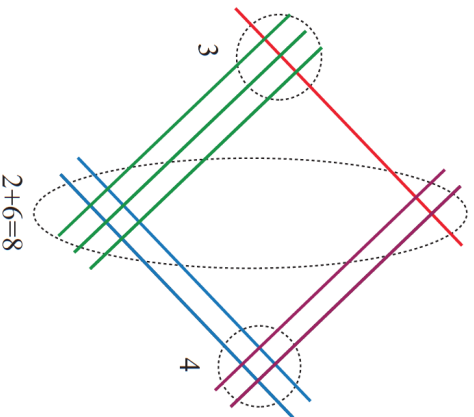


A new multiplication algorithm

Here is a new way to compute 12×32 . Begin by drawing 3 parallel lines to represent 12, the first number in the product. Draw one line, and then, a little further to the right, draw two more lines. These lines (red and blue below) represent the number 12. Similarly, draw 5 more parallel lines to cross the previous three — three lines on the left and two lines on the right. These will represent the number 32, the second number in the product (green and purple below).

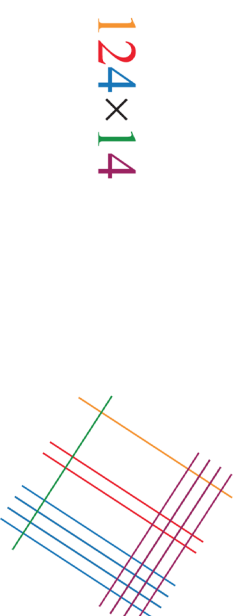


Now we must count how many times all of the lines intersect. Begin by grouping the intersections vertically. That is, draw a loop around the group of intersections that is closest to the left side (where the red and green lines intersect). Then begin moving right. Draw a loop around the center intersections (the red and purple, and the blue and green). Finally, draw a loop around the intersections that are closest to the right side (where the blue and purple lines intersect). Count how many intersections are in each loop.

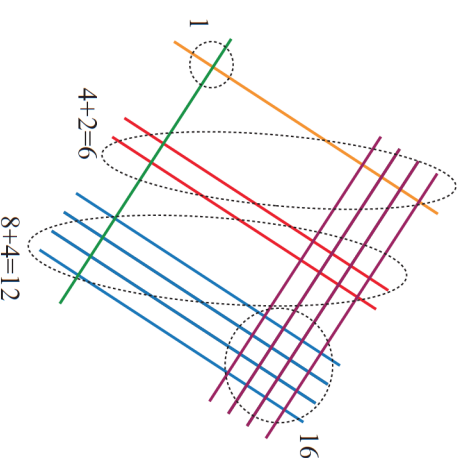


So there are 3, 8, and 4 intersections. By combining the numbers from left to right you get 384. As a matter of fact, $12 \times 32 = 384$. Amazing!

Let's evaluate 124×14 using this method. We must draw 7 parallel lines to represent the first number in the product, 124. Draw one line, then two more lines to the right, and then four more lines to the right, again. Then, drawing the lines in the opposite direction, represent 14 with one line, and then 4 more lines further to the right.



Group the intersections vertically and count every intersection in every group.



If you put the numbers together like we did in the last example you would get 161216, but this is not correct. Because 12 and 16 are 2-digit numbers you must carry the first digit to the group on its left, as you would with addition. You can set it up like this:

$$\begin{array}{r}
 1 \\
 6 \\
 12 \\
 + \quad 16 \\
 \hline
 1736
 \end{array}$$

Thus $124 \times 14 = 1736$.

Oral Assessment 2

Name: _____

Problem (10 points). The materials given describe a “new multiplication algorithm.” Read the description carefully and prepare the following:

- Two new examples: a two-digit number times a two-digit number, and a three-digit number times a three-digit number, that demonstrate how the algorithm works.
- An explanation for *why* the algorithm works.

THE STUDENT...	strong evidence (✓+)	weak evidence (✓)	little evidence (✓-)	no evidence (--)
selects appropriate examples (use of different digits, involves some carrying)	1	.5	0	0
correctly describes the algorithm procedure using examples, and can explain why the number of intersections of two sets of lines correspond to multiplication of two digits	3	2	1	0
discusses place value: <ul style="list-style-type: none"> describes the separated lines for each factor as carrying different values, identifies vertical loops as indicating place values for the product, explains why the intersections inside particular loops contribute to that place value 	3	2	1	0
discusses multiplication properties: <ul style="list-style-type: none"> shows how the algorithm captures an expansion of the multiplication problem based on the distributive property, or correctly relates the algorithm to an area or array model 	3	2	1	0