MULTIPLICATION WITH STRAIGHT LINES

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Abstract: There are three main types of learning styles: visual, auditory and kinaesthetic (or physical). Visual learners learn best watching. Gloria Markowitz-Sweet, coordinator of Parents Place Express defines the visual learners as someone who “Needs to see it to know it”. They have strong sense of colour and be very colour oriented. The objective here is to teach multiplication of integers to these visual learners in intersecting and visual way.

Key words **- COLOUR ORIENTED, MULTIPLICATION OF INTEGERS, VISUAL**

I. INTRODUCTION

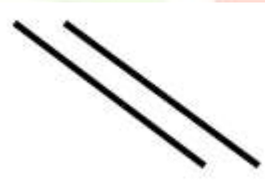
“Imagination is more important than knowledge” - Albert Einstein. In the process of imagination several new techniques has been developed. Some of the techniques saves time, energy, money and those are then replaces the old one. Yet some techniques are interesting and easy to understand but not always time saving. One such technique is multiplying with straight lines. The technique is easy when two or three digit numbers are multiplied but it gets laborious with the number of digit increases.

PROCESS DESCRIPTION

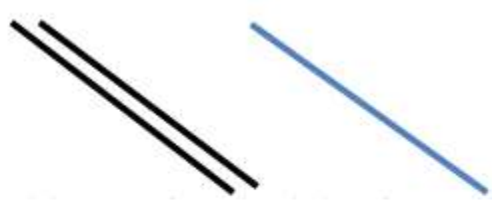
We discuss the technique with an example.

Suppose we are to multiply **21 X 32**.

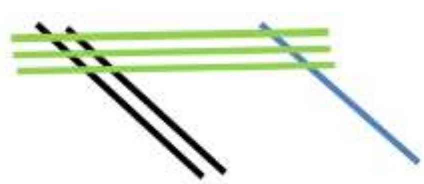
Step 1: The first digit of the first number is 2. So we draw two parallel straight lines in the following way:



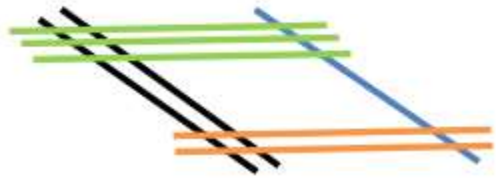
Step 2: The second digit of the first number is 1 so we draw 1 straight line parallel to the previous set of straight lines leaving a space between the two sets of straight lines in the following way:



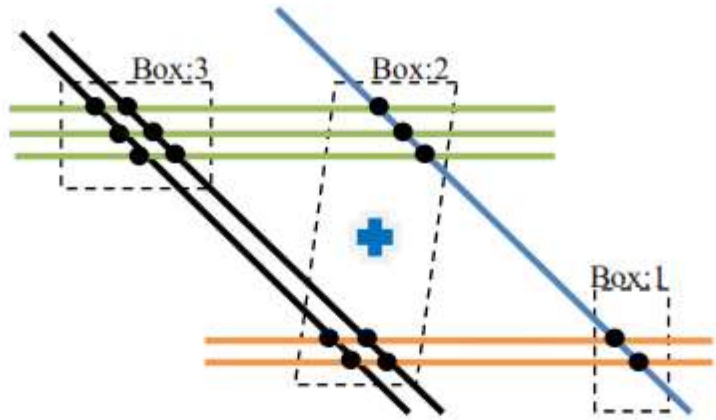
Step 3: The first digit of the second number is 3 and so we draw three parallel straight lines intersecting the previous two set of straight lines in the following way:



Step 4: The second digit of the second number is 2 so we draw two parallel straight lines parallel to last set of straight lines in the following way:



We now considered the intersecting points.



There are two intersecting points in the 1st box, so the digit at the unit place of the resultant is 2. The total number of intersecting points in the 2nd box is 3 + 4 = 7 so the tens place digit is 7. The number of intersecting points in the 3rd box is 6 so the 100 place digit is 6.

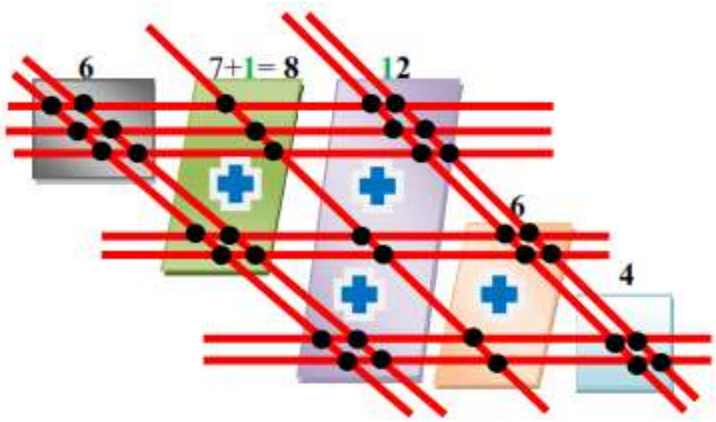
Hence the result is 21 X 32 = 672.

The Math Behind the Fact:

The method works because the number of lines are like placeholders (at powers of 10: 1, 10, 100, etc.), and the number of dots at each intersection is a product of the number of lines. You are then summing up all the products that are coefficients of the same power of 10. Thus in the example

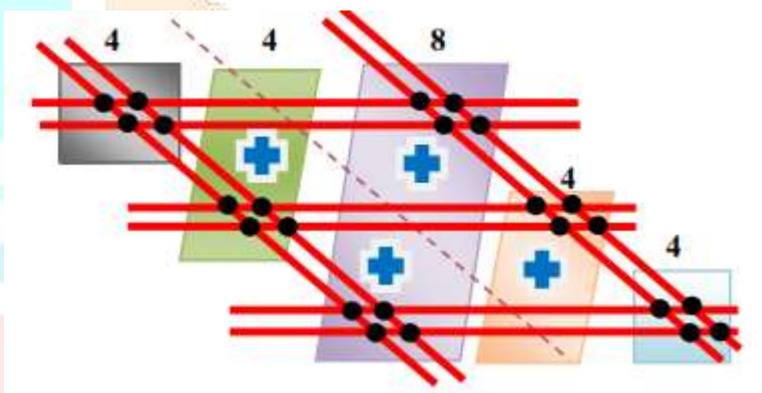
21 X 32 = (2 x10 + 1) x (3 x10 + 2) = 2*3x100 + (1*3 + 2*2) x10 + 1*2 = 672.

Note: (1) In case when the number of intersecting points exceeds 10 then we consider units place digit for that step and tens place digit for next step which is shown in the next example.



Hence 212 X 322 = 68264

Note: (2) In case a number has a zero digit then we draw dotted line corresponding to that zero and should not consider any intersecting points, which is shown in the next example.



Hence 202 X 222 = 44844

Line multiplication is sometimes called stick multiplication, and its origins are unclear, with some source claiming it comes from the Japanese, Chinese or Vedic cultures. It is basically the same process as the standard multiplication algorithm we are taught in school, except it is represented in a more visual way. This method might be helpful for those learners who are more visually-oriented.

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