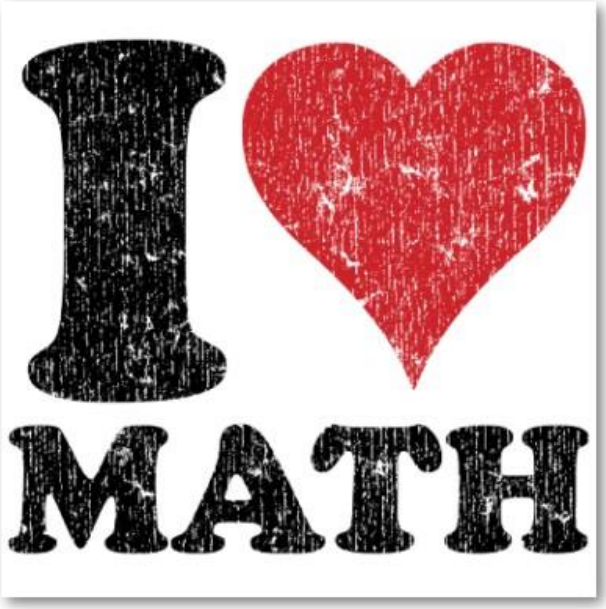
Math: Not Just a Four Letter Word

A handbook for helping your 3rd, 4th, or 5th grader find success in math



Jennifer Jolly Long, NBCT, M. Ed.

4th grade teacher, Riverview Elementary School

Helping Your Child Be Successful in Math

Make math practical.

Adults use math every day from mentally calculating how much we've spent at the grocery store, balancing the checkbook, measuring ingredients while making dinner, paying for gas per gallon, etc. Make your child part of that "everyday" math. Have them help you keep track of how much you've spent or let them help you measure. When students see that math has practical applications to daily life, they are more likely to engage.

Don't take a break from math.

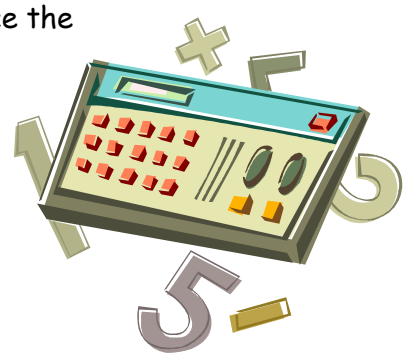
As students move into more challenging math concepts, they must rely on the facts that they have learned in the lower grades. Too often, students don't memorize these facts or they forget them over the summer or breaks. Fact practice should be a **daily** priority, no matter the level. Use flashcards, sing songs, use websites. Give students as many opportunities as possible to practice their facts. Time is so valuable so have them practice in the car on the way to soccer or listen to the songs while brushing teeth and getting ready for bed.

Be positive.

Adults can easily cause math anxiety for a student. Only relay positive experiences from your childhood. Many children say, "Well, my mom said she didn't do well with fractions so I'm not good at them either." This type of thinking is a self-fulfilling prophecy!

Have mathematical conversations.

When helping students with homework, ask them if their answers are reasonable. Have them explain, in detail, how they solved a problem. Walk through the steps of problem-solving together, even in "everyday" situations. Reinforce the vocabulary you see on homework or in the standards (see attachment). Regularly talking about math will not only communicate your support of their mathematics education, but will also teach students that you, too, value math.



Created by Jennifer Jolly Long, NBCT, M.Ed

Alternative Algorithms?

It seems like just a few years ago that I was sitting in an elementary school classroom learning the "only" way to add, subtract, multiply, and divide. I had no idea there was more than one way and I certainly didn't know that meant the same thing as "alternative algorithm." I didn't even know what an algorithm was! I managed to make it through school just fine learning the traditional way. So, why do teachers teach students how to use alternative algorithms like "the box method" and partial products? Several reasons:

1. Students are different. Sometimes the traditional algorithm just doesn't click while others seem to work.
2. Many alternative algorithms are more efficient and easier to learn.
3. Many alternative algorithms provide strategies for students who may not have a handle on their facts yet.
4. While the traditional algorithms work, they often do not reinforce understanding of the concepts and rather focus on rote, step-by- step directions. Some of the alternatives promote number sense because they conceptually make sense.

Commonly Used Alternative Algorithms

Partial Sums Addition:

The Partial Sums method is a two-stage process. In the first stage one looks at each column (working left to right) and adds up the place-values represented by the digits in that column. In the second stage those partial sums are added together. While this may seem to be extra work, it does build a stronger understanding of place value and can be used to help avoid carrying in some situations. This process could be repeated until there is no carrying necessary (as in the example to the left).

```
  147
   68
+ 266
-----
  300 (100 +200)
  160 (40 +60 +60)
   21 (7+6+8)
-----
  481
```

Subtraction:

One of the biggest differences in subtraction now is terminology. What used to be called borrowing is now called regrouping. Another change is the way this regrouping looks:

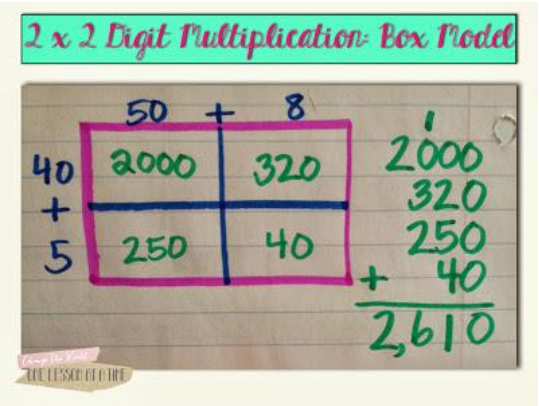
While this change seems simple, it cuts down on careless errors. The less "crossing out" students do, the more likely they are to make fewer careless mistakes.

$$\begin{array}{r} {\scriptstyle 14} \\ 2\,\not{4}\,{}^{1}2 \\ -\ 1\,2\,4 \\ \hline 1\ 1\,8 \end{array}$$

Multiplication

The traditional multiplication algorithm often proves difficult for students. With all of the crossing out and adding to, students often get lost. For this reason, many teachers try alternate algorithms that help students organize their answers. If nothing else, try a trick that I've found to be very helpful: turn notebook paper so that the holes are at the top and you have columns instead of rows. This helps students be much more organized and neat in their work.

The Box Method for Multiplication



The Box Method is a student favorite! It reinforces place value, but in an organized way that helps students cut down on mistakes. Students decompose factors (in expanded form) and put them on the outside of the box. Then, they multiply the factors on the top and side and write a product in each box. The products in each box are added together to get the final product. While this seems like so many steps to get a correct answer, it helps students cut down on careless errors and makes sense conceptually.

Partial Products Multiplication

Using the partial products method of multiplication, students break the problem into "partial"

$$\begin{array}{r} 83 \\ \times\ 27 \\ \hline \end{array}$$

$$\begin{array}{rl} 80 \times 20 & = 1600 \\ 80 \times\ 7 & =\ 560 \\ 3 \times 20 & =\ \ 60 \\ 3 \times\ 7 & =\ \ 21 \\ & \overline{\quad 2241} \end{array}$$

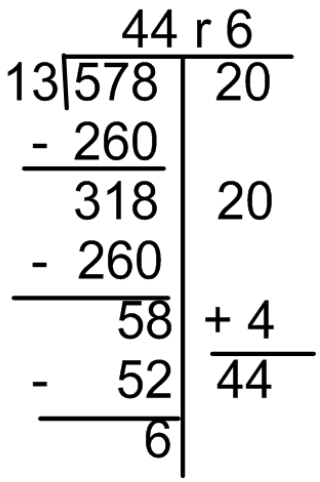
pieces and complete the multiplication in small chunks and then products at the end. The value of the top tens place digit is multiplied by the value of the lower tens place digit and the lower ones place digit. Then the upper ones place digit is multiplied by the value of the lower tens place digit and the lower ones place digit. These products are added together to find the final product.

Division:

Division also proves difficult for students as they are performing a lot of steps, usually without really understanding how the process connects to know what division means. Due to this lack of conceptual understanding, students may be able to solve a problem but have no idea if their answer makes sense.

Partial Quotients Division

Long division has been a source or struggle for students for years, especially those who still do not have their facts mastered. The partial quotients method allows students to use the facts they do know to their advantage in finding the quotient.



When given a problem, students use facts they know (1, 2, 5, 10, 20, 50, 100, etc.) to make estimates. In the example to the left, a student could say that 13 x 20 is 260 and subtract from 578. The difference is 318 so the student would know that 20 could be used a second time. 260 is subtracted again, this time resulting in a difference of 58. From here, students figure out how many times 13 will go into 58. When four is tried, 52 is the product, giving a difference of 6. The estimates are then added together to get the quotient. Since 6 is less than 13, it is the remainder.

Helpful Links for These and Other Alternative Algorithms

Division Using "Friendly Multiples" https://learnzillion.com/lessons/1482-divide-two-digit-dividends-using-friendly-multiples

Adding Using Partial Sums: https://learnzillion.com/lessons/3121

Adding Using an Open Number Line: https://learnzillion.com/lessons/3057

Solving Multiplication and Division Word Problems: https://learnzillion.com/lessonsets/611

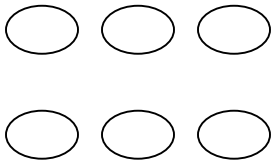
Math Vocabulary Cheat Sheet

Algorithm – a systematic step-by-step procedure for solving a problem

> Note: This is just a method. Many of us grew up using only ONE algorithm for multiplying, dividing, etc. Now, we are encouraged to teach students multiple algorithms.

Array – orderly arrangement or drawing of objects used to model multiplication.

3 x 2 = 6



Associative property – the mathematical property that states that changing the grouping of the numbers used in an operation does not change the result. This property is true of addition and multiplication but not division and subtraction.

(3 + 4) + 1 = 8 **4 + (3 + 1) = 8** **3 x (4 x 3) = 36** **(3 x 4) x 3 = 12**

Attribute – characteristics or qualities

Benchmark - reference point that can be used to help make an estimate

Circumference – the distance around a circle

Common denominator – a common multiple of the denominators of two or more fractions. For example, 1/6 and 3/8 would have 24 and 48 as common denominators. The least common denominator would be 24 because it is the smallest common multiple of 6 and 8.

Common factor – a factor that two or more numbers share. For example, factors of 10: 1,2,5, 10; factors of 20: 1,2,4,5,10, 20

Commutative property – the mathematical property that states that changing the order of the two numbers in an operation does not change the result of the operation. This property applies to multiplication and addition but not subtraction and division.

4 + 3 = 7 **3 + 4 = 7** **4 x 3 = 12** **3 x 4 =12**

Composite number – a whole number with more than two factors. For example, 25 is a composite number. Its factors are 1, 5, 25.

Computation - doing the mathematical operations needed to solve a problem

Concave - curved inward

Congruent - having the same size and shape

Convex – curved outward

Data – facts or information gathered for a purpose. Data can be written in the form of words or numbers and can be displayed in graphs, tables, etc.

Decimal – based on ten. Decimal is common used to mean decimal fraction which means a piece of a whole number.

Denominator – the part of a fraction that tells how many fractional parts there are in the whole or set;' also the second term in a ratio

Difference – the result of subtraction

Digit – a basic symbol used in numeration system. We have a base-10 system with 10 digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

Dividend – the number being divided. In 10 ÷2 = 5, 10 is the dividend.

Divisibility – if one number divides another number, it is divisible

Divisor – the number by which another number is divided. In 10 ÷2 = 5, 2 is the divisor.

Elapsed time – the amount of time that has passed

Equal – the same as

Equivalent – having the same value

Estimate - a number close to the exact number

Expanded form – a number written in a way that shows the value of each of its digits. 423 = 400 + 20 + 3

Factor – any of the numbers multiplied to form a product

Function - a relation between two sets in which each number of the first set is paired with one and only one member of the second set

GCF (Greatest Common Factor) – the largest factor that two or more numbers share

Identity property for addition – the sum of 0 and any number is that number

Identity property of multiplication - the product of 1 and any number is that number

Isosceles – two sides of equal length

Least Common Denominator – the least common multiple of the denominators

Mean - the most common form or average. To find the mean, first find the sum of the set of numbers and then divide by the number of numbers in the set.

Median – the middle number for a set of data when the data are arranged in order from least to greatest or greatest to least. To find the median of a set of numbers, arrange the numbers in order and then find the middle number

Mode – the number that occurs most often in a set of numbers. Some sets of numbers have more than one mode and some sets have no mode.

Numerator - the "counting" number in a fraction. It tells how many fractional parts there are in a whole or set that have been counted.

Order of operations – an order for performing operations to simplify expressions.

Parentheses, Exponents, Multiplication and Division (left to right), Addition and Subtraction (left to right)

Perimeter – the name for the outer edge of a figure or shape. It is also the distance around a shaper or figure.

Period – groups of three digits separated by commas in large numbers

Perpendicular – meeting or crossing at right angles

Plane – a flat surface that extends in all directions without ending

Polygon – closed plane figure formed by line segments

Prime factor - a prime number that is a factor of a whole number. For example, the factors of 12 are 1, 2, 3, 4, and 6. Of these factors, 2 and 3 are prime factors.

Prime factorization – the expression of a composite number as a product of its prime factors.

Prime number - a counting number that has exactly two factors: one and itself

Probability – the likelihood, or chance that a given event will occur. Probability is represented as a fractional number between 0 and 1.

Product – the result of multiplication

Quadrant – one of the four sections of a rectangular coordinate plane

Quotient – the number resulting from division

Range – the difference between the greatest number and the least number in the set of data.

Reflection – a mirror image of a figure. (Also called a flip.)

Regrouping - changing a number from one form to an equivalent form. In this process, the number is renamed. Regrouping is helpful in doing arithmetic computations such as subtraction.

Remainder - the number left when one number does not divide another number exactly

Rotation – the movement of a figure around a fixed point. (Also called a turn.)

Scalene - different lengths

Similar – same shape, not necessarily same size

Tessellation - a pattern of shapes repeated to fill a plane. The shapes do not overlap and there are no gaps.

Transformation - a change in the size, shape, or position of a figure. Transformations that are changes in the position of a figured are called flips (reflections), slides (translations), and turns (rotations).

Translation - the movement of a figure along a line

Variable – usually a letter or other symbol that stands for a number or quantity

Vertex – a point at which two or more sides or edges of a geometric figure meet

Zero property of multiplication - the product of any number and 0 is equal to 0.