ELECTRONOTES

WEBNOTE 52   2/20/2018

Just The (Math) Facts

-by Bernie Hutchins

Many years ago, my daughter's teacher said, "Teresa does not know her 'math facts' ".

I was accustomed to deflecting comments/actions of her teachers. For example, we had a note saying that they wanted to feed a live mouse to a live snake, and they wondered if any parents would object to their children seeing this "natural event". And just how was putting a mouse into a cage with a snake considered "natural"?   Isn't that "staged"? Let the snake catch his own darned mouse in the woods and then take his own chances getting across the road without getting run over. Apparently enough other parents objected to (if not to the logic!) the "cruelty in the pursuit of education".

But I digress. What the Hell is a "math fact."   I guessed it must be something like a times table: 9 x 7 = 63. In what sense is this a fact? It is a fact that the capital of Tennessee is Tallahassee – isn't it? It would alliterate much better if it were, but the fact is, it is Nashville. This is an example of a fact that you have to learn.   You could never have "figured it out". On the other hand, if you don't **know** 9 x 7 = 63 off the top of your head, you could have figured it out yourself.   Perhaps you could have drawn a 9 by 7 grid and counted the squares. Or since 10 x 7 is obviously 70 you just subtract 7. Or take out your calculator.

The schoolkids and teachers alike perhaps prefer dealing with what they consider to be "facts" rather than reasoning. The required depth of a fact-based lesson is clearer to the students; and for the teachers, is easier to grade.

Kids seem to hate "word problems" in math. This hatred is, I suspect, based on the cumbersome mandated methodology for solving them outlined by the teachers, which begins with the step of "converting" the problem to a math form. We hear this as a lament as to whether it is a "plus problem" or a "subtraction problem" or a "times problem" or a "division problem", knowing that it almost always is at best some combination. WHO CARES? Forget the How - What is the answer!

"Teresa – if you buy three candy bars for 30 cents each and give the clerk a dollar bill, how much change do you get?" About three seconds later: "Ten cents, except there is some tax so you don't get much except a few pennies." She even considered tax!   We should be sending the kids to the store – not to school!

The fact that elementary school math and general reasoning issues are so much better received as fun, real-world examples was mentioned by John Paulos in his famous book *Innumeracy*, Hill&Wang (2001) pg 100:

> "Puzzles, games, and riddles aren't discussed-in many cases, I'm convinced, because it's too easy for bright ten-year-olds to best their teachers."

The only way for an instructor, <u>at ANY level</u>, to <u>regain</u> the status as the "smartest one in the room" is to be very much aware that this is probably NOT the case, objectively.

Perhaps they no longer require math facts to be mastered. I wonder how they teach fractions. Engineers are so used to using what are called "improper factions" that the pejorative "improper" is likely shocking. I had to look up a "proper fraction" (numerator integer less than denominator integer) to see what that was, and also found "mixed faction" (whole number plus a proper fraction).   I seem to recall begin told to always express a result as a mixed fraction, but when carrying a result forward, to first convert to an improper fraction. Engineers (and engineering students) apparently throw off that burden.   Imagine trying to deal with something like $e^{-(3\frac{1}{2})j\omega}$ instead of $e^{-(7/2)j\omega}$? Still some students delight in telling a college-level instructor that the way they learned it in high-school was such-and-such – as though that was an excuse of any sort – let along a higher-level excuse!

On the subject of fractions, how many times are you offered something at "a fraction of the cost"?   I suppose that one is to assume it is a fraction significantly less than 1, like perhaps 1/2. If you are offering me a $100 item for $90, that's a fraction of 9/10 and I would take it IF I were inclined to purchase anyways. But two things matter: what is the actual fraction and the general level of the expense.

Another case of a basically meaningless descriptive is a "6-figure income".   Order of magnitude is a useful notion. But it seems to me that there is a lot of difference between someone making $101,000 vs. $999,000 (both 6 figures) and very little between someone making $101,000 and $99,000 (6 figures vs. 5 figures).

I guess it's easier to have a RULE than to pay attention !