Learning the Language of the Universe: How to Study Math

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Effective and Efficient Learning

"Efficiency is doing things right;

effectiveness is doing the right things."

Peter Drucker

Traditional Method

- review the lesson, watch the video, etc.
- look over the examples worked in the text (only if you know mom/dad/teacher is going to ask)
- do homework problems (as quickly as humanly possible)
- repeat for several lessons
- maybe try some sort of chapter review/chapter test (if you're an over-achiever),
- take a test (usually with questions almost identical to the homework)

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Result:

- if you "get" math: success (ish)
- if you don't: utter frustration, doom, gloom, and despair

  … then repeat with the advice to spend more time or do more problems

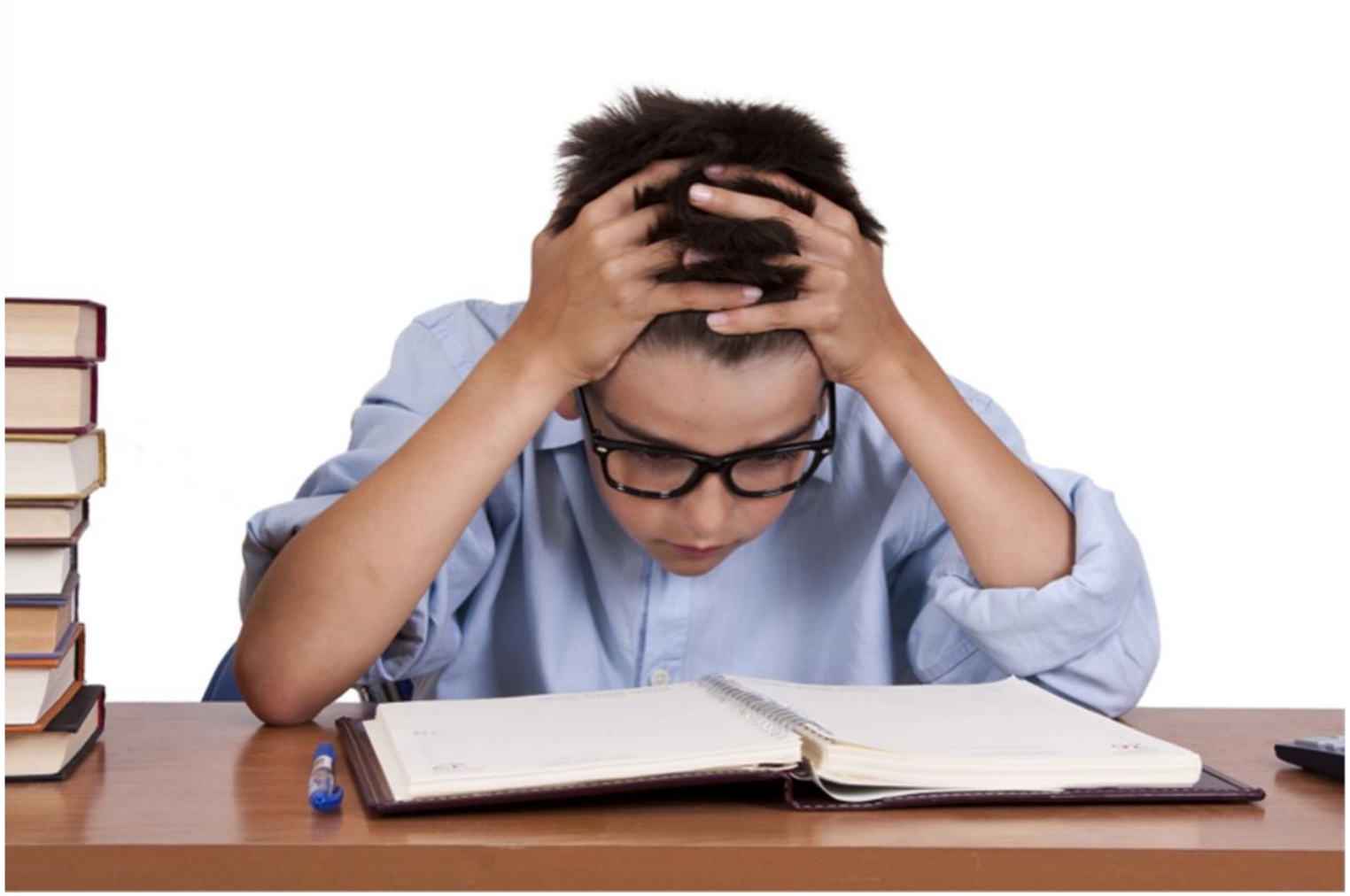
Better Solution … but first

Adjust Expectations for your student

learning is hard work

Adjust Expectations for your student

learning takes focus

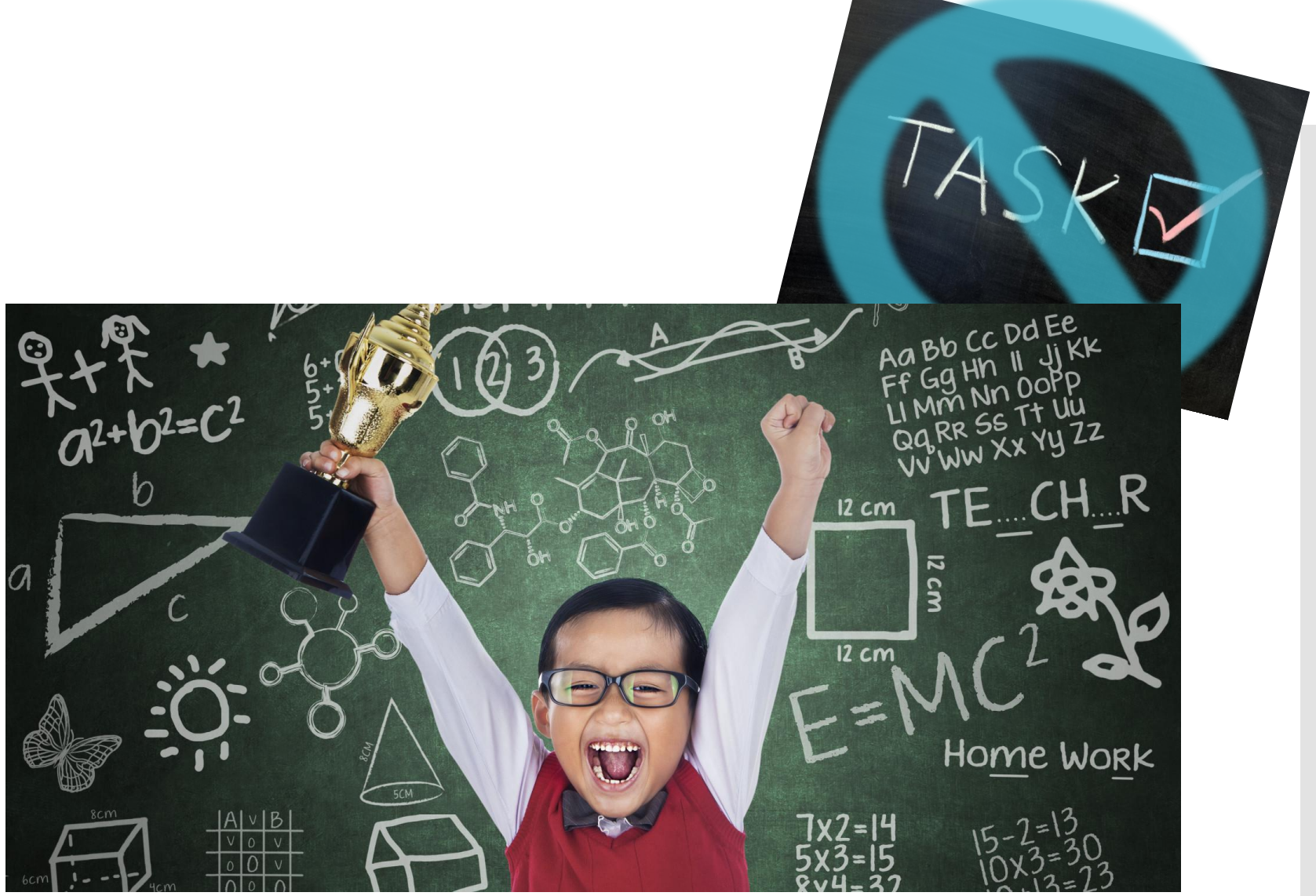


Adjust Expectations for your student

learning is a skill

Adjust Expectations for your student

mastery not completion



Adjust Expectations for you

prepare for resistance

Adjust Expectations for you

prepare for resistance

Taken from https://www.anthem-sports.com, 03/18/2021

Adjust Expectations for you

rehearse your goals

Adjust Expectations for you

improvement not perfection

Acknowledge the balance …

The Dream

Reality

Study Effectively ….

means doing the right stuff

Understand what math is and is not …

- it **is a process** by which a variety of problems are solved
- it **is not a numerical answer**

Traditions are great for a reason …

Some traditions can be improved on …

learn effectively

Consider

- read/watch – but with a new purpose
- create study notes (1/2 to 1 page per topic)
- work problems (possibly not as many)
- have an oral quiz/teaching session
- take a test (recommend timed, speed and accuracy both matter)

Meet the goal:

learning a variety of processes by which many problems can be solved

Being effective

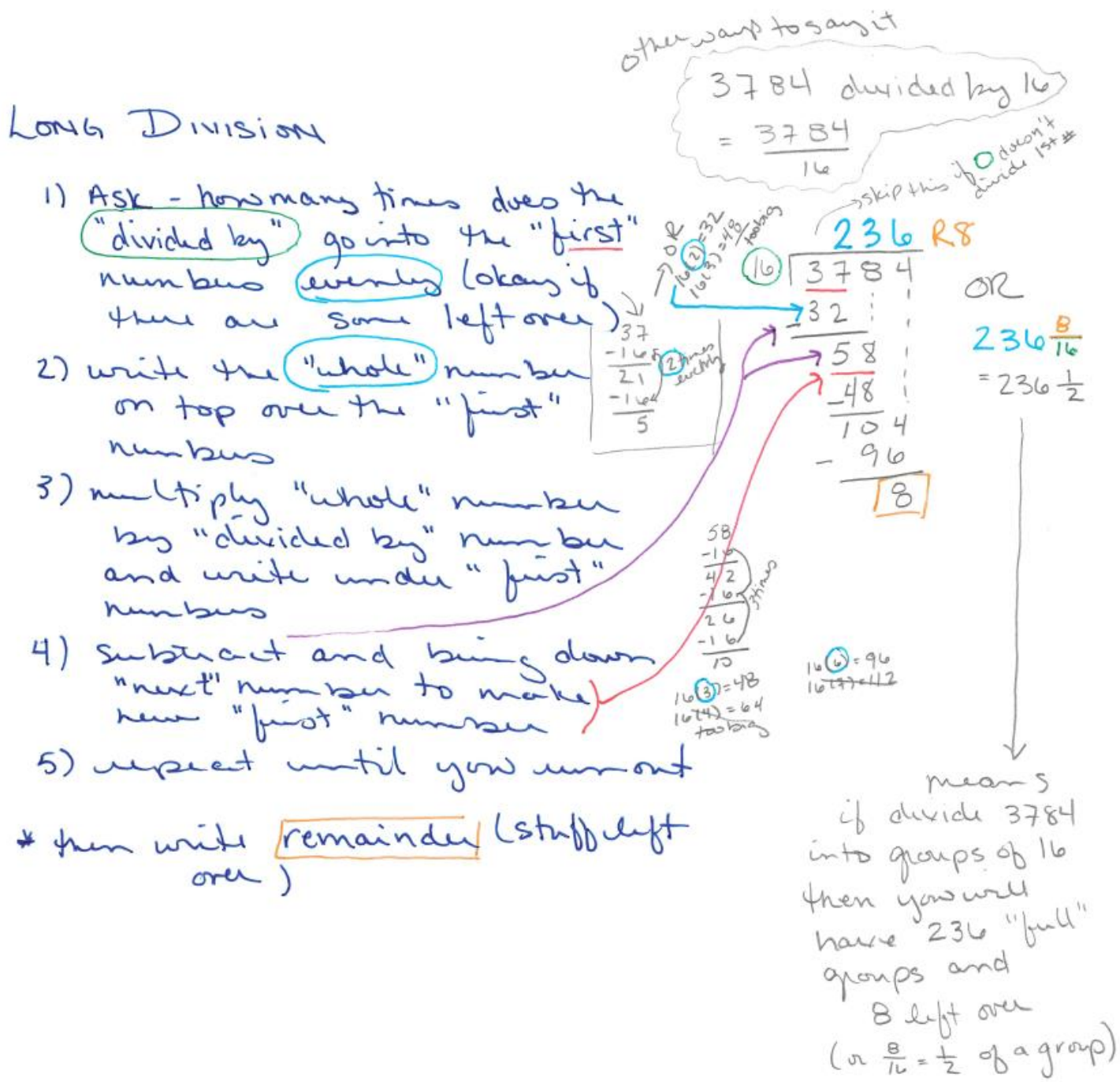
Adjust Expectations

listen/read to understand not finish

Being effective

Adjust Expectations

describe ideas/processes in "English"



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https://math.bju.edu/

Being effective

Adjust Expectations

work problems for accuracy and speed

$4\overline{)236}$	$5\overline{)165}$	$7\overline{)518}$	$6\overline{)516}$	$8\overline{)448}$
$8\overline{)720}$	$8\overline{)304}$	$9\overline{)774}$	$3\overline{)162}$	$5\overline{)285}$
$4\overline{)244}$	$9\overline{)765}$	$8\overline{)480}$	$8\overline{)192}$	$2\overline{)76}$

Being effective

Adjust Expectations

build understanding for the future

$$
\begin{array}{r}
2x^2 + 5x - 7 \\
3x - 2 \overline{)\,6x^3 + 11x^2 - 31x + 1} \\
\underline{-(6x^3 - 4x^2)} \\
15x^2 - 31x \\
\underline{-(15x^2 + 10x)} \\
21x + 15 \\
\underline{-(-21x + 14)} \\
1
\end{array}
$$

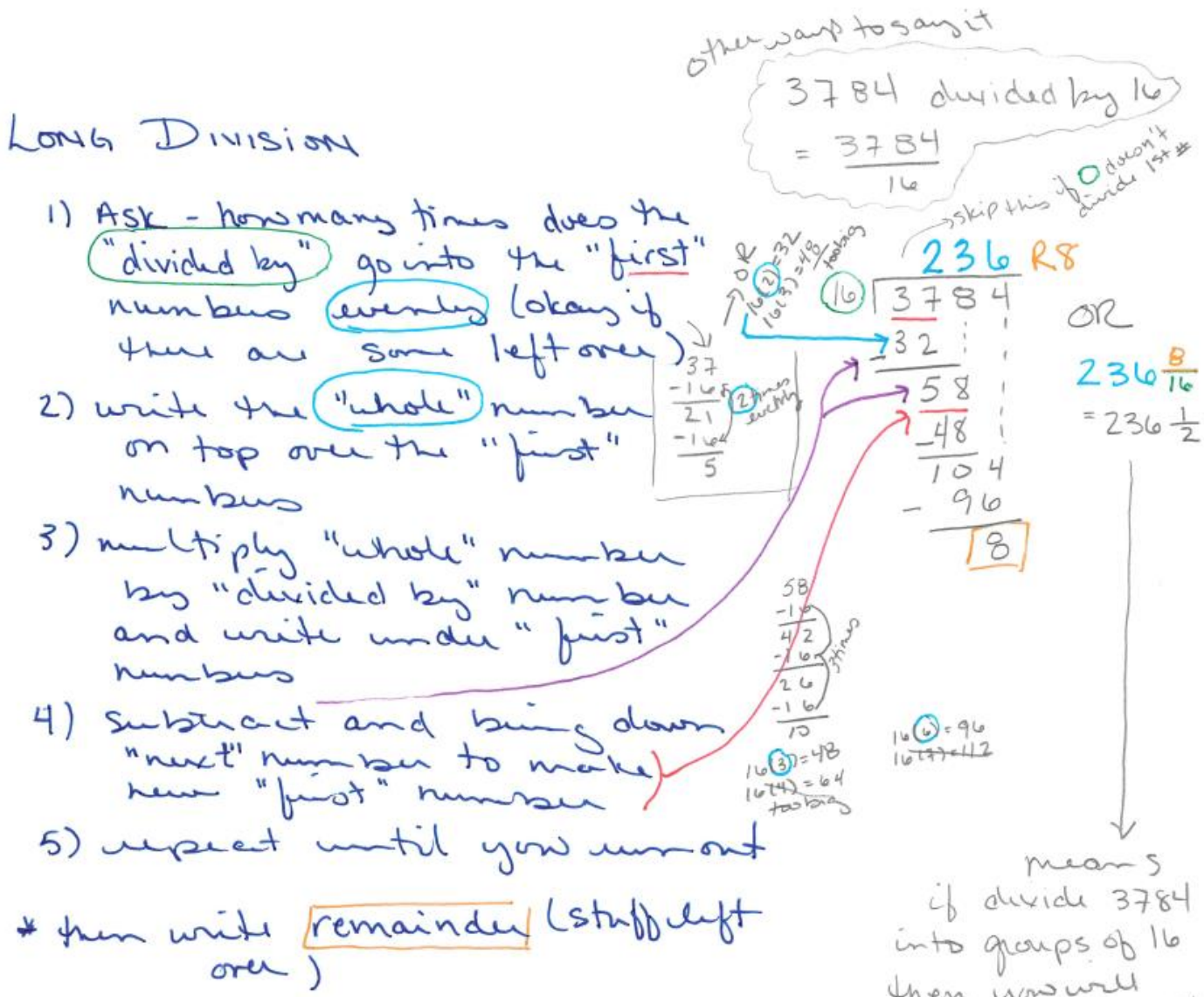
$6x^3$ divided by $3x$ is $2x^2$.

Multiply $x + 2$ by $2x^2$.
Subtract. Bring down the next term. $15x^2$ divided by $3x$ is $5x$.
Multiply $3x - 2$ by $5x$.
Subtract. Bring down the next term. $-21x$ divided by $3x$ is -7.
Multiply $3x - 2$ by -7.
Subtract. The remainder is 1.

Math Study Notes …

create ½ to 1 page notes for each lesson

check to see if they're any good



Sample Study Notes

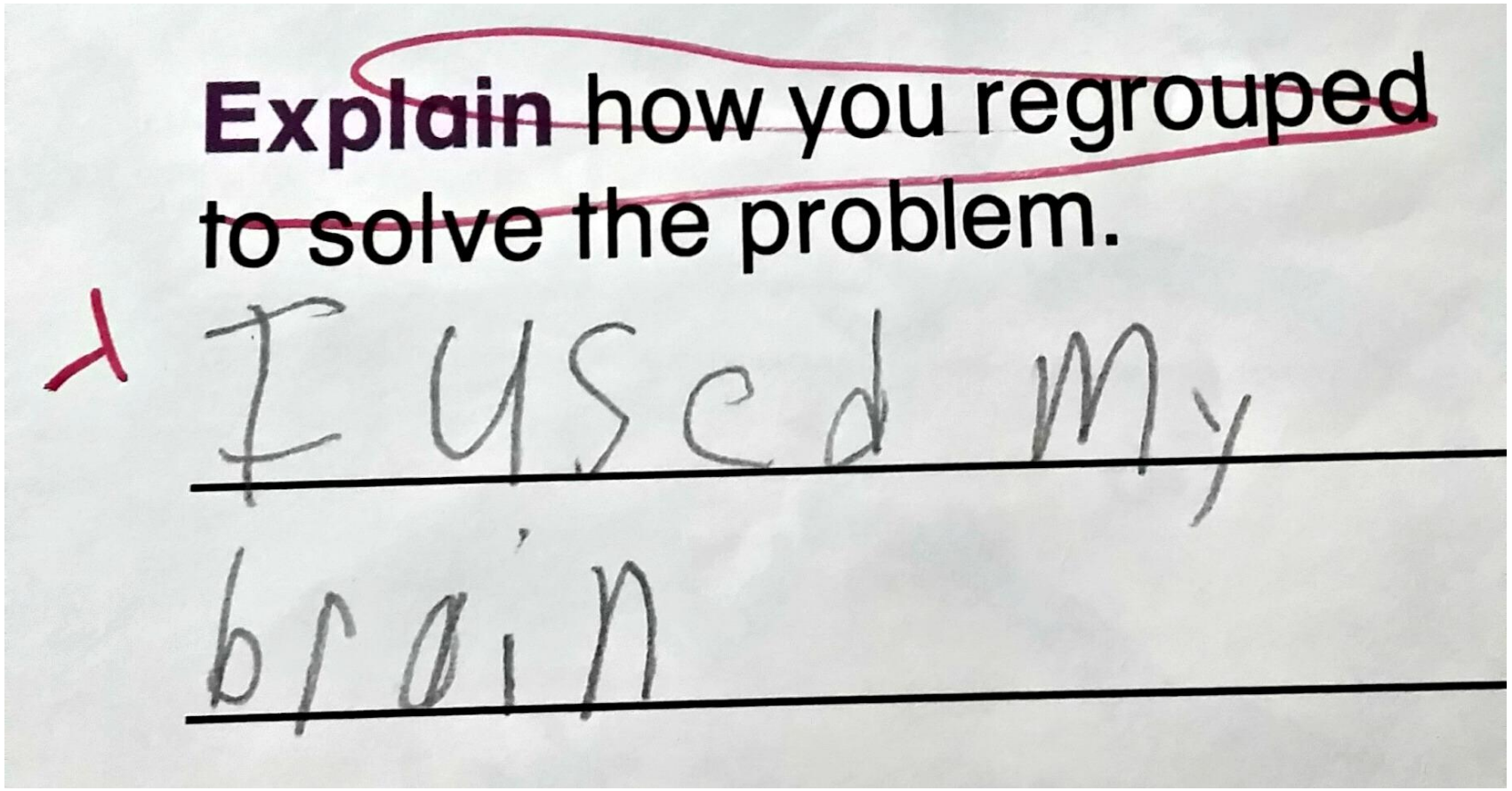
"Help" our student learn to use their good study notes?

"Helping" without diminishing learning

embrace the struggle,
build perseverance

"Helping" without diminishing learning

value mistakes, build resilience



"Helping" without diminishing learning

answer questions with questions

Study Efficiently ….

means not being stuck doing something longer than necessary

Study Efficiently ….

math needs good focus

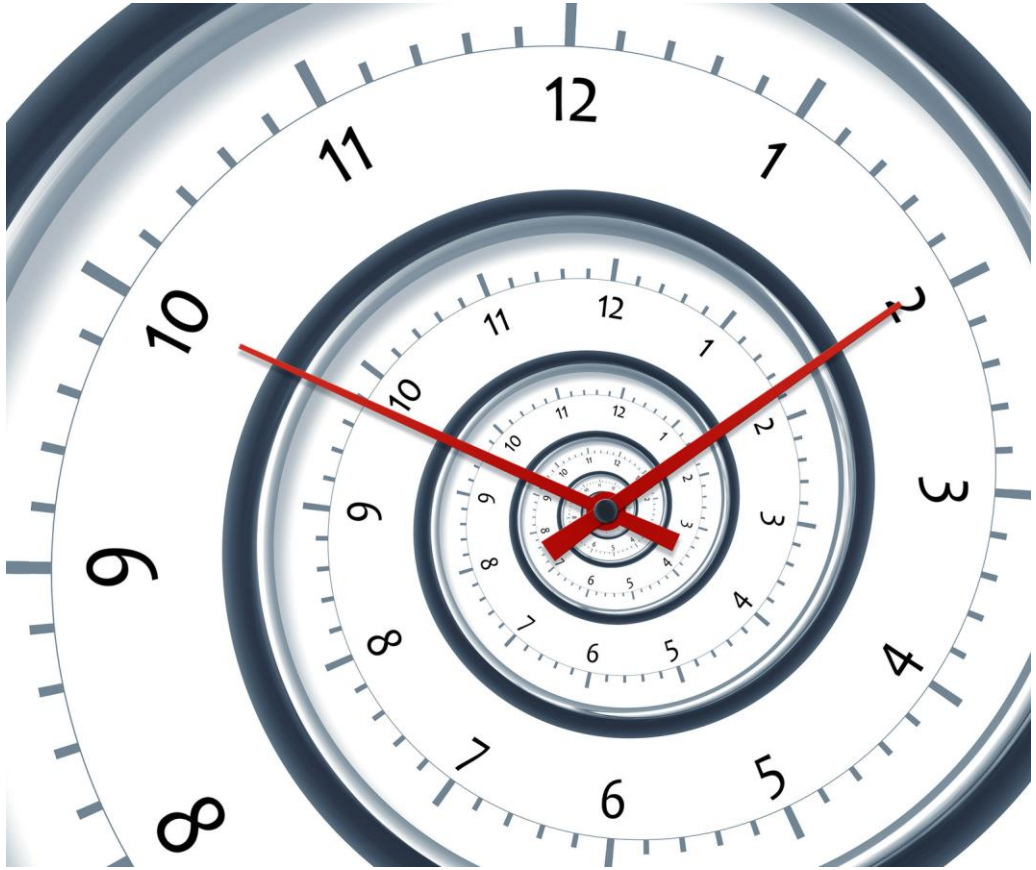
Count "quality hours" not clock hours

quality hours = clock hours * % of concentration

Study Efficiently ….

learn to get more done in less time

Develop comfort with a time-pressured environment



Study Efficiently ….

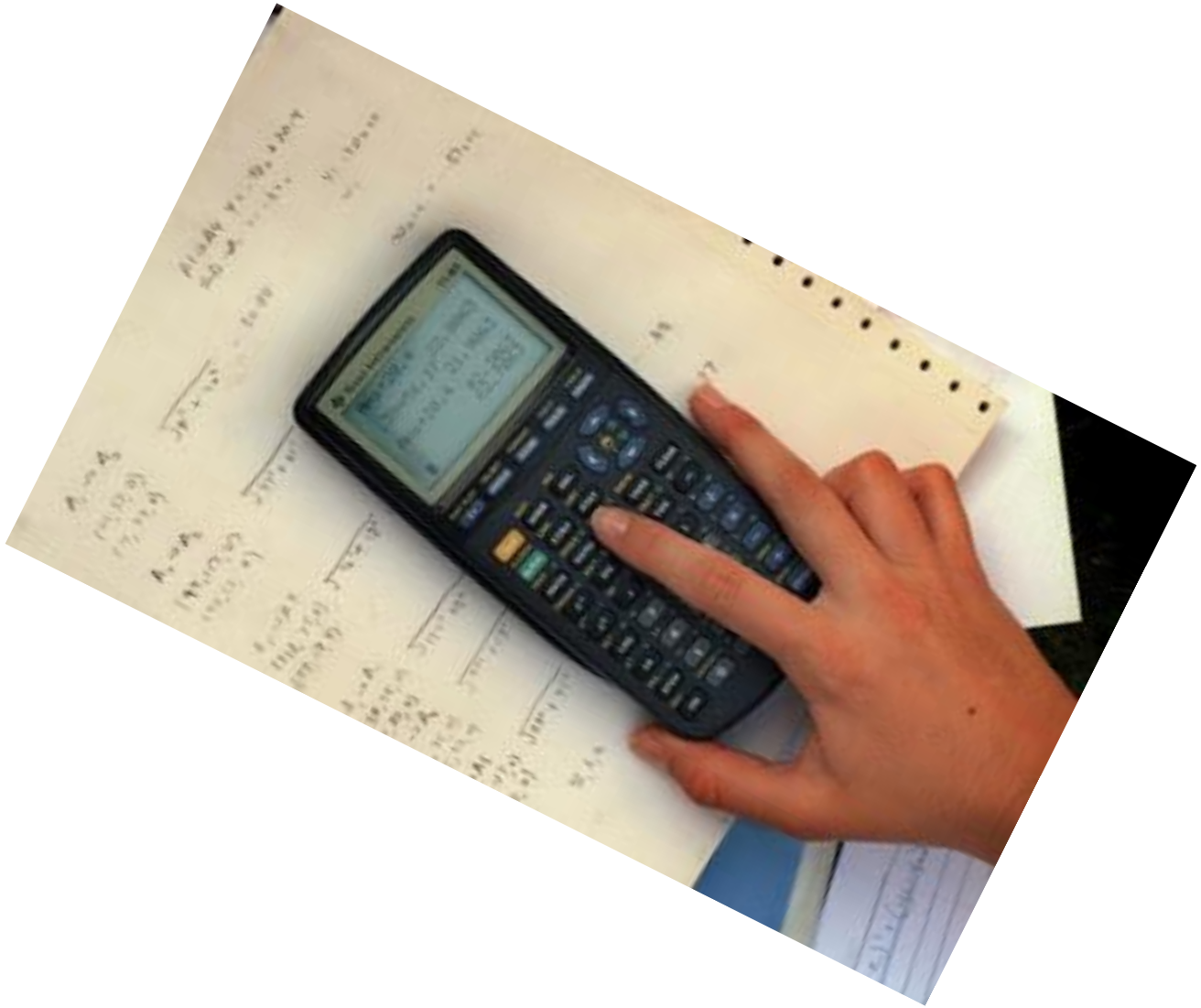
don't let the "opportunity" to learn it "again" slow you down

Learn it the first time:

- Hide the solutions
- Sorry, no redos allowed
- Cheat sheets are verboten

Study Efficiently ….

break free from bondage to calculators



Study Efficiently ….

develop more than one skill at a time

Develop critical reading/writing and communication

- describe the problems?
- how to solve?
- teach it to someone else?

Allocate your math time well

…. fast is slow,
so don't rush to get problems done

Before "starting the homework"

… take 5 and test understanding

- explain in "normal English"
- ask, "how was I supposed to know?"
- pick a problem, and only do ***exactly*** what they say

Allocate your math time well

use homework problems strategically

OR

Keep the goal in mind

Mastery not completion