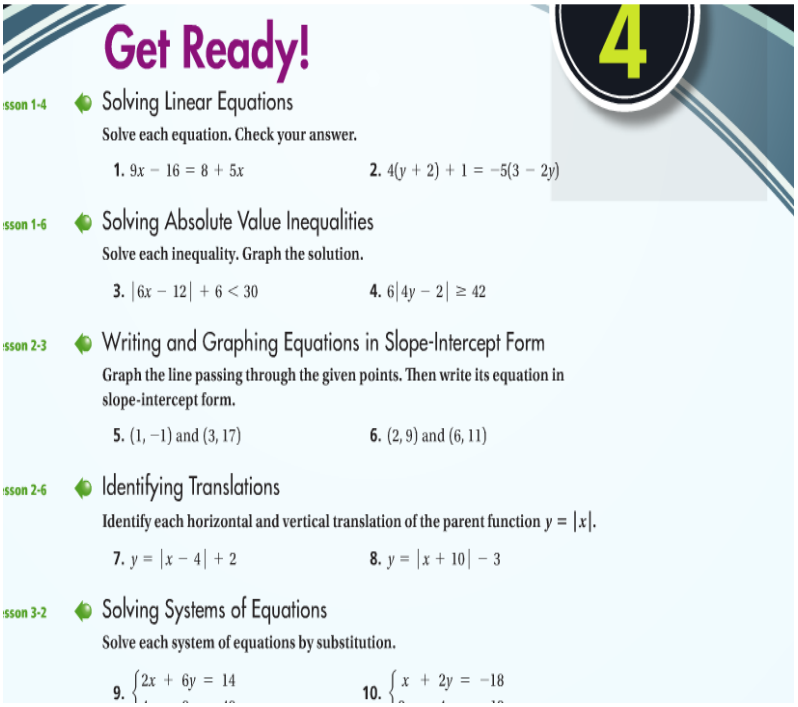
Why the American Math Education fails and how to fix it

By Jaivir Singh Baweja

I am a mathematically talented 15-year old who is capable of doing advanced mathematics such as differential geometry and differential forms in my free time. If it wasn't for my curiosity I wouldn't have been able to do all of this. However, it is prominent in teenagers and other K-12 mathematics students that they have a lack of this curiosity, as the way mathematics education is being done to our students fails. There are several reasons to this. First of all there is little *enlightenment* in textbooks. For example, look at the practice problems below from a Pearson *Algebra 2* textbook.



Get Ready!

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sson 1-4 Solving Linear Equations

Solve each equation. Check your answer.

1. $9x - 16 = 8 + 5x$ 2. $4(y + 2) + 1 = -5(3 - 2y)$

sson 1-6 Solving Absolute Value Inequalities

Solve each inequality. Graph the solution.

3. $|6x - 12| + 6 < 30$ 4. $6|4y - 2| \geq 42$

sson 2-3 Writing and Graphing Equations in Slope-Intercept Form

Graph the line passing through the given points. Then write its equation in slope-intercept form.

5. $(1, -1)$ and $(3, 17)$ 6. $(2, 9)$ and $(6, 11)$

sson 2-6 Identifying Translations

Identify each horizontal and vertical translation of the parent function $y = |x|$.

7. $y = |x - 4| + 2$ 8. $y = |x + 10| - 3$

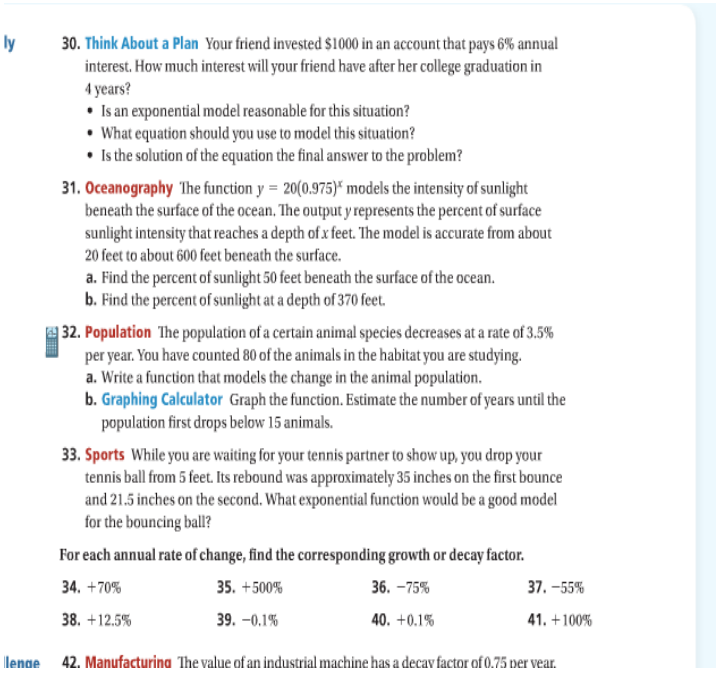
sson 3-2 Solving Systems of Equations

Solve each system of equations by substitution.

9. $\begin{cases} 2x + 6y = 14 \end{cases}$ 10. $\begin{cases} x + 2y = -18 \end{cases}$

This book has "examples" that give the student *step-by-step solutions* to the problems. There is no way they can *figure out* what to do; mathematics as a study is about figuring out how to solve a certain conjecture; then who knows it could be based on

algebraic geometry for a number theoretic problem, just the like the recent proof of the *abc*conjecture ,or if it is just a simple thing to solve. Moreover, all the problems in this book involve *calculating,* and even worse *calculators.* Thus students at this level are given the impression that mathematicians punch in huge numbers into gigantic computers, which is not even infinitesimally close to what they do. Finally, the last major problem of many others in the system is *word problems.* They are trying their best in order to give *real-life* applications of mathematics, but the problems *are not realistic*, as can be seen in this next picture, taken from the same textbook as the example for the first



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30. Think About a Plan Your friend invested $1000 in an account that pays 6% annual interest. How much interest will your friend have after her college graduation in 4 years?

- Is an exponential model reasonable for this situation?
- What equation should you use to model this situation?
- Is the solution of the equation the final answer to the problem?

31. Oceanography The function $y = 20(0.975)^x$ models the intensity of sunlight beneath the surface of the ocean. The output y represents the percent of surface sunlight intensity that reaches a depth of x feet. The model is accurate from about 20 feet to about 600 feet beneath the surface.

a. Find the percent of sunlight 50 feet beneath the surface of the ocean.

b. Find the percent of sunlight at a depth of 370 feet.

32. Population The population of a certain animal species decreases at a rate of 3.5% per year. You have counted 80 of the animals in the habitat you are studying.

a. Write a function that models the change in the animal population.

b. Graphing Calculator Graph the function. Estimate the number of years until the population first drops below 15 animals.

33. Sports While you are waiting for your tennis partner to show up, you drop your tennis ball from 5 feet. Its rebound was approximately 35 inches on the first bounce and 21.5 inches on the second. What exponential function would be a good model for the bouncing ball?

For each annual rate of change, find the corresponding growth or decay factor.

34. +70%	**35.** +500%	**36.** −75%	**37.** −55%
38. +12.5%	**39.** −0.1%	**40.** +0.1%	**41.** +100%

lenge **42. Manufacturing** The value of an industrial machine has a decay factor of 0.75 per year.

Problem mentioned in this paper. Now to fixing the system itself. First of all, we need to introduce mathematical reasoning at a much earlier level, through games and other activities. Note that this is not introduced until the beginning of *high school geometry.* Speaking of geometry, it should be taught at the elementary level using the logic gained in such a way children get to *figure out why* something works or something doesn't work. Secondly, we need to get rid of *calculating* and nonsensical *word problems*

as they are the root of the wrong impression of what a mathematician is to children. These should be replaced by *interactives*that allow the user to use their mathematical reasoning along with their knowledge of applicable theorems in order to prove a proposition or solve a real-life problem. After all, it is just common sense.