Life of Fred

Pre-Algebra 1 with Biology

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Polka Dot Publishing

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for Goodness' sake

or as J.S. Bach—who was
never noted for his plain
English—often expressed it:

Ad Majorem Dei Gloriam
(to the greater glory of God)

Pre-Algebra

Is there a time between childhood and adulthood? Yes and no.

Yes. There are those million adolescent years that begin when you first start to get hair under your arms and ends somewhere between ages 18 and 28. My daughter Margaret once told me that she wanted to "grow up and be a dolt like you." She was three when she said that. She became an English major in college.

No. There is no time between childhood and adulthood. There are years in which childhood and adulthood are blended together. These are years in which we hold onto parts of childhood with one hand as we stretch out to grasp parts of adulthood with the other hand. In those years, we sometimes make the noises that kids make. And sometimes we make the noises that adults make.

Is there such a thing as pre-algebra? Yes and no.

Yes. The book that you are holding is a pre-algebra book. Doesn't that prove that pre-algebra exists?* If you tell your grandma that you are studying pre-algebra, she will pat you on the head and say, "I'm proud of you." In contrast, if you tell your grandma that you have a pet unicorn, she will tell you, "You are a big silly." She will pat you on the head and feel for soft spots.**

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* Of course, if there were a *Life of Fred: Horses With Wings* book, would that mean that horses with wings exist?

** Since this is a biology book, this is a good time to start. Your grandma is feeling your head to find soft spots on your head called **fontanels**. When you become an adult, they may call you a bonehead, but babies at birth might be called bonesheads. Their skulls have about seven bones. (That makes being born a lot easier.)

For many first-time parents, they get nervous when they notice the fontanels on their newborn. There's a big soft spot in front and a much smaller one in back. (When Fred was born, it was his nose that scared his parents.) The fontanels disappear in the first two years of life as the bones fuse together.

No. There is no such thing as pre-algebra. I checked two dictionaries and "pre-algebra" wasn't in either one of them.*

A better argument for the non-existence of pre-algebra is that there is no mathematics that is uniquely pre-algebra. It is just a blend of arithmetic and the first parts of algebra.

"Solve $2 + 2$" is arithmetic.
"Solve $\frac{2}{3} + \frac{4}{5}$" is arithmetic.
"8 is what percent of 32?" is arithmetic.
"Solve $3x + 6 = 5x$" is algebra.
"Combine x^5x^4" is algebra.

} are all called pre-algebra.

So why did they invent the name "pre-algebra"? For the same reason they invented the name "teenager." It gives a name to the place you stand when you are between two worlds.

childhood ↔ adulthood
arithmetic ↔ algebra

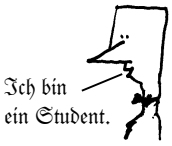
---

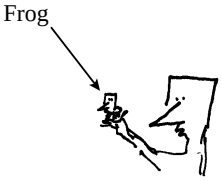
* Is this a good argument? I'm not in the dictionary. You are not in the dictionary. But we exist.

To make things worse, *unicorn* is in both of my dictionaries. And in Deuteronomy 33:17 (King James Version).

Biology

You go to school. You sit in a room for fifty minutes and study history. Then they ring a bell, and you go into another room and study a foreign language. Then they ring a bell, and you go into another room and study biology.





History Foreign Language Biology

Doesn't that seem a little unnatural to you? The world is not divided up into little water-tight compartments of aerospace science & engineering, agricultural & environmental education, animal biology, animal science & management, anthropology, art history, art studio, atmospheric science, avian sciences, biochemical engineering, biochemistry & molecular biology, biological sciences, biological systems engineering, biomedical engineering, biotechnology, cell biology, chemical engineering, chemistry, Chinese, civil engineering, classical civilization, clinical nutrition, communication, comparative literature, computer engineering, computer science, dramatic art, ecological management & restoration, economics, electrical engineering, English, entomology, exercise biology, fiber & polymer science, film studies, food science, French, genetics, geology, German, history, human development, hydrology, international agricultural development, international relations, Italian, Japanese, landscape architecture, linguistics, *mathematics*, mechanical engineering, medieval & early modern studies, microbiology, music, neurobiology, physiology, nutrition science, optical science & engineering, philosophy, physics, plant biology, political science, psychology, religious studies, Russian, sociology, Spanish, statistics, textiles & clothing.

One teacher will say, "I teach chemical engineering."
Another will say, "I teach German."
Let us give five stars to the teacher that says, "I teach students." What a novel idea!—treating students as if they were humans, rather than receptacles into which they can pour a single distilled subject.

So this is a pre-algebra book . . . and a biology book. And we will quote six lines of Italian poetry. We will discuss the difference between a metaphor and a simile. Talk about first-aid for fainting. Balance some chemical equations. Play with a French phrase in the movie *Camelot*.

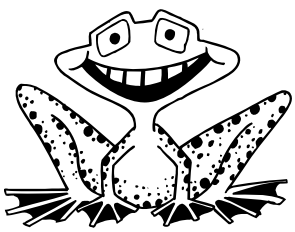
And in the meantime, you will learn some algebra and a lot of interesting biology.

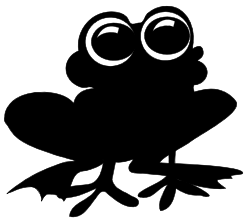
INTERESTING BIOLOGY

Is "interesting biology" an oxymoron?✶ Your typical modern biology book weighs a ton and costs a fortune. I opened one of my biology books at random. The heading was "Producers of Zygosporangia." The first sentence under than heading was "Consider the zygomycetes." A second biology book has a whole chapter entitled "Excretion." No thanks.

One reason I chose to become a mathematician rather than a biologist is the mind-numbing number of terms that you have to memorize in beginning biology. Did I want to learn that insects get rid of water through Malpighian tubules? Or, flipping to another page in another biology book, we learn, "11-*cis* retinaldehyde combines with a protein, opsin, to form the visual pigment rhodopsin."

Names, names, names. If I know the names of every frog in the pond, do I really *know* anything?





But getting beyond all the memorizing of details, there is a ton of interesting parts of biology—several ounces of which are in this book. You learn why, if George Washington had traveled to every place in the whole world, he would never have found a Concord grape. (You'll also learn how a two-year-old, Sally, became the owner of an 80-store mall, and about silver wedding axes—but neither of these have anything to do with biology.)

Many students who have had a year of high school biology can't tell the difference between a gene and a chromosome.

Or they look at a six-ton tree. They know that the water in the tree came from the roots. You ask them, "Where did the rest of the mass of the tree come from?" Many don't know. (It did *not* come from the dirt.) You will find out in this book.

✶ OX-ee-MORE-on. An oxymoron is a phrase that seems to be contradictory, like "painless IRS audit" or "full-length bikini."

About This Book

. . .

VARIOUS FONTS

There are three fonts of type that are used extensively in the book. The text of the book is written in this font. It is called Times New Roman.

When Fred is thinking, I will put his thoughts in this font.

When you, the reader, want to interject your thoughts, ***you express yourself in this font.***

WORRIES THAT SOME PARENTS HAVE

This is a biology book. You can stop worrying. Fred is much purer than Mae West.

No chapters on excretion. We never mention what you do when you "go to the bathroom."

No sex stuff—although we happen to mention that Fred has a Y chromosome.

No mention of E[redacted]n.*

✶ See. I didn't mention Evolution even once.

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Chapter One

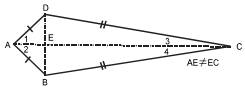
Living Things

It was just before dawn. Fred was
in his sleeping bag,
under his desk,
in his office,
in the math building
at KITTENS University
in Kansas.
And he was asleep. Dreaming.

You might think that someone who taught arithmetic, beginning algebra, advanced algebra, geometry, trigonometry, calculus, statistics, and linear algebra would have dreams filled with

$x + 3 = 7$

$\Delta ABC \cong \Delta DEF$

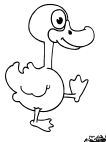


∞

$\sum_{i=1}^{3} x^i = x^1 + x^2 + x^3$

$\alpha, \beta, \gamma, \delta$ are the first four letters of the Greek alphabet.

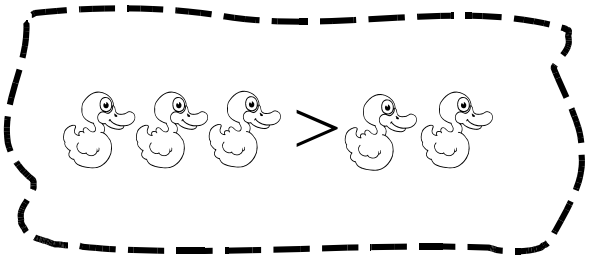
Thirty percent of 20 is 6.

And some days, those were his dreams. But not this morning. Our five-and-a-half-year-old professor of math dreamed about a cow having a glass of milk. And a duck out for a walk. 

And flowers and trees.

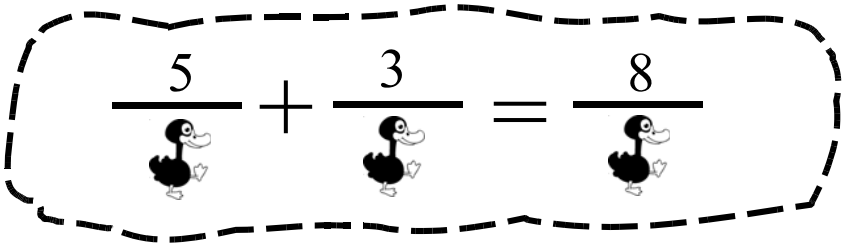
And cotton, corn, and cacti.

Have you ever had a dream and wondered what it meant? This wasn't Fred's typical math dream. If he had dreamed,



then that would have been easy to understand. Three ducks are greater than two ducks. Just like $8 > 6$.

Or if he had dreamed of adding fractions with a common duck—I mean with a common denominator—that wouldn't have puzzled Fred.



Cows and ducks, flowers and trees, cotton, corn, and cacti—what's this dream all about? Then he dreamed of this dog with the answer:

On the next page it's *Your Turn to Play*. You learn by reading, and you also learn by doing. This is your turn to *do*. Take out a piece of paper and write your answers down before you look at the solutions I have provided.

Chapter One Living Things

Did you know that teachers used to be students? Why are they now smarter than the students they teach? One reason is that they *do* the stuff. They stand at the blackboard, and they write and talk.

Please don't just read the questions and then read the answers. Use a piece of paper and a pencil.

Please.

Your Turn to Play

1. When scientists study the stars and the moon, it's called astronomy. When they study matter, energy, motion, and force, they are studying physics. What do they call the study of living things? (Hint: Look at the title of this book.)
2. Which of these are true?

$7 > 4$

$\frac{44}{11} > 5$

$\pi > 3$

3. Let's add some fractions with a common ~~duck~~ denominator.

$\frac{4}{13} + \frac{7}{13} = ?$

Complete Solutions

1. If you guessed "Pre-algebra," you only get half credit. The study of living things is called biology.
2. $7 > 4$ is true. Seven is greater than four.

$\frac{44}{11} > 5$ is false. Four is not greater than five.

$\pi > 3$ ($\pi \approx 3.14159265358979323846264338327950 28$ where $\approx$ means *approximately equal to*.) Since $3.14159265358979323846264338327950 28 > 3$, we know that $\pi > 3$ is true.

Many students memorize that $\pi \approx 3.14$ or that $\pi \approx 3\frac{1}{7}$.

3. $\frac{4}{13} + \frac{7}{13} = \frac{11}{13}$ not $\frac{11}{26}$

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