

A Perfect Regression Problem for Algebra 2

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Introduction

I keep on looking up at my students and wondering why none of them ever seem to ask why math is important. Why the math we are doing, solving quadratics, for example, is important. Some students, those wanting to major in engineering, for example, seem particularly sharp and annoyed, as it seems to me, that math seems so much drill with no real meaning. How can I convey to them that math is a very important subject and indeed, looking around the room, that just about every object, inclusive of students, can be and has been analyzed with mathematics: the projector, the height of student desks, the blood glucose in students' bodies, their IQ's, their incomes, how much they can afford for food, medicine, the building the classroom is in, the weather outside, the room temperature (weather inside) – all of it has been thought out using mathematics.

Of course the students who take calculus will see some of the applications, but what about those who will just take algebra and maybe statistics. Is there a way to get the importance of mathematics without getting too technical and too difficult?

I do have a kind of mini-lecture I give some curious looking student who really wants to get a clearer picture, faster of the value of math. Here is what I say. The math I am teaching you in Algebra 2 (or College Algebra), the departmental test that you are required to take, my slant on the subject is the same as that of courses, books, this department, in effect, for the last 100 years. We still teach drill and use calculators minimally. In truth the ability to do regression and determine models for lots of phenomena is a thing of the last 20 years or so – calculators put this capability in the palm of your hand, literally. But things change very slowly and committee's get larger and larger mirroring the pages of modern algebra textbooks. Everybody's toes can't be stepped on. As another instance: the

idea of regular students programming their calculators is taboo. Programming, although it is everywhere, is too new for old teachers, old administrators, and old governmental ideas. It gets worse though.

You are not allowed to understand mathematics at a deep and pertinent level because the powers that be want to continue to exploit your emotional, hormonal controls. They don't want you to know that McDonald's, the federal, and state governments, in cahoots with such business interests want to exploit your body's legacy controls to make money. They do not care that such legacy systems will not enable humans to solve global warming. They especially don't care very much that you, thanks to not having a good mind, will not be able to avoid personal health and financial risks. They just want to have teachers teach the same math the same way to keep you in a state of child like obedience within a primitive, predatory culture: a kind of cruel zoo. Take a look at the vending machines selling high fat, salt, and sugar content for profit to you. That's the state, the school, the government thinking about you. You are just a primitive organism that can't break out of your legacy mental works, the mental works appropriate for scarce environments where famine was frequent. Think about it: as humans were evolving, in order to survive, they needed to gorge on fat, salt, and sugar when ever they could. So, they are saying to you, stay stupid so we can get rich. I should teach you regression and models so you can get smart, but I can't. It isn't allowed. No time.

The student (sometimes students) start nodding their heads in agreement. They understand: college doesn't train students to become biologically sound animals imbued with mathematics to make them impervious to the evil machinations of government and corporations; college just makes students cogs in the wheels of a great and stupid machine that thinks like a crazed animal. There is no idea of car pooling, for example, to reduce carbon emissions. There is in the parking lot, however, bragging rights amongst teachers and students to have the fastest, most polluting car with the greatest all leather interiors. That's also the default, legacy system of herds of animal; alpha males and females arise from cash, cars, in effect muscles and aggression. When you think about it status is really measured by size of carbon footprint: square footage of homes, horsepower of cars, vacations, clothes – all to satisfy some prehistoric idea of worth. Mental power and mental qualities that enable sound decision making leading to an elevated, enlightened animal uncontrolled by such legacy ideas is not the goal at all. It is literally unthinkable; no time. And guess what the zoo keepers are just as bad as the animals: teachers? Look at their cars, their waist-lines, their minds. They are just trained cogs, possessed of no better (qualitatively) mental works than students

and everybody else.

Is any of this true though? Could an algebra instructor actually do something in class, consistent with department guidelines, books, peers that might just show a few students the possibility that math could be used to make their lives better, the world better? Could I in an afternoon show the way to a brighter, smarter human future?

A fast linear model

The design of a good regression problem should be immediately interesting to students. Gasoline prices are good. Students buy gasoline for their vehicles frequently. It should be easy to put into a calculator. If possible, it should show the idea of code to students. Code is the hope of humans. It is the stuff of the Internet, our i-phones, our world. So, programming a calculator is a nice idea. The upshot just could be that we too run with code: what authorities say to us, for example, is a kind of code. So, what is a good code for humans, now? They might stretch their minds to grasp that all important question, if coding a calculator is involved. Some kind of sense that they are able to frame problems, to make up numbers, to input their numbers, not some book's or some teacher's is also of importance. This fights the idea that teachers, books, homework web-sites give you problems, numbers in effect or parameters and you are to solve their, not your problem; you are just a slug again. No, students should supply the numbers, in effect make up the problem. They have imaginations, a random number generator inside them. They should use these things.

All of these ideas in place, the picture is that when students go out onto the street maybe they can feed inputs into their minds, process it, and make their own, enlightened decision. Here are two: don't eat the crappy food they are trying to sell to you; and, seek good, global solutions to modern problems. All and all out of the afternoon of math out should come the new word to the wise: Be a genuinely advanced, modern human being, not a slug waiting to be stomped on by foolish, Neanderthals all around you. Revolt! is the idea we should promote at our college.

One year model

Make up what you think the per gallon gas price currently is, in this the month of January. Now make up what you think the price will be in December. Make

sure the price goes up or down from the January price. We then are going to use mathematics and our calculators to find a linear model, and then interpolate, find the likely gas price for the months of April, June, and October (or any other three months).

The math

Given two points on the plane, (C, D) and (E, F) , we want the slope intercept form of the line. We know we can put this into the Y_1 variable and then look at the line and use the table feature to look up values at integer x-values.

We need the formula for the slope given two points and the point-slope form of a line. Here is the reasoning. The slope is

$$M = \frac{F - D}{E - C}$$

and the line in slope intercept form is, via the point-slope form the line,

$$Y - D = M(X - C)$$

and this gives

$$Y = MX - MC + D.$$

We know the slope intercept form is $Y = MX + B$, where B is the y-intercept, so we can infer $B = -MC + D$.

Coding the calculator



Figure 1: Code for linear regression using two points.

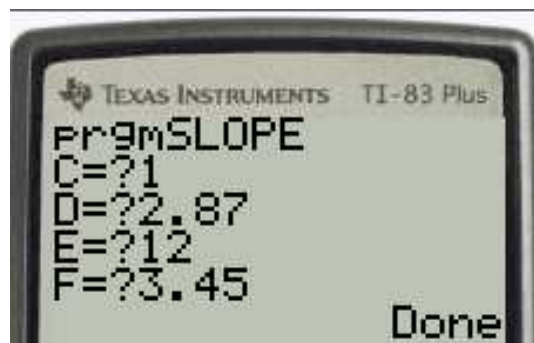


Figure 2: January and December gas prices (data points) inputted into the program.

X	Y1
1	2.87
2	2.9227
3	2.9755
4	3.0282
5	3.0809
6	3.1336
7	3.1864

X=1

Figure 3: The table shows gas prices for all months of the year.

What does this do? When?

Truth be told a single presentation like the above would not do it. To really make modern mental works, students would have to be surrounded by models and encouraged to make such models in all courses for which it is remotely possible. Certainly nursing, medical majors, business majors, engineers, para-medics easily have subject matters where models are used. Math could be so much more meaningful to so many students it isn't funny. But this is just good teaching. To actually get the full potential of math, one needs to use it to measure the effectiveness of building a better mind, a mind able to make biologically sound personal and collective decisions. What should you eat? Drive? Think? Be? These are much harder things that require the over-riding of legacy mental controls of emo-

tions, hormones, and especially reliance on social forces. A new generation of humans needs to revolt against the current society. The over thirty crowd are hopeless relics, programmed, imprinted with antiquated math: they are stupid robots still using pencils and paper to do calculations per some imagined authority figure. Can't be changed. Worse they can't be influenced by models built by reason. They are primitive animals; look at what they drive, eat, where, and think. They don't compute their decisions; they are controlled by legacy mental works, following the herd, not global warming models and their dire warnings. No change is possible with them. They don't really understand computers and math; these are things of the last 20 years. Left to their own devices they will sit there and tell you to factor quadratics until the human species goes extinct. As long as they get a pay check, it makes no difference to them. Look at them: they gorge on steaks and fries, watch pornography, drink, do drugs, and drive SUVs – I'm talking about the deans of science disciplines at MIT!

The banter of the teacher continues

Can humans really have mental works that are biologically reflected of modern science? Maybe no amount of regression analysis, prodding of students with making models will get them to make personal decisions using them. We are just destined for extinction because we can't use meaningfully what science teaches us. We eat, mate, and pollute per instincts and *written in stone* drivers. That's it. End of story. I mean if you push away all the bunk the ultimate equation for developing countries is *in order to compete and win, you need to make your CO₂ emissions to get energy apace and make your populations crazed with advancement as evidence by personal carbon footprints*. Isn't that the truth of the matter.

The picture we want is humans to get a new value system based on their decision to make personal decisions per the higher ideal (than instinctual control) of conformity to science, models. They need to get pleasure from being biologically coherent, stable, advanced – not slavish to instincts, hormones, and social pressures. It is a stretch, but the life of our species doesn't it depend on this quantum leap in human mental works. Make a game, played on i-phones world wide that makes the truth so obvious current ideas are rendered totally bizarre – like eating with fingers, after learning and having eating utensils. Check out *The Mathematics of Eating* by this same author.

Plot salaries versus rate of inflation

An especially nasty one for academia: plot teacher versus administrator salaries against CO_2 emissions. They pay teachers less and administrators more and yet the results as measured by lots of scores of students being the same or worse. Go figure! How about paying teachers to deliver biologically advanced, next generation human beings able to make biologically sound decisions – driving down CO_2 emissions!

References

- [1] R. Blitzer, *Algebra and Trigonometry*, 4th ed., Pearson, Upper Saddle River, New Jersey, 2010.