



# *Why take algebra?*



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# *Reasons to take algebra*

- Reasons to take algebra fall into two categories:
  - 1) abstract or indirect reasons
  - 2) Concrete reasons
- Both types of reasons are important, so we'll look at both. If you care more about concrete reasons, wait... they're coming. Don't skip the indirect reasons!

# *Abstract/Indirect Reasons*

- General knowledge:  
We live in a scientific society driven by technology, most of which runs on the basis of advancements in science and math. Knowing some of those basic principles is just a good idea. It's a bit like learning history: it helps put our modern society in a context that makes it easier to understand.

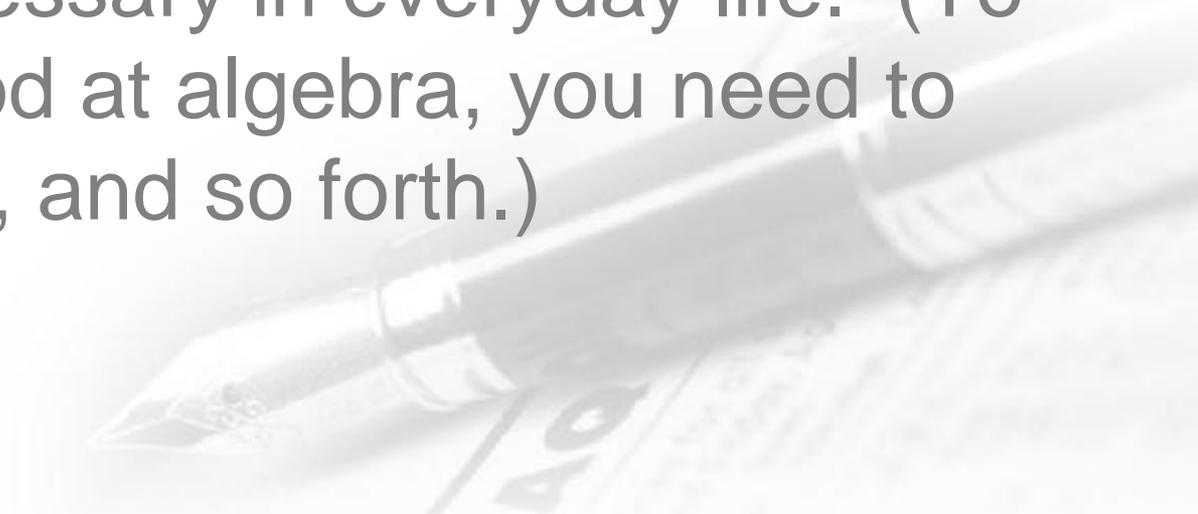
# *Abstract/Indirect Reasons*

- Abstract thinking:  
Since the IQ test was invented, it has to be renormed every 10-15 year because the median drifts upward from 100. The reasons for this seem to be an increase in abstract thinking skills. We are getting better, as a culture, at the abstract thinking that IQ tests test. Some people come by it naturally, but it can be learned. Abstract thinking is essential to science and dealing with complex political problems in our daily lives.

# *Abstract/Indirect Reasons*

- Learning a more complicated task can help you improve a simpler one.

In this case, doing algebra can help really reinforce your arithmetic skills, which are certainly necessary in everyday life. (To get really good at algebra, you need to take calculus, and so forth.)

A fountain pen is shown in the lower right corner of the slide, resting on a document that contains some mathematical formulas. The pen is silver and black, and the document is slightly out of focus.

# *Abstract/Indirect Reasons*

- **Problem Solving Skills:**  
Much of what we learn in math is how to solve word problems. The purpose of the equations is a means to this end. Word problems are often difficult, but they teach us how to break down problems into what we know and what we don't and relate them to each other so that they can be solved. These skills can extend beyond mathematical topics to be applied to other complex, non-mathematical problems.

# *Concrete Reasons*

- Employers like employees with good problem solving skills  
Good math skills makes you an asset to employers and can make it easier to find a good job. Employers tend to recognize those with strong math backgrounds as flexible on the job, and capable to learning complex processes.

# *Concrete Reasons*

- **It's a requirement!**

This is the most often-cited reason for needing to take math from people who don't know or who are tired of explaining: someone else thinks it's a good idea, and they are in charge, so it's just a hoop you've got to jump through. It's pretty unsatisfactory, but it is the truth. The requirement exists because of one of the other concrete or abstract reasons listed, not just to bilk money out of students to keep the elite smarties employed, or because they just want to keep kids off the street.

# *Concrete Reasons*

- Algebra was invented to solve specific problems. You may not need to solve all these problems, but chances are pretty good that you will encounter things in your work or daily life that requires similar mathematical skills. These problems include:
  - 1) Mixture problems
  - 2) Motion in gravity
  - 3) Statistical analysis
  - 4) Finances
  - 5) Working with formulas
  - 6) Computer programming

# Mixture Problems

- Mixture problems come up in everything from baking to chemistry.
  - You have a dessert recipe which calls for chocolate with 82% cocoa content. In your pantry you have semi-sweet chocolate (64%) and baking chocolate (99%). What proportion and amounts of semi-sweet and baking chocolate do you need that when combined give you 4 ounces of 82% chocolate? □

When cooking at home, you don't always have exactly the right ingredients. Being able to find the right substitutes can save a recipe from being crappy.

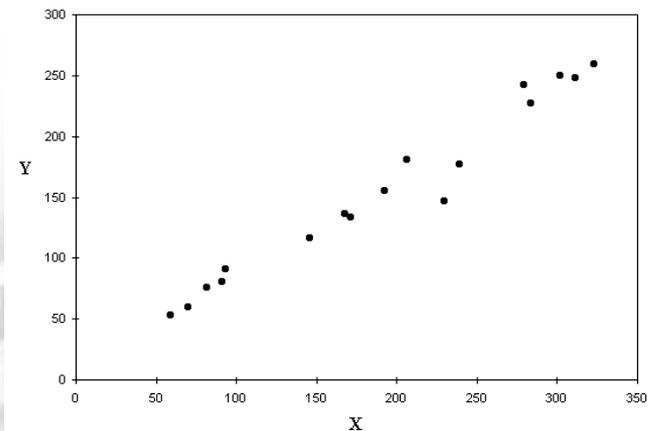
# *Motion in Gravity*

- In physics, simple motion in gravity is modeled with a quadratic equation. With some algebra, you can use this equation to solve for the time needed to reach any given height, or the length of a ballistic trajectory.
- In English units:  $H(t) = -16t^2 + v_0t + h_0$  or in SI  $H(t) = -4.9t^2 + v_0t + h_0$ .

# Statistical Analysis

- Many occupations require the use of statistics, and so does just analyzing the news. We can plot the data on the graph and draw a line that approximates the data. From that we can see trends and predict future results.

We learn about graphing and linear equations in algebra.



# Finances

- Many things in the real world are modeled with exponential growth, such as population growth, and interest-bearing accounts, as well as inflation. This is very important for personal use (monitoring your personal accounts), and in conducting business.
- The interest rate formula for money sitting in a bank account is  $A=P(1+r/n)^{nt}$ .

# *Working with Formulas*

- Nearly all fields have formulas that relate area to length, or distance to force, or current to resistance, or one temperature scale to another. We don't always have the formula handily solved for the one thing we need. Or we only know a relationship between the elements in terms of another unknown. Algebra helps us rearrange formulas and solve problems even when we don't have direct information. Working with formulas is important in nearly all fields, but especially in construction, and engineering.

# Computer Programming

- Most computer programs are built on simple algorithms like the algorithms we use in math for, say, long division. To implement these procedures in code often requires iteration, something you learn in algebra. Computers also work differently depending on the kind of numbers that you use (integers, rational numbers, etc.). If you don't know these things, then your program won't do what you expect it to do.

# Summary

- These are just a short list of reasons why algebra is important. If you think about it a little bit, you can probably come up with a few more of your own ideas. Every scientific field, and even many non-scientific fields use math to understand what they are doing. Even English and history have applications that require math such as textual analysis, historical trends, and linguistics. And even when you aren't using formulas, the concepts will help you better understand the news and the world around you daily.