Transcription by Evernote for

Trigonometry Satisfaction

I enjoy the intellectual stimulation of mathematics. I like to use that part of my brain. During those times in my life when I was not using that part of my brain, I felt as if something was missing. I took a number of mathematics classes when I was in high school. Unfortunately, I didn't get as far along as I could have. This was due in part to a bad junior high and also in part due to an honest error of my high school counselor.

I attended a good junior high for the first part of the year. This was in West Des Moines, Iowa. There, I was taking pre-algebra. It was preparing me for advanced algebra my freshman year of high school. Then I transferred to Garrison Junior High in Garrison, South Dakota, a very small town. The school there really sucked. There were few courses offered. I suppose not that many people were college bound, so the school didn't need to have that much. There, I had to take basic math.

Worse yet, because of an error when I had my teacher fill out a form listing grades, I got a bad grade. I was getting a B in pre-algebra, but the teacher mixed up the columns for initials and grades. In the column for initials, he put the grades. In the other column, he put the initials. Unfortunately, his initials were RC. Thus, the school thought I was getting a C in math. I tried to get the school to change it, but it didn't seem to work. I even resorted to calling the principal at home.

When I started at Jefferson High School, my dad and I talked to my counselor about what classes I should take. I was college bound, so honors classes sounded like a good idea [according to the counselor and us]. Math and science were two areas of concern. Not because I had troubles in those areas, but because of my coursework in the past. I remember asking my counselor if I had troubles with advanced algebra, could I get out of it? She said, “no”. So I took basic algebra.

At my high school, basic algebra takes two years to complete the same material that is in advanced algebra. Advanced algebra takes one year to complete with that same material. Basic algebra went well for me, so the next year I took advanced algebra. The first year was essentially wasted. I also took geometry, computer programming, and college algebra. I took honors chemistry and honors physics, which were heavily math-based. I liked that part of those science classes.

In college, I, like many other students [like people say], debated what I wanted to major in. Before I went to college, it was going to be education, but soon that was discarded. Initially, I majored in political science, but I really didn't have a passion to major in that. Psychology and French were two majors I played around with. It looked like I was going in a liberal arts direction, so math wasn't something I was going to do much of. I ultimately double-majored in Sociology and Philosophy. Although, on first glance, these majors may not seem to be math-related, each does have something that pertains to math:

- In Philosophy, it's logic. Logic is just like geometry and computer programming [educational experts say], which I took in high school.
- In Sociology, you have statistics, and all levels of Sociology, bachelor's, master's, and PhD, “statistics are important, particularly if you are into quantitative research methods” [sociologists say]. “Quantitative research methods are number-crunching.” [sociologists say]. Statistics is unlike what I did in high school, although there was some carryover. For example, odds and probabilities were part of statistics, which is also part of algebra.

Toward the end of college, I got an urge to study Trigonometry. I never got to study that in high school. In college, like I said, I wasn't studying math-related fields. In one Federation Without Television lecture, I even remarked that I wanted to study Trigonometry to balance what I was doing in my other classes. Graduate school kept me busy. It was nice taking physics that one semester because it balanced my other classes. Most of my other classes in graduate school were heavy textbook-based classes. You did a lot of reading and then writing papers.

After graduate school, I moved here and worked. My job here was not intellectually stimulating. I also had an urge to study Latin, so I did that. Later, I again felt an itch to study Trigonometry. I knew that Latin was very time-consuming, but still, I had this itch. I checked out a book, and eventually, I did study Trigonometry. I'm ever so glad I started. It has been a very intellectually stimulating field of endeavor. I feel actualized because I have begun to study it. At first, it was strictly Trigonometry. Later, it branched out to Pre-Calculus as well.

Trigonometry is defined as “the branch of mathematics that pertains to understanding the relationships of sides and angles of triangles.” [I forgot where I got this definition. Here is a similar definition from Google AI: “The branch of mathematics that deals with the relationships between the sides and angles of triangles is called trigonometry. It specifically focuses on triangles, especially right triangles, and how their sides and angles are related”]

You may think, how in the world can a full field of math pertain just to triangles? Share a full field of math ranges. How? Actually, it's quite easy because there are so many different concepts.

Precalculus, like its name suggests, involves concepts that prepare you for calculus. In Pre-Calculus, you study:
- Logarithms
- Functions
- Exponents
- Matrices
- Arithmetic sequences
- Geometric sequences
- Mathematical induction
- Permutations
- Combinations
- Conic sections

[I forgot the exact source for this. Google Gemini for" what do you study in precalculus" yields something similar: "AI Overview In precalculus, you'll delve deeper into algebra and trigonometry, building upon concepts learned in previous math courses. Specifically, you'll study functions, including polynomial, rational, exponential, and logarithmic functions, as well as trigonometric functions and their inverses. You'll also explore topics like complex numbers, vectors, matrices, and parametric/polar curves"]

Some textbooks and courses include Trigonometry inside of Pre-Calculus. Trigonometry is considered a part of Pre-Calculus. At my high school, one semester was Trigonometry, the other semester was Pre-Calculus.

For a little over a quarter, I attended Lincoln High School in Sioux Falls, South Dakota. At the beginning of the year, the school had these skits. A lot of people thought they were hilarious. I thought they were pretty dumb and lowbrow. One skit involved glorifying seniors while stomping on first-year students. Besides the ageism of this skit, it was inaccurate. The skit portrayed seniors as being really cool and sexual. The one main character talked about using whipped cream for sexual purposes. The freshman character talked about studying Trigonometry. He had the stereotypical nerd look. This is so wrong.

At my high school, the most advanced group of kids took Trigonometry and Pre-Calculus their junior year. The next group behind them, college-bound but not quite as advanced, took Trigonometry their senior year. In maybe one case, I heard of an especially gifted student taking Trigonometry in his sophomore year. It's unheard of that someone would take it freshman year. It would be way hard to get all the previous math in by that time. If anyone in that skit would have been taking Trigonometry, it would have been that senior character, not the freshman character.

"Trigonometry involves some of the same concepts of geometry. Degrees is one of the more basic geometric concepts. Degrees are used to measure angles. In Trigonometry, angles are represented by big letters and sides of triangles are represented by small letters. There's another way of measuring angles. It's called radians. Degrees are generally big in number. For example, you may have 304 degrees. Radians are much smaller. They also include the symbol pi, which is a very important, if not the most important, mathematical symbol. Radians are numbers such as:

- 2 thirds pi
- 3 fourths pi
- pi over 2

Pi over 2 is equivalent to 90 degrees. Pi over 3 is equivalent to 60 degrees. Pi over 4 is equivalent to 45 degrees. Pi over 6 is equivalent to 30 degrees. Pi is equivalent to 180 degrees. There are some equations that enable you to convert between the two. Some problems ask for solutions in radians form,others ask for solutions in degrees form. 180R over pi enables you to convert from radians to degrees. Pi D over 180 enables you to convert from degrees to radians." [I forgot the exact source for this, yet for "what do you study in precalculus", Google Gemini yields this "Vectors and Matrices: You'll learn about vectors and matrices, including their operations and applications.]

• • Conic Sections: You'll study ellipses, parabolas, and hyperbolas, including their equations and graphs.

• • Sequences and Series: You'll learn about sequences and series, including arithmetic and geometric progressions.

• • Parametric Equations: You'll learn how to represent curves using parametric equations." [I consider this paragraph common knowledge.]

In Trigonometry, there are some basic ratios known as the trigonometric ratios. These ratios to me are pretty simple to understand. In fact, I remember being introduced to them in college algebra. The most basic problems involving these ratios are pretty cut and dry. These ratios, even in the most simplest form, can be used to solve some word problems. One common word problem is figuring out how tall or how long a shadow is. The sine ratio is equal to the opposite side of the angle in consideration over the hypotenuse. The hypotenuse is the longest leg of a triangle. The cosine is equal to the adjacent side of that given angle over the hypotenuse. The tangent ratio, unlike the other two, does not involve the use of the hypotenuse. The tangent ratio is equal to the opposite side over the adjacent side. [I consider this paragraph common knowledge.] These three ratios have reciprocal functions. These are ratios which involve inversing these three ratios that I just mentioned:

- For sine, you have cosecant. That is equal to the hypotenuse over the opposite side.
- For cosine, you have secant. That is equal to the hypotenuse over the adjacent side.
- For tangent, you have cotangent. That is equal to the adjacent side over the opposite side. [I consider this paragraph common knowledge.]

As you may recall, when you multiply inverses by each other, they cancel each other out, or they equal one. [I consider this paragraph common knowledge.]

One common type of problem in Trigonometry is verifying identities problems. At first, these intimidated me. Then I eventually gave them a whirl, and they weren't as bad as I made them out to be. They were challenging, surely, but I found some satisfaction in them. Some of the more difficult ones still are quite challenging. It helps to do it and then look at the solution, and you get some ideas that you can apply in the future.

Verifying identities is sometimes known as proving identities.
What are identities? Identities are further relationships of these trigonometric ratios. You may square the ratios, you may square root them, you may multiply them, add them, divide them. Pythagorean identities are the three most common:
- Sine squared A plus cosine squared A equals 1.
- Tangent squared A plus 1 equals secant squared A.
- Cotangent squared A plus 1 equals cosecant squared A.

You also have your quotient relations:
- Sine A over cosine A equals tangent A.
- Cosine A over sine A equals cotangent A.

Double angle formulas are:
- Sine 2A equals 2 sine A cosine A.
- Cosine 2A equals cosine squared A minus sine squared A.
- Or 2 cosine squared A minus 1.
- Or 1 minus 2 sine squared A.
- Tangent 2A equals 2 tangent A over 1 minus tangent squared A.

The squared formulas are:
- Sine squared A equals 1 half (1 minus cosine 2A).
- Cosine squared A equals 1 half (1 plus cosine 2A).

There are a number of others. When you solve identity problems, unlike algebra, you don't manipulate both sides. The aim is to get one manipulate just one side. side equal to the other side. [I consider this paragraph common knowledge.]

It's like solving a puzzle to me.

Another common type of problem in Trigonometry is a problem type called solving triangles. You figure out parts of triangles in geometry, but this is pretty limited in contrast to what you do in Trigonometry. In geometry, you may figure out the third angle when you have two angles. If you subtract two angles from 180 degrees, you get the third angle. If you have a right triangle, you can figure out the third side using the diagram theorem, which is a squared plus b squared minus 2ab cosine c.

When you use which, if you have two sides and an angle between those two sides, you use the law of cosines. If you have two sides and an opposite angle, you use the law of sines. This is known as the ambiguous case. If you have three sides, you use the law of cosines. If you have two angles and one side, you use the law of sines. For the ambiguous case, there are a number of conditions that tell you how many solutions your problem has. [I consider this paragraph common knowledge.]

Inverses are commonly used in Trigonometry. Basic inverse problems are taught to you in algebra. For example, you realize that 4 fifths, when inverse, is 5 fourths. In fact, this is even taught earlier than algebra. When you're dealing with inverses here, you're dealing with inverses using the trig formulas, relationships, and ratios. [I consider this paragraph common knowledge.]

One common use of the inverses is in problems that are in the form of cosine arc tangent 17 over 18. First, you use that inverse and you create a triangle which corresponds to the given ratio. Since tangent is opposite or adjacent, you have 17 for the opposite, 18 for the adjacent. Your goal is to figure out the third part so you can make the cosine ratio. You figure that out and whatever that is, you take the adjacent side and put it over that. And then, often you convert that to radians or degrees. [I consider this paragraph common knowledge.]

Inverses are restricted. They fall within a given range. For three of them, arc sine, arc tangent, and arc cosecant, the range is negative pi over 2 to pi over 2 or negative 90 degrees to 90 degrees. For the other three, arc cosine, arc cotangent, and arc secant, the range is 0 to pi or 0 degrees to 180 degrees. Some problems ask you to restrict or expand that range. In order to do this, with the answers you get, you add multiples of 2 pi. A problem may want you to restrict the range from 0 to Watch units to a second range from zero to two pi. If you have a negative answer, you need to add multiples of two pi to bring that to the positive. [I consider this paragraph common knowledge.]

You can graph the trigonometric functions. The sine graph and the cosine graph are regular curves. They can vary in width, height, and location on the coordinate plane, but they're regular curves. The other four are irregular. They become undefined at some given interval:

- For the tangent graph, it becomes undefined at every pi over two or 90 degrees.
- The cotangent graph becomes undefined at every pi degree.
- The arc, the secant graph, and the cosecant graph become undefined at every two pi or 360 degrees.

Thus, these graphs start regularly and then abruptly at a given interval stop, and then they start again. They start and stop, they start and stop. Like I said, sine and cosine are continuous. [I consider this paragraph common knowledge.]

Trigonometry uses curves. The basic formula for a curve is y equals a sine or one of the other ratios, parentheses, w, t plus v.
- A is the amplitude, which is the height of the curve.
- W is the angular frequency in radians.
- T is the time.
- B is a parameter used for the initial phase. To get the phase, you divide b by w.

Waves are similar to curves. In fact, the equation is very similar, almost the same. There's two variables added. The equation for waves is y equals a sine, parentheses, kx minus wt plus b.
- You add kx.
- k is the number of waves, and 2 pi is x, is the location. [I consider this paragraph common knowledge.]

There are several formulas associated with these waves:
- The wavelength is equal to 2 pi over k.
- Frequency is equal to w over 2 pi.
- The period is the inverse of the frequency or 2 pi over w.
- Velocity is equal to w over k or frequency times wavelength.

Waves are used in physics and electricity, so they're very powerful uses of Trigonometry. [I consider this paragraph common knowledge.]

Sometimes triangles are part of circles. When they're part of circles, it's dangerous. Saying equations that work on a regular plane don't work here.
- The length of a circular sector is s equals longitude times r.
- The area of a circular sector is 1 half longitude r squared. That is very similar to the formula for the area of a triangle. You add the angle longitude here. [I consider this paragraph common knowledge.]

In spherical Trigonometry, you have different equations for the law of sines and cosines. Also, “it's more difficult to solve your triangles in spherical Trigonometry.” [as the Trigonometry experts say]

- The law of sines in spherical Trigonometry is sine small a or sine big a equals sine small b or sine big b equals sine small c or sine big c.
- There are two formulas for the law of cosines:

1. For sides, it's cosine small c equals cosine small a cosine small b plus sine small a sine small b cosine big c.
2. For angles, it's cosine bigc equals negative cosine big a cosine big b plus sine big a sine big b cosine little c. When you graph coordinates for sure go to geometry, use what is

called a polar plane. A rectangular plane is what you use in algebra. It's xy. 3, 4 is a coordinate pair for example. 3 involves going 3 to the right and going up 4.

Polar coordinates are r, longitude. r is equal to the square root of x squared plus y squared. Longitude equals the arctangent of y over x. If you reverse, z is the other way around. If you have the polar coordinates, you can make them in rectangular coordinates. Polar coordinates are north, south, east, west.

f equals r cosine longitude,y equals r sine longitude.

Associated with this is also converting equations. You can convert a rectangular equation to a polar equation and vice versa. [I consider this paragraph common knowledge.]

Linked to spherical Trigonometry is complex numbers, particularly in signal metric form. Complex numbers are numbers involving the use of i, which represents an imaginary number. I remember studying these in algebra. i is a number that when squared equals negative 1. No real number does that. In real mathematics, positive numbers multiplied by themselves give you another positive number. A negative number multiplied by itself gives you a positive number. Because of this unique function of i, i becomes very versatile. [I consider this paragraph common knowledge.]

The basic form for complex numbers in Trigonometry is a plus bi equals r, parentheses, cosine longitude, i sine longitude. In one book, I saw it as “r sixth longitude.” [I consider this paragraph common knowledge.]

But that is not a common way to represent it, at least from what I have seen.

With trigonometric form, you can perform a number of operations:

You can multiply or divide. You can take the equation to given powers. You can find the roots of the equation. It's useful. [I consider this paragraph common knowledge.]

At first, complex numbers intimidated me. But then I found out how awesome they can be. I really like solving problems with complex numbers.

I wondered why Trigonometry after algebra, because it really seemed easier. One book said, “Trigonometry marks a point in mathematics where you go from manipulating numbers and variables to understanding relationships.” Some books describe “Trigonometry as the bridge between algebra manipulation to calculus relationships.” Indeed, in Trigonometry, oftentimes the computation is less involved than in algebra. But you could probably say the relationships you need to understand through forms sometimes simple computation are more complex. Once you understand the relationships, then the computation is not that bad. If you don't understand the relationships, even if you can do the computation, you probably won't get enough of the right answer.

Hopefully, I can master Trigonometry. Hopefully, I can master Trigonometry and Pre-Calculus so I can go into Calculus. I know that is quite...