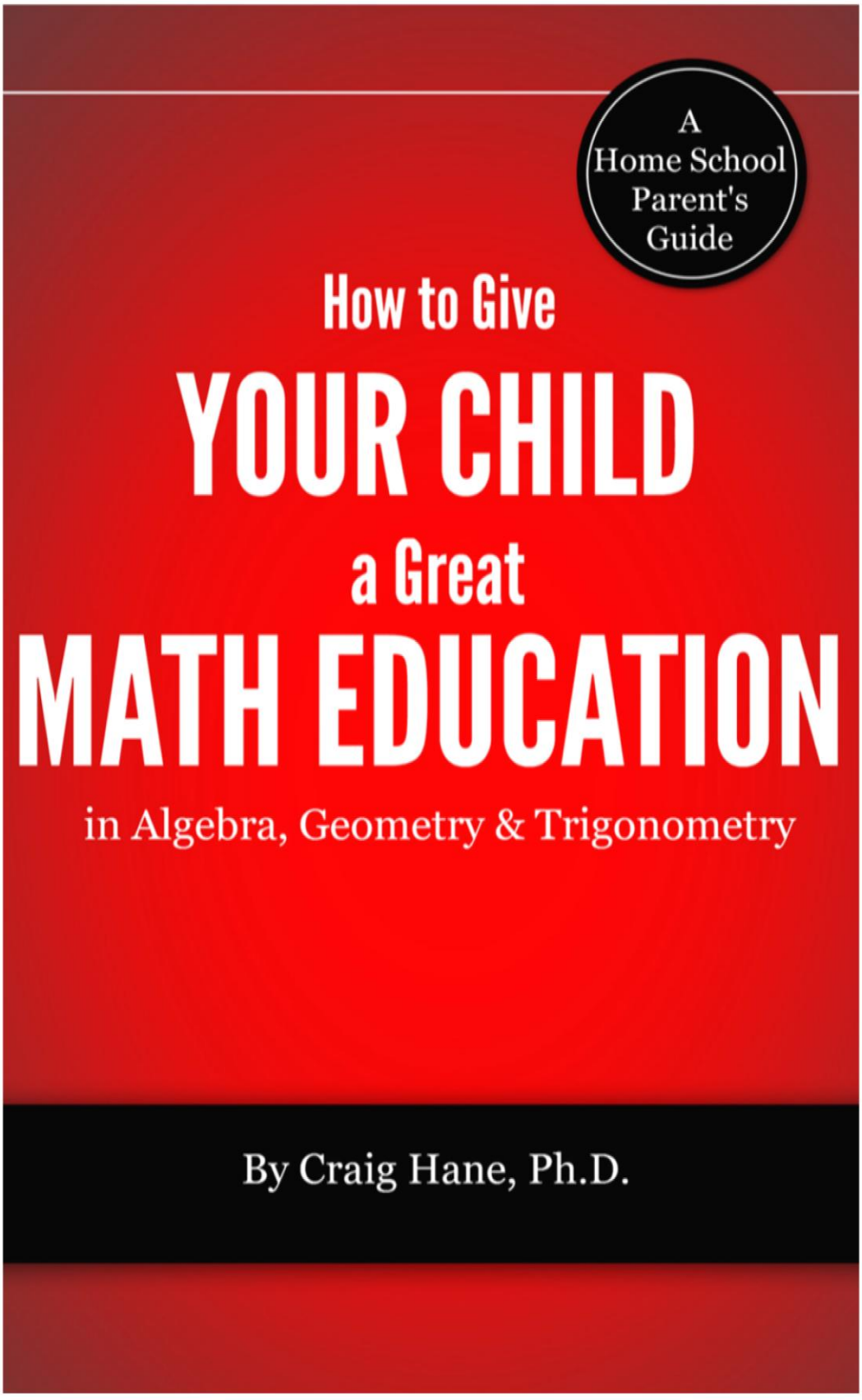

A
Home School
Parent's
Guide
How to Give
YOUR CHILD
a Great
MATH EDUCATION
in Algebra, Geometry & Trigonometry
By Craig Hane, Ph.D.

A Home School Parent's Guide on…

How to Give Your Child

a Great

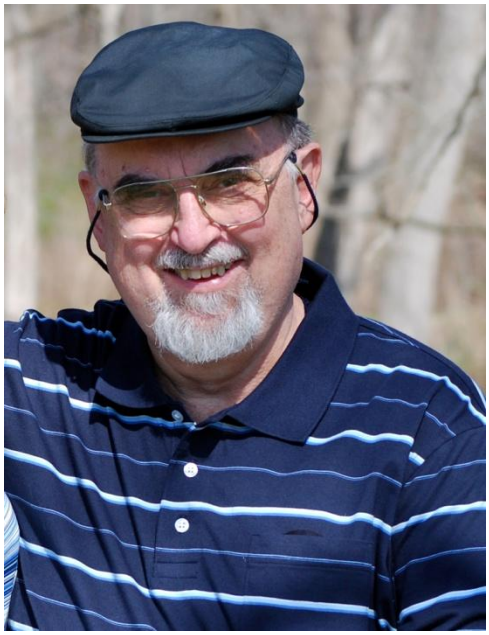
Math Education

in Algebra, Geometry, & Trigonometry

Craig Hane, Ph.D.

Dr. Del's Photo by: Expressions by Lisa Gupton

2013 Edition
Published by:
Triad Math Inc.
1983 N. Hunt St.
Terre Haute, Indiana 47805
Phone: 812-355-3030
Email: info@triadmathinc.com
www.TriadMathInc.com



Questions or Comments for the Author?

Email Craig: craig@hane.com

For much more free information and many valuable resources,

Visit: www.CraigHane.com

Mathematics, post-elementary, is a challenge for many home school parents/teachers. It is very difficult to teach mathematics unless you are a highly trained and experienced math teacher. However, "the times – they are a changing."

In this book you will learn several things, such as how . . .

- You can deliver your child/student a superlative mathematics education thanks to modern technologies and modern resources.

- You can do this very affordably both in terms of time and money. You'll probably be amazed at what you can achieve today.

- And most important, it is possible even if you do not know or like math yourself or have the adequate time to dedicate to it.

Many home school parents have been asking Craig Hane Ph.D. (aka Dr. Del) several questions for some time now, and he is now answering these questions in this book. For additional information, go to www.CraigHane.com

Dr. Del has been teaching math at all levels from industrial math to advanced graduate school theoretical math for decades. Many of his students claim he is the best teacher they have ever had. Now, you and your child can benefit from this too.

When you finish studying and digesting this Guide, and the many free supplemental materials you will be given, you will know exactly what you should do and how to do it.

"It" is to deliver your child a superlative math education that will be appropriate for your child no matter what career he or she wishes to pursue.

How you choose to do this will depend on you and your abilities, interests and resources. If you are going to teach the math yourself Dr. Del will give you many resources for free that should help you do an even better job.

If you need more help, then Dr. Del has created an incredible program that you and your child will find very valuable. It is called the Practical Math Foundation.

It will kind of be like having a great math tutor on call for less than a dollar per hour. Actually in many ways it is better than a live tutor as you will learn in this Guide.

A Home School Parent's Guide. . .

How to Give
YOUR CHILD
a Great
MATH EDUCATION
in Algebra, Geometry & Trigonometry

Chapter 1. Why is Math so important?

In a nutshell, Math will open up many doors of opportunity for your child that will otherwise remain closed. Math is like a special language that is necessary for understanding many things in life.

Mathematics, or Math, is an indispensible tool used in almost all modern technologies. You may have heard of the STEM subjects.

STEM stands for Science, Technology, Engineering and Mathematics. It is widely known that a STEM career can be very lucrative and satisfying. Mathematics at some level underlies all STEM subjects.

So if your child has any aspirations for a STEM career, then your child needs a good math education. Many STEM careers require advanced education in science or engineering schools, which require math competency for success.

There are hundreds of thousands of jobs going unfilled today in our modern manufacturing economy because there are not enough qualified trained people available. The Boston Consulting Group estimates that may be around 600,000 in 2012. And, the U.S. manufacturing economy is actually expanding so there will be more and more new jobs created. Health care is similar.

But also, you should know that there are many non-professional technical careers or jobs that do not require college that also are very well paid. For example, jobs in high tech maintenance require training and knowledge in things like hydraulics, electronics, electrical and mechanical power systems, and much more.

You might want to visit www.HaneTraining.com to see a listing of the types of subjects and programs industry is training its employees in. And, all of these programs require practical mathematics for optimal success. If a worker knows practical mathematics s/he is much better off than one who does not. I will tell you more about this in later chapters.

You are also going to learn in later chapters that math ideally should be learned in a tiered fashion. It is much better to introduce a child to basic practical mathematics first, before going on to more advanced topics for reasons you should soon fully understand.

What may surprise you even more is you will learn how virtually all children can learn all the math they need for any STEM subject, all the way through calculus and differential equations, in high school IF, and this is a very big IF, they are taught math properly and in a tiered manner.

But, even more amazing, is how quickly and easily a child can learn all of the practical math they will need for a non-professional career.

Unfortunately, this is not how math is taught in our modern standard middle and high school mathematics curriculum.

Fortunately, there is something you can do about it. In fact, a home school teacher can do things for their student today that is not possible in a regular school.

Chapter 2. Just what is Math?

Math consists of numbers and geometry, and the tools needed to solve problems.

Numbers start with the counting numbers, 1, 2, 3,… and expand to include negative numbers, fractions or rational numbers, and then decimal representations.

At that point you could just mention irrational numbers which are non-repeating decimals. This constitutes what is called the Real Number System and corresponds to the points on a straight line ruler. Complex Numbers corresponding to points on a plane come later.

Arithmetic consists of learning to perform various operations with these numbers like addition, multiplication, etc.

Geometry consists of various physical figures you can create like lines, angles, triangles, polygons of various types, circles, cones, boxes, balls, etc.

Algebra is a tool used to solve arithmetic and geometry problems. It combines numbers and geometry in a very powerful way resulting in what is called analytic geometry.

Trigonometry is an extension of geometry to better understand triangles. This is what we cover in the Practical Math Foundation, Tier 2.

Then trigonometry has been extended in many wonderful ways to solve many more problems. For example, the Fourier Transform is an amazing tool that underlies many modern technologies and it is essentially based on a sophisticated extension of trigonometry and calculus.

Calculus, which we cover in Tier 5, is a powerful tool that extends the power of algebra and geometry to solve many more problems involving rates of change and continuous sums. If you want a "crash course" in calculus and you already know pre-calculus math you may simply visit: homeschoolmathematics.com/svcm/and watch three videos.

Differential Equations are an extension of Calculus and are the workhorses of modern science and engineering. We cover this is Tier 6.

Math can be understood at many levels. It is kind of like some video games. There are many levels each building on the previous one. One can go as far as one has the time and energy and motivation to do so and there is NO END ever.

Math is a huge field. There is as much math as there is music or literature. It is continuously expanding. As we progress as a civilization our math expands too. New mathematics is being created all the time.

Math also consists of "tools" developed and used to solve problems. In the old days we used many "tables" to solve problems.

For example, we used logarithm tables just to carry out arithmetic calculations. Then these tables were put into a device called a slide-rule which was the tool all engineers and scientists used for three centuries, until 1972. Trigonometry tables were also used a lot, and they too were sometimes included in a circular slide-rule.

Then, in 1972, came the scientific calculator and all these tables and tools became obsolete. Later came the spreadsheet which was an even more powerful tool which we introduce in Tier 3. Then came an extremely powerful tool called Mathematica, which we introduce in Tier 4, and which does for calculus, differential equations, and linear algebra what the calculator does for arithmetic and trigonometry. And, so on.

However, what You Need to Know is this:

Today a student should first learn to use a power tool called the scientific calculator (the TI30XA is the one I use), and all of the Algebra, Geometry, and Trigonometry needed to solve most practical everyday problems in about fifty hours of their time and less than $200, and, very easily and enjoyably too.

In fact, the TI30XA can seem like "magic". It is kind of like having a staff of many very fast brilliant calculating mathematicians at your disposal 24/7. It is hard for a person today to appreciate just how much drudgery has been eliminated – literally 99% of the very tedious and difficult calculation techniques that were taught and used pre-1972 are gone – disappeared – vanished. It really seemed like magic in the 1970's.

Learning to use the TI30XA is a great way to "motivate" students who have previously had difficulties with math. And, it is a great Foundation for any student, even those who will go on into a STEM subject.

Chapter 3. Why do some children (and adults) fear or dislike math?

Good question. There's probably not just one simple answer. But, most likely they have had a "bad experience" with math and are now afraid of it. This can happen at any level or age, but the effects can be long lasting.

If anyone is introduced to a new topic and does not have the pre-requisite knowledge or skills, it will be very difficult or impossible to understand or master this new topic. That happens to everyone from time to time, especially with math. There's no "faking it" with math. And, if it happens early on and if the teacher is not empathetic enough, it is easy for the student to develop a "phobia" or negative feeling about themselves and math.

Math is easy to learn IF it is presented properly. Learning math is a little like climbing a ladder. It is easy if you do it one step at a time, and if you do not skip steps.

But all too often in our math programs, we try to teach a student a concept or technique before s/he has the necessary prerequisite knowledge or tools. This is especially true in a classroom setting, where there is a syllabus and schedule given that the students must get through in the class. Many students fall by the wayside.

In our technical training aimed at skilled trade people in industry, we must first teach them the pre-requisite math before they can learn the technical subject at hand. The most common comment we get goes like this: "I didn't know math was this easy. Why didn't someone teach me this twenty years ago?" Of course, we are just teaching them the practical math they need, not all the unnecessary difficult "theory".

I earned my living for thirteen years as a one-on-one math tutor. I started tutoring students when I was 15 years old and did so until I received my Ph.D. in math at age 28. I never had a student who could not learn math if they tried. And, most of them really learned to like math once they realized they could "do it".

The classroom is another story. I also taught math in the classroom. There it was much more difficult. It is virtually impossible to meet all of the students at their place in time and give them the attention they need for interactivity and self-pacing.

It was much easier to teach advanced theoretical math where the students selected the class and were usually prepared, than high school or undergraduate required courses where the students had quite varied backgrounds and skill sets.

I was often the highest rated teacher, but my success rate in terms of successful students was nowhere near 100% like it was in tutoring.

I loved teaching high school and early undergraduate math, but also found it heart breaking that I could not have the adequate time or resources to give each student what s/he needed. In college, I did have office hours and this helped a lot. High school was really frustrating, even though I loved the students who could keep up.

Fortunately, today's technology has changed all of this. As you will soon learn, there is a solution today and there is no reason any student has to "fail" at math.

Chapter 4. What should you do if your child doesn't like math or isn't "good at math"?

Short answer: Teach them math properly. If you can't do it yourself read the next Chapter 5 and the 5 Essential Ingredients of a Successful Math Education - SPIKE.

How? Follow the three Principles of what I call the Effective Math Education Triad. You may learn all about it in more detail at www.CraigHane.com/SPIKE

But, here it is in a nutshell.

First, you must get your child's psychology corrected. You must replace fear and loathing with confidence and joy. How?

Start by treating Math as a game. Give them something to do that they are quite capable of doing. One easy way is to teach them to use a calculator to do various arithmetic problems. Start with the four basic operations. Demonstrate them and then give a lot of problems. Then give them a lot of feedback and praise.

Nothing succeeds like success. Feedback is vital. That is why people like to play games. They keep score. Give them some type of recognition for their successes and progress.

Celebrate mistakes. Is this counter-intuitive to you?

Mistakes are a sign of progress and activity. Math is like any sport or game. You must play it, and you will make a lot of mistakes. Laugh at them. Understand them and try to avoid them in the future. Learn from them. Celebrate them as a sign of action and progress.

For example, if a student makes a mistake the first thing you might say is "Good try". Only then show them how to rectify their mistake. And, practice some more.

Very quickly a student will learn to perform all types of operations like square roots, squares, reciprocals, trig functions, and more if you like. They won't understand what all of these operations mean, but they can do them. And it may whet their appetite to learn more.

Then review pre-algebra, i.e. arithmetic rules and calculations. This is a pre-requisite to beginning to learn Algebra. It is not important they learn all the names. For example, they will learn the order of + or x is commutative by learning $3 + 5 = 5 + 3 = 8$ without learning the term commutative. Ditto for the associative and distributive "laws".

Review the number line, negative numbers and fractions. The TI 30XA handles both negative numbers and fractions very easily. It is fine to learn the manual algorithms, but what you must learn is how to use the calculator because that is how you will do your arithmetic in the real world. No one today would find the square root of 32,950 the manual way when you can find it on the calculator in five seconds. It is 181.5.

It is best to teach your student in a self-paced manner. We all learn at different rates. Do not compare one student's progress with another's. There is no ideal pace. Each of us learns at our own pace. And, this will vary from topic to topic and day to day and over time. Learning is exponential and cumulative in nature. The more math we learn, the faster we learn new topics.

Never give a student a test s/he is not prepared for unless you tell them they are not expected to answer all questions.

There is no such thing as failure. You weren't ready just yet.

Recognize there will always be problems you can't solve. Part of math is learning what we can and can't do. "A man's got to know his limitations." Women too.

Continually celebrate and recognize personal progress and achievements. DO NOT ever compare a student to a more advanced student. And, certainly do not compare a student's knowledge or ability to the teacher or expert.

And, now the really "biggy".

Select the content you are teaching very carefully. DO NOT get ahead of what the student is ready for or needs to learn. The biggest failure of our current standard math curriculum today is that much of the content is presented prematurely.

Later, in Chapter 6, I will share with you what I believe is a very good content for a beginner and where every child should start. This works for both slow learners and fast learners and students of all ages.

Once your child starts succeeding and being recognized for his or her achievements, fear will be replaced with self-confidence. Loathing will be replaced with joy. And, now you are off to the races. (See Chapter 7.)

I have seen this with students of all ages ranging from 8 years old to 80 years old, believe it or not. I know for a fact that I can teach the appropriate math content to anyone at any age if they do not have some serious mental disability, which very few people do.

But to do it effectively I must teach them one-on-one in an interactive and self-paced way. Fortunately, as a home school teacher you can do this too.

Public and private schools in the traditional classroom batch mode find this extremely difficult and impossible for many students. And, throwing more money at it won't solve the problem. It is a systemic problem.

Beware of putting your child into such a situation, unless you can provide the necessary and adequate supplementation when needed by your child.

Chapter 5. What should you do if you don't know math very well yourself?

Punt? Pray? Give up? Soldier on as best you can?

What would you do if you had a mechanical problem with your car you didn't understand or have the tools or knowledge to fix?

My guess is you would take it to a mechanic you trust. That's what I do.

First, you should realize you will not be able to teach math effectively and optimally to your child if you don't really understand math any more than you could fix your car on your own unless you are a trained mechanic.

You will need to find a math teacher you trust who can do the job for you. You may use the later chapters in this book to help you evaluate a potential teacher or tutor. But beware, a bad teacher can "ruin math" for your child and induce a dislike of math or even a phobia.

Enrolling your student into a classroom situation might work, but it won't for most children for reasons discussed in other Chapters. Any child needs self-pacing, interactivity and continual positive feedback to succeed in any real or optimal way. And, this is virtually impossible in a typical classroom class no matter how good the teacher is. See www.CraigHane.com/SPIKE

Some home school teachers are members of groups who have a designated teacher teach all the children in that group. That is great IF you have a really good math teacher. But, this is often not the case.

One problem is with the standard math textbooks. As you will learn later, the modern standard math textbooks are quite inappropriate for the teaching of math properly for several reasons. The most prominent reason is their topic selection. See Chapter 6 for an elaboration on the subject.

Fortunately, if you have access to the Internet there are online programs that can help you solve your problem. You can obtain the services of a really good math teacher for a small fraction of what you would pay a live tutor. See Chapter 8 for one such resource.

But, the bottom line is that you must get help just like you would for any professional need you might have.

Chapter 6. What math topics should your child learn first?

Let's assume your child is ready for post-elementary math. S/he understands the real number system and how to perform basic arithmetic. S/he may know some basic geometry, but we won't assume it. Most children have reached this point by age ten or so. But age is not important.

The first thing I teach any child is how to use a scientific calculator. I would teach her/him how to perform the basic operations necessary for what I call practical math. S/he would not understand the full meaning of these operations at this time.

The main purpose is to get them comfortable and familiar with the calculator. I use the TI 30XA. It has large keys, all the functions I would teach them at this time, and the functionality I want them to use, and it is affordable at around $10.

If a child has a math phobia this is a good way to get them over it. Treat this like a game. Teach them how to calculate something and then give them a lot of exercises to do it until they can do it easily. Then praise them. Encourage them to ask questions and make up their own problems.

It is very important to be sure the child understands all s/he needs to know before going on. So I would review all the arithmetic operations using the calculator. This is sometimes called pre-algebra. Be sure they understand the various number and numerical operations. See the Syllabus for both the Calculator and Pre-algebra in Appendix A.

Then I would teach the student those topics and techniques from Algebra necessary to solve practical everyday math problems. Algebra is not a particularly interesting subject just on its own. Algebra is really a tool to help solve problems in conjunction with Geometry. So I restrict the algebra topics to those I give you in the Algebra Syllabus in Appendix B.

Note this is just a small portion of the algebra taught in Algebra 1 in a standard curriculum course. The other topics from Algebra 1 will be taught in the next Tier 3 for those students who are going on in math.

Then I would teach various topics from Geometry that are needed for practical math problem solving. See the Geometry Syllabus in Appendix C. Note that at this time, I would not be teaching the child how to prove theorems. The focus would be on practical problem solving using Algebra and the Calculator as tools.

Then I would teach the student Trigonometry again from a practical problem solving point of view. See Appendix D for the Syllabus. The reason I would teach trig at this time is that it is a natural extension of Algebra and Geometry and now

empowers them to solve problems involving triangles that are difficult or impossible to solve with just the Algebra and Geometry they have learned.

One of the most important things to do is to continually motivate the child to learn more and to be aware of the limitations of their current knowledge. I do this by occasionally giving the student a problem they do not yet have the knowledge or tools to solve. This is how it is in life and they should never feel they are stupid or inferior just because they are not yet ready to solve a problem.

Let me give you an example.

What is the area of a triangle whose three sides measure 3", 4", and 6"? Give me the answer to three significant digits. Think about it before you read on. Give yourself at least five or ten minutes to see if you can do it. This is a problem that might come up in practical math. You may use a calculator, but don't look it up on the Internet. See if you can do it based on what math you know.

This is my "One Question Test" to determine if a person will benefit from a Practical Math Foundation Course I will tell you about in a later chapter.

The answer is 5.33 sq. in. Did you get it? How long did it take you?

There are various ways to do it. I actually have a series of videos that explains this problem and several various solutions you can get at http://www.triadmathinc.com/m19

My preferred way that I teach my students is to use trig. An application of what I call the generalized Pythagorean Theorem, or Law of Cosines, and the general area formula utilizing the SIN function yields the answer in less than one minute.

This is not a problem that would ordinarily be given in a regular geometry course. The usual area formula isn't adequate since you do not know a height. And, you cannot apply the generalized area formula I would have given you already because you do not know any of the angles.

Now the triangle is the only rigid polygon in the sense that the lengths of the sides determine the angles. So the angles are determined, but we must have the right "tool" to find them. Of course, the right tool is the Law of Cosines, which I like to call the Generalized Pythagorean Theorem.

Then, a little algebra they learned in Algebra lets them easily find an angle. And, then they can apply the general triangle area formula they learned in Geometry.

In fact, I often give them this problem in Geometry and most of them can not solve it. Of course, it can be solved with just Geometry and Algebra, but it is not something I would expect them to be able to do since it involves setting up two quadratic equations from two triangles with the Pythagorean Theorem and then solving them. If by chance I have a student who figures this out on his or her own, I know I have a potential mathematician on my hands. I would not expect most students to get it at this time.

For a full discussion and demonstration of this along with some other interesting geometric formulas and facts you may visit http://www.triadmathinc.com/m19.

Chapter 7. How can you give your child a great math education?

To begin with: Lay a Foundation. Teach your child the math topics I have described in Chapter 6 and the syllabi from Appendices A, B, C, and D.

In other words, teach your student to use their first power tool, the scientific calculator, and then selected topics from Algebra, Geometry, and Trigonometry necessary to solve most practical problems. As a result:

- Your child will be ready to pursue a non-professional technical career.
- Your child will know more math than about 95% of U.S. adults
- Your child will be ready to study further math topics if s/he wants to pursue a more professional STEM career path.

This will give your child a good foundation.

You may teach your child the topics I am recommending yourself if you understand them and are comfortable teaching them. I would recommend you study a special Math Teachers Guide I have written. You may obtain a PDF copy of it for free at www.triadmathinc.com/media/High-School-Math-Teachers-Guide.pdf.

If you do not want to teach the math yourself, then you will need to get some other teacher to do it. Be sure the teacher is fully qualified.

Do not put your child into a classroom situation. Math is much better delivered in a one-on-one tutorial situation. It is very good, however, to have your student work in a group helping other students and receiving help from them too. But, this should not be their primary source of receiving instruction.

No teacher can do a fully adequate job with more than one student at a time. This is because no two students learn at the same pace. A student must have time to absorb and "play" with the exercises. And, then take a Quiz only when they are ready.

A real live tutor teacher is the ideal situation. If you can afford it and if there is one available, then that is the ideal resource for your child.

But beware; a weak teacher can do great harm to your child. And, this potential harm is magnified in any "batch" teaching mode such as a classroom.

Again, it is good for students to work on projects together and help each other with problems. But, that is not enough for most students. They must be interactively and self-paced tutored with positive feedback for full effectiveness.

If you do not have such a resource, do not despair. See the next Chapter 8.

Chapter 8. How can I deliver my child a great math education affordably?

If you cannot find a teacher/tutor you can trust or afford to teach you child, I would offer my services to you, and more significantly, your child.

One of the great frustrations of my life was that I was not able to teach more students due to logistical restraints of time and money. I did earn my living for many years as a tutor. It didn't pay very well, but was very satisfying and fulfilling.

I did teach quite a few students in a traditional classroom environment, from high school through undergraduate to graduate school. I found the more elementary classes frustrating due to the impossibility of giving adequate attention to individual students.

This was particularly true of the high school although I enjoyed it the most since it did have the most profound impact on the lives of those students I could help adequately. Fifty years ago I fantasized the ability to somehow help many more students and any student who really wanted to learn math. But, it was just an unfulfilled fantasy due to the lack of any mechanism to do so.

So many years ago I went off and pursued many other adventures. And, it's been quite a party.

In the meantime, technology has evolved to the point where I can at least partially realize my old fantasy.

To that end I have created an online program that I believe achieves the first goal of laying a Foundation for any post-elementary student. And, it can be delivered at a reasonable cost.

So, if you are interested in my help, I invite you to go to www.CraigHane.com/pmf and explore it further.

The topics I would teach your student are those listed in the Appendices A through D. Most students can complete this course in about fifty hours of their time spread over two or three months.

There are other alternatives. For example, if you want to deliver your student a more conventional math curriculum, I would recommend you exp lore the Khan Academy. Sal Khan has produced a lot of really good videos. They too have the advantage of being self-paced and thus interactive. I don't know what other ancillary materials he is currently offering.

Wikipedia as a great resource, if you know what you want. It contains information on just about any math topic you can imagine. Youtube is also a great resource, again if you know what you want.

Of course, there are many other resources. But, beware always of the content. As you know, I believe the Standard Math Curriculum in the U.S. today is very bad for most students for many reasons.

And, whatever you do, always be sure to be aware of SPIKE. Be sure you fully understand Chapter 4.

If you want to fully understand my position on this and the reasons for it, I would direct you to my book, *Teaching Math*, which is my manifesto on math education. I only recommend it to those you who want to take a comprehensive look at our current math education system.

Undoubtedly, the quickest and safest thing you can do is enroll your student in the Practical Math Foundation Program.

www.CraigHane.com/pmf

Chapter 9. What tools should your child be using to learn and do math?

First, I believe you should introduce you child to a scientific calculator. I recommend the TI 30XA. I do not recommend a fancier calculator. And, it is very important this introduction be proper.

They do not need to understand many of the functions, especially in the beginning. For example, they don't need to learn about the HYP Trig functions. They won't be using the **log** or **ln** keys in the beginning. And so on. You can see which keys I would teach them by looking at the syllabus in Appendix A.

Then after the Practical Math Foundation I would introduce them to the spreadsheets in Tier 3. There they will be able to enter complex formulas, manipulate large data sets, and do a lot of graphing. This is the time to begin to explain functions.

Next, in Tier 4, I would introduce the student to Mathematica in the form of Wolfram Alpha which is a free version available on the Internet. This is indispensible when you get into calculus, linear algebra, and differential equations.

There are numerous specialty tools in many other subject areas you might introduce the student to. For example, if you are going to teach the student statistics, I would recommend SPC for Excel.

But, start with the TI 30XA. It only costs about $10 US 2012, and is more powerful than the original scientific calculator, the HP 35, which cost $2000 US 2012 dollars when it was introduced forty years ago. It was a bargain even then due to fantastic labor savings and improved quality of learning math and other STEM subjects.

To insist on the old obsolete manual algorithms for arithmetic calculations is, in my judgment, just as bad as teaching the use of an obsolete tool like the slide rule. Your child will be expected to use the latest and most advanced tools in this modern economy where productivity and quality are paramount.

Chapter 10. What resources are the best for you to achieve your objectives?

It all depends on you and your abilities, resources and objectives, of course. If you are going to teach math yourself, then I would invite you to go to www.CraigHane.com/pmf.

If you need more help, then I recommend you enroll yourself or your student into the Practical Math Foundation Course.

If your student wants to go beyond the Foundation to pursue a STEM career path, then I recommend you go to the next level. I strongly recommend the best book I have ever seen on pre-calculus math. It is called *Pre-Calculus Math in a Nutshell* by Dr. George Simmons. It costs about $20 on Amazon.

I plan to add more material on the needs of post-Foundation education in a future edition of this book. That may depend on the feedback I get from you and students as we move forward.

I may create some future courses that go beyond the Practical Math Foundation. I discuss the plans for these in the Teaching Math book in some detail. You may find this book at www.TriadMathInc.com/tmpdf/.

Chapter 11. OK, exactly what should you do first?

Well, either you've read this book and you already know the answer, or you like to skip to the end and see the quick and dirty "punch line". Here it is.

If you need help teaching your child in post elementary math, go to www.CraigHane.com/pmf and purchase the Practical Math Foundation course for yourself or for your student.

Whoever takes this course should become matherate and proficient in Algebra, Geometry, Trigonometry, and the use of the TI 30XA scientific calculator in about 40 Hours of their time +/- 20 Hours.

Your student will then be ready to pursue a non-professional technical job or career, or to go on and study these math subjects at a deeper level required for a professional STEM career, which is fully discussed in my book *Teaching Math*. Q.E.D.

In the meantime, you may learn a lot more about the teaching of math at our two websites.

www.CraigHane.com

www.TriadMathInc.com

There is a ton of free material there including many videos designed to help any math teacher improve their skills.

Appendix A. Calculator and Pre-Algebra Syllabus from Dr. Del's Practical Math Foundation

Using a Scientific Calculator: Introduction plus 16 lessons

- CI: Introduction (5 Min.)
- C1: Basic Operations (6 Min.)
- C2: Real Numbers (6 Min.)
- C3: Negative Numbers (6 Min.)
- C4: Multiplication, Division and Percentage (7 Min.)
- C5: Percentage (3 Min.)
- C6: Using Memory (7 Min.)
- C7: Squares (3 Min.)
- C8: Square Roots (5 Min.)
- C9: Reciprocals (6 Min.)
- C10: Fractions (6 Min.)
- C11: Proper & Improper Fractions (6 Min.)
- C12: Converting Fractions to Decimals (6 Min.)
- C13: Trigonometry Operations (6 Min.)
- C14: Using Sine (6 Min.)
- C15: Using Cosine (6 Min.)
- C16: Using Tangent (6 Min.)

Pre-Algebra: Introduction plus 10 lessons:

- PI: Introduction (3 Min.)
- P1: Real Numbers, Integers & Rationals (5 Min.)
- P2: The Number Line & Negative Numbers (8 Min.)
- P3: Rules of Addition (10 Min.)
- P4: Rules of Multiplication (11 Min.)
- P5: Distributive Law (7 Min.)
- P6: Fractions (6 Min.)
- P7: Squares (5 Min.)
- P8: Square Roots (7 Min.)
- P9: Reciprocals (5 Min.)
- P10: Exponents (15 Min.)

Appendix B. Algebra Syllabus from Dr. Del's Practical Math Foundation

Algebra: Introduction plus 10 lessons

- AI: Introduction (7 Min.)
- A1: Four Ways to Solve an Algebra Equation (5 Min.)
- A2: The Rule of Algebra (8 Min.)
- A3: X + A = B (9 Min.)
- A4: AX = B (6 Min.)
- A5: AX + B = CS + D (11 Min.)
- A6: A/X = B/C (8 Min.)
- A7: X squared = A (5 Min.)
- A8: Square Root of X = A (5 Min.)
- A9: SIN X = A (11 Min.)
- A10: COS X = A (8 Min.)

Appendix C. Geometry Syllabus from Dr. Del's Practical Math Foundation

Geometry: 19 lessons

- G1: What is Geometry? (9 Min.)
- G2: Straight Lines and Angles (8 Min.)
- G3: Parallel Lines (19 Min.)
- G4: Triangle Basics and the Sum of Angles (11 Min.)
- G5: Right Triangles and the Pythagorean Theorem (12 Min.)
- G6: Similar Triangles (12 Min.)
- G7: Quadrilaterals, Polygons and Perimeters (14 Min.)
- G8: Area of Triangles and Rectangles (18 Min.)
- G9: Formulas for Polygons (11 Min.)
- G10: Circles and Circumferences (13 Min.)
- G11: Circles and Areas (13 Min.)
- G12: Circles and Special Properties (10 Min.)
- G13: Surface Areas of Blocks and Cylinders (9 Min.)
- G14: Surface Areas of Cones (7 Min.)
- G15: Volumes of Blocks and Cylinders (7 Min.)
- G16: Volumes of Cones (7 Min.)
- G17: Surface Areas of Spheres and Balls (7 Min.)
- G18: Archimedes Tombstone, Sphere Area and Volume (12 Min.)
- G19: When Geometry is not enough for Triangles (7 Min.)

Appendix D. Trigonometry Syllabus from Dr. Del's Practical Math Foundation

Trigonometry: Introduction plus 8 lessons

- TI: Introduction (6Min.)
- T1: Trigonometry Functions (16 Min.)
- T2: Sines (20 Min.)
- T3: Cosines (18 Min.)
- T4: Tangents (9 Min.)
- T5: Warning about SIN-1 (9 Min.)
- T6: Law of Sines (12 Min.)
- T7: Law of Cosines and the generalized Pythagorean Theorem (14 Min.)
- T8: Trigonometry beyond Practical Math (5 Min.)

About The Author

Delbert Craig Hane, Ph.D., aka Dr. Del, has taught mathematics at virtually all levels from basic industrial technical math to the most advanced math required by engineers, scientists and theoretical mathematicians.

Dr. Hane graduated from Oberlin College with a BA in Math and English. He earned his Ph.D. in Algebraic Number Theory from Indiana University.

Dr. Hane, or Dr. Del as his students call him, has tutored, taught high school math, and instructed college level calculus, differential equations and logic, advanced theory math, at Indiana State University and Rose Hulman Institute.

"I love to teach math, both theoretical and practical. However, for most people the proper way to begin is with practical math. Theory should only come later, if ever, for many people."

Throughout his teaching career, Dr. Del discovered that the key to success was a proper grounding in practical math. "This is where I really learned how poorly prepared many of our adult workers are in math. I also learned that almost all of these people are capable of learning practical math when it is presented appropriately, and it greatly empowers them to do so much better in their jobs".

Today, thanks to modern technologies, Dr. Del is "tutoring" math to a diverse audience of students ranging from young middle and high school students to adults in a unique revolutionary Ten Tier Mathematics program that starts with a Practical Math Foundation. This program stands in stark contrast to today's standard math curriculum that we all know is failing so many of our students.

Dr. Hane has explained all of this comprehensively in his book, *Teaching Math*, which is aimed at those who care about our modern math curriculum and what is happening in our middle and high schools.

To view Dr. Hane's Vita, please visit: www.CraigHane.com/vita-of-craig-hane-ph-d/