DR. DEL'S

GOLDEN RULE MATH

FOR

21st Century Math Students

21st Century Technologies and Tools
Revolutionizes and Transforms
Math Education
for All 21st Century Math Students

Craig Hane, Ph.D.

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21st Century Technologies and Tools
Revolutionizes and Transforms
21st Century Math Education
for All of Our Wonderful
21st Century Math Students

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Table of Contents

Foreword

Many parents and students find teaching and learning post-elementary math extremely difficult and frustrating.

Investing an hour or so of your time reading this book, you will be amazed by what can be done today with 21st century technologies.

SPIKE Pedagogy is now possible. Proper Content is possible. Utilizing 21st Century tools such as the TI-30Xa Scientific Calculator and Wolfram Alpha will empower your 21st Century STEM student.

STEM Math is now only a difficulty of 2 on a scale of 1 to 10 when compared to a difficulty of 8 before Wolfram Alpha.

In working with homeschool families since 2007, I have had numerous conversations with parents that all seem to end with the same statement, "We've tried everything and now I don't know what to do!"

Dr. Hane addresses this situation immediately in the book's Introduction.

I have also dealt with families whose children are not being properly challenged, and these children will become our future engineers and scientists.

Dr. Hane provides a path for such students, which is covered in Chapter 5.

"Golden Rule Math" is the name of this book because this is the way Dr. Hane would want math taught to him. That's where Dr. Hane, aka Dr. Del to his students, has become a saving grace with his Six Tier Online Math Program, which is explained in this book.

Here are just a few statements parents and students have shared with me:

- "I am just in shock!!! We went from such a hard, hard struggle with my son failing it all to finding this program and now he is acing it all!!"

- "My daughter hated doing math but has really enjoyed your program."

- "I am enjoying taking math lessons from you. You teach things in simple ways that I can grasp."

- "My daughter is excited about math for the first time! Dr. Del explains it so well. Thankfully there are no more tears and frustration over math!!"

- "I find it funny that before high school I planned to have nothing to do with math in my job, but now I will be specializing in it thanks to Dr. Del."

I have had the pleasure of working with Dr. Hane since 1999 as his editor and business partner.

During this time, I have watched, and assisted, his passion to help math students get an optimal 21st Century math education grow from vision to fruition.

For many years, Dr. Hane recognized that our current math education was short-changing ALL of our students, not only those who were weak, but those who were strong as well.

He witnessed this first hand when teaching all four years of high school math at Western Reserve High School, Wakeman, Ohio, and all levels of college math at Indiana State University, and advanced STEM mathematics at Rose-Hulman Institute of Technology, and throughout many of his early years of teaching and tutoring.

Even then, he knew there was a systemic problem with our math education system.... It was stuck in the 20th century based on 17th, 18th and 19th century methods.

Many "education experts" acknowledge and recognize the problem, but very few propose an answer, much less how to go about achieving it.

In this book, Dr. Hane will educate you on the issues math education faces, as well as provide a concrete answer to the problem with achievable results for all students.

Dr. Hane holds a Ph.D. in Algebraic Number Theory from Indiana University and has been teaching students of all ages for over 60 years.

The problem really became evident to him when he was teaching skilled technicians in the workplace.

All the adults needed to know certain math concepts and the majority of them were lacking.

After teaching them just the "math they needed to know," many of them said, "This was easy... why didn't they teach us like this in school?"

Through this book, you will gain an understanding of what "math they need to know."

By looking at math education through the lens of what the student's goals in life are, this book will give you a deeper understanding of how math success can be achieved.

This book is only the first in a series that will address each student category in depth.

I highly encourage you to explore math education through this book series.

As a parent or educator, you will gain an understanding of the issues, and most importantly, how you can make a difference in a child's life through proper math education.

Our children are our future, and only you, as the adult in their lives, can steer them in the proper direction and most importantly, to a successful life.

Debbie Goodman
President, Triad Math Inc.

Introduction - -
A Typical Homeschool Story

A frantic call came in to Dr. Del from Mary, a Homeschool Parent.

“Dr. Del, I am a Homeschool Parent with three children ages 11, 12, and 13 and they are all quite different.

“I have been able to teach them basic elementary math. But, I am way over my head going forward.

“We have used several different math programs, and frankly nothing is working for two of them, and I'm even worried about the third.

“Can you help me?” asked Mary

“Yes, but first tell me a little more about each of them.” answered Dr. Del

“Okay, Jonas is 11 and likes math and science and is my easiest to teach, but I don't know what will be best for him.

Christie is 12 and is good at math, but isn't very interested in it and wants to study other things like history and English. She doesn't see much value in math.

Noah is 13 and really dislikes math. He has struggled and I think is afraid of math.

"So I have three different situations and don't really know what to do with any of them!" responded Mary.

"Wow. Sounds like you're having fun." said Dr. Del.

"Just kidding. Actually your situation is fairly typical although most parents only have one or two challenges compared to your three.

"The Good News is that there is a Solution to all three of your Challenges.

"It's a new Math Program we call Golden Rule Math," said Dr. Del.

"What IS Golden Rule Math? I never heard of it," interrupted Mary.

"Good question. In a Nutshell it is the way we teach Math to any student.

"You do know the Golden Rule don't you?" chuckled Dr. Del.

"Yes, of course. *Do unto others as you would have others do unto you.* Any Christian knows that, Right?" responded Mary.

"Yes, and you don't have to be a Christian to live by the Golden Rule.

"This is a "Rule" anyone should live by if they want to have a really good life."

"Right?" said Dr. Del.

"Sure, I guess so," said Mary.

"So, why do you call your Math Program, *Golden Rule Math*?" asked Mary

"Because I teach my students Math the way I would want a Teacher to teach Math to me if I were a student in today's world.

Does that make sense?" said Dr. Del.

"I guess so.

"But I still don't understand what makes your Math Program different from any other Math Program like the ones I have been using that have not been working very well for my children," responded Mary.

"Right. This is now where the "rubber meets the road" so to speak and this is what you need to understand about my Golden Rule Math Program," said Dr. Del.

"As you may know I have been learning math myself and teaching math for many decades.

"I have a Ph.D. in advanced math and have taught all levels of math from 7th Grade through Graduate School for over 50 years.

"Here is what I know it takes to successfully teach any student math."

First, you must use SPIKE Pedagogy.

Chapter 6 explains this in detail.

SPIKE is an acronym for **S**elf-paced, **P**roper Content, **I**nteractive, **K**eep Score, and **E**mpathy and Humor.

This is very difficult to do in a group setting like a classroom.

All students are different and each student must be taught at his or her own pace and with the Proper Content the student is ready for and will find valuable.

Historically, this could only be done with a good Math Tutor, one on one.

It's expensive, and very difficult to find a good Math Tutor. Very few students could have this necessary resource. Only rich parents could afford it.

Thank God, several new 21st Century Technologies make this possible today, and I use them in my Golden Rule Math Program.

It's actually better than a live tutor.

Now each of your students will go at their own pace.

It's like climbing a ladder and not missing any steps.

And, **You** will be their Coach and give them praise for each step they climb. See Chapters 7 and 8 for elaboration on this vital job.

A Good Teacher and Coach work together to build a student's confidence and self-esteem.

Math is like a Sport as you will learn.

Second, Proper Content is critical too.

A student must be ready for each new Math Topic.

Golden Rule Math does this too.

Furthermore, the Math Topics must be relevant and interesting for each student," was Dr. Del's response.

The other Golden Rule books explain this in much more detail for various categories of students.

Now for your three children see:

> Chapter 1 for Noah, who dislikes Math and is struggling.
>
> Chapter 2 for Christie who is doing well with Math.
>
> Chapter 3 for Jonas who also is interested in STEM.

Finally, be sure to look at the Special Offers and Free Resources.

"Remember, our Mutual Missions are to give Your Children an Optimal 21st Century Math Education. Right?" asked Dr. Del.

"RIGHT!" responded Mary, with a sigh of relief.

Chapter 1: Struggling Students

Dr. Del's discussion with Mary about her child Noah, who dislikes math and perhaps is afraid of Math follows.

“You did tell me Noah does understand the basic number system with fractions and decimals, right?” asked Dr. Del.

“Yes, I think so. But, he really hates doing arithmetic problems like division and fractions. He wants to know why he can't just use a calculator or his phone,” responded Mary.

“Good for him! Good question. What is, or was, your answer?” asked Dr. Del.

“Well, we were using a Math Program that taught the manual techniques and didn't teach him how to use a calculator,” answered Mary.

“Wasn't that the right thing to teach?” asked Mary.

Dr. Del's response was, “In my judgment, the answer is No!

No modern employer or technician or engineer or scientist will do arithmetic problems manually, will they?

That would be like drilling a lot of holes in wood with an old manual Brace and Bit instead of a cordless electric drill.

Time consuming, error prone, difficult to learn, expensive, etc.

What do you think?" asked Dr. Del.

"Hmm. I sort of see what you mean.

So, what do you teach or recommend?" asked Mary.

"The first thing I teach a post elementary student is how to use a Scientific Calculator to perform ALL arithmetic calculations.

MUCH easier to learn and to do, and less error prone.

And perhaps most important, it will be fun once you learn and practice it.

Like a Sport," said Dr. Del.

Dr. Del then explained:

"We first teach your students how to use the TI-30Xa Scientific Calculator, which costs less than $10, and is a really great calculator that would have been worth a million dollars a century ago or even in the early 1940's on the Manhattan project.

It is Fun and Easy to master and use.

We start Tier 1 with this and most students do it in just a couple of weeks or so.

Our program is Self-Paced and helps build confidence and self-esteem towards math. It uses SPIKE Pedagogy. (See Chapter 6.)

This is very important. Maybe most important.

Good Pedagogy!

Then we review all the rules of arithmetic in what we call Pre-Algebra to be sure the student is ready to move forward. Also, part of Tier 1.

The Student will be given written Notes and a Tutorial Video for each Lesson.

And, also Exercises, with the answers, of course.

You really learn Math by doing Math, not just reading about it or watching a video. The Notes and Tutorial Video explain the Concept or Topic and how to do the Exercises.

The student really learns and masters Math by doing the Exercises.

And, the student can rewatch the Tutorial Video as many times as needed to understand the Topic. Much better than a live Tutor on a schedule.

It's all on the student's own schedule! Very important.

Then there will be a Quiz consisting of more Exercises.

Nothing tricky or unexpected.

The Quiz lets the Student and Parent and Coach know the student is ready to move on to the next Topic or Lesson.

This is all kept track of in a Learning Management System so both the Student and Parent and Coach can monitor the student's progress.

Like climbing a ladder one step at a time.

This is how we start ALL of our students.

Those who already know the Lessons will go through it very fast just like a good review. Be sure the student is ready to go on up the ladder.

We also recommend the parent provide a Coach, which is quite different from the Teacher, who is me. (See Chapter 7.)

Most parents become the Coach. We have some training on Coaching for the Parent. (See Chapter 8.)," explained Dr. Del.

Read this discussion again to be sure you understand it if you have a Noah in your family.

You may also want to read the *Golden Rule Math -- Struggling Students* book for more in depth information.

Particularly the Chapter in that book on Math? Help!

Chapter 2: Successful Students

A Successful Student is a student who is doing well in Math like Mary's daughter Christie in the Introduction.

Here is what Dr. Del told Mary about Christie that should be applied to any Successful Student to be sure they remain successful.

“Christie will probably like Math better when it becomes more like a Game or Sport for her, which is how we teach Math.

We start her the same way we started Noah. It will probably be easier for her and she probably will climb the ladder faster.

However, NEVER compare two students.

Each will learn at his or her own pace.

Always praise each student for his or her progress and success.

Kind of like any Sport. I like to think of Math as a Sport.

In Tier 2, as you will learn, we teach Practical Algebra, Geometry and Trigonometry and most students see value in them, since it empowers them to learn all sorts of technical subjects and do a lot of practical things.

And, most students complete Tier 2 in about one semester. Believe it or not!

Pretty amazing how much a student can learn when all of the irrelevant and obsolete and premature topics are omitted.

You will probably want to read the Golden *Rule Math - Successful Students* book for more details and insights.

A successful student will want to learn the Math the student will need to pursue their ambitions.

All students should go through Practical Algebra, Geometry, and Trigonometry which we cover in Tier 2.

It takes most students about one semester to do this.

Then if the student is not college bound, see Chapter 3.

College bound students... see Chapter 4

STEM students... see Chapter 5.

Chapter 3: Non-College-bound Students

There are two categories of students who do not go to college.

I. Students who might want to pursue a technical career or job or who just are interested in some technical subject.

II. Students who are not in category I.

We recommend all students learn the Math in Tiers 1 and 2.

This covers Practical Algebra, Geometry, and Trigonometry and how to use a Scientific Calculator for all arithmetic calculations.

Neither Type I nor II students need to study certain Math topics needed to excel on the SAT or ACT tests.

We recommend Type I students also study Quantitative Reasoning Math.

We call this Workforce Math.

This is Math that will be necessary and valuable for many technical subjects.

It's like ‘Open Sesame’ for many technical subjects.

If a student learns this Practical Math the student will be well prepared mathematically for the Military, an Apprentice Program or a Technical School for many technical subjects.

Practical Math is the Key to Success in any of these technical fields.

For Type II students, we recommend Consumer Math after Tiers 1 and 2.

Consumer Math is valuable for both Type I and II students since it applies to all sorts of real world math situations.

You may look at the Syllabus for all of these programs at my website: www.CraigHane.com

Chapter 4: College-bound Students

If a College bound Student is interested in any STEM subject, go on to Chapter 5.

Otherwise, I recommend studying the Math Topics in Tier 3 to prepare for the Math portion of the SAT.

The SAT is a test designed to result in a Gaussian or Normal Distribution of scores, i.e. fit into a Bell shaped Curve.

So, it is a timed test that contains some very easy questions, some reasonably hard questions and a few very difficult questions unless you have specially prepared for them.

In Tier 3, we get the student ready for the more difficult questions. See below.

It is best to take a few sample SAT tests and learn how to solve all the questions there and that will help to prepare you for the current SAT.

It is also important to learn how to prepare for the test and how to actually take it. This we teach too in Tier 3.

The ACT test is similar. There you may also need some Math topics from Tier 4.

In my opinion, the SAT and ACT don't prove much other than how much the student prepared for the tests.

There are quite a few SAT and ACT prep programs available as you probably know.

Finally, suppose a student scores a perfect math score on the SAT or ACT tests.

Is the student now well prepared for a top notch STEM program at a good University?

Amazingly and sadly, NO.

See Chapter 5 to find out what Math a STEM student needs to learn.

It's quite amazing in this 21st Century.

Chapter 5: STEM Students

Dr. Del's answer to Mary about Jonas' desire to pursue a STEM education applies to any student who might be interested in STEM subjects.

"Now, Jonas is a real challenge and opportunity.

Math for STEM is totally revolutionized in the 21st Century thanks to an amazing Modern Math Tool called Wolfram Alpha, unleashed on the world in 2009.

Wolfram Alpha revolutionizes how you learn and do STEM Math like Pre-Calculus Algebra, Trigonometry, Analytical Geometry, Calculus, Differential Equations. and much more. But, this is enough for high school!

Thus, we teach the student how to use Wolfram Alpha in Tiers 4, 5 and 6.

This is radically different from the current Math Programs given by our schools and in the current math textbooks.

It is unlike any Math Program I am aware of today.

Vastly Superior!

IF Jonas goes through Tiers 4, 5 & 6, he will be prepared for any STEM Program in any University like MIT better than any student who is still doing the Standard Math Curriculum taught in virtually all schools today, both public and private," explained Dr. Del.

Amazingly, thanks to several modern technologies, all of this Math, Tiers 1 - 6 are available for all three of your students for less than $1/Day via the Succeed with Math Crusade.

Indeed, it might be even less than this if you can help us spread the word to other families and students.

To more fully understand this we recommend you read the *Golden Rule Math - STEM Student* book.

Finally, be sure to check the Free Resources and Special Offers at the end of this book.

Chapter 6: SPIKE Pedagogy

Pedagogy means: "The method of teaching a subject."

SPIKE Pedagogy is wonderful for delivering an optimal math education to any student, *if you can do it*.

Any good Math Tutor knows this.

SPIKE Pedagogy is virtually impossible to practice in a group environment.

Fortunately, Parents can easily practice SPIKE Pedagogy for each of their children thanks to a modern 21st Century Math Program.

Any experienced math teacher or tutor will tell you there are five ingredients of good pedagogy for Math expressed by the acronym SPIKE.

So, What is SPIKE Pedagogy? S P I K E

Self-pacing. Each student will learn math at his or her own pace which is determined by many factors unique to each student.

It is difficult, usually impossible, for a student to have self-pacing in a group environment where the Math is being taught on a schedule.

Any good math tutor realizes this, and this is one reason why rich parents use good tutors to teach their children math, especially when they are struggling with math taught in a classroom to a group of students.

Indeed, that is how I made a good living during my school years from ages 15 – 27, high school thru graduate school, and learned the value of SPIKE Pedagogy

Proper Content. A student should be taught Math in a sequence of topics so that the student always has the necessary prerequisite math knowledge for each new topic.

Furthermore, it is desirable that the Math topics chosen are of interest and relevance to the student.

This is a horrible failure of our current Standard Math Curriculum taught in most Math Programs which include many obsolete manual tools and much premature theory.

An essential ingredient of proper motivation is to explain to the student how a given topic will serve the student well in the future given the student's larger potential interests in life.

Just realize that Math is a HUGE subject.

No single Human understands or knows all of the Math there is.

Different people need different math topics depending on their broader interests in life. Just like any language.

Indeed, Math is a Universal Language capable of expressing things no natural language can. In addition, Math is Math anywhere in the world.

Interactivity. Math is like a sport or game.

To learn math You must do math.

You must practice.

You will make a lot of mistakes.

You will struggle to overcome hurdles.

Fortunately, with the right attitude Math can be one of the most Fun and Rewarding sports or games you can ever play.

This is why the psychology of the student is so important.

The student must enjoy the sport or game of Math.

This is why having both a great Teacher and a great Coach is so important.

The Teacher explains the Math and selects the proper topics for the student.

The Coach guides and encourages the student.

Mistakes are celebrated as evidence of effort, just like in a sport.

Personal achievements are celebrated as the student climbs the ladder of Math topics.

The Coach must be sure the student doesn't miss any rungs of the ladder.

The Coach must be sure the student practices.

And, K and E are very important for the Coach and Student too.

Keeping Score.

It is very important to keep score of a student's progress and recognize the student's progress and achievements, just like any game or sport.

This is an important responsibility of the Coach.

Keeping Score is a powerful motivator for a student.

It is like ranks and merit badges in scouting.

Or, playing a game with one's self.

Climbing the Ladder of Success.

It is important to create and maintain a good psychology for the student.

Math can sometimes be frustrating for virtually any student.

“I have a Ph.D. in Math, but I can tell you that many, many times I was frustrated.

I probably have made more mistakes in Math than anyone you know.

Remember, Babe Ruth was the Strike Out King, as well as the Home Run King.” says Dr. Del.

The Proper Math Content will vastly improve most student's lives.

Keeping score will prove this when you compare it to the student's other achievements, especially those that depend on a good Math foundation.

Empathy and Humor.

A good math student will practice a lot, and make a lot of mistakes.

When I make a mistake, I just chuckle a little and correct it and go on.

If I make a big mistake I laugh out loud.

Life is funny if you approach it right.

In your life you will make a lot of mistakes.

Indeed, Mistakes are a sign of growth.

You learn from your mistakes.

It is up to You to decide how to deal with them.

This is very important if you want to maintain a good psychology.

"I would not have earned a Ph.D. in Math IF I had not learned to laugh at myself and my mistakes." confesses Dr. Del.

Summary:

SPIKE Pedagogy is necessary for a good Math Education.

The facts are that it is very difficult to deliver the SPIKE Pedagogy for each student in a group setting of many students which is how math is still being taught in many of our schools.

That is why Homeschool Math can be Superior to Public School Math.

In a typical classroom, the teacher will be going too fast for some students and they will fall behind and FAIL.

Any grade less than an “A” is essentially failure.

You either understand a Math Concept or Tool, or you don't.

And, the teacher will be going too slow for some students and they will become bored and frustrated. Bad for them too.

Grading on the Bell Curve is a HOAX.

Math performance is essentially Bi-modal.

Either you understand a math topic, or you don't.

So, if a teacher tries to slow down as much as possible to keep fewer students from failing, this then makes the Math boring for the good students.

Boredom with a subject again creates bad psychology and ultimately bad results.

Indeed, often the primary “motivation” for a good student in a math class is to just get a good grade by scoring high on the Bell Curve.

Conclusion:

Deliver Math Education to your students utilizing SPIKE Pedagogy.

Chapter 7: Teacher & Coach

To learn Math, a Student needs both a Teacher and a Coach.

The Teacher selects the appropriate topics for a student and then explains each topic as well as gives the student exercises and feedback via a quiz.

The Coach monitors the student's activities and gives the student motivational feedback with both "carrots" and "sticks."

The "sticks" might be requiring the student to spend a certain amount of time studying math with the Teacher.

The "carrots" are giving the student positive feedback in the form of compliments and rewards for efforts and accomplishments.

Mistakes are unavoidable when learning math, just like any sport or skill.

The Coach should acknowledge the student's mistakes as good efforts and progress in learning the math concepts and skills.

DO NOT ever let a student feel s/he is a "failure" because of some mistake s/he makes. Celebrate mistakes as a sign of effort and progress.

A Coach should be able to come up with various "rewards" for a student's progress and efforts.

Recognition and sincere compliments are often the best rewards.

A Coach must be present in a student's life, care about the student, and make persistent and consistent efforts to give the student these positive feedbacks.

And, a Kick when needed.

A Coach must be prepared to encourage the student to make efforts even when these efforts seem to not be producing good results.

All successful people go through periods of "doldrums."

Any successful person in the development of any skill will make many "mistakes."

That's Life! We all live it.

The Coach must be sure the student understands this and appreciates this.

Compare Math to some game or sport or music or any other skill the student likes. We all make mistakes.

The better we become, the fewer mistakes we make, but we always make mistakes.

The more we learn the more mistakes we will have made.

The Coach should try to help the student see where learning the concepts and skills of Math will help the student in other areas of interest to the student.

If a student is interested in any technical field s/he must realize the value of math in this field.

The Coach should be sure the student is aware of this.

A Coach does not have to be the Teacher.

The Coach does not have to know much math.

The Coach will work with the Teacher.

It is possible that one person can be both the Coach and the Teacher. But, this is usually impossible.

I can be the Teacher thanks to modern technologies

You can be the Coach.

Any parent must find a local person to be the Coach since this requires a continual presence and a personal relationship.

Sometimes the Student can be his or her own Coach.

Chapter 8: How to Be a Great Coach

Motivation and Learning Techniques:

Intrinsic vs. Extrinsic

Intrinsic Motivation . . . is when a student studies and learns math simply for internal satisfaction and enjoyment.

It is what motivates any person to play a game or sport.

Once a student starts to learn math and gain confidence and self-esteem, Intrinsic Motivation often sets in.

This is what we want as a Coach and Teacher.

However, for many students this takes some time.

In the meantime, a Coach can use Extrinsic motivators.

Extrinsic Motivation . . . is when a student wants something that the study of math will provide. That "something" is an extrinsic motivator.

For example, if a student wants to study a STEM subject, then that is an extrinsic motivator, since Math is necessary for virtually any STEM subject.

If a student wants to enter a technical field in industry or the military, then Practical Math is necessary and that is an

Extrinsic motivator.

Triad Math's Tiers 1 and 2 provide this necessary math and also are a great foundation for future math studies.

If a student wants to excel on the SAT, then Triad Math's Tier 3 program will satisfy this need.

Of course, other extrinsic motivators can include any type of rewards.

This can include grades, praise, privileges, money or many other things the student might want including the avoidance of some type of punishment.

However, we find that when the Proper Content and SPIKE Pedagogy are utilized by the Teacher, then usually the student becomes intrinsically motivated since most of us enjoy anything that is challenging and we succeed at.

Okay, let's assume that your student is motivated enough to study math.

It is imperative that the math be taught in such a way that the student is successful. Only that will lead to intrinsic motivation.

Learning Techniques.

To successfully learn math, a Coach should teach the student to engage in certain practices.

This is different than teaching the math itself.

That is why a Coach and Teacher are two different but necessary components of a good math learning experience.

I recommend Dr. Barbara Oakley's great book, "*A Mind for Numbers – How to Excel at Math and Science, even if you Flunked Algebra*", for an elaboration on what I am going to recommend to you as a Coach and to any student.

First, be sure the student studies topics in a proper sequence so that the student always has the necessary prerequisite knowledge for the topic at hand.

Go back and fill in any deficiencies you can identify.

Follow the Tiers if you utilize me as your Teacher.

Do not skip any Lessons, and Review a lot to be sure you don't forget what you have learned.

Second, be sure the student studies a new topic with a Focused approach by studying the Notes and the Tutorial Video and then working on the exercises.

Do this for a reasonable length of time until either the student understands the topic and how to do the exercise, OR until the student gets confused and tired.

Then STOP. Take a break!

Third, have the student engage in various activities so his or her mind can go into an Unfocused Mode.

This is when and where the subconscious mind processes the focused activities.

We don't understand how this really works, but it often does.

Usually this involves some routine task or habit that requires little thought. Do some routine boring chores.

Watching entertaining videos or playing games may not work. You want the mind relaxed.

Who knows?

Try various things and see what works for the student.

Fourth, have the student then engage in another Focused session and work on the same topic.

Now, usually, the topic seems more understandable and the confusion lifts some.

It's pretty amazing how often this works.

Persistence will yield success.

No one to my knowledge knows how this really works, but it does often work.

Many great thinkers have confessed this is how they often solve a problem or discover a new concept.

It certainly works for me and I use it all the time.

Try it. Give it a chance to work.

It is important for a Coach to explain and convince a student that s/he will succeed if s/he practices and tries hard enough and perseveres.

I can remember many times when, as a student, I struggled with a new Concept and after several Focused and Unfocused Sessions, it finally fell into place.

That's how I wrote my Thesis for my Ph.D. in Math.

Sometimes, after I mastered a Topic I wondered why I ever had a problem with it in the first place.

Often, you have to try many things and go down many blind alleys before you achieve the understanding and solve the problem.

The more you believe in your capabilities the more success you will have.

Yes, you will have failures and frustrations.

The more difficult the problem or concept the more you will experience this.

But, the greater the reward and satisfaction will be when you achieve the breakthrough and achieve success.

A good Coach will explain these things and encourage the student.

Celebrate Mistakes as Progress too.

Success does breed Confidence and more Success.

But, Failure should also be a sign of Progress in ultimately achieving Success.

Success is built on the back of many Failures.

A student must “learn to learn” and a Coach can greatly facilitate this.

The Coach and Teacher must work in tandem.

Eventually, the Student should become the Student's own Coach.

Chapter 9: Tiers 1 – 6 Syllabus Overview

For full details go to: www.CraigHane.com and you may download the full Syllabus about half way down my homepage.

Getting Started. Tier 1 and the Scientific Calculator

Tier 1 teaches the student how to use a Scientific Calculator, the TI-30Xa.

16 Lessons and then...

Pre-Algebra which is a review of the Rules of Arithmetic.

10 Lessons.

Tier 1 usually gets any student into a good frame of mind and convinces them Math can be Easy and Fun.

Getting a student's positive psychology toward Math is the first and most important thing to do in the beginning.

Foundation. Practical Math Tier 2

Tier 2 covers Practical Algebra (10 Lessons), Practical Geometry (19 Lessons), and Practical Trigonometry (7 Lessons).

Most students can cover this in about 60 Hours of study time +/- 30 Hours depending on their background and their Math Aptitude. So about one semester.

Now a student is really confident of their ability, and most now really like Math.

They also realize that they are now prepared to learn many different technical subjects.

Indeed, they will now know more Math than 95% of USA Adults and will be ready for the Military and Apprentice Programs.

High Confidence and Self-Esteem!

Here's a Problem they will be able to solve in less than one minute. You, the reader, can try it or give it to someone you know.

Find the area of a triangle whose sides measure 6.4 ft, 8.7 ft, and 12.3 ft. (Answer is at end of this book.)

College Bound. SAT or ACT Prep Tier 3

Some of these topics are also good for Consumer Math.

Some of these topics are good for Quantitative Reasoning.

Some of these topics are just good for tricky questions on a test like the SAT.

Most students take about a year to master Tier 3. Tier 3 is broken into three parts.

Part 1 of Tier 3 should prepare you for a standard test you may need to pass to graduate from high school.

Part 2 of Tier 3 will teach you additional mathematics you will need to excel on the SAT, ACT and other exams.

Part 3 is SAT Prep. How to prepare and how to take such an Exam.

This will help you get into a College by scoring higher on the SAT or ACT tests.

But, will it mean you are prepared for a STEM subject in college?

No! You need a lot more Math to be well prepared for a STEM subject and to compete with other students who have been properly educated with STEM Math.

STEM Math. PreCalculus Tier 4

Now we will cover Algebra and Geometry and Trigonometry at a much deeper level required for STEM, plus Much More!

We now introduce and use a 21st Century Math Tool unleashed on the world in 2009... Wolfram Alpha.

Wolfram Alpha revolutionizes the way You learn Math and do Math, i.e. solve Math Problems.

No Math Textbooks teach this so far as I know as of July 2021.

No Math Courses in any schools teach this either so far as I know.

In Tier 4 we also teach Complex Numbers the proper way by utilizing Euler's Equation and the Geometric Approach which unites Complex Numbers with Trigonometry.

Again, I know of no current Math Curriculum that does this.

AND, it is vitally important for many STEM subjects in Science and Engineering.

Calculus the right 21st Century way. Tier 5

Differential Calculus, or Calculus I, teaches a student how to analyze Functions, which are the building blocks of all STEM subjects.

This is not too difficult with the old manual tools, but time consuming, error prone, and often not possible for some problems.

With Wolfram Alpha it is now very Easy and will solve any calculus problem.

Integral Calculus, or Calculus II, is very difficult using the old manual tools.

One must find the Antiderivative of a Function to apply the Fundamental Theorem of Calculus to calculate a definite integral.

Finding the Antiderivative can be very difficult and time consuming and often impossible with ordinary functions.

Calculus II has probably flunked more students out of STEM schools than anything else. Some schools use it as a "filter" to "weed out" weak students, but ironically it often weeds out very good students too, who have just had some poor teachers. I can tell you some horror stories.

Now Wolfram Alpha makes Integral Calculus very easy too. It will find the Antiderivative of any Function even if it involves a Special Function.

Now Calculus goes from an 8 on the difficulty scale of 1 to 10 down to a 2.

And, it gets even better.

Now most students can learn Calculus in Tier 5 in about one semester, not one or two years like the old manual Calculus programs.

And, the student will now be ready to compete with the best trained peer students.

Differential Equations. Tier 6

Differential Equations are the Workhorse of Science and Engineering subjects.

Historically, Differential Equations are not taught in high school.

It is too difficult. Most schools don't even teach Integral Calculus.

Solving Differential Equations whose solutions are Functions is even more difficult than Integral Calculus.

All this changed in the 21st Century due to what ??????

Wolfram Alpha!

In Tier 6, we teach a student how to solve Differential Equations with Wolfram Alpha. It takes most students about one semester.

SO, today if a student starts studying our Program at say age 12, the student should get through Tier 6 by age 16 or 17.

Also, the student will probably acquire a SupraComputer and begin to learn Wolfram Language, which was introduced to the world in 2016.

Now, the student is off to the STEM races.

Homeschools, Private Schools and Charter Schools will probably lead the way.

They can now use an Online Program with Coaches to teach 21st Century Math the right way, thanks to many new technologies.

Be sure to look at the special offers at the end of this book.

Free Resources

Simply go to www.CraigHane.com to get the current free resources available from Dr. Del.

The Video Library Tab will yield many videos Dr. Del has created, and is an ever expanding Library.

These videos are all YouTube videos.

Potential STEM students will want to watch the three videos on the Concepts of Calculus.

Some are also YouTube videos of others that Dr. Del finds inspirational and informative.

Special Offers

Go to www.TriadMathInc.com/SO for the current Special Offers.

Dr. Del and Triad Math, Inc. like to give students and families actual training so they can evaluate the methods our Programs use to determine if they would then benefit from some of our training products.

Seeing is believing.

Your experience is the only one that counts for you.

So, go take advantage of our current Special Offers.

Dr. Del wants the best for you and your family.

Affiliates

Go to: https://www.triadmathinc.com/affiliate/ to learn about our current Affiliate Program.

The Affiliate Program is designed to empower you to help other students and families improve their lives.

Usually, this will involve giving them a valuable Gift from Triad Math with your recommendation to try it.

Giving your own testimonial experience will be invaluable in getting them to use the Gift.

Then, IF they purchase a product from Triad Math, Inc. you may be eligible for a commission or some other valuable product.

Dr. Del's Mission should be one you share, which is to help students get an Optimal Math Education in the best way possible.

Who is Dr. Del?

Dr. Del is a pen name used by Delbert Craig Hane, Ph.D.

You may get a full biography at: https://craighane.com/vita-of-craig-hane-ph-d/

or just go to www.craighane.com and press the Vita Tab.

In a nutshell, Dr. Del has been a Learner of Math and a Teacher of Math for over 75 years.

75 years?

Yes. Craig was taught the decimal number system and how to count and add by his Uncle Jack (Davis) who was a barber and builder, using Cheerios in about 1942 when Craig was five years old.

This was the beginning of WWII for the USA and most parents were heavily involved and had little time to teach their children at home.

When Craig was five years old, he was enrolled in the first grade at Putnamville, Indiana, a four room school with eight grades.

He was the youngest student in the first grade with teacher Miss Bernice Lewis.

Craig also was the only student in this first grade who had been taught to count in the decimal number system and so Miss Lewis had him help her teach his classmates to count.

Thus, Craig had his first teaching experience at age five.

No doubt this was a life transforming experience.

You are urged to have your children teach other children things they have learned as soon as possible to other children.

Of course, Craig went on to learn Math from other teachers and teach other students Math the rest of his life right up to the first writing of this book in July, 2021.

Learning and Teaching Math are just Two sides of the Same Coin.

Then, Applying Math to situations in the real world can lead to all sorts of wonderful successes.

Answer to Problem on page 36 is: 26.5 sq.ft.

I did this with the TI-30Xa Scientific Calculator twice to check my work in about one minute.

26.45883595 is a more precise answer according to the calculator, but I fixed the decimal place to 1 to get 26.5

The student will learn to do this Quick and Easy using the last Lesson in Trigonometry and the Formula for Area of a Triangle given earlier.

For teachers of math. Message to students.

Interestingly enough you can get this answer using Wolfram Alpha which I teach you to use in Tier 4.

However, in the Step by Step Tutorial Wolfram Alpha uses Heron's Formula which does not use Trig. But, I think it is much harder than using Trig. Many different ways to solve a Problem as you will learn.

Understanding Heron's Formula is much harder. I mention it in a later Tier since it is a starred problem in George Simmon's wonderful book, *PreCalculus in a Nutshell.* we start using in Tier 3.

It is Problem 20 on page 18. George gives a proof which is tricky and doesn't add much to one's understanding. That's why it is not in his main treatment of Geometry.

Actually, Heron's Formula is a special case of Brahmagupta's Formula which George explains and proves in Appendix F. on page 30. Again, of historical interest, but not in the mainstream of George's book.

Ironically, this proof is much more enlightening than George's proof of Heron's Formula, because it uses Trigonometry. But again, not in the mainstream of learning Practical Math.

Proper Content is Critical in a Math Program.

My granddaughter's public school has taught her Heron's Formula, without explanation, before even mentioning Trig. She memorized the formula, but does not understand why it is true or what it really means.

Just memory without understanding.

Not the way to learn math in my judgment.

You need to understand the concepts, and then learn to use the best modern tools. Look at the Syllabi for Tiers 1 - 6 to see how this can be done.