

# MATH WARS

Video Workshop Transcript

**Welcome to *Math Wars*.** My guess is that each of you poured your own meaning into the title of our workshop and clicked the button wondering what we were going to talk about.

To some of you *Math Wars* might be the almost daily interchange you have with your 12 year old: “When am I ever going to need this stuff, Mom?” Or perhaps to you *Math Wars* represents the battle you have with yourself knowing you really need to include math in your homeschooling day but you desperately don’t want to. Or perhaps you thought we might mean the battle between different math curricula as to which is The Best. After all, we are Rainbow Resource Center—seller of math books.

You might be surprised to know that if you googled “*Math Wars*” you would come up with some thirty million responses. In Googleland, the term “*Math Wars*” means something, and what it means is the ongoing debate between mastery learning and what is called higher order learning.

I’m Janice Price, one of Rainbow’s team of homeschooling consultants. Hardly a day goes by as I talk to moms and dads that I don’t address at least one question in math—and most days will bring lots of math questions. You want to know what are the best and strongest math choices. You want to know what is the difference between this series and that series. You want to know what to use when something else isn’t working. You want to know how to get a student caught up to where they should be. And you want to know what programs will be the easiest to use.

Math is all about formulas—and I’m happy to say that we’ve developed a sure-fire formula to predict exactly what math program you should be using. All you have to do is compute your Math Curriculum Selection Number—your MCSN.

Start by multiplying the number of children you have by the number of years that you’ve been homeschooling, and then divide by the number of math programs you’ve tried.

- a. If your answer is an EVEN number—then of course you should use Singapore Math because even little children know that the Asian countries are good at math.
- b. If your answer is an ODD number—then you probably should use Life of Fred—because it’s quirky and just a little bit odd.
- c. If your answer has a fraction in it, then, you should probably be using Saxon—because it rhymes with fraction.

Obviously, these suggestions are provided for humor—although all three of these math programs are very strong. Unfortunately, there is no sure-fire formula to determining your MCSN and subsequently the perfect math choice. I guess that means we’ll just have to do it the old-fashioned way and stick with your questions.

My plan is to give you a general overview of math education for homeschoolers, to look at some of the factors involved in making a good selection for your family, and to address some questions that we’re frequently asked.

My husband and I started homeschooling in 1985. There weren’t a lot of curriculum choices back then and we chose Bob Jones over another because somebody recommended it. We did well with it but when Saxon came on the scene with a strong recommendation from Mary Pride, we made the switch. Saxon worked well for us—it was easy to use, well defined for my kids, and they performed well. If there was a bit of a slogging feel to it, I wasn’t asking too many questions because it was getting the job done. I had no idea that we—along with many other homeschoolers and some private schools—were supplying ammunition for the *Math Wars* taking place in the public schools.

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What to teach and how to teach it has long been a struggle in terms of math education. You might even say it is a struggle between the teachers of math—those who are concerned with how math is taught—and mathematicians—those who are concerned with what is being taught.

For awhile the educators were the ones with influence and in the early 1900s the idea of “a guide on the side and not a sage on the stage” prevailed. That is, until the awkward moment in the 1940s when both the armed forces and industry realized they had to offer remedial programs. New Math emerged in the 1950s—the result of mathematicians’ influence and the space race after the Sputnik launch. But New Math was too formal. Teachers did not know how to teach it. Parents did not know how to help.

By the 1970s New Math was dead and progressive educators were once again the most influential but there began to emerge a call to return to basics and a call for standards. In 1989, the National Council of the Teachers of Mathematics—the NCTM—published standards that set some general goals everyone was happy with. But they also de-emphasized long division, fraction computation, and for the first time strongly encouraged the use of calculators.

Funded by the National Science Foundation (NSF) a number of math programs were developed in compliance with these standards but they quickly became unpopular with parents. The Math Wars had flared into open battles.

Written criticisms came from many sources with parent groups on either coast becoming the most vocal. Websites and coalition groups opposed to the standards were established. Several parallel events occurred to support their claims.

First, Standardized Achievement test scores continued to decline.

Then, international test scores showed Americans trailing miserably behind the Asian nations like Singapore.

Finally, homeschoolers using Saxon and later Singapore Math programs as well as other “basics” curricula were getting attention because their standardized test scores were much higher than public school students.

California became the focal point and after several task force reports, a 1996 bill forced the rewriting of math standards. Adopted in December of 1997, the CA standards were clear, coherent, and they were competitive with the math standards of the highest performing countries. The NCTM, protesting all the way, republished their standards in 2000 and again in 2006.

The final chapter in this saga involves the Common Core Standards—a response to the somewhat unpopular “No Child Left Behind” program. Adopted now by more than 40 states, the Common Core math standards are stronger than many states’ but not as strong as others—including California.

Common Core does a pretty good job with arithmetic, and even a very good job with fractions. These skills are the foundation for higher level math. Unfortunately, expectations for algebra and geometry were quite a bit lower than the published standards of other countries.

So what does this mean for us? Why is all this information important to homeschoolers? If math curriculum products say they are aligned to “standards”, we need to ask—what standards? NCTM? Then what year? 1989, 2000, 2006? Or California, 1997? Or the new Common Core standards?

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My sister is a high school math teacher and has had to face the unprepared casualties of the Math Wars. She says that students entering high school are calculator dependent, unable to do long division, and they have a fear of fractions. And most importantly, they lack any sense of “connectedness”—how numbers work together. All of these issues have to be addressed before she can even begin the basics of algebra and geometry.

She compares math education to the game of *Jenga*. Have you every played *Jenga*? It takes several minutes to set up the game. Wooden blocks—exactly the same size are laid three abreast and then topped by three more laid abreast and perpendicular to the previous row. A *Jenga* tower is carefully built through 18 layers. The resultant tower is solid and strong. Then the play begins! With each turn, a player removes a block from the tower and adds it to the top resulting in a taller but increasingly unstable tower. At some point, with some block removal, the tower collapses.

What, you may be wondering, does this have to do with math? That’s a good question. Assume that those eighteen levels correspond to the foundational math skills of addition, subtraction, multiplication, division, and then fractions, decimals, and percents—basic arithmetic skills. Those skills need to be laid carefully and sequentially through the elementary years and the student needs to be proficient in them. More than proficiency, the student needs to develop a number sense—the intuitive sense of what numbers mean to each other and how they interact. Fact families—or number bonds as they are sometimes called—are a good example of this:

$$5 + 4 = 9 \text{ just as } 4 + 5 = 9$$
$$9 - 4 = 5 \text{ and } 9 - 5 = 4.$$

These facts belong to the same family and they interrelate with each other. If a student’s math tower is solid and strong, then they are ready and prepared to start building the upper levels—algebra, geometry, trigonometry, calculus. However, if blocks have been removed (because a student can’t remember certain skills) or if they were never there in the first place, the structure is unstable and the student will have difficulty topping it off with higher level math. If enough blocks are missing, the entire structure will topple and the student will be mired in a pile of miscellaneous skills without ever understanding the beauty and complexity—or the sturdiness of the structure as it is supposed to be.

Most of the homeschool math products that Rainbow carries provide excellent preparation. Programs like *Saxon*, *Horizons*, *Bob Jones*, *Life of Fred*, *Prentice Hall*, *RightStart* and the various Singapore programs all teach the basic operations: addition, subtraction, multiplication, and division, fractions, decimals, percents. There are variations in terms of review and repetition, in the amount of fact drill, in the amount of teacher-student interaction, and in the emphasis on problem-solving skills, and in pacing. But the basics are there and taught in sequence with an emphasis on mastery.

So do you just pick one of those and get started? Well, that plan might work very well but we usually encourage moms to consider some basic factors—we call them the FAMILY factors. These FAMILY factors are so important that we’ve covered them more thoroughly in separate workshop—Choosing Curriculum. Here, we’ll look at them briefly in terms of math.

The FAMILY “F” factor is Faith or Philosophy. We’ve spent some time on educational philosophy but it might also be important to you to have a math program that is from a Christian publisher.

The FAMILY “A” factor is the homeschooling Approach of this program. Usually as part of this factor we talk about approaches like classical or Charlotte Mason or traditional. While classical and traditional there’s going to be quite a bit of overlap when it comes to math. There are some programs—specifically *Math Lessons for a Living Education*—that have a Charlotte Mason perspective and teach math through stories.

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More often, though, when we talk about different approaches to math we are speaking of “spiral” verses “sequential”. Programs that employ spiral learning cover topics several years in a row, advancing slightly on each pass. *Saxon* utilizes both a spiral and an incremental approach. Sometimes spirals are broader and less incremental than Saxon’s—for instance *Horizons*, *Bob Jones* or *Prentice-Hall*. The advantage of a spiral approach is that concepts are reviewed and repeated and supporters will cite research that shows that such review and repetition is the way to move conceptual learning from short term to long term memory. The goal is for basic arithmetic skills to become almost second nature, something that is done quickly and easily.

Sequential learning is different. Well-defined learning objectives are organized into smaller, sequentially structured units. In a highly sequential program like *Developmental Math* or *Mastering Mathematics*, whole books or levels might be devoted to a particular skill set – for instance subtraction. Other sequential programs—such as *MCP Math* or the Singapore programs have the student working for a chapter or a unit on a single skill set before going on to another skill set. The advantage of this approach is that the student is better able to master a particular concept before progressing to the next concept. The disadvantage is that there is typically much less review. Highly sequential programs also have the disadvantage of being out of sync with standardized tests.

The FAMILY “M” factor is money. Most families are concerned with how much a program will cost and if there is a way to do the same thing for less money.

First of all, make sure you are comparing apples with apples. If programs are sold as complete packages—like *RightStart*—they will seem pricey but if you start adding up the individual components that seem inexpensive by themselves—in a program like *Singapore*, you may be surprised how the cost difference disappears.

The issue of consumable components is another factor in determining the real cost of any program. Consumable means that the student writes in the book and when he is finished, it’s been consumed. Non-consumable components, can be re-used and/or re-sold making your actual investment less than it might seem initially. Non-consumables will also allow you to purchase used materials—but be careful with this and make sure you can match publication dates and editions with the consumables you will need to replace.

This is as good a place as any to discuss our #1 math question. We’re continually asked about the various versions of *Singapore Math*. Everybody knows there are different programs but no one is very sure what the differences are. The bottom line answer is that the differences are minimal and somewhat cosmetic in nature.

Actually, “Singapore Math” is an approach rather than a single product – or a single publisher. There is a publisher called [singaporemath.com](http://singaporemath.com) who publishes several programs—*Essential Math* and *EarlyBird Math* for the Kindergarten level; *Primary Math*—both the US and the Standards Edition for the elementary level; *New Elementary Math* and *Discovering Mathematics* for the high school level. They also publish some science and language arts materials. However, *Math in Focus* is another program using the Singapore Math approach and it’s published by Great Source—part of the Houghton Mifflin family of publishers.

The *Primary Math US Edition* is an Americanized version of the 3<sup>rd</sup> edition which was imported directly from use in the Singapore schools. This edition includes US weights and measurements and US money.

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*Primary Math Standards Editions*—or the SE—is the version that is aligned to the CA standards (remember them?). But since the CA standards were written to be in sync with the Asian countries there were actually relatively few changes that were necessary to bring the familiar US edition into alignment. There were some topics that have been rearranged and introduced at slightly different points in the coursework. There are a few—a very few—topics that are “new” to the SE—which were actually brought back from a previous edition (the 2<sup>nd</sup>). There are some topics that are re-taught. Another feature of the SE is the introduction of assessments or tests. Both editions have a similar format although the SE has color in the upper level texts. The workbooks in both editions are black and white.

*Math in Focus* is an Americanized version of the Singapore’s most popular math program: My Pals are Here. It was developed by Marshall Cavendish and distributed by Great Source. *Math in Focus* looks and feels the most American of all the Singapore Math programs. Its scope and sequence is very close to the SE and its most distinguishing characteristic is that the Teacher’s Manual is more developed and includes reduced copies of the student pages.

Although there are not huge content differences in the various Singapore versions, there *is* a cost difference. The U.S. Edition is the least expensive, the SE is next, and Math in Focus has the highest price tag.

The good news is that it’s not necessary to spend a lot of money in order to get a quality math program—particularly for the elementary years. The *Strayer-Upton Practical Math* series (a reprint of a 1930s program) is thorough and comprehensive in terms of basic arithmetic. The cost point is rather unbelievable—and the books are non-consumable. They’re worth considering if you’re on a tight budget but you will be missing some of the niceties of more modern texts—things like workbooks, color, teacher’s manuals—you will get a bit of an historical education at the same time via the examples and word problems.

We’ve looked at the “F” and the “A” and the “M” of our FAMILY factors in terms of math education. Now it’s on to our FAMILY “I” factor. Does a program fit the learning style and abilities of my student? As you consider the individuals in your family, many of the factors we’ve been talking about may emerge as important for one child or another. For instance, pacing—how fast the instruction moves. Some children need a slower pace with more review and repetition while others need the challenge of a fast pace.

Use of manipulatives is another consideration. Many—if not most—math programs are either organized around the use of manipulatives or they strongly encourage their use, particularly in the early primary years. This is because manipulatives help the child to move from concrete thinking to abstract thinking. Students first touch and feel and manipulate concrete items; then are taught to recognize “pictorial concrete”—or pictures of concrete items—then taught to understand the abstract meaning of math symbols used to represent the concrete items. Even though most math programs will use manipulatives to some extent, there can be a lot of variation in terms of how much. Programs like *RightStart* and *Shiller Math* and *Miquon Math* are completely immersed in manipulatives. Others like *Singapore* or *Horizons* allow the teacher to pick and choose how often manipulatives are used. Some—like *Saxon*—are fully integrated with manipulatives in the early years but phase out completely in middle school. *Saxon* also uses manipulatives not only for concept presentation but also for the development of thinking and reasoning skills. One thing to remember is that courses that use manipulatives tend to also require a large amount of teacher-student interaction—particularly at the early elementary grades.

Students will vary in terms of the need for manipulatives-based instruction. Some might be bored and uninterested, readily able to make the jump to pictorial concrete. Others will need the tactile/kinesthetic connection in order to learn.

Other factors that might affect the individuals in your family include the amount of review; the amount of color; and whether or not there is a workbook available rather than the student needing to write all the problems out on separate paper. Any one of these factors might be a “deal-breaker” in terms of a particular curriculum or a particular student.

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Our FAMILY “L” factor is Life. Your family’s situation is unique. Do you need a program where your child can work independently? How able are you to commit to the time necessary for a program that’s designed to be totally teacher-student interactive? It’s important to consider these aspects.

I think this might be a good time to warn you about the danger of constantly changing math programs. It’s not unusual for me to talk to moms who have used several math programs—one after another never really sticking with one more than a year because they just don’t seem to be working. Sometimes it is necessary to switch because a student is really floundering in a particular math program. However, if at all possible, especially in the elementary years it is best to find a program that works well for your family and **STICK WITH IT**.

Do not listen to what everybody is saying about the latest program. Do not switch because your friend is using something that sounds like more fun or that sounds like it might be easier to use. Math is sequential and different programs have different pacing. You can actually miss important chunks of instruction if you’re not careful because of the differences in the scopes and sequences of various programs. This is particularly true if you are moving between sequential/mastery programs and spiral programs. Remember our *Jenga* game?

It’s different at the high school level. Courses are more complete and content is more stable. Public schools routinely switch between publishers for individual courses.

If you are starting a course of study with a new publisher, we always recommend that you have your student take a placement test. Most of our major math program publishers provide placement tests—and we’ve added them to our website to make it more convenient for you. On our website search for “math placement tests” and a list of all the tests we have available will come up. Just download, print and have your student take the test.

Our last FAMILY factor is the “Y” factor—YOU. This is probably the factor that is most often overlooked. How much teacher support do you need? How confident do you feel about teaching math?

If I were to conduct a study, I suspect that I would discover that homeschool moms are more insecure about teaching math than any other subject. Perhaps this is because the math instruction they received as a child left them unprepared to master the high school math courses. Perhaps because the conflict surrounding the various methods of teaching leaves an underlying fear that if they don’t do it right, their children will have serious “holes” in their education.

This insecurity is very understandable but homeschooling moms can relax a bit. Today’s math curricula provide many “helps” and support.

First of all, there are excellent, well-constructed courses each with a comprehensive scope and sequence. A family can literally start in Kindergarten with a particular publisher and continue clear through high school.

Some publishers provide scripted lessons—particularly at the early elementary level. Scripting means that every word the teacher needs to say is right there in the teacher’s manual. *RightStart*, *Saxon’s* K through 3<sup>rd</sup> and *McRuffy* are totally scripted.

Even if not completely scripted most math programs have comprehensive and helpful Teacher’s Guides or Home Instructor’s Guides. These provide lesson plans, lesson presentations, answers, solutions.

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Sometimes answers just aren't enough. Being able to view complete step-by-step solutions can make all the difference. This seems to be something that publishers are recognizing more and more. *Saxon* was probably the first to offer a Solution Manual but now you see them as options on many courses. Even if you love math and can easily complete high school math problems, the solutions manuals will save you time—and provide a good teaching tool for your student as they compare the correct solution with their incorrect one. Some publishers also provide a computer version—like *Saxon Teacher*.

When mom is busy with other children or a home business or insecure about teaching math, courses designed for independent work are a blessing. All instruction is written to the student and when you couple those with solutions manuals, students can work somewhat independently. Alpha Omega—both *Lifepacs* and *Switched-On-Schoolhouse*, *Saxon's* middle school and secondary courses, *Developmental Math*, *Math Mammoth*, and the *Life of Fred* are all written directly to the student.

One word of caution. While I wouldn't want to assume its inevitable, I think we do need to be careful to not provide an opportunity for our children to be tempted beyond their ability to withstand. I've talked to enough moms to know that cheating does crop up in homeschooling. Never let your child continue day after day with only self-checking of their math. Keep them honest. You can do that with random spot checks. Another advantage of spot checks, by the way, is that you will know if they are consistently missing certain types of problems.

Technology can be another "support" if you do not want to teach upper level math yourself. There are video instruction courses—like *VideoText* or *A+ TutorSoft*—or supplements like *DIVEs*, *Ask Dr. Callahan* and *Mastering Algebra*. These options provide complete instruction—usually in the form of DVDs or PowerPoint presentations coupled with workbook practice. Typically there are also complete solutions for every problem.

One of the nicest features of some courses is the fact that there are real people at the end of a phone line or email that are willing to answer questions and help students figure out how to work particular problems. Both *Saxon* and *Ask Dr. Callahan* have this feature.

Our Rainbow consultant team has put together several math program comparison charts that are available on our website. These are designed to show how the various math programs provide for the needs of your family along the lines of the FAMILY factors. There's a chart for math programs for all grades, one for elementary grades, and one for secondary grades.

We've talked some about the foundational aspects of math—what should be included in the early and middle years. But we get lots of questions about high school math—and math credits. High School math courses have traditionally been algebra, geometry, advanced algebra, and advanced math (which usually includes trigonometry and precalculus). Now, though, college prep students will often be on a track to take algebra in 7<sup>th</sup> or 8<sup>th</sup> grade so they can take calculus (and/or college algebra) in high school. Some high schools offer dual credit courses in college algebra and/or calculus. Homeschoolers can also get dual credits by taking courses at a local community college or taking AP and CLEP tests. If a student is heading toward a math or science career path, there are distinct advantages to having AP courses like *Saxon Calculus* on his transcript. Some upper tier universities will only consider students who have taken AP courses and at the same time they don't accept any AP credit.

On the other end of the spectrum, it is possible to receive high school credit for pre-algebra as well as consumer math courses. Be sure to check the requirements specified by your state's homeschooling laws.

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We're often tempted to let our children slide by in terms of higher level math. We're like my son and we think our children will not need it. Or other times it just happens that we're busy and it's difficult and maybe our friends are letting it slide, too. If you're tempted to do that, please consider these things:

- 1) Algebra and geometry build thinking and reasoning skills. How often have we run into people that can't "think in a straight line"—this is often the direct result of a limited math education.
- 2) Taking strong college-prep high school math courses keeps the doors open for our children. It gives our students more options—it allows them more choices should they decide later that they want to pursue a math or science career. Do we really want our children's options limited because we failed to challenge them with classes of appropriate difficulty.
- 3) If we allow our children to slide by with math classes that are barely more than arithmetic, then we are in effect handicapping them for teaching our grandchildren. They will be less prepared and they will sense that they are unable to teach—or even supervise—higher level courses. I tend to think that it will even impact a mom's ability to teach basic arithmetic.
- 4) If we let our children slide by in math, we contribute to the general perception many have that home-schooling provides an inferior education.
- 5) Conquering higher level math at the high school level is empowering. It causes a student to realize that he can work hard and do something that requires discipline and determination, that he doesn't need to be afraid of a whole discipline. Letting our children slide by on math cripples them.
- 6) There's a beauty and orderliness to math—one might even call it a God-likeness—that we only catch a glimpse of in the lower levels. As we conquer those levels and start to explore at higher levels, we can begin to understand—or at least be fascinated with—math phenomena such as fractals and Fibonacci sequences.

Remember my son who asked me almost daily why he had to take math since he didn't think he would ever use it? Guess what—he isn't using it—not in an everyday-in-his-job-sort-of-way. But, I had the pleasure of overhearing him tell another young man that he should be sure to take more math than he ever thought he would use. Afterwards, I asked him about that and he said, somewhere along the line he had just realized that it was good to keep his options open for awhile.

We've covered a lot of territory here but it's time to summarize and pull things together. Repeatedly moms ask us: what is the best program? What is the BEST math curriculum? There are even some math curriculums that have labeled themselves as the BEST. This is, essentially, foolishness. There is no one-size-fits-all math program. There is no program that is so superior to all the other excellent programs that it can call itself THE BEST. What you want is the best curriculum choice for you—and for your students.

Every program has its strengths and its weaknesses. Every program has the things that it does very well. What's going to make the happiest match is when the things that a program does very well are exactly the things that you've determined are the most important. Find the program that FITS your family.

We can help. At Rainbow we have hundreds—probably thousands—of math curriculum products. Our consultants are here to help you sort through those and make wise choices. It's our goal that no Rainbow homeschooling home should ever serve as a battleground for the Math Wars.