

Living Math!




BOOK LIST FOR LIVING MATH LESSON PLANS

Cycle 1, Unit 4 (C1U4) Intermediate Level


Power Mathematicians in the Age of Enlightenment


Resources Used In Multiple Lessons and Units


The **parent introduction letter** has a great deal of information on math activity books used in multiple units. It is not necessary to purchase all of these. Use the information in the parent letter and information here to determine which resources are appropriate for your family.

 **Joy of Mathematics** and  **Math Talk Poetry in Two Voices** by Theoni Pappas and  **Mathematicians Are People, Too Volume 1** by Luetta Reimer are used in all four Units of Living Math. The selections and chapters in Unit 4 finish all three books.

 **Marvels of Math** by Kendall Haven has stories that apply to both Cycle 1 and 2.

 Several **math history readers** from prior units may be finished in this unit. If you do not have these from prior units and are only using Unit 4, they are less applicable to this unit than prior Units and are not necessary to purchase.

Why Pi?  How Math Applies to Everyday Life by Johnny Ball

Think of a Number  A fascinating look at the world of numbers, by Johnny Ball

Pantheon Story of Mathematics For Young People by James T. Rogers, for older kids in this level.

Mathematics: The World of Science by Irene Fekete

 Optional **MathFocus** readers and resources used in this unit and prior units are:

MathSmart Junior II by Paul Foglino - used only in Unit 4

Challenge Math for the Elementary and Middle School Student by Ed Zaccaro, suggested chapters in all units.

Living Math Through History

C1U4 Intermediate Level Book List

Books with activities suggested in Units 1-3 that are used in Unit 4 are:



Historical Connections In Mathematics by Wilbert and Luetta Reimer:

Volume 1: Lessons 26, 28 and 29 - Euler, Germain and Gauss

Volume 2: Lessons 30 and 32 - Galois and Ramanujan

Volume 3: Lessons 27 and 31 - Lagrange and Noether

Mathematics by Irving Adler

Science Projects About Math by Robert Gardner

More advanced activity books that are mentioned in these plans, but which will only apply to Intermediate kids on the upper end of the age range are:

Famous Problems and Their Mathematicians by Art Johnson

Famous Experiments You Can Do by Robert Gardner



The Story of the World by Susan Wise Bauer is continued as optional historical context from prior units. This unit finishes Volume 3 and begins Volume 4.



The Story of Science by Joy Hakim: Because Living Math Unit 4 concentrates on mathematics rather than science, The Story of Science readings are not scheduled in this unit, and will resume in Cycle 2, Unit 2 where the content lines up with the lessons.

Younger Intermediate Kids: **Mathematicians Are People, Too Volume 1** will be the primary source for the stories of mathematicians for younger kids. If more background is desired, the corresponding **Historical Connections** material can be added. For older kids, or younger kids with the attention span for longer readings, the books listed under each individual lesson plan below may be appropriate.

Picture books from the Primary lessons often still appeal to younger Intermediate kids and have the benefit of review of easier concepts. Families are encouraged to add these into Intermediate lessons as desired. You have free access to the Primary Level booklists by unit on the [Living Math Website](#).

Lecture series from The Teaching Company suggested for parents self-educating:



The Queen of Sciences: A History of Mathematics and Zero to Infinity: A History of Numbers

Living Math Through History


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Lesson 25: Harrison and Bowditch: Navigational Mathematics



Choose one or more biographical sources (highly recommended)

The Longitude Prize by Joan Dash, written for upper elementary / middle school level, includes illustrations

Longitude, *The True Story of the Lone Genius Who Solved the Greatest Scientific Problem of His Time*, by Dava Sobel. Also very readable for this level, although a bit higher than Dash's book. The  illustrated version is very nice.

Carry On, Mr. Bowditch (Newbery award winner, enjoyable even for adults). Some children in Primary level may enjoy portions of this as a readaloud.


Sea Clocks, The Story of Longitude by Louise Borden and Erik Blegvad - picture book version of the Sobel story, but not overly juvenile, more advanced text than the Lasky book, approximately ages 9 and up.

The Man Who Made Time Travel by Kathryn Lasky - picture book story of Harrison's invention and the race for the Longitude Prize. For about 7 and up, for the youngest in this level who still enjoy picture books.



If your family enjoys related stories, consider reading **Endurance: Shackleton's Incredible Voyage to the Antarctic** by Alfred Lansing. This amazing true story is accessible to kids approximately 10 and up. In the story, the explorers use Nathaniel Bowditch's Navigator tables in a desperate mission to rescue the crew of the ship.


 **Video:** The PBS NOVA production based on Dava Sobel's **Longitude** is excellent after reading the book, <http://www.pbs.org/wgbh/nova/longitude/>


 **Video:** The PBS video based on the story of **Endurance: Shackleton's Incredible Voyage to the Antarctic** is also a very good complement to this lesson. Best if viewed after reading the book.


Living Math Through History

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Lesson 26: Leonard Euler: Model Mathematician

 **Maps, Tracks, and the Bridges of Konigsberg:** A Book About Networks, by Michael Holt. This is a Young Math reader that is out of print, but if you can find it, it is an excellent presentation of networks and the kind of mathematics Euler did to solve this famous problem. Text is a bit young, but the math isn't.

 **Leonard Euler and the Bernoullis** by M.B.W. Trent. Fictionalized biographical story line based on actual historical facts. For upper Intermediate to Advanced. If you read the first half of this in Lesson 24 of Unit 3, pick up the reading from Chapter 20, "Leonard Euler," p. 133.

 **The Parrot's Theorem** by Denis Guedj is suggested for this lesson as a book with a very readable storyline including all significant mathematicians up to the time of Euler and beyond. Written for a younger group than Trent's novel, middle school on up. More conservative families may want to be aware there are one or two instances of questionable language in the story.

Living Math Handouts

Euler's Formula (adaptable to )

Perfect Numbers

Perfect Number Formula ( only)


Divide by Zero?


Mersenne Primes

Euler's BIG Perfect Number

Goldbach's Conjecture

Lesson 27: Joseph Lagrange: Measurement Goes Metric

 **Meter Means Measure:** The Story of the Metric System by S. Carl Hirsch. A history of how the metric system came into being. Approx. 6th grade level up. If this book is not available, there is a short chapter in Jeanne Bendick's **How Much and How Many, the Story of Weights and Measures** on how the metric system came about.

 **Parent Resource: Lectures on Elementary Mathematics** by Joseph Louis Lagrange. This has a short biographical sketch of Lagrange's life, followed by a translation of a series of Lagrange's lectures. Lagrange knew his math history, and discusses each mathematical topic from its historical progression. He also had strong opinions on how mathematics should be taught.

Living Math Through History

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Living Math Handouts

The Four Square Theorem

Measurement Goes Metric

Lagrange's Statistics

More Square Number Patterns

Miles and Meters

Proof Challenge

Lesson 28: Sophie Germain and Monsieur LeBlanc



Choose one or more biographical sources:

Celebrating Women in Mathematics and Science edited by Miriam P. Cooney.

This is a compendium of biographical sketches written on 22 women mathematicians and scientists, and is quite readable at about middle school level on up. If studying women in mathematics, the entire book is recommended.

Marvels of Math by Kendall Haven - The Truth About "M. Le Blanc"

Sophie's Diary, A Historical Fiction by Dora Musielak tells Sophie Germain's story in the form of a first person dialogue, as it chronicles how young Sophie's self education might have occurred during the turbulent times of the French Revolution between 1789 and 1793 (Sophie's teenage years).

This is an unusual book. The text is written at a level a middle schooler can understand, but the math ranges from simple ideas such as the geometry behind Pythagorean triples and the Pythagorean theorem, to calculus where Sophie's self-education takes her. Like a journal, "Sophie" talks about the events occurring around her and her family, from the first rumblings of the Jacobin revolutionaries, to the full blown storm of the "Reign of Terror" raging around her while she stayed home and studied.

This format makes the book more dense to read, and not a book that can simply be breezed through, unless the math is skipped or skimmed over. This is fine if a student and/or parent does not have the interest to explore the math in *Sophie's Diary*, but it would be a shame to assume that students without higher math education cannot comprehend any of the math beyond their textbook experience. The author of the book has presented some more complex ideas in some unique ways, making an effort to follow through Sophie's own exploratory journaling of these ideas to understand some of the ideas, even if they are not fully mastered, is the challenge of these lesson.

Some of the activities and supplements in the links, activities and handouts may help a student understand some of the ideas explored in **Sophie's Diary**.

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In Code, *A Young Woman's Mathematical Journey*, by Sarah Flannery. This is the autobiographical account of Sarah Flannery's journey to winning the Young Scientist of the Year Award in 1999 for her work in cryptology. Not essential to this lesson, but interesting reading from a modern perspective.



Just for Fun: An idea associated with Sophie Germain is the palindrome, related to Sophie's Primes. Explore word palindromes with our favorite palindrome books: **Mom and Dad are Palindromes!** by Mark Shulman - very fun for young kids as well as old kids, a clever story written in palindromes and **Palindromania!** by Jon Agee



Parent Resource: Prime Numbers, The Most Mysterious Figures in Math by David Wells. Lots of interesting vignettes, history and facts about discoveries involving prime numbers.



Living Math Handouts

Germain Primes

Palindromic Numbers

More Playing With Prime Patterns

Happy Numbers

Prime Suspects

Prime Number Reference Table

Graphic Art - Graphing Calculator Activity

Lesson 29: Carl Gauss, Third Giant of Mathematics and Science



The Prince of Mathematics, Carl Frederick Gauss by M. B. W. Trent. A very readable fictionalized story of Carl Gauss based on known details of his life. Easier to read and more accessible to younger kids than the Euler/Bernoulli book by Trent. Middle school on up, may be read aloud to upper elementary.



Living Math Handouts

EUREKA! Triangle Numbers Return

Evens and Odds

Modular Arithmetic

Patterns to the 9s

Geometry on a Sphere, Non-Euclidean Geometry

Living Math Through History

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Lesson 30: Evaristé Galois: Revolutionary Mathematics



Whom The Gods Love, The Story of Evaristé Galois by Leopold Infeld. This is a well written, fictionalized biography of Galois based on actual events and documents. For middle school level on up. The story emphasizes his life and the events occurring around Galois during the French Revolution, although some of his mathematics are included. This book is unfortunately out of print and may be hard to find, but is worth it if you would like to dig deeper into Galois' life and times.



Living Math Handouts

Divide and Conquer

Factoring Large Numbers **I+** version

Factoring Large Numbers **A** version

Splitting the Beans **PIA**

Splitting the Beans Calculation Sheet

And The Winner Is . . .

Lesson 31: Emmy Noether and Grace Hopper: Women in Mathematics



Choose one or more biographical sources

Emmy Noether: The Mother of Modern Algebra by M. B. W. Trent. A fictionalized story of Emmy Noether based on known details of her life. Much of the focus is on her personal life and the mathematical environment she was raised in. Easier to read and more accessible to younger kids than the Euler/Bernoulli book by Trent.

Celebrating Women in Mathematics and Science edited by Miriam P. Cooney

Marvels of Math "Amazing Grace" The Invention of Computer Languages by Grace Hopper in 1944 pp. 152 - 159

Extraordinary Women Scientists by Darlene R. Stille



Math Equals by Teri Perl, Chapter 10 contains some excellent **I+** **A** activities on mathematical systems. These are significantly more advanced than the HCM activities. **Women In Numbers** by Teri Perl contains similar information, but is less advanced, and can be brought more down to **P** level. The chapter, "The Wisconsin Three" highlights the careers of three women in computer science and includes some activities.

Living Math Through History

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Living Math Handouts

Stick Figure Arithmetic

The Magic of Binary

Knight's Move Puzzle Template

Number Tricks with Algebra

Binary Gallery

Through The Rabbit Hole

Lesson 32: Ramanujan, Unschooled Mathematician



The Penguin Dictionary of Curious and Interesting Numbers by David Wells-
The title says it all. It begins with -1, "i" and zero, and proceeds to Graham's Number, the World Champion largest number in the Guinness Book of World Records.

Living Math Handouts

How Much is That Pound Worth?

Fibonacci Meets the Squares

Surprising Number Patterns

Ramanujan's Interesting Number

1089, Another Interesting Number

Surprising Number Patterns II