

Mathematics in a Charlotte Mason Education

PRACTICAL GEOMETRY

YEAR 2 • TERM 1

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Beauty & Truth Math

- Mathematics in a Charlotte Mason Education -

PRACTICAL GEOMETRY YEAR 2 • TERM 1

Used in conjunction with LESSONS IN EXPERIMENTAL AND PRACTICAL GEOMETRY by H.S. Hall and F.H. Stevens

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"Never are the operations of Reason more perfect and more delightful than in mathematics. Here, men do not begin to reason with a notion that causes them to lean to this side or to that. By degrees, absolute truth unfolds itself. We are so made that truth, absolute and certain truth, is a perfect joy to us; and that is the joy that mathematics affords." (Charlotte Mason, <u>Vol. 4</u>, pp. 62-63)

"How sad that this subject, ethereal as faery and powerful beyond telling, should find no other adjective than 'useful' to justify us in imparting it to our children. Number to the philosophers of old was a touchstone of learning; it was worthy of their greatest respect and deepest thought. Let us take this gift with the others they have given us; this thought of Number as worthy of our best, aesthetically satisfying as an art, beckoning onward as a science, and luring us ever forward towards increasingly enchanting prospects ahead." (Stephens, Number: A Figure and a Step Onward, p. 4)

"And if our boys and girls can be brought to feel that arithmetic is a game—a noble game—one of the noblest though not one of the most spectacular that the numan race has played—and that it is an honour and a privilege to play at it; and if we can keep that feeling alive by the right exercise and the apt stimulus, cunningly applied with a smile and a jest, as becomes so noble a game, the arithmetic lesson will cease to be a dismal grind and become a grand pursuit full of glamour and excitement." (Ballard, <u>Teaching the Essentials of Arithmetic</u>, p. 34) S

WELCOME

Thank you for purchasing this guide! We are humbled and honored by your support. Please read through this introduction carefully. Understanding our approach is vital to maximizing the benefits of each guide.

THE VISION

Beauty & Truth Math exists to assist students AND teachers in the realm of mathematics in a Charlotte Mason education. It is possible to simply read the scripted lessons and check your students' answers. However, this keeps the teacher from being an engaged and involved partner in the learning process.

These lessons are written with the idea that the teacher will be *working with* the students, asking questions, having discussions, and monitoring progress. Each lesson is an opportunity for building relationships between you, your students, and the Lord. Please make the most of this time together, walking beside your students in exploring and understanding mathematical ideas.

We thoroughly believe that math done completely in isolation misses opportunities to make deep connections. Just like a foreign language needs to be communicated and spoken to make connections, math is its own language with its own big ideas that are best learned through discussion.

You are working with *living*, born persons; our aim is to provide a *living* education. *Living* involves changes and adaptations. These lessons are guides and servants, not masters you must follow. Please use the Spirit's wisdom when discerning what you should modify, skip altogether, push forward on, or slow down on as you and your students are on this journey.

CONTACTING US

We welcome feedback and questions! For general inquiries, please email us at <u>contact@beautyandtruthmath.com</u>.





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WEBSITE LINKS DISCLAIMER

PLEASE PREVIEW LINKS BEFORE USING! While we have done our best to ensure all sites we link to are appropriate, we do not have any control over changes made to them.

We are thankful for the free resources other sites make available and want to support them whenever possible. As they generate revenue through traffic on their sites, we link directly to their pages.

In many cases, there will be multiple worksheets provided on the pages linked. Most of the time, we will specify which worksheet is needed in the guide. Sometimes, you will need to choose the worksheet. This will be stated in the guide as well.

It is the teacher's final responsibility to ensure the content is age-appropriate for the lessons. Please email us at <u>contact@beautyandtruthmath.com</u> to report broken links.

PILOT YEAR

The Practical Geometry 2 Guide is being released one term at a time. Since it is in its first year, it is considered a pilot year. This means it may receive some updates before the Full Year Bundle is released in Summer 2023. All updates are free to anyone who has purchased the curriculum.



READY, SET, GO!

"Putting in the work up front to make the school days run easy."

We have created three folders to easily access the teacher help documents and printables included in this guide. Their unique QR codes and links are included in multiple places in this introduction and are shown here for easy identification.

We will walk you through how to use these linked folders in the following few pages, so please don't worry about viewing them now. This page is simply an introduction to them.

Important Teacher Helps – This folder contains helpful resources to assist and support you as you implement math in a Charlotte Mason education. It includes the following documents:

- A CHARLOTTE MASON MATH EDUCATION lays out a vision for a Charlotte Mason math education.
- ALL ABOUT THE PG GUIDES is everything you need to know about the guide's setup.
- LEPG CONSTRUCTIONS ANSWER KEY provides the constructions to assigned problems from Lessons in Experimental and Practical Geometry.
- **PROGRAMME EXAM ANSWER** KEY provides the construction answers to the P.U.S. Programme Exam questions.
- SUPPORT VIDEOS LIST is a compiled, linked list of support videos in this guide.
- ADDITIONAL SUPPLEMENTAL RESOURCES provide extra teacher support.

Cardstock Printables – This folder contains all resources that need to be printed on cardstock, as these will be used with your students multiple times throughout the lessons.

<u>Printables</u> – This folder contains all of the consumable printables for your students. Sometimes, you will need several copies.











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Practical Geometry • Y2.T1 Introduction

GET READY!

- **SEE** the **Materials Needed** section in this guide to determine what materials you have and still need to purchase.
- **BUY** Lessons in Experimental and Practical Geometry (1911) in physical and/or digital form and the geometry toolkit. Our Favorites page provides links to the textbook and other recommendations we have compiled to help you prepare and organize your materials.
- PRINT ALL OF THE DOCUMENTS in the Cardstock Printables folder You will use these documents multiple times, so we recommend using cardstock paper. Some may need to be cut apart as well.
- PRINT AT LEAST THE FIRST TWO WEEKS of materials in the Printables folder. In the Materials Needed, we list how many copies you need for the entire term. Feel free to print all of them ahead of time or print them only a week or two in advance. You can find these documents listed under the Special Materials Needed section of the Weekly Resources Pages for Weeks 1 and 2.

DECIDE if you will print the guide or use it on a screen.







GET SET!

- READ THROUGH THE FOLLOWING <u>IMPORTANT TEACHER HELPS</u>:
 - A CHARLOTTE MASON MATH EDUCATION
 - \circ $\;$ ALL ABOUT THE PG GUIDES
- Learn how to implement the guides in daily life. Read through the <u>Putting It Altogether</u> section of this guide.
- **Prepare your materials.** There is no one right way to do this! The following list is simply a compilation of ideas Beauty & Truth Math users have found helpful.
 - Create a student math notebook for each student.
 - Fill it with both graph and unlined, blank paper. In general, we
 recommend ¼" squares for the graph paper. Some students may need
 larger squares based on their writing ability.
 - Create sections in the notebook for daily assignments, a math vocabulary page, and a reference section. It is up to you and your student how to order these. If applicable, create different sections for the different streams of math.
 - Decide if you will have your student write headings for each assignment. Information such as the date and page number are great things to include. Writing the problem number and showing the final answer, either with a box or a circle around it, is also strongly encouraged. We recommend starting this in Year 2 or 3.
 - Put together a teacher math notebook for yourself.
 - Create sections for your personal calendar, the lessons from the guides, printable & supplementary resources, exams, notes, etc.
 - Find a place for the Cardstock Printables.
 - These could be stored in a folder in your teacher notebook or an accordion file folder. The goal is to keep them accessible and in good condition since you will use them often.
 - Use tabs to label and easily find what you need!
 - In the Lessons in Experimental and Practical Geometry text, tab where you are at for the current lesson and the corresponding answer key section in the back of the book.
 - If you choose to print the Constructions Answer Key document, place a tab where you are at.
 - Have individual containers for each of your student's supplies.





GO!

Any author of math textbooks or guides will tell you that we write to accommodate as many students as possible, and we provide more than is needed. You have complete freedom not only to modify the lessons, but also to adjust the number of problems assigned to meet the needs of your students.

Each week, you will need to do the following:

- Look over the new lesson to be covered with your student. Understand the big ideas and objectives.
 - If there are constructions that you are unfamiliar with, take a few minutes and go through the steps to complete them on your own.
- Take the Beauty & Truth Math Guide Vow I do solemnly promise that I will remember and implement the following statements:
 - I have permission from Charlotte Mason and the authors of these lessons to adjust or modify any lesson, at any time, to provide a living education to my unique, born persons.
 - I have permission from Charlotte Mason and the authors of these lessons to assign fewer problems than written in the lessons to provide a living education to my unique, born persons.
 - I have permission from Charlotte Mason and the authors of these lessons to assign more problems than written in the lessons to provide a living education to my unique, born persons.
 - "...the educator has to deal with a self-acting, self-developing being, and his business is to guide, and assist in, the production of the latent good in that being, the dissipation of the latent evil, the preparation of the child to take his place in the world at his best, with every capacity for good that is in him developed into a power." (Mason, <u>Vol. 1</u>, p. 9)
- Pray for joy and wisdom as you set out each day exploring mathematical truths with your students. Now dive right into using the lessons, confident that the Lord is with you and for you!







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ALL ABOUT THE TERM

SEEING THE BIG PICTURE

There is NOT a one-size fits all way to teach math using the Charlotte Mason method. Our guides are one option for teachers to use. We have created them to be adaptable to each unique student, both in the big picture and in the guides' details.

We have designed our curriculum to imitate the math streams used in Charlotte Mason's schools. Students have several options for the tracks and combinations of these streams. For more information, see our **Scope & Sequence** page on our website.

Additionally, <u>The Guides' Big Ideas</u> page on our website shows the main ideas throughout the years.



This is the first term of the second year of Practical Geometry. During this term, students learn about parallel and perpendicular lines, including their properties, characteristics, angles that are formed, and how to construct the lines with both set squares and compass and straightedge. They are also introduced to triangles, focusing on their side lengths and different types of triangles.

The maximum lesson time for students in Practical Geometry 2 is 30 minutes.

EVERY DAY & SPECIAL MATERIALS

We assume students will always have their pencil, math notebook with grid and blank paper, the geometry toolkit, ruler, and a large eraser handy for lesson time. Any additional materials beyond these items are listed in the Special Materials Needed section.

CARDSTOCK PRINTABLES VS. PRINTABLES

The teacher must prepare all cardstock printables before the term begins. The cardstock printables are listed as special materials, but links are not provided. Links for the Printables Folder are always provided in the special materials.



MATERIALS NEEDED

- 1 Piece of Construction Paper
- 2 Highlighters (yellow and another color)
- 3 Straws
- 8 Sticky Notes •
- Black Permanent Marker •
- Colored Pencils (blue, red, yellow) ٠
- Dictionary •
- Painter's Tape •
- Scissors •
- String about 1.5 ft. long •
- **Two Books** •
- Washer (or something small, heavy, • and can be easily tied onto the string)

Our Favorites provides links to

Lessons in Experimental and Practical Geometry as well as other recommendations that may be helpful to you in preparing and organizing your materials.



Textbook

Lessons in Experimental and Practical Geometry (Stevens & Hall, 1911)

Everyday Materials

- Notebook with Graph & Blank Pape
 - Pencil
 - Geometry Toolkit (includes a compass, dividers, protractor, and set squares)
- Ruler (with markings of inches in tenths and sixteenths of an inch and centimeters and millimeters)
- Large Eraser

Cardstock Printables

- **Geometry Vocabulary** • Page
 - PG2.Angle Relationships Handout

Printables

Shorter School Geometry, p. 5







• Parallel and Perpendicular Lines, Ls. 1 •

PG2. T1. L2

SUBJECT

Practical Geometry



RESOURCES USED

Lessons in Experimental and Practical Geometry (p. 17, 36, 37, 40, **41**), Oxford Languages

OBJECTIVES

Students will be able to define and construct parallel and perpendicular lines.

SPECIAL MATERIALS NEEDED

Geometry Vocabulary Page, Paper Circle (from the previous lesson), Black Marker String about 1.5 ft. long, Washer (or something small, heavy, and can be easily tied onto the string)

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📋 REVIEW

- 1. Complete p. 40: 25, Fig. 1, in your math notebook.
- 2. Work on the Geometry Vocabulary Page, adding any words, definitions, and drawings that you did not finish last week.

THE PLAN

- 1. Grab the paper circle that you made last week and a black marker. With the marker, make the line segments \overline{CD} and \overline{AB} bolder than the other lines. We saw last week that these lines divide the circles into fourths or quadrants. Let's label the quadrants
 - with Roman numerals to specify which part of the circle we are talking about.
 - a. The first quadrant is the section in \COA. Put your finger in that part of the circle. Label it I, meaning Quadrant 1.
 - b. We move around the circle counterclockwise, so the second quadrant is the section in ∠COB. Label it II, meaning Quadrant 2.
 - c. The third is in $\mbox{\sc BOD}.$ Label it III.
 - d. The fourth quadrant is in \DOA. Label it IV. Good job! See the diagram above.
- 2. Give an example of the following as quickly as you can. Are you ready?
 - a. A diameter (Example answers include \overline{AB} , \overline{DC} , \overline{FH} , etc.)
 - b. An acute angle in the first quadrant. (\LeOA or \LeOE)
 - c. A right angle in the fourth quadrant. (\mbox{DOA}



- d. An obtuse angle that has part of the angle in Quadrant III. (\BOH, \COG, ΔGOA , or ΔDOF) Nice job!
- 3. Using your straightedge, draw \overline{CH} . See the diagram to the right. Do you remember what this line segment is called? Draw out that this is a chord.
 - a. How would you describe a **chord**? (A chord is a line that joins two points on a circle's circumference, but it does not have to go through the center of the circle.)
 - b. What is the longest chord of a circle? (The diameter)
 - c. Use a straightedge to draw \overline{FD} . See the diagram to the right.
 - d. Measure the distance between points F and C. Then measure the distance between points D and H. What do you notice? (The distances are the same.)
 - e. Because the distances are the same, what does that tell you about the lines. \overline{CH} and \overline{FD} ? (They are the same distance apart.)
 - f. Do you remember what we call two lines that are the same distance apart? (Parallel lines)
 - g. Name another pair of parallel lines in the circle (Example answers include \overline{CF} and \overline{HD} , \overline{EA} and \overline{BG} , and \overline{EH} and \overline{FG} .)
- 4. Draw \overline{AB} 8 cm long. Draw point P, about 5 cm away from \overline{AB} . Let's review how to construct a line that is parallel to \overline{AB} that goes through P.
 - a. Complete pg. 36-37 Problem 5.
 - b. How could you know that these two lines are parallel? We will discuss more ways of knowing that lines are parallel, but for now, draw out the idea that the lines can be measured in two different

places. As long as the two places are the same distance apart, the lines are parallel.

Now, let's review one more construction. Do you remember how to bisect a line segment?

- a. Complete p. 17: Problem 1.
- b. Measure the angles formed with the protractor. What do you notice? (There are four right angles.)
- c. Two lines that form four right angles are very special. Do you know what they are called? They are **perpendicular lines**.
- 6. Grab a piece of string and something that would weigh it down. Tie the item onto the end of the string. Hold it next to the wall and notice where the string would intersect the floor. What angles do you see? (The string intersects the floor at right angles.) So the string and the floor are perpendicular.







- 7. When you tied the washer onto the string, you made a plumb line. Have you ever used one or seen someone use a plumb line? What is its purpose? (To make perpendicular lines)
- 8. The word perpendicular comes from the Latin *perpendicularis*, from *perpendiculum* 'plumb line', from *per-* 'through' + *pendere* 'to hang.' You were hanging the string through the floor at right angles, which is the literal meaning of perpendicular. And you already know one way to construct them using a compass and straightedge! Whenever you bisect a line segment like we learned last year, you construct perpendicular lines.
- 9. Tell me what you know of parallel and perpendicular lines. Give examples of each that you see around the room. Choose one of each to measure and test that the lines are indeed parallel or perpendicular. For example, the top and bottom lines of baseboards are parallel. The student can measure the distance between the top and bottom lines in two different places to see if the measurements are the same. If the student sees window moldings as perpendicular, he can measure the lines with the protractor to ensure that the lines form four right angles.

STUDENT RESPONSE

- 1. In your math notebook, complete the following.
 - a. p. 37: Ex. 11
 - b. p. 41[.] Ex. 1
- 2. Add parallel and perpendicular lines to the Geometry Vocabulary Page.

