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# Math Mammoth Geometry 1


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# Introduction

*Math Mammoth Geometry 1* gives the student a thorough view of basic plane geometry. The topics suit best 4th-6th grade mathematics. The emphasis is on learning through drawing.

The problems in this book involve lots of drawing. Geometry is a “hands-on” subject, and many children like that. Moreover, drawing is an excellent means of achieving the conceptual understanding that geometry requires. Exercises marked with the symbol “” are meant to be done in the student’s notebook or on blank paper.

The study of geometry is also full of strange-sounding words to learn. I encourage you to get the student (s) started with a geometry notebook, where they will write every new concept or term, and draw a picture or pictures and text to explain the term. This notebook will then be their own creation, and while working with it, the terms also will stick better in their memory. The students could also do the drawing exercises in this book, or just keep it as a terminology notebook, either way.

## The lessons in the book

The first lessons concentrate on **angles**. Students are introduced to the concept of an angle, and learn about acute, right, obtuse, and straight angles. Students learn how to measure angles with a protractor, draw angles, and estimate some common angles.

After angles, we study various **shapes**: triangles, quadrilaterals, polygons, and circles.

Students are now able to **classify triangles** both in terms of their sides and also in terms of their angles. The lesson has several drawing problems and one easy compass-and-ruler construction of an equilateral triangle.

Then we go on to study the seven different terms used for **classifying quadrilaterals**. Many textbooks concentrate only on learning the vocabulary, but I have also included several problems that require some thought and even one construction, that of a rhombus. I feel just learning the words—“rhombus,” “trapezoid,” “kite,” and so on—is meaningless unless students can also do something with the figures, such as calculate their areas, find their angles, and reason about their properties.

In the lesson about **circles**, we learn the terms circle, radius, and diameter. Students draw circles and circle designs using a compass.

In the middle of the book, there is a brief section about **congruent and similar figures**. These lessons are introductory, as these topics will be studied more in *Math Mammoth Geometry 2*.

Then follow several lessons that focus on **calculating areas**, beginning with the area of a right triangle, which is always half of the area of the corresponding rectangle. Once students learn to calculate the area of a parallelogram and realize that the principle applies not just to right triangles and rectangles, but that the area of *any* triangle is always half of the area of the corresponding parallelogram, then they can split any polygon into triangles and thus find its area.

In the last major section of the book, we study certain aspects of common **solids**: the volume of a rectangular prism, surface areas of some solids, and nets of common solids. (Printable pages of some of the nets are included also.)

The volumes of round-shaped solids, such as cylinders, cones, and spheres, are not studied until middle school, as students first need to study the concept of  $\pi$  (3.1416...) and its relation to the area of a circle. Another limitation is that students cannot yet find the altitude of the triangle from only the lengths of its sides because that requires the Pythagorean Theorem. Because of these limitations, students cannot yet calculate the surface area or volume of most solids, and these calculations are therefore limited here to certain solids only.

*I wish you success in your math teaching!*

*Maria Miller, the author*

## Helpful Resources on the Internet

*Use the online resources as you see fit to supplement the main text.*

*You can access an up-to-date online version of this list at*

[www.mathmammoth.com/weblinks/geometry\\_1.htm](http://www.mathmammoth.com/weblinks/geometry_1.htm)

### Shape Cutter

Draw any shape (polygon), cut it, and manipulate the cut pieces. You can have the computer mix them up, and then try to recreate the original shape.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=72>

### Patch Tool

An online activity where the student designs a pattern using geometric shapes.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=27>

### Interactive Quadrilaterals

See all the different kinds of quadrilateral “in action”. You can drag the corners, see how the angles change, and observe what properties do not change.

<http://www.mathsisfun.com/geometry/quadrilaterals-interactive.html>

### Polygon Matching Game

[http://www.mathplayground.com/matching\\_shapes.html](http://www.mathplayground.com/matching_shapes.html)

### Polygon Sort

Drag and drop the polygons in the correct place in the diagram.

<http://www.crickweb.co.uk/assets/resources/flash.php?&file=quad>

### Polygon Playground

Drag various colorful polygons to the work area to make your own creations!

<http://www.mathcats.com/explore/polygons.html>

### Geometry - Math Warehouse

Detailed lessons about angles, triangles, quadrilaterals, circles, similar triangles, parallelograms, polygons, and trapezoids.

<http://www.mathwarehouse.com/geometry/>

### Interactive Tangram Puzzle

Place the tangram pieces so they form the given shape.

[http://nlvm.usu.edu/en/nav/frames\\_asid\\_112\\_g\\_2\\_t\\_1.html](http://nlvm.usu.edu/en/nav/frames_asid_112_g_2_t_1.html)

### **Tangram set**

Cut out your Tangram set by folding paper

<http://tangrams.ca/inner/foldtan.htm>

### **Shape Explorer**

Find the perimeter and area of odd shapes on rectangular grid.

<http://www.shodor.org/interactivate/activities/ShapeExplorer/>

### **Area of Rectangle**

Drag the corners of the rectangle and see the calculated side lengths and areas change.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=46>

### **Symmetry Game**

Tell how many lines of symmetry a shape has.

[http://www.innovationslearning.co.uk/subjects/maths/activities/year3/symmetry/shape\\_game.asp](http://www.innovationslearning.co.uk/subjects/maths/activities/year3/symmetry/shape_game.asp)

### **Online Kaleidoscope**

Create your own kaleidoscope creation with this interactive tool.

[http://www.zefrank.com/dtoy\\_vs\\_byokal/](http://www.zefrank.com/dtoy_vs_byokal/)

### **Primary Resources: Mirror Images**

See images mirrored in a line.

<http://www.primaryresources.co.uk/online/symmetry.swf>

### **Primary Resources: Reflection**

Color the squares and reflect the given pattern in a line.

<http://www.primaryresources.co.uk/online/reflection.swf>

### **Make Your Own Mandala**

A mandala is a circular symmetrical design based on eights. Make your own and experiment with symmetry.

[http://www.girlsgotech.org/world\\_around\\_us.html](http://www.girlsgotech.org/world_around_us.html)

### **Geometric Solids**

Manipulate various geometric solids. Color the solid to investigate properties such as the number of faces, edges, and vertices.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=70>

### **Cubes**

Fill a box with cubes, rows of cubes, or layers of cubes, and then fold in the sides of the box. Illustrates the concept of volume.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=6>

### **Cuboid Exploder and Isometric Shape Exploder**

These interactive demonstrations let you see either various cuboids (a.k.a. boxes or rectangular prisms) or various shapes made of unit cubes, and then "explode" them to the unit cubes, illustrating volume.

[www.teacherled.com/resources/cuboidexplode/cuboidexplodeload.html](http://www.teacherled.com/resources/cuboidexplode/cuboidexplodeload.html) and

[www.teacherled.com/resources/isoexplode/isoexplodeload.html](http://www.teacherled.com/resources/isoexplode/isoexplodeload.html)

### **Space Blocks**

Build with blocks to illustrate three-dimensional shapes.

[http://nlvm.usu.edu/en/nav/frames\\_asid\\_195\\_g\\_2\\_t\\_2.html](http://nlvm.usu.edu/en/nav/frames_asid_195_g_2_t_2.html)

**Sample worksheet from**

[www.mathmammoth.com](http://www.mathmammoth.com)

**Shapes Identification Quiz from ThatQuiz.org**

An online quiz in a multiple-choice format, asking to identify common two-dimensional shapes. You can modify the quiz parameters to your liking.

<http://www.thatquiz.org/tq-f/math/shapes/>

**Geometry Area/Perimeter Quiz from ThatQuiz.org**

An online quiz, asking either the area or perimeter of rectangles, triangles, and circles. You can modify the quiz parameters to your liking, for example to omit the circle, or instead of solving for area, you solve for an unknown side when perimeter/area is given.

<http://www.thatquiz.org/tq-4/?-j201v-lc-m2kc0-na-p0>

**Geometry Bridge**

An interactive review lesson on types of angles, types of triangles, angle sum of a triangle, and the Pythagorean Theorem. You get to build a bridge!

<http://mysite.verizon.net/vzex2lij/>

**Angle Find!**

Click on the angle with the given angle measure within a geometric figure. Three different modes: Easy Cornering, Parallel Play, and Tangled Angles. Practices your ability to estimate angles and your knowledge of vertical angles, corresponding angles, and angles in a triangle.

<http://puzzlezapper.com/aom/mathed/anglefind/anglefind.html>