
Contents

Introduction	4
Angle Relationships	10
Classify Triangles	14
Angles in a Triangle	16
Quadrilaterals Review	18
Angles in Polygons	20
Drawing Problems	22
Congruent and Similar Figures	24
Similar Figures and Scale Ratio	26
Congruent Transformations	29
Transformations in the Coordinate Grid	31
Review: Area of Polygons 1	35
Review: Area of Polygons 2	38
Circumference of a Circle	40
Area of a Circle	43
Area and Perimeter Problems	46
Converting Between Metric Area Units	49
Converting Between Customary Area Units	53
Volume of Prisms and Cylinders	57
Volume of Pyramids and Cones	60
Surface Area	63
Converting Between Units of Volume	66
Basic Compass and Ruler Constructions 1	68
Basic Compass and Ruler Constructions 2	71
Bisecting Lines and Angles	76
Geometry Review	79
Answer Key	84
More from Math Mammoth	105

Introduction

Math Mammoth Geometry 2 continues the study of geometry after *Math Mammoth Geometry 1*, and is suitable for grades 6-7.

The main topics in the book include

- angle relationships
- classifying triangles and quadrilaterals
- angle sum of triangles and quadrilaterals
- congruent transformations, including some in the coordinate grid
- similar figures, including using ratios and proportions
- review of the area of all common polygons
- circumference of a circle (Pi)
- area of a circle
- conversions between units of area (both metric and customary)
- volume and surface area of common solids
- conversions between units of volume (both metric and customary)
- some common constructions.

This is a lot of topics, and includes most geometry topics taught commonly in middle school, though not all. For example, Pythagorean Theorem is not covered, nor is the area of a sector of a circle. Some topics are not covered to the same depth as in 8th grade (for example congruent transformations or angle relationships). After this book, most students should be fine studying the geometry sections included in pre-algebra books.

I have tried to make connections between geometry and other areas of mathematics, such as using proportions and ratios with similar figures, including problems that involve use of percent, coordinate grid, and even equations. Student will also use a calculator in some problems (those are marked with a small calculator symbol).

There are still lots of drawing problems, though calculations are becoming more important than in *Math Mammoth Geometry 1*. I hope the book will fill your teaching needs.

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_2.htm

Angles

Working with Angles

An interactive lesson with explanations and quiz from Absorb Mathematics course written by Kadie Armstrong, a mathematician.

<http://www.absorblearning.com/mathematics/demo/units/KCA003.html>

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/>

Angles in Polygons

An interactive lesson with explanations and a quiz from Absorb Mathematics course written by Kadie Armstrong, a mathematician.

<http://www.absorblearning.com/mathematics/demo/units/KCA004.html>

Properties of Parallelograms

Investigate the sides and interior angles of parallelograms using these two interactive tools.

<http://www.keymath.com/x3331.xml>

Interior Angles

A nice lesson and explanation about interior angles of polygons.

www.coolmath4kids.com/interior.html

Similar Triangles Quiz from ThatQuiz.org

This quiz has 10 questions and asks you to provide a missing side length when two similar triangles are shown. You can also modify the quiz parameters to your liking.

www.thatquiz.org/tq-A/?-jg-l1i-m2kc0-na-p0

Polygons

Triangle Explorer

Practice calculating the area of a triangle using this interactive tool.

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

Properties of Kites

Investigate the interior angles and diagonals of kites with these interactive tools.

<http://www.keymath.com/x3329.xml>

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>

Sample worksheet from

www.mathmammoth.com

Looking at Polygons

An interactive lesson with explanations and a quiz from Absorb Mathematics course written by Kadie Armstrong, a mathematician.

<http://www.absorblearning.com/mathematics/demo/units/KCA007.html>

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

Tangram set

Cut out your Tangram set by folding paper

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

Congruent Transformations

Primary Resources: Reflection

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

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

Primary Resources: Rotation

From the arrow you can change the shape. Use the circular arrow buttons to rotate the shapes either 90 or 45 degrees.

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

Similarity and Congruence

An interactive lesson with explanations and a quiz from Absorb Mathematics course written by Kadie Armstrong, a mathematician.

<http://www.absorblearning.com/mathematics/demo/units/KCA035.html>

National Library of Virtual Manipulatives for Interactive Mathematics: Geometry

A collection of interactive geometry activities: Congruent triangles, fractals, geoboard activities, Golden rectangle, Ladybug leaf, Ladybug mazes, platonic solids, tangrams, tessellations, transformations and more.

http://nlvm.usu.edu/en/nav/category_g_3_t_3.html

Symmetries and Their Properties - Lessons from NCTM Illuminations

Ready-to-use online lessons that use interactive Java applets:

Rotational symmetry: http://illuminations.nctm.org/index_o.aspx?id=138

Reflections: http://illuminations.nctm.org/index_o.aspx?id=139

Translations: http://illuminations.nctm.org/index_d.aspx?id=474

Glide reflections: http://illuminations.nctm.org/index_d.aspx?id=475

Symmetry Game

Tell how many lines of symmetry a shape has.

http://www.innovationslearning.co.uk/subjects/maths/activities/year3/symmetry/shape_game.asp

Similar Figures

Length, Perimeter, Area and Volume of Similar Figures

Use this interactive figure to explore how the scale factor affects the size and the area of similar figures. The discussion provided helps the teacher, but a specific lesson plan would be more helpful.

<http://standards.nctm.org/document/eexamples/chap6/6.3/index.htm>

Ratio and Scale

An interactive lesson with explanations and a quiz from Absorb Mathematics course written by Kadie Armstrong, a mathematician.

<http://www.absorblearning.com/mathematics/demo/units/KCA024.html>

Circle /Pi

Area of a Circle, Formula & Illustrated Lesson

The interactive tool shows you the area of the circle as the radius increases. The page also includes a short quiz.

<http://www.mathwarehouse.com/geometry/circle/area-of-circle.php>

Circle Tool

An applet that allows you to investigate how the area and circumference of a circle compare to its radius and diameter in the Intro and Investigation sections and then hone your skills in the Problems section.

You can drag the radius to various lengths, and then click the “Add to Table” button to record the data in the table. You can also examine the ratios of any two measures, and make a graph of the data

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=116>

Radius, Diameter, and Circumference

A simple lesson with an interactive quiz about radius, diameter, and circumference of a circle.

<http://www.mathgoodies.com/lessons/vol2/circumference.html>

The Area of a Circle as a Limit

An animation that illustrates how the area of a circle is a limit of the sum of the areas of interior triangles as the number of triangles goes to infinity. This is the idea I explain in this book (Math Mammoth Geometry 2).

<http://www.learnerstv.com/animation/animation.php?ani=96&cat=physics>

Area of Circle

An activity where you measure a circle and the resulting figure when you cut it into wedges and tape them together to form a crude parallelogram.

http://www.learner.org/courses/learningmath/measurement/session7/part_b/index.html

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 you can 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/?-j3vu0-lc-m2kc0-na-p0>

Amazing History of Pi

A short and simple introduction to the history of pi.

<http://ualr.edu/lasmoller/pi.html>

Sample worksheet from
www.mathmammoth.com

Approximating Pi

How did Archimedes find the approximate value of pi? This interactive tool illustrates Archimedes' basic approach with inscribed or circumscribed polygons.

<http://www.pbs.org/wgbh/nova/archimedes/pi.html>

Pi Day Activities & Links

Two pi-related activities to do at home, plus a lot of fun links about pi. Originally meant for Pi Day (celebrated 3/14 each year).

http://www.exploratorium.edu/pi/pi_activities/index.html

5 Trillion Digits of Pi

As of August 2010, the world record for computing digits of pi was 5 trillion digits. This will keep changing, of course.

<http://www.numberworld.org/digits/Pi/>

Rolling circle illustrating Pi This is a short animation where a circle with diameter 1 rolls on a number line one complete roll. Of course having rolled once around its circumference, it now lands at 3.14 or Pi.

<http://i.imgur.com/dsCw0.gif>

Volume & Surface Area

Geometric Solids

Rotate various geometric solids by dragging with the mouse. Count the number of faces, edges, and vertices.

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

Interactivate: Surface Area and Volume

Explore or calculate the surface area and volume of rectangular prisms and triangular prisms. You can change the base, height, and depth interactively.

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

Geometry Volume/Surface Area Quiz from ThatQuiz.org

An online quiz, asking either the volume or surface area of cubes, prisms, spheres, cylinders, or cones. You can modify the quiz parameters to your liking, for example to omit some shapes, solve only for volume or surface area, or instead of solving for volume/surface area, you solve for an unknown dimension (side or radius) when the volume or surface area is given.

<http://www.thatquiz.org/tq-4/?-j3vu0-lc-m2kc0-na-p0>

Constructions

Geometric Construction

An interactive lesson with explanations and a quiz from Absorb Mathematics course written by Kadie Armstrong, a mathematician.

<http://www.absorblearning.com/mathematics/demo/units/KCA006.html>

Animated Geometric Constructions

Simple animations that show how to do basic geometric constructions.

<http://www.mathsisfun.com/geometry/constructions.html>

Geometric Constructions Illustrated with Interactive Java Applets

Drag various points in the sketch to explore additional cases. Also gives complete directions for using The Geometer's Sketchpad® software to construct the basic geometry constructions.

www.nvcc.edu/home/tstreilein/constructions/contents.htm

Simulations of Ruler and Compass Constructions

Practice compass & ruler constructions interactively online. Hints and solutions included.

<http://wims.unice.fr/wims/wims.cgi?>

[session=1V77FB9E9B.5&+lang=en&+cmd=intro&+module=tool%2Fgeometry%2Frulecomp.en&+special_parm=1](http://wims.unice.fr/wims/wims.cgi?session=1V77FB9E9B.5&+lang=en&+cmd=intro&+module=tool%2Fgeometry%2Frulecomp.en&+special_parm=1)

Interactive Constructions

Interactive online course covering points, lines, circles, perpendiculars, bisectors, Euclid, irrationals etc.

www.mathsnet.net/campus/construction/index.html

General

Geometry - Math Warehouse

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

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

Geometry course from Learning Math

This online geometry course includes readings, problems, videos, interactive activities, homework problems and solutions. It is meant for K-8 teachers but will work well for middle school students as well.

www.learner.org/courses/learningmath/geometry

Geometry Reference Sheet

Both online and printable versions; includes area and volume formulas for common shapes plus Pythagorean Theorem.

www.ecalc.com/math-help/worksheet/geometry

Geometry Tutorials

Simple tutorials on triangles and their properties, polygons, symmetry, angles and much more. Also includes lots of solved geometry questions and some interactive applets.

www.analyzemath.com/geometry.html#tutorials

Online Kaleidoscope

Create your own kaleidoscope creation with this interactive tool.

http://www.zefrank.com/dtoy_vs_byokal/

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