

Interactive Online Resources

Arcademic Skill Builders

www.arcademicskillbuilders.com

A variety of free and fun educational games that can be played online or on a Wii

Brain Pop

www.brainpop.com

This site, available by paid subscription, includes interactive activities on ratio, proportion, and percent as well as other math topics. The introductory movies for each topic are free.

Calculation Nation

calculationnation.nctm.org/

On this free site from the National Council of Teachers of Mathematics, students play strategy games to challenge themselves and others from around the world. Skills include multiplication; fractions; finding the area and perimeter of rectangles; and understanding angles, symmetry and reflections.

ExploreLearning: Gizmos

www.explorelearning.com

These interactive simulations for math and science students—available by paid subscription—are designed for inquiry and exploration. Teachers can take advantage of a free trial period to see what the site offers.

Illuminations

illuminations.nctm.org/

This free site from the National Council of Teachers of Mathematics has over 500 lessons and over 100 online activities related to NCTM PreK-12 educational standards as well as hundreds of links to other online resources. A search for “proportion” yields dozens of lesson plans and other activities.

Interactivate

www.shodor.org/interactivate

Free interactive explorations in science and mathematics that include activities, lessons, and discussions. Several of the activities listed for proportion help students visualize and manipulate fractions.

LineUp with Math

smarskies.nasa.gov/lineup/index.html

The Ames Research Center created this free interactive site for grades 5-9. Students apply proportional reasoning to make decisions and resolve conflicts in realistic air traffic control problems involving two or more planes. The site includes teacher and student materials, videos, and more.

MathTools

www.mathforum.org/mathtools/

Funded by the National Science Foundation, this free service from The Math Forum @ Drexel offers many interactive tools, lessons, and handouts related to scale, ratio, and proportion. Most are Java-based.

Interactive Online Resources (continued)

National Library of Virtual Manipulatives

nlvm.usu.edu/

This free site has virtual manipulatives matched to NCTM PreK-12 standards in the strands of number and operations, geometry, measurement, algebra, and data analysis and probability. Middle grades activities related to proportional reasoning include dynamic exercises involving the Golden Triangle, dilations, and congruent triangles.

Thinking Blocks: Model Your Math Problems

www.thinkingblocks.com/

This free site provides step-by-step interactive ratio and proportion problems.

Thinkport

www.thinkport.org

Thinkport, the educational site for Maryland Public Television, available free of charge, offers many resources for mathematics teachers and students.

Wolfram Demonstrations Project: Middle School Mathematics

demonstrations.wolfram.com/education.html?edutag=Middle+School+Mathematics

The interactive demonstrations on this free site use *Mathematica* software to explore mathematical concepts. Several demonstrations in the middle school section are related to proportional reasoning.

Computer Software

Algebra World: An Algebra Introduction

www.sunburst.com

These interactive challenges include activities involving gears, music, and speed.

GeoGebra

www.geogebra.org

You and your students can use this free mathematics software to create geometric constructions such as rectangles, cubes, prisms, circles, cylinders, and triangles.

Geometer's Sketchpad

www.dynamicgeometry.com

This software program allows you and your students to build and investigate mathematical models, objects, figures, diagrams, and graphs. It would be useful for exploring ideas related to two- and three-dimensional scaling.

Shape Up!

www.sunburst.com

Students in grades K-8 can explore two- and three-dimensional geometry in five unique electronic playgrounds using this software program. Activities include symmetry, congruence, and area estimation as well as a writing tool for students to write about their findings.

Tenth Planet: Comparing with Ratios

www.sunburst.com

Fifth- through eighth-grade students can explore ratio and proportion concepts through such activities as mixing colors and changing shapes.

Classroom Materials and Manipulatives

AngLegs™

www.learningresources.com

A set of plastic pieces of different lengths that snap together to form geometric shapes that includes a snap-on protractor. Students can explore measurement of angles, area, and perimeter, as well as similar and congruent plane figures.

Base Ten Blocks

www.basetenblocks.com

These manipulatives are marketed to younger students, but they are also useful for helping older children understand concepts related to percent, decimals, proportionality, similarity, and volume.

Books for Teachers

Bright, George; Jordan, Patricia L.; Malloy, Carol; Watanabe, Tad. ***Navigating through Measurement in Grades 6-8***. Reston, Virginia: National Council of Teachers of Mathematics, 2005. ISBN: 0873535456.

This book and CD offer hands-on explorations of proportionality, similarity, and scaling, including building a scale model of a room.

Elam, Kimberly. ***Geometry of Design: Studies in Proportion and Composition***. New York: Princeton Architectural Press, 2001. ISBN: 1568982496.

This brief book explores how humans have incorporated the proportionality of nature into design, including an examination of Golden Sections, Divine Proportion, and the Fibonacci Sequence.

Fosnot, Catherine Twomey and Dolk, Maarten. ***Young Mathematicians at Work: Constructing Fractions, Decimals, and Percents***. Portsmouth, NH: Heinemann, 2002. ISBN: 0325003556.

This book describes how students in grades 5-8 construct their understanding of fractions, decimals, and percents. It focuses on teachers as learners and ways in which teachers can “lead from behind” as they begin to see themselves as mathematicians finding ways to make sense of problems and appreciating the nature of mathematics.

Lamon, Susan J. ***Teaching Fractions and Ratios for Understanding: Essential Content Knowledge and Instructional Strategies for Teachers***. Mahwah, NJ: Lawrence Erlbaum Associates, Inc., 2005. ISBN: 0805852107.

An inquiry-based approach to teaching complex mathematical concepts in grades 3-8

Litwiller, Bonnie and Bright, George. ***Making Sense of Fractions, Ratios, and Proportions: 2002 Yearbook***. Reston, Virginia: National Council of Teachers of Mathematics, 2002. ISBN: 0973535197

This book offers a variety of activities related to proportional reasoning that address the concepts of speed, percents, and multiplicative reasoning.

Smith, Margaret Schwan; Silver, Edward A.; and Stein, Mary Kay. ***Improving Instruction in Rational Numbers and Proportionality: Using Cases to Transform Mathematics Teaching and Learning, Volume 1***. New York: Teachers College Press, 2005. ISBN: 0807745294.

The four cases in this book show how students solved proportional reasoning problems and how the teaching they received supported or inhibited their learning.

Picture Books, Fiction, and Films Related to Proportional Reasoning

Picture Books

David Schwartz's Picture Books

www.davidschwartz.com/books.html

This page on author David Schwartz's web site includes book descriptions and ordering information for *How Much Is a Million?*, *If You Hopped Like a Frog*, and *If Dogs Were Dinosaurs*, among other titles. These books are a fun and engaging way to explore ratio and proportion even for older students.

Smith, David J. *If the World Were a Village: A Book About the World's People*. Tonawanda, NY: Kids Can Press Ltd., 2002. ISBN: 1550747797.

The author imagines the world's total population is 100 and uses that scale to help explain statistics about nationalities, languages, religions, air and water quality, and more.

Sunby, Scott. Illustrated by Wayne Geehan. *Cut Down to Size at High Noon: A Math Adventure*. Watertown, MA: Charlesburg Publishing, 2000. ISBN: 1570911681.

A picture book set in the fictional Western town of Cowlick that uses humor and parody to teach students about scale and scaling

Fiction

These books all involve fictional representations of scale. They are available in multiple editions, so no single edition is cited.

Banks, Lynne Reid. *The Indian in the Cupboard* series.

Carroll, Lewis. *Alice in Wonderland*.

Greenburg, J.S. *Andrew Lost* series.

Norton, Mary. *The Borrowers*.

Peterson, John. *The Littles* series.

Swift, Jonathan. *Gulliver's Travels*.

White, E.B. *Stuart Little*.

Films

Donald Duck in Mathmagic Land

This enchanting animated short film features a curious Donald Duck exploring the wonders of Mathmagic Land, including fractions, music, the Golden Rectangle, and more. Available on DVD.

Selected Resources for Individual Learning Modules

Dinosaur World

Math Packs: Measuring Growth

www.smm.org/mathpacks/

This site from the Science Museum of Minnesota provides online activities and resources related to proportional reasoning.

National Geographic Society. ***The Dinosaur Museum: An Unforgettable, Interactive Virtual Tour Through Dinosaur History***. Washington, D.C: National Geographic Children's Books, 2008.

This picture book gives students a behind-the-scenes look at a dinosaur museum, with interactive investigations including comparing the size of dinosaurs with modern animals.

The Strange Laboratory of Dr. LaBarbara

magazine.uchicago.edu/9612/9612LaBarbera.html

A University of Chicago professor explores the biology and math of scaling organisms up and down, using examples from movies such as *The Incredible Shrinking Man*, *Fantastic Voyage*, *King Kong*, *Mothra*, and *Jurassic Park*.

Louisville Slugger Museum

"Pyramids, Olives, and Donkeys"

ecr.lausd.k12.ca.us/staff/llocurto/Algebra/thalesprofile.pdf

This story from *Mathematicians Are People Too* is a fictionalized account of how the Greek mathematician Thales used proportional reasoning to measure the Great Pyramid.

How To Measure the Height of a Tree

www.wikihow.com/Measure-the-Height-of-a-Tree

This site gives step-by-step instructions for measuring a tree using your shadow and the tree's shadow.

National Register of Big Trees

www.americanforests.org

American Forests is a non-profit dedicated to preserving and protecting trees. They maintain a database for Champion Trees throughout the U.S. This site includes instructions for measuring the heights, diameters, and crown spreads of trees. Many states have their own Champion Tree site; Kentucky's site, for example, is www.forestry.ky.gov/programs/kybigtree/default.htm.

World of Mural Painting

Super Size It: Scale in Art and Advertising

edu.warhol.org/aract_supersize.html (edu.warhol.org/aract_supersize.html)

A lesson on scaling up in images from the Andy Warhol Museum in Pittsburgh, Pennsylvania

Chris Jordan: Photographic Arts

www.chrisjordan.com/

Chris Jordan uses images of mass consumption and concepts of scale to create works of art that address environmental concerns and issues. See especially *Running the Numbers: An American Self-Portrait* and *Running the Numbers II*.

Selected Resources for Learning Modules (continued)

Miniature Land

Ames Room Optical Illusion

www.instructables.com/id/Ames-Room-Optical-Illusion/

An Ames Room uses variations in the proportions and design of a three-dimensional space to create optical illusions. This site provides templates and instructions for building a tabletop Ames Room.

Google SketchUp

sketchup.google.com/download/

Google SketchUp 7 is free software that allows you and your students to create, modify, and share 3D models.

The Great Buildings Collection

www.greatbuildings.com/buildings.html

A collection of resources about more than 1,000 great buildings worldwide, this web site includes the building of the day, tours of 3-D models created in Design Workshop®, links to architects whose buildings are featured on the site, and photographs and drawings of buildings.

SkyscraperPage.com

www.skyscraperpage.com

This site features diagrams of famous skyscrapers, including the world's 10 tallest buildings, historical skyscrapers, and skyscrapers in 330 cities worldwide. Dozens of American cities large and small (Louisville and Lexington among them) are represented. New scaled drawings are added weekly.

World Chicken Festival

Geometry: Area of a Circle

math.about.com/library/weekly/aa111002a.htm

This step-by-step activity helps you understand and practice the formula for finding the area of a circle.

The Story of Pi

www.geocities.com/capecanaveral/lab/3550/pi.htm

For many millennia, scholars have been searching for the value of pi. This web site highlights the discoveries from the beginning more than 4,000 years ago.

Selected Resources for Learning Modules (continued)

Sky-View Drive-In

Wisniewski, David and Wisniewski, Donna. ***Worlds of Shadow: Teaching with Shadow Puppetry***. Teacher Ideas Press: Englewood, CO, 1997. ISBN 1563084503

A step-by-step guide to using simple equipment and materials to introduce K-6 students to shadow puppetry

Playing with Shadows: An Introduction to Shadow Puppetry

<http://artsedge.kennedy-center.org/shadowpuppets/artsedge.html>

This beautiful interactive site provides a history of shadow puppetry plus step-by-step instructions for making shadow puppets; constructing and using screens; light, set, and sound design; and storytelling. Students can also use interactive features to create their own puppet show.

Belle of Louisville

Harmony and Proportion

www.aboutscotland.com/harmony/harmony.html

This web site includes interactive demonstrations of various musical ratios identified by Pythagoras and other Greek philosophers and mathematicians.

Make a PVC Flute

www.nativeaccess.com/ancestral/flute-adv.html

This web site provides step-by-step instructions on how to make a flute out of PVC pipe.

Panpipes

www.philtulga.com/Panpipes.html

This site includes virtual panpipes and instructions on how to make five- and eight-note panpipes using the Western and pentatonic scale.

Kentucky Horse Park

The Legacy of the Horse: The Story of Humans and Their Relationship with the Horse

www.imh.org/museum/history.php?pageid=9

This site, created by the International Museum of the Horse at the Kentucky Horse Park, provides chronological information about horses from their earliest origins to the modern era.