

Raise the Roof Geometry

7th grade Math and Visual Arts

CORE SUBJECT AREA

Math

ART FORM + ELEMENTS

Visual Arts
Drawing
Media Arts
Functional
Shapes
Proportion

DURATION

14 Days

OBJECTIVES

1. Students will use formulas to calculate area for triangles, squares, rectangles, trapezoids, and parallelograms.
2. SW accurately measure using standard units.
3. SW determine cost per square foot for carpet, tile, paint, and wallpaper.
4. SW plan costs within a budget.
5. SW show all calculations for computing area and cost/square footage.
6. SW accurately compute the cost of carpet/tile and wallpaper/paint for four of the differently shaped rooms.
7. SW use proper units when calculating costs.
8. SW write a paragraph clearly explaining the reasons why this is the students' dream house.
9. SW share a finished product by oral presentation and written explanation.

VOCABULARY

Polygon, Quadrilateral, Rectangle, Parallelogram, Square, Area, Triangle, Trapezoid, Scale Drawing, Perimeter, Ratio, Scale, Scale Factor, Scale Model, Square Feet, Budget Spreadsheet, Columns, Rows, Formulas, Analysis, Mitered, Corners, Critique, Collaboratively, Design, Artist Statement, Visual Organizational Strategy

MSCCR STANDARDS

7.G.1 Draw, Construct, and describe geometrical figures and describe the relationship between them. Solve problems involving scale drawings of geometric figures, including actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

7.G.6 Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

7.RP.1 Analyze proportional relationships and use them to solve real world and mathematical problems.

MSCCR CREATIVE ARTS STANDARDS

VA:Cr2.3.7 Organize and develop artistic ideas and work a. Apply visual organizational strategies to design and produce a work of art, design, or media that clearly communicates information or ideas.

VA:Cr3.1.7 Redefine and complete artistic work. a. Reflect on and explain important information about personal artwork in an artist statement or another format.

MATERIALS NEEDED

Prepared Area Worksheet (Appendix A, from 'Raise the Roof' lesson), Prepared Rubric (Appendix B), Prepared Sample Floor Plan Worksheet (Appendix C), Pencils, Black Pens, Grid Paper (1 square= 1 foot), Overhead projector/Elmo, Prepared Budget Worksheet (Appendix D), Prepared Analysis Worksheet (Appendix E), Newspaper/ magazines with ads for floor coverings/paint/wall coverings, Computers, Internet access, Microsoft Excel, Printer, Safety Guidelines (Appendix F), Foam Core Board, Scissors, Safety Glasses, Glue, Straight Pins

RECOMMENDED RESOURCES

Glencoe Practice Worksheets from the Glencoe Mathematics Applications Series (attached to the lesson)

Glencoe Mathematics Applications and Concepts Course, McGraw-Hill, New York ISBN 0-07860139-8 (this is a grade level text, used to instruct prior knowledge, any grade level text can be substituted)

Core Knowledge Sequence Content Guidelines for Grades K-8 1999 Core Knowledge Foundation ISBN 1-890517-20-8 Page 172-173

Mathematics Applications and Concepts: Course 3

<http://www.glencoe.com/sec/math/msmath/mac04/course3/webquest/unit3.php/10/10/06>

Technology Education Learning By Design, Burghardt, David and Hacker, Michael Prentice Hall ISBN 0-13-036353-7

Sketchup Google Model Your World (google app) <http://sketchup.google.com/>

<https://www.youtube.com/watch?v=ZvTVZbexz8M>

LESSON SEQUENCE

TT should start the lesson with the song ‘Raise the Roof’ (link attached). TT should ask ‘What is your idea of a dream home? Has anyone ever seen MTV Cribs?’ TS should respond with some outlandish idea about homes.

TT will then say ‘For the next couple of weeks we are going to design and draw your vision of the perfect house. You will apply area formulas and learn how important it is to measure accurately. The fun begins when you start shopping for flooring, paint and wall coverings. Using a Spreadsheet, you will create a working budget for your home. Then finally ‘Raise the Roof’ on your house, by constructing a scale model of your dream home. dream home? Has anyone ever seen MTV cribs?’ TS should respond with some outlandish ideals about homes.

Lesson 1: Draw a square, rectangle, triangle, trapezoid, and parallelogram on the overhead and have students name each figure and describe characteristics of each (e.g., Square - four sides, same lengths, etc.). Discuss the meaning of area. Explain the overall activity that the students will be working on and pass out the rubrics to the students. Go over the expectations and explain the rubrics. Handout Area Practice Worksheet. Demonstrate with examples how to complete the worksheet correctly. Check for understanding by circulating room. Worksheets should be completed by end of class period. Handout Sample Floor Plan Worksheet – Appendix C. Explain to students that this is a sample of a possible floor plan. Give students the window and door dimensions. Windows are 4 ft. x 4 ft. Doors are 6 ft. x 3 ft. All walls will be 8ft. height Illustrate the process to the students by choosing one room. Explain that the window and door areas are subtracted from total area when figuring square footage for walls. Working in pairs, the students will calculate costs of carpet/tile and wallpaper/paint for two different rooms. Hand out two sheets of graph paper to each student. Explain that they going to be designing the floor plans of their single story house. Explain that the scale is one square = one square foot. The students must use at least four different shapes and each room must be labeled with the name, dimensions, and area of each room. Tell the student that they must indicate where all windows and doors will be. Students should have the rough draft of their design completed by day four – rough draft is completed using pencil. Final Copy to be completed by day six – final design will be completed using pen.

Lesson 2: Explain to the students the possible types of floor coverings, paint, and wallpaper. Explain that one can of paint covers 400 square feet and one roll of wallpaper covers 55 square feet. Students will be given a predetermined budget for their flooring and wall covering. Students will use newspaper ads and internet resources to find information and costs for flooring, paint, and wall coverings. (TT could pre determine cost to save time within the lesson). Students will prepare a rough draft of their calculations using Budget Worksheet Appendix D. Students will calculate the square footage for all floors and walls and determine if their selections

are within their allotted budget. Introduce the use of Microsoft Excel spreadsheets to students. (extended part of the lesson) Demonstrate how label columns and rows. Demonstrate how to create formulas in Microsoft Excel.

Have students create a simple spreadsheet using basic formulas in Microsoft Excel. Students will prepare a final budget sheet using Microsoft Excel. Students will prepare an analysis worksheet explaining their selections and reasoning behind those choices by completing Appendix E.

Lesson 3: Review safety procedures for using the cutting utensils, using straight pins, and wearing safety glasses. Students will be required to pass a Safety Quiz before they are allowed to begin construction. Teacher made test. <https://docs.google.com/forms/d/e/1FAIpQLScdvjTGU9ZPaYKxA2lzWYSQhBeUybQiyESmb2qa2k09DkxOQ/viewform> (Example Safety Quiz) Students will use their final floor plan as the base for their construction project. Students will calculate the surface area of their exterior and interior walls to determine the amount of foam core board needed to construct their home design. Students will use foam core board to cut exterior and interior walls. Students will cut out all windows and doors in the exterior and interior walls. Students will attach the foam core board to their floor plan using glue. Students will present their completed final project to the class.

EXTENDED LEARNING ACTIVITIES

The ladder part of Lesson 2 in the plan is used to teach excel and formula building.

SOURCES

2007 Core Knowledge National Conference, 7th Grade/Technology/Math, (Raise the Roof) 'Edited by Jessica Jarman'<https://3o83ip44005z3mk17t31679f-wpengine.netdnssl.com/wp-content/uploads/2016/11/Raise-the-Roof.pdf>

TIPS + FREQUENTLY ASKED QUESTIONS

-To modify this lesson, TT could provide prices of different materials for TS homes. -TT could also cut out the 'Budget' section of the lesson, if time is not allotted and TS will still gain knowledge of Surface Area, Proportions and Ratios.