

Sarah Lovejoy

Wake Forest University

TOPIC: Malawian Houses**NCTM STANDARDS:** Geometry, Measurement, Connections, Representation**GOALS:**

Students will use the concepts of similarity, scale factors, and conversion factors to make scale drawings of different Malawian houses. Students will also practice the concepts and formulas of area and perimeter.

INTRODUCTION:

In rural Malawi villages, there are both traditional and Western houses. The traditional huts are of a circular shape and are made of mud and branches. The Western style houses are rectangular and made of brick.

ACTIVITIES:

- Part 1. Introduction. Teacher reviews the concepts of similarity, scale factor, and conversion factor. The teacher also reviews the formulas for perimeter and area of a rectangle and circle. Then the teacher shows the students how to make a scale drawing of a simple rectangular and circular house.
- Part 2. Blueprint. With a partner, students select two hut descriptions. The students then use the information given to construct blueprint of the houses that are drawn to scale and find the perimeter and area of each house.
- Part 3: Scale Model. Each group must choose one of the houses and then build a model that is similar to the actual physical house.
- Part 4: Other Countries. Students will use the internet to research other countries that have circular homes. Students must then pick a country and write a one page paper on the culture of that country.

ASSESSMENT: The students will use their knowledge of similarity, scale factors, perimeter, and area to complete the assignments which will be turned in.

Part 1: Introduction/Lesson

In rural Malawi villages, there are both traditional and Western houses. The traditional huts are of a circular shape and are made of mud and branches. The Western style houses are rectangular and made of brick. Before people build houses, they create scale drawings.

- Does anyone know what a scale drawing is? **Depiction of an object in which its dimensions (and those of its elements) are proportional to the actual dimensions in a predetermined ratio.**
- What is the conversion factor? **Factor by which a quantity that is expressed in one set of units must be multiplied in order to convert it into another set of units.**
- What is a scale factor? **The constant multiplier that scales your measurements.**
- What is the difference between scale and conversion factors? **Conversion factors are when you are changing a set of measurements into a different measuring system. For example: changing inches to centimeters. A scale factor is contained within the same measurement system. For example: inches to feet.**
- What does it mean when two objects are similar? **Similar polygons are polygons for which all corresponding angles are congruent and all corresponding sides are proportional. This means that the angles of the houses are the same physically and on paper but the length of the walls will be different.**
- So how does all this relate to making blueprints? **Our blueprints will be scale drawings and the drawing on paper will be “similar” to the actual house. Also, we will use a scale factor to make our blueprints.**
- What are the formulas for perimeter and area of a rectangle? **$P=2l+2w$ and $A=lw$**
- What are the formulas for circumference and area of a circle? **$C=2\pi r$ and $A=\pi r^2$**

Now work through an example. Have a circular house with a diameter of ten feet.

Therefore, the area would be 25π and the circumference would be 10π . For the blueprint, have one foot=one inch. So the house has a diameter of 10 inches. What is the scale factor? Since there are twelve inches in a foot, the scale factor is 12.

Lets say the rectangular house has a length of 16 feet and a width of 14 feet. What is the area? 224 ft. What is the perimeter? 60 feet. What is the scale factor? Again, it is twelve since we are moving between inches and feet.

Part 2: Make your own blueprint with a partner

Teacher will assign partners beforehand. Partners will choose a circular home and a rectangular home, draw a blueprint on worksheet and find the area and perimeter/circumference of each one.

Circular House choices:

1. Radius of 8 feet (height of 10 feet)
2. Diameter of 6 yards (height of 12 feet)
3. Diameter of 13 feet (height of 9 feet)

Rectangular House choices:

1. 17x20 with two rooms (height of 8 feet)
2. 15x15 with only one room (height of 9 feet)
3. 8x11 with one room (height of 10 feet)

At the end of the project, students will be given an opportunity to evaluate their partner and whether the work was shared evenly.

Part 3: Build a model

Choose one of the houses that you used for the blueprint activity and build a physical model using whatever materials you wish. In Malawi, rectangular houses are built out of brick or mud whereas circular homes are always made out of mud. Your dimensions of the physical model need to be proportional to the blueprint and actual dimensions of the house. The roofs can be slanted or flat: choose whether the height will refer to the height at the peak or at lowest point.

Suggested Materials: Clay, Play-Dough, Legos, Popsicle Sticks, Sugar cubes

Part 4: Culture Paper

Each group will use the internet to research other countries that have predominately circular houses. Examples include Guinea, Lesotho, Kenya, and Zimbabwe. Students will then pick one of those countries and write a one page paper on the culture in that country. The paper can be on any aspect of culture and is very open-ended. Students will be graded on accuracy of information, correct citations, paper organization, and spelling.

Assessment

Teacher will grade blueprint, physical model, and culture paper.

TEACHER NOTES/SOLUTIONS

Part 1: The teacher should use the notes provided in the students' introduction to review that material.

Part 2:

Area and Circumference of Circular Homes:

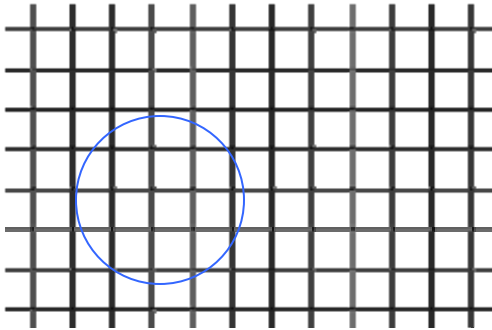
1. Radius of 8 feet: Area= $64\pi \sim 201$ feet Circumference= $16\pi \sim 50$ feet
2. Diameter of 6 yards: Area= $81\pi \sim 254.5$ feet Circumference= $18\pi \sim 56.5$ feet
3. Diameter of 13 feet: Area= $42.25\pi \sim 132.7$ feet Circumference= $13\pi \sim 40.8$ feet

Area and Perimeter of Rectangular Homes:

1. 17x20 ft: Area=340ft Perimeter: 74 ft
2. 15x15ft: Area=225ft Perimeter: 60 ft
3. 8x11ft: Area=88ft Perimeter: 38 ft

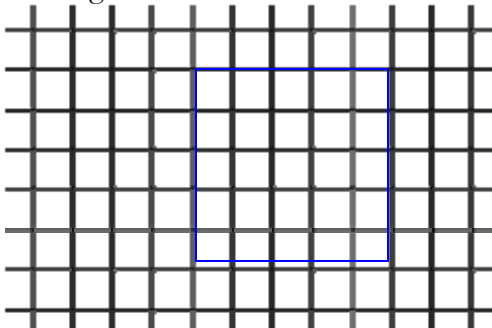
Sample Blueprint:

Circular Home: radius of 8 feet



In this blueprint, one unit on the graph equals 4 feet

Rectangular Home: 15 x 15 ft



In this blueprint, one unit on the graph equals 3 feet.

Rubric for Assessment:

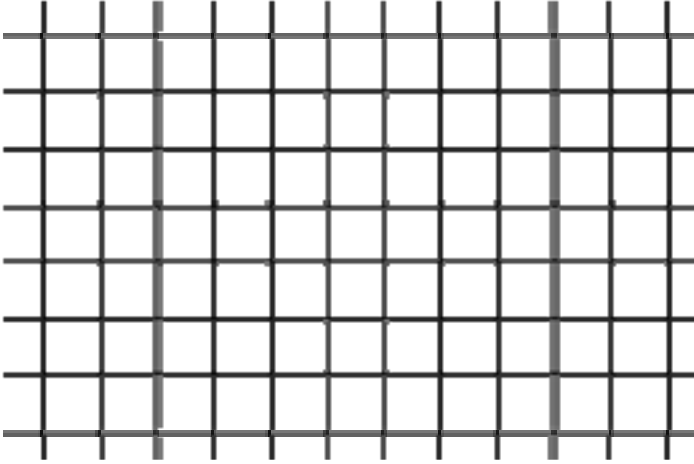
It is possible to receive 100 points for this assignment.

Number of Points	
20	Correct blueprint of circular house (correctly drawn to scale)
20	Correct blueprint of rectangular house (correctly drawn to scale)
5	Correct area and circumference of circular house
5	Correct area and perimeter of rectangular house
20	Physical model is done to scale
20	Paper <ul style="list-style-type: none">• Accuracy of information in the paper (5 pts)• Correct Citations in paper (5 pts)• Solid organization of information in the paper (5 pts)• Correct spelling in the paper (f pts)
10	Partner Evaluation

Hint: Assign intermediate due dates for each part of the project.

Worksheet

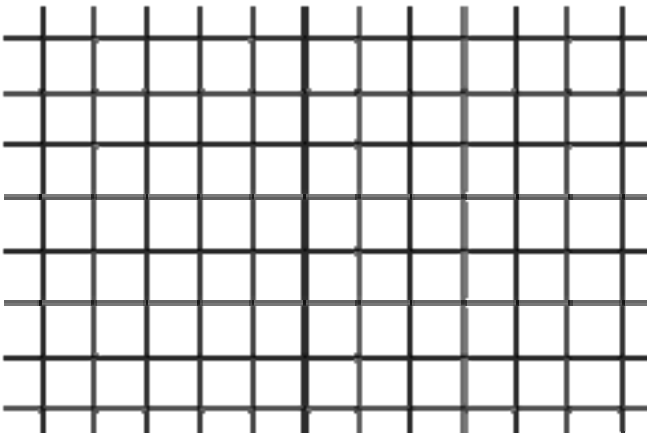
Sketch blueprint of circular home:



Calculate circumference:

Calculate area:

Sketch blueprint of rectangular home:



Calculate perimeter:

Calculate area: