

Geometry Foundations

Version 3.0

Student Journal



[Click Here to View
Problem of the Day](#)

[Click Here to View
Lesson 1:
Chromatic Numbers](#)

Unit 1

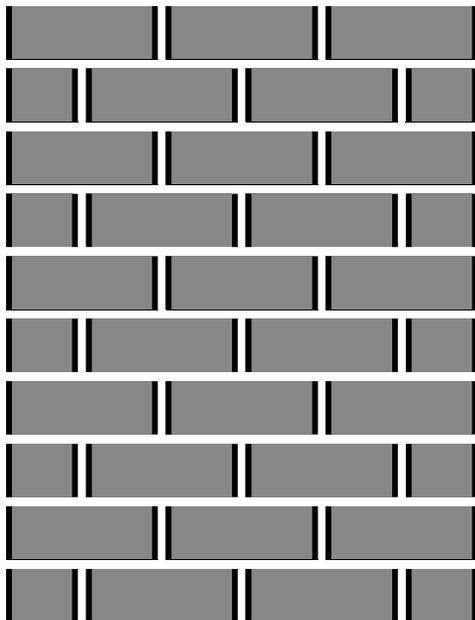
Introduction to Geometry

Problem Set 22

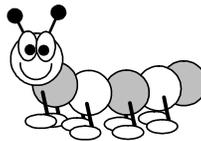


CHALLENGE

Try the following exercise. Be prepared to explain your answer.



A caterpillar is climbing a structure made of ten large bricks. The caterpillar is able to climb five bricks in an hour. Then, it rests by taking an hour nap. During the nap, the caterpillar slips down four bricks.



If the pattern of climbing and napping continues, how long will the caterpillar take to reach the top?



THINK IT THROUGH

Fill in the missing terms to make the expression on the right of the equal sign the simplified version of the expression on the left.

Work with a partner.

1. $10x + \underline{\hspace{2cm}} + \underline{\hspace{2cm}} 6 = 8x + 15$

2. $4a - 3b + \underline{\hspace{2cm}} + \underline{\hspace{2cm}} - 5 + \underline{\hspace{2cm}} = 3a + 9b + 10$

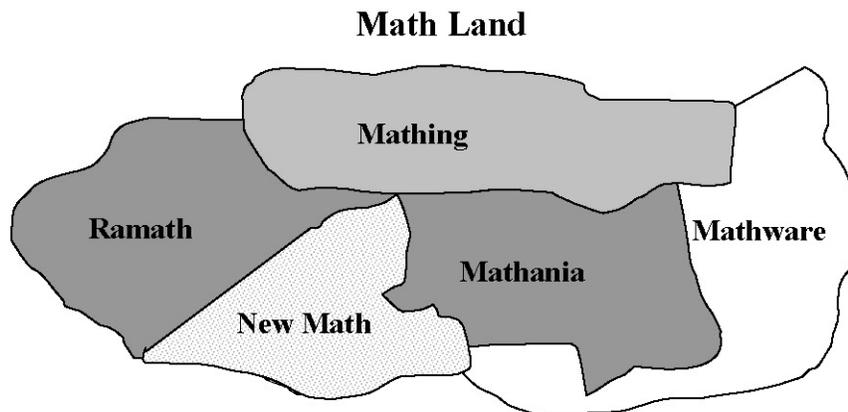
3. $3d + 2c - 5g + \underline{\hspace{2cm}} + 12 + \underline{\hspace{2cm}} - \underline{\hspace{2cm}} = 3d + 5c + 5$

Lesson 1: Chromatic Numbers

Discovery Activity 1

Maps and quilts are generally made up of smaller parts. A map of the United States is generally broken into states. A large quilt is created with smaller pieces of fabric. On a drawing of a map or quilt the part that two sections share in common is called a **boundary**. Sometimes two sections do not share a boundary but they meet at a **point**. Sometimes two sections do not touch at all.

Samantha created a map of an imaginary country. She named the country Math Land and divided it into five states named Mathing, Ramath, Mathware, New Math, and Mathania.



1. Study Samantha's map of Math Land.

a. Name two states in Samantha's country that share a boundary?

b. Name two states that only meet at a point?

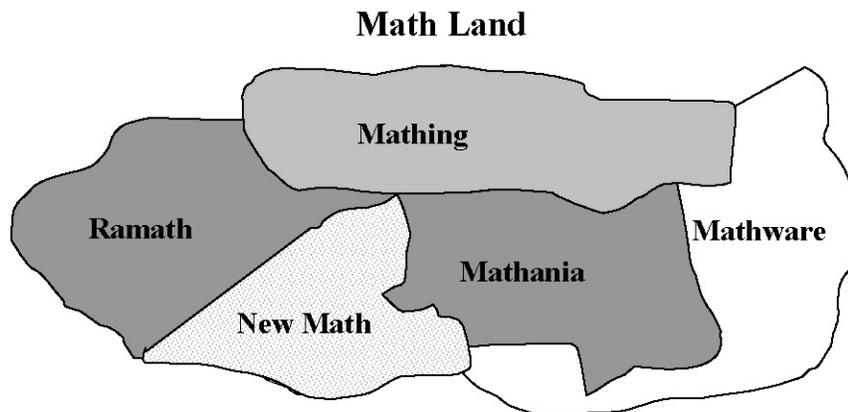
c. Name two states that do not touch at all?

Lesson 1: Chromatic Numbers

Discovery Activity 1

Maps and quilts are generally made up of smaller parts. A map of the United States is generally broken into states. A large quilt is created with smaller pieces of fabric. On a drawing of a map or quilt the part that two sections share in common is called a **boundary**. Sometimes two sections do not share a boundary but they meet at a **point**. Sometimes two sections do not touch at all.

Samantha created a map of an imaginary country. She named the country Math Land and divided it into five states named Mathing, Ramath, Mathware, New Math, and Mathania.



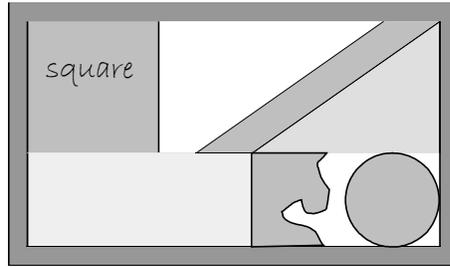
1. Study Samantha's map of Math Land.

a. Name two states in Samantha's country that share a boundary?

b. Name two states that only meet at a point?

c. Name two states that do not touch at all?

Samantha's grandmother likes to make quilts with different shapes sometimes the shapes have names and sometimes they don't. Samantha drew a picture of one of her grandmother's quilts.



2. Study the drawing of the quilt.

- a. Name five sections of the quilt with the geometric term that represents the shape. For example, one of the shapes in the drawing is called a "square."

- b. List two sections of the quilt that only meet at one point?

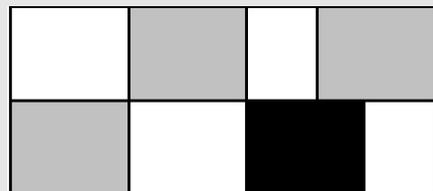
- c. List two sections of the quilt that do not touch at all?

Definition

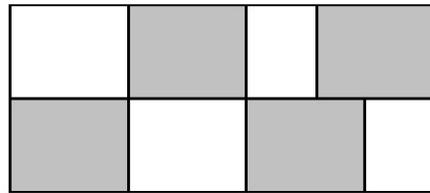
Map makers generally color a map with the following **chromatic number** guidelines.

- No two sections (states or countries) sharing a boundary can have the same color.
- Sections (states or countries) that meet at a single point can have the same color.
- Use the minimum number of colors possible.

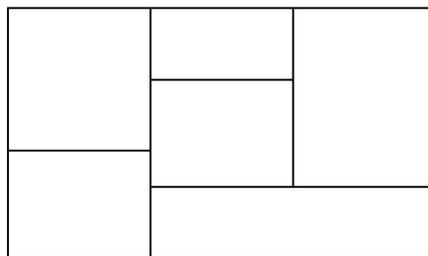
For example, a quilt using these guidelines may look like the following and have a chromatic number of 3.



3. Explain why the following quilt design **does not** meet the chromatic number guidelines.



4. a. Color the quilt pattern using the chromatic number guidelines.



b. What is the minimum number of colors needed to fill in the sections?

Lesson 1: Chromatic Numbers

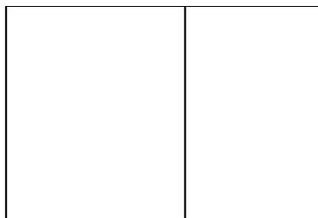
Discovery Activity 2

1. Determine the chromatic number by coloring each quilt pattern.

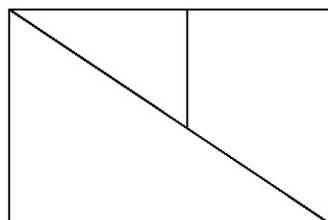
a. One-Section Quilt



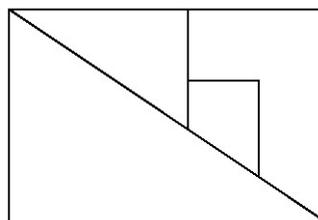
b. Two-Section Quilt



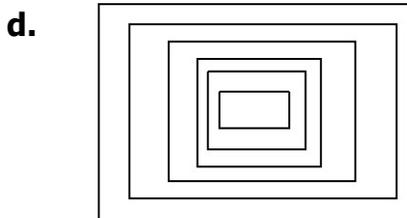
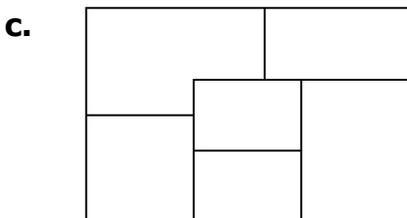
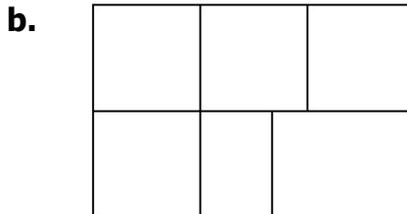
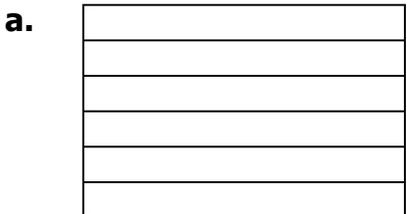
c. Three-Section Quilt



d. Four-Section Quilt



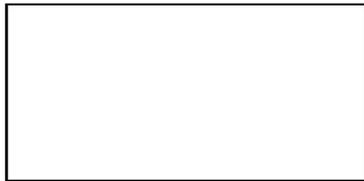
2. The following quilts all have six sections, but they each have a different chromatic number. Determine the chromatic number of each quilt by coloring each section according to the chromatic number guidelines.



3. Create a three-section quilt that has a chromatic number of 2.



a. Create a four-section quilt that has a chromatic number of 2.



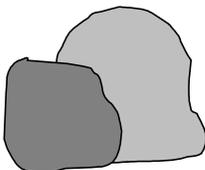
b. Create a five-section quilt that has a chromatic number of 4.



4. To better understand chromatic number it helps to work through the pattern of drawings. Based upon the chromatic number guidelines, a drawing with one section only needs one color.



Based upon the chromatic number guidelines, a drawing with two sections that have both sections touching will need two colors.



a. Draw a figure that has three sections with all three sections touching one another and determine the chromatic number.

b. Draw a figure that has four sections with all four sections touching one another and determine the chromatic number.

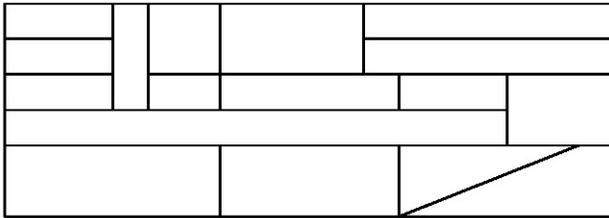
c. Try to draw a figure that has five or more sections with all sections touching each other and determine the chromatic number. Is it possible?

d. Describe why your solution to part c reinforces the fact that all maps or quilts drawn on paper will have a maximum chromatic number of 4.

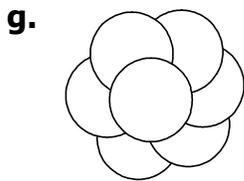
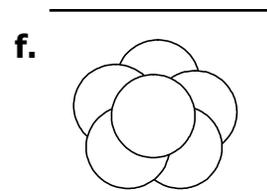
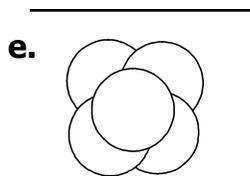
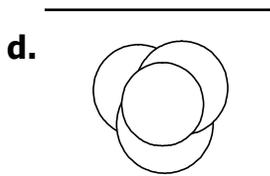
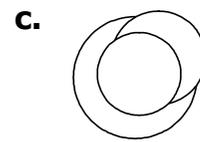
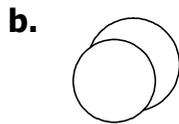
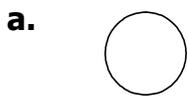
Lesson 1: Chromatic Numbers

Exercises

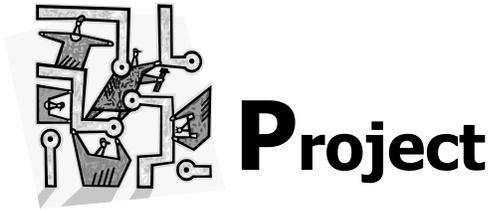
1. Determine the chromatic number of the quilt pattern below. _____



2. Determine the chromatic number for the diagrams.



Lesson 1: Chromatic Numbers

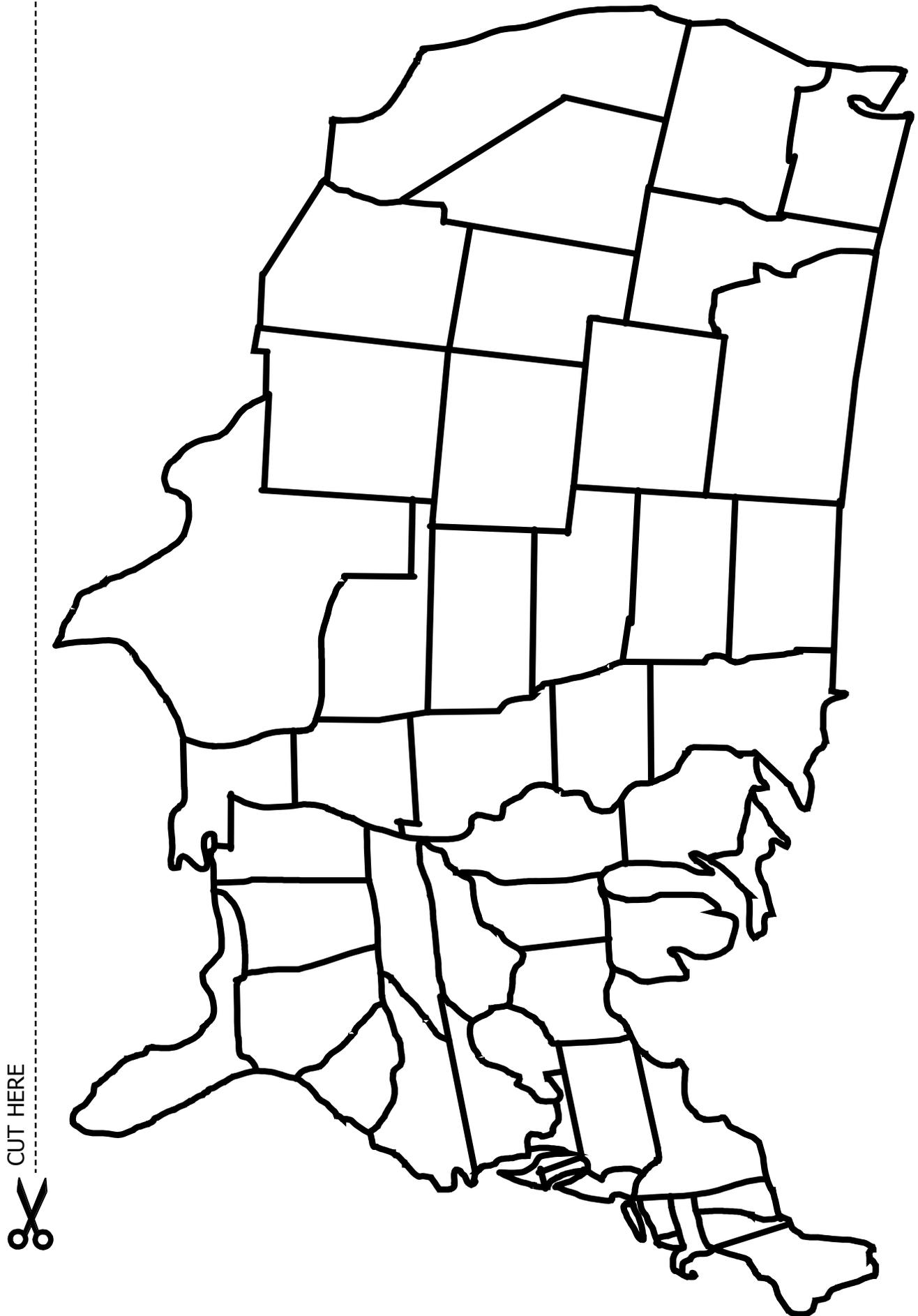


What is the chromatic number of a map of the continental United States? _____

Part 1: Color the map on the following page using the guidelines with the least number of colors to determine the chromatic number.

Part 2: Describe the places on the map where you were forced to use a new color.

Part 3: Cut out the map and display it in the room. Write comments and thoughts on a self-adhesive note for two other maps displayed in the room. Place the notes on the maps.



Page intentionally left blank.

Outcome Sentences

1. I was surprised that a chromatic number _____

_____.
2. I would like to find out more about _____

_____.
3. I would conclude that maps _____

_____.
4. I now realize that my career _____

_____.