Title: PATTERNS: Recognition, Creation and Applications

Brief Overview:

Students will explore patterns using a variety of formats: music, people, weather, charts and pattern blocks. They will identify, describe, extend, and create patterns. Students will discuss their findings and write a summation of their pattern explorations including how to find a pattern, understand and identify the rules of functions, and define pattern vocabulary. Students will also relate the use of patterns to a real world situation. Students will examine thermometers and make accurate readings.

NCTM Content Standard/National Science Education Standard:

Identify, describe, extend and create patterns
Understand pattern relationships and functions
Data collection and analysis
Sort, classify and order data

Maryland State Voluntary State Curriculum:

Identify, describe, extend and create numeric patterns and functions
Collect, organize, and display data

Grade/Level:

Grades 4-6

Duration/Length:

Lesson 1: 60 minutes (may be repeated as a review on 2nd day)
Lesson 2: 5 days (30 minutes each day). Lesson has the potential to become a project and continue for a longer length of time.
Lesson 3: 60 minutes (may be repeated as a review on 2nd day)

Student Outcomes:

Students will:

- Collect data on the weather, chart the data in various forms
- Use the internet
- Recognize patterns in collected data
- Recognize patterns in real life or practical situations
- Write about patterns in real life
- Apply what they have learned about patterns to another data collection project
- Identify, evaluate and create function tables

Materials and Resources:

Map of Maryland with Counties outlined (*Another state may be used.)*
Chart with Grids
Overhead transparencies and markers
Overhead Pattern Blocks
Book on Patterns (Literature connection for launch)
Weather data collection worksheet
Poem about patterns (Literature connection for launch)
Pattern Blocks
Copies of Student Resources
Almanac or Internet weather site

Development/Procedures:

Lesson 1

Preassessment – Students will identify what they know about numeric patterns by completing Student Resource Sheet #1a. They will state what they know about numeric patterns. Then they will identify and complete the pattern in the artwork on the Student Resource Sheet #1a using the Student Resource Sheet #1b. In addition, they will identify patterns using words, symbols, or pictures. Finally, they will complete a function table and write the rule. See Teacher Resource Sheet #1 for answers.

Launch – Demonstrate a pattern found in dance, music, art, etc. For example, demonstrate a pattern found in a song or a line dance. See Visual arts, and performing arts examples and web links on Teacher Resource Sheet #2. Discuss these patterns with students.

Teacher Facilitation – Provide a paper and pattern blocks. On the overhead, show students the pattern block resource sheet (Teacher Resource Sheet #3 Pattern Block Art). Discuss how patterns are repeated (yellow hexagon, blue rhombus, red trapezoid, green triangle). Show students how to use pattern blocks to create a pattern by demonstrating with the overhead pattern blocks. Students and teacher will then discuss what they see, such as color, number, arrangement, etc. Students will make patterns using the pattern blocks on Student Resource Sheet #2 (plain Pattern Blocks). Next, assign a number for each shape or use the colors to show how the numbers and/or the colors can represent the patterns. Then make up a number or color series and create a pattern using that color or numeric series. See Teacher Resource Sheet #4 The Village.

Student Application – Students will be in small groups to create their own pattern using dance, music, blocks, and etc. In creating their own pattern, students should first

assign a numerical value to each step/part of their creation then create their pattern.

Homework: Students will create a number series using the value of the penny, nickel, dime or quarter to create a pattern. (Student Resource Sheet #3 Coins)

Embedded Assessment: Perform the gallery walk (where every one in the class goes to each student's project) so that they can show and explain their patterns to the class.

Reteaching/Extension –

- Provide Student Resource Sheet #4 Pattern Practice, to identify patterns.
- Extension for those who finish early: Provide worksheet list for students to see how many patterns they can identify in the classroom (Student Resource Sheet #5 Real Life Patterns).
- Have students create a cryptogram to be used as a drill for the next day.

Lesson 2

Data Collection / Chart Selection / Weather Patterning

Preassessment –

- Provide students with a copy of a Maryland map outlining the different counties. (Student Resource Sheet #6 Maryland Map.) Each named county has a temperature degree reading showing the average temperature for that county. Have students find and read a few of the temperatures from various counties.
- Students should color the counties according to average temperature readings. Use the color blue for temperature readings in the 50's, yellow for 60's, orange for 70's and red for 80's. Once students have completed the exercise, discuss counties that have the same temperature readings.
- Have students observe the color scheme of their temperature recordings on the Maryland map. Hold up their sheets first facing each other to observe by color scheme the similarities in their classmates' work. Raise hands if they think a color scheme is different from the format that they have. Explain what might have created the difference.
- Have students turn their completed maps toward the teacher. Make brief observations as to whether most or all students have the same pattern.

Launch –

- Transparency displays: Have students transfer the data from the map onto a chart. (Student Resource Sheet #7) Answers can be found on Teacher Resource Sheet #11. Discuss summary

statements that could be made from the review of the temperature data.

Teacher Facilitation –

- Discuss several different ways of collecting data: written form (write the numbers, words or sentences), charts, grids, graphs, shapes, colors. Explain that students will be collecting data about weather temperatures for the next five days or longer. They will create a chart and graph and color in a pattern map to collect the data.
- Distribute Student Resource Sheet #8 (Weather Data Sheet) for students to view. Explain that students will use this sheet to collect a daily temperature reading for assigned counties in Maryland using the Internet each day. They will be given team assignments to cover each county. A designated time will be established for each team to use the Internet and create the information in the different formats mentioned above: chart, graph, colorful map display.
- Talk about the logistics of doing this project. Answer any questions the students may have about the project.
- As students create the different weather temperature reports. They are to place them on the display board.

Student Application –

- Assigned students will enter temperature data each morning on the weather data collection sheet using Student Resource Sheet #15.
- The student responsibility should be explained and pre-assigned for each day of the week. The student teams will also present or report the information to the class during the scheduled time. Students will journal a summary of their findings daily.
- Assigned students will make a brief presentation as to what their findings and conclusions were concerning the weather each day.
- Students will write their temperature predictions for their assigned counties for Saturday and Sunday based on their weekly data collection information. On Monday, the official weather data for the county will be provided. Students will compare data and discuss the reasoning or logic behind their predictions in comparison to the actual weather temperature.

Embedded Assessment –

- Check to see that students understand how to look for similarities in the data in order to make comparisons. This process should include correct additions and subtractions to help them make conclusions about the data that has been collected. This will also show them how to report changes. Student progress can be checked as the teacher listens and observes the presentations. Also

check to see if they are finding and displaying various patterns in the collected data. Students should also be using some of the terms that relate to patterns, series, functions, etc.

Reteaching/Extension –

- Allow students to continue the Student application process until all students have presented. Make a note to have students who do not summarize the information well the first time to have them do another presentation or to continue with the student application portion of the assignment on an on-going basis.

Lesson 3 Function Crunches

Preassessment:

- Students will complete the preassessment on function tables (Student Resource Sheet #9, Teacher Resource Sheet #7 answers). Students will explore functions to help find the applicable rules and operations. The exploration will begin in abstract form. Students will view an arranged layout of balls for various sports. Looking at the patterns, students should be able to predict what the missing or next item should be.

Launch

- Teacher will display a Function Crunch machine (which is really a function chart). Discuss the similarities between the numbers in the first column and the second column. What arithmetic operation can be used to convey the relationship between them? Is this relationship the same at each level of the function chart?

Teacher Facilitation

- Explain and define the terms associated with a function chart. Discuss fixed relationships between numbers and or symbols. Have students practice using various function charts to arrive at the rule. Explain the relationship between function charts and patterns. Have them look back at the pattern block exercise they did earlier (Lesson 1) or just look at a pattern design. Notice the relationship between symbols that make a pattern. Help students see that if numbers are placed on the patterns, you could also see a function.
- Have students complete another function crunch machine with the correct numbers based on a rule.

Student Application

- Have students' journal about function rules. In their journal they should create a function machine of their own. Fill in the answers that belong in their machine with a colorful marker.
- Have students create a function crunch machine as a piece of art. They should use colorful markers and frame their machines with the shape of something that would use a function in real life, such as ____?____.
- Have students do a journal walk to view their work after it is finished. Teacher should take the journal walk as well noting any improvements or assistance that may be needed.
- Display student Function Crunch machines on Display boards.

Embedded Assessment

- Observe student's work and discussions to check for understanding of functions. Students should come up with a process of their own to look for a function. Students should also be able to see some relationship between functions and patterns. Provide additional function machines as warm ups to start the morning, or a math class. Function Crunch machines should be colorful and imaginative whenever possible.

Reteaching/Extension

- Reteaching: Students who need additional help with this concept should be provided with short reading assignments or handouts to explain functions in different ways. Have them complete a function table and explanation of what they learned from the reading. Also allow opportunities for students to work together to create tables. This will provide added assistance.
- Extension: Allow students who have mastered this function lesson to create their own tables or to make function puzzles to challenge each other to find the rule and the answers.

Summative Assessment:

The students will complete a quiz and test as part of their final assessment after six to eight days of this lesson. The Summative assessment will require students to submit a logical application and explanation of patterns in real life. It will also check their knowledge of pattern creation, ability to recognize patterns and to reformat collected data.

Authors:

Evelyn Campbell
Rosemont Elementary School
Baltimore County

Pauline Washington-Diggs
Shabach! Christian Academy

Name_____ **Date** _____

Pre Assessment #1

Directions: Complete the following questions.

1. Write what the following words mean to you.

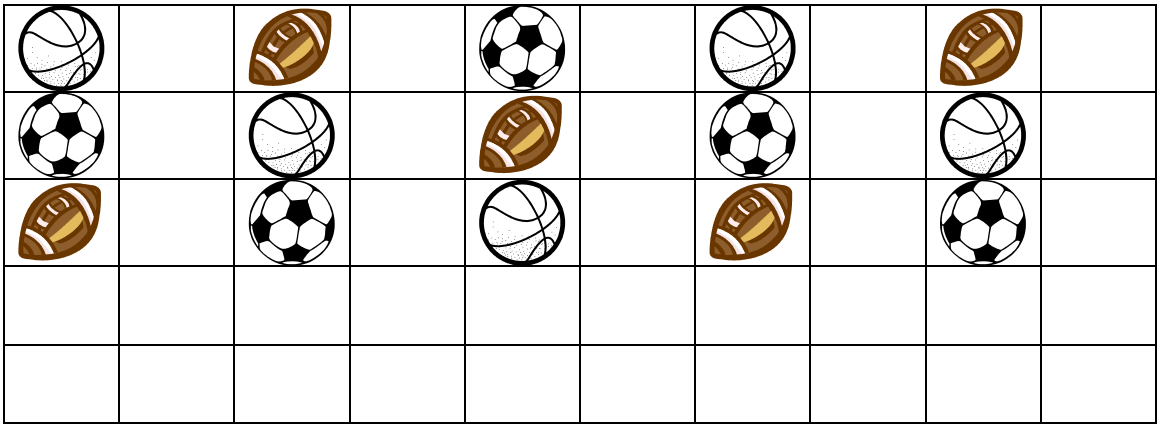
    a. numeric patterns

_____

_____

_____

2. Use the cut-outs provided to complete the last two rows of the patterns below.



3.

    a. Using words, symbols or pictures, describe the above pattern in the box below.

    b. If the  represents the number 1, the  represents the number 2, the  represents the number 3 and blank represents the number 4. Write the numeric series for this pattern.

_____

_____

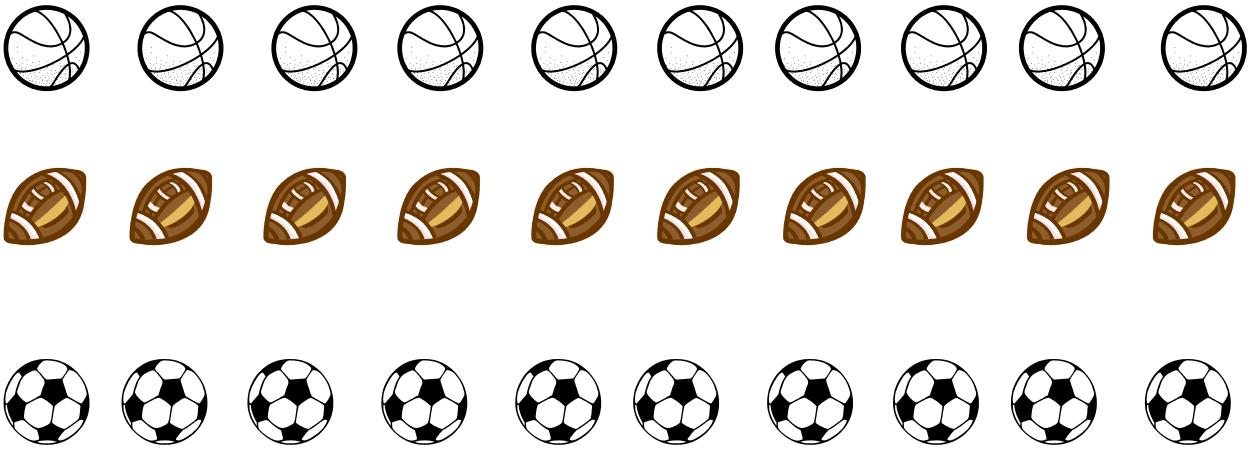
_____

_____

_____

Student Pre Assessment #1 Resource Sheet

Directions: Use the following pictures to complete the chart on Pre Assessment #1.



Pre Assessment #1 (Answer Sheet)

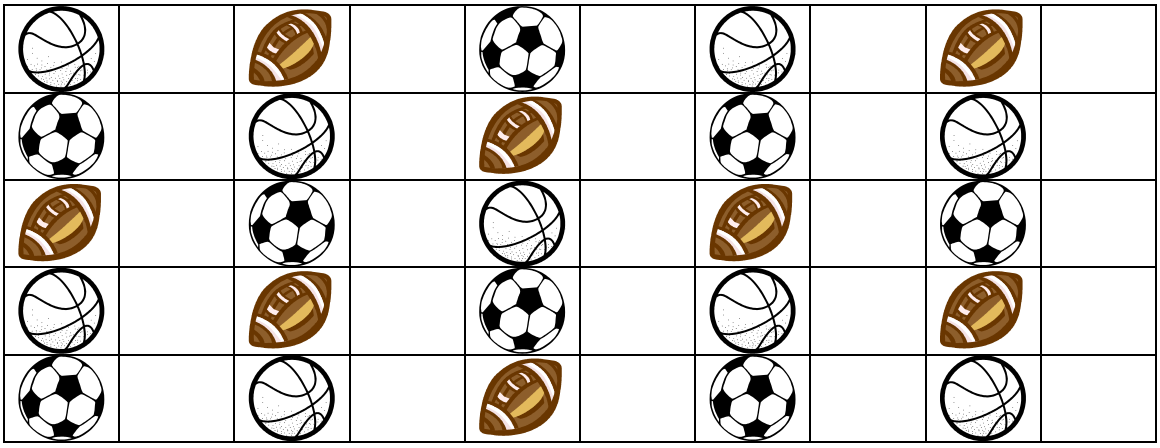
Directions: Complete the following questions.

1. Write what the following words mean to you.

    a. numeric patterns

A numeric pattern is a number sequence such as 3, 6, 9, 12 . . .

2. Use the cut-outs provided to complete the last two rows of the patterns below.



3. Using words, symbols or pictures, describe what is the pattern of the previous visual art work.

If the  represents the number 1, the  represents the number 2, the  represents the number 3 and blank represents the number 4. Write the numeric series for this pattern.

The pattern is a basketball, blank, football, blank, soccer ball, blank, and then this is repeated for the remaining squares.    is correct also. The numeric series for the pattern using numbers are 1,4,2,4,3,4, …

Visual Art examples

M. C. Escher - Visual Artist
http://www2.spsu.edu/math/tile/symm/types/index.htm

Kente cloth – Cloth worn as academic stoles and garments

Kente cloth is a patterned strip of cloth made by the Akan people of West Africa. Various regions of Ghana make different styles of cloth. Ashanti kente is from the central Kumasi area, and Ewe kente is from the eastern Volta region.
http://goldcoastafrica.safeshopper.com/52/cat52.htm?748

Akiyoshi Kitaoka – Psychologist verse in visual illusions

http://www.ritsumei.ac.jp/~akitaoka/index-e.html

Faith Ringgold – Visual Artist

http://www.faithringgold.com/ringgold/images.htm

Music examples

This Old Man Song

This old man, he played one,
He played knick-knack on my thumb.
With a knick-knack, paddy whack,
Give a dog a bone,
This old man came rolling home.

This old man, he played two,
He played knick-knack on my shoe.
With a knick-knack, paddy whack,
Give a dog a bone,
This old man came rolling home.

This old man, he played three,
He played knick-knack on my knee.
With a knick-knack, paddy whack,
Give a dog a bone,
This old man came rolling home.

This old man, he played four,
He played knick-knack on my door.
With a knick-knack, paddy whack,
Give a dog a bone,
This old man came rolling home.

This old man, he played five,
He played knick-knack on my hive.
With a knick-knack, paddy whack,
Give a dog a bone,
This old man came rolling home.

This old man, he played six,
He played knick-knack on my sticks.
With a knick-knack, paddy whack,
Give a dog a bone,
This old man came rolling home.

This old man, he played seven,
He played knick-knack up in heaven.
With a knick-knack, paddy whack,
Give a dog a bone,
This old man came rolling home.

This old man, he played eight,
He played knick-knack on my gate.
With a knick-knack, paddy whack,
Give a dog a bone,
This old man came rolling home.

This old man, he played nine.
He played knick-knack on my spine.
With a knick-knack, paddy whack,
Give a dog a bone.
This old man came rolling home.

This old man, he played ten.
He played knick-knack once again.
With a knick-knack, paddy whack,
Give a dog a bone.
This old man came rolling home.

Additional songs' lyrics
http://www.bussongs.com/

Dance Examples

Electric Slide
A song to use with dance - "Electric Boogie" by Marcia Griffiths

THREE SLIDING STEPS RIGHT & CLAP

1. Step side right with RF and slide LF to RF
2. Repeat step 1
3. Repeat step 1
4. Touch LF next to RF and clap

THREE SLIDING STEPS LEFT & CLAP

5. Step side left with LF and slide RF to LF
6. Repeat step 5
7. Repeat step 5
8. Touch RF next to LF and clap

THREE STEPS BACK AND TOUCH

9. Step back with RF
10. Step back with LF
11. Step back with RF
12. Touch LF in place

ROCKING FORWARD, BACK, FORWARD & 1/4 TURN LEFT

13. Rock forward on LF
14. Touch RF in place
15. Rock back on RF
16. Touch LF in place
17. Rock forward on LF and make 1/4 turn left
18. Touch RF next to LF

REPEAT

Additional dance with steps
http://www.cut-a-rug.com/line.htm

http://www.cut-a-rug.com/country.htm

MACARENA

1. Right arm extended out in front, palm facing down
2. Left arm extended out in front, palm facing down
3. Flip right palm up toward the ceiling
4. Flip left palm up toward the ceiling
5. Bend right arm; place fingertips on left elbow
6. Bend left arm; place fingertips on right elbow
7. Put right hand on right side of head
8. Put left hand on left side of head
9. Put right hand on left hip
10. Put left hand on right hip
11. Put right hand on right backside
12. Put left hand on left backside
13. Shake down for 3 beats
14. Jump a quarter turn to the right; clap hands when feet hit the ground

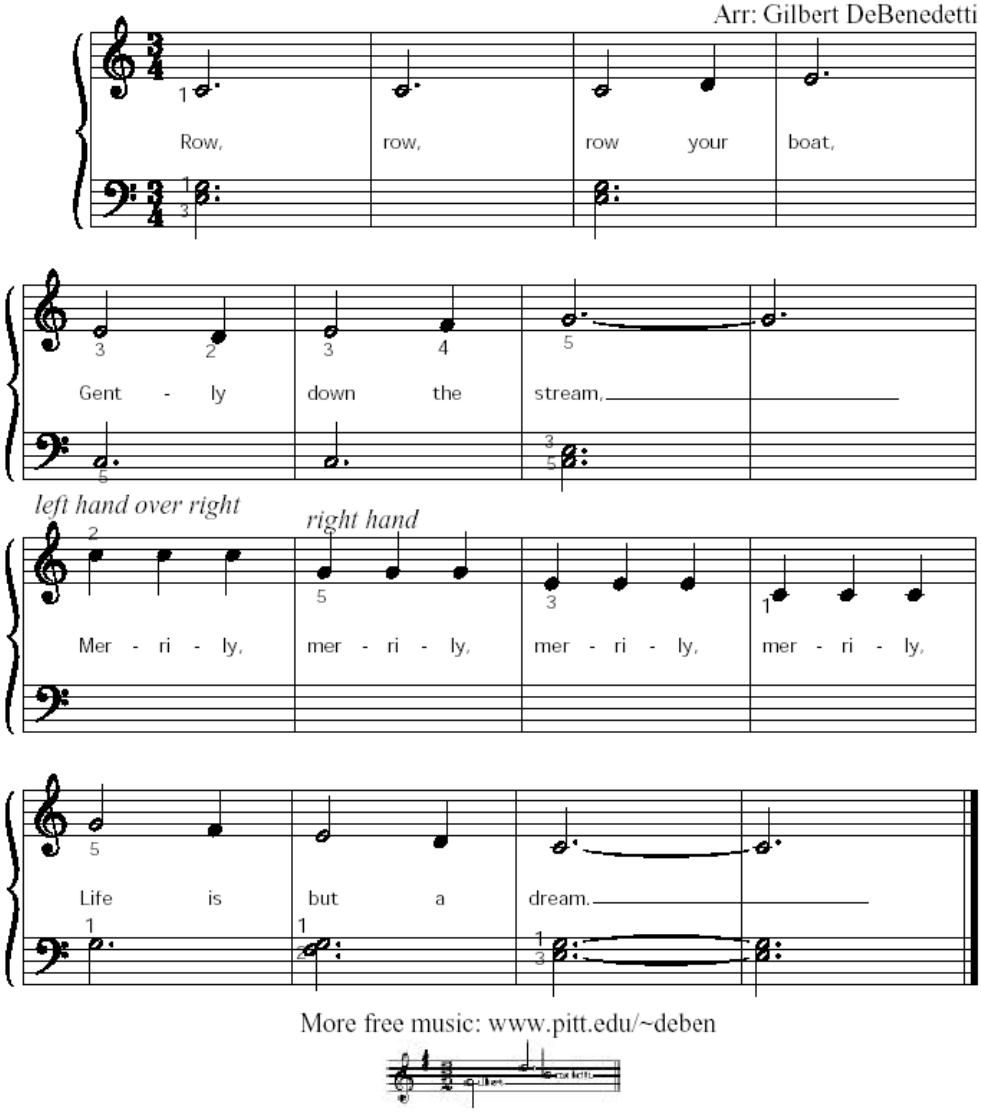
REPEAT

Music Composition Patterns

Row, Row, Row your Boat

Primer Level

Arr: Gilbert DeBenedetti



More free music: www.pitt.edu/~deben

Word Patterns

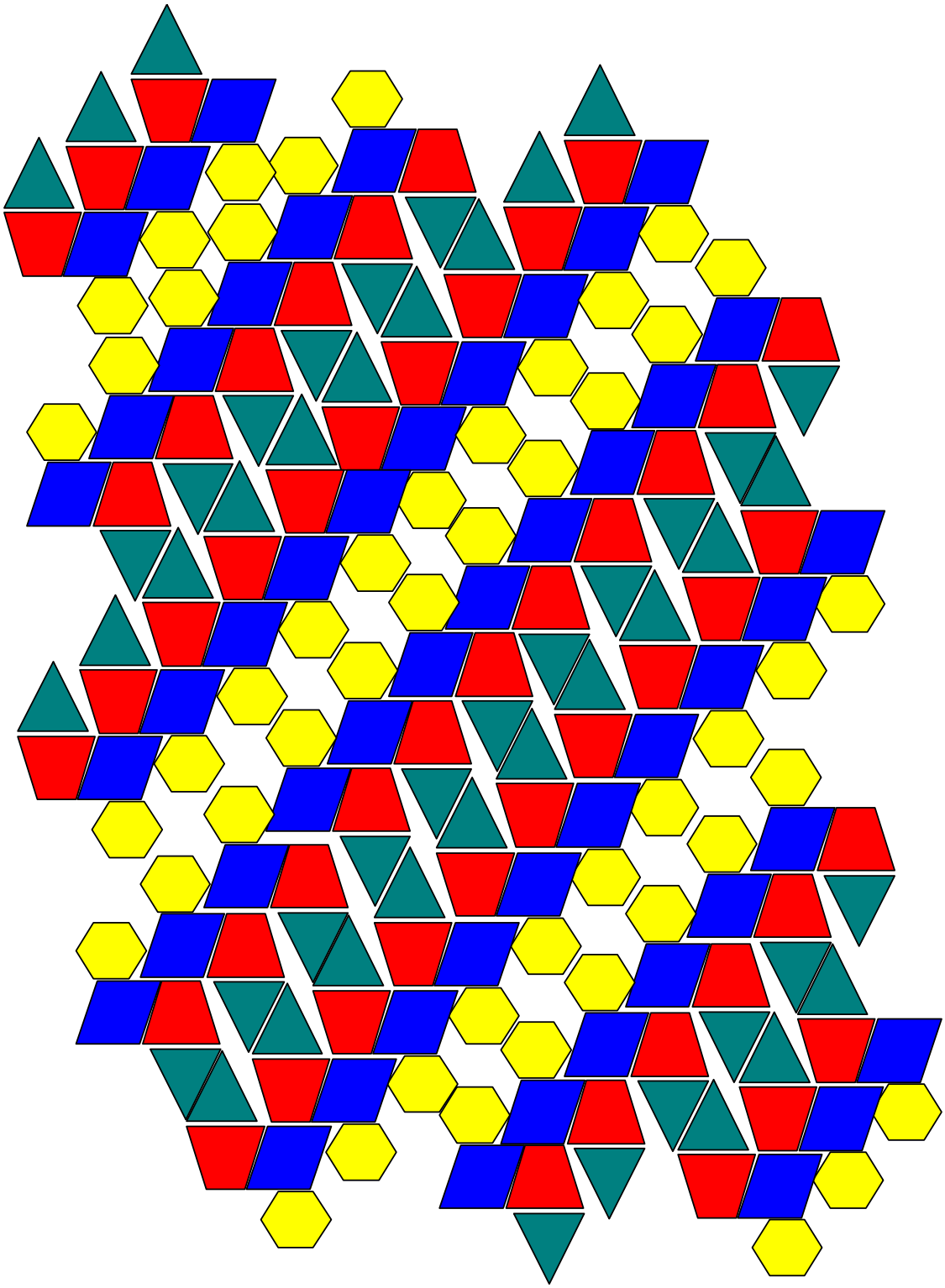
Cryptograms – using a code to code and decode words

http://www.nsa.gov/kids/kids00006.cfm

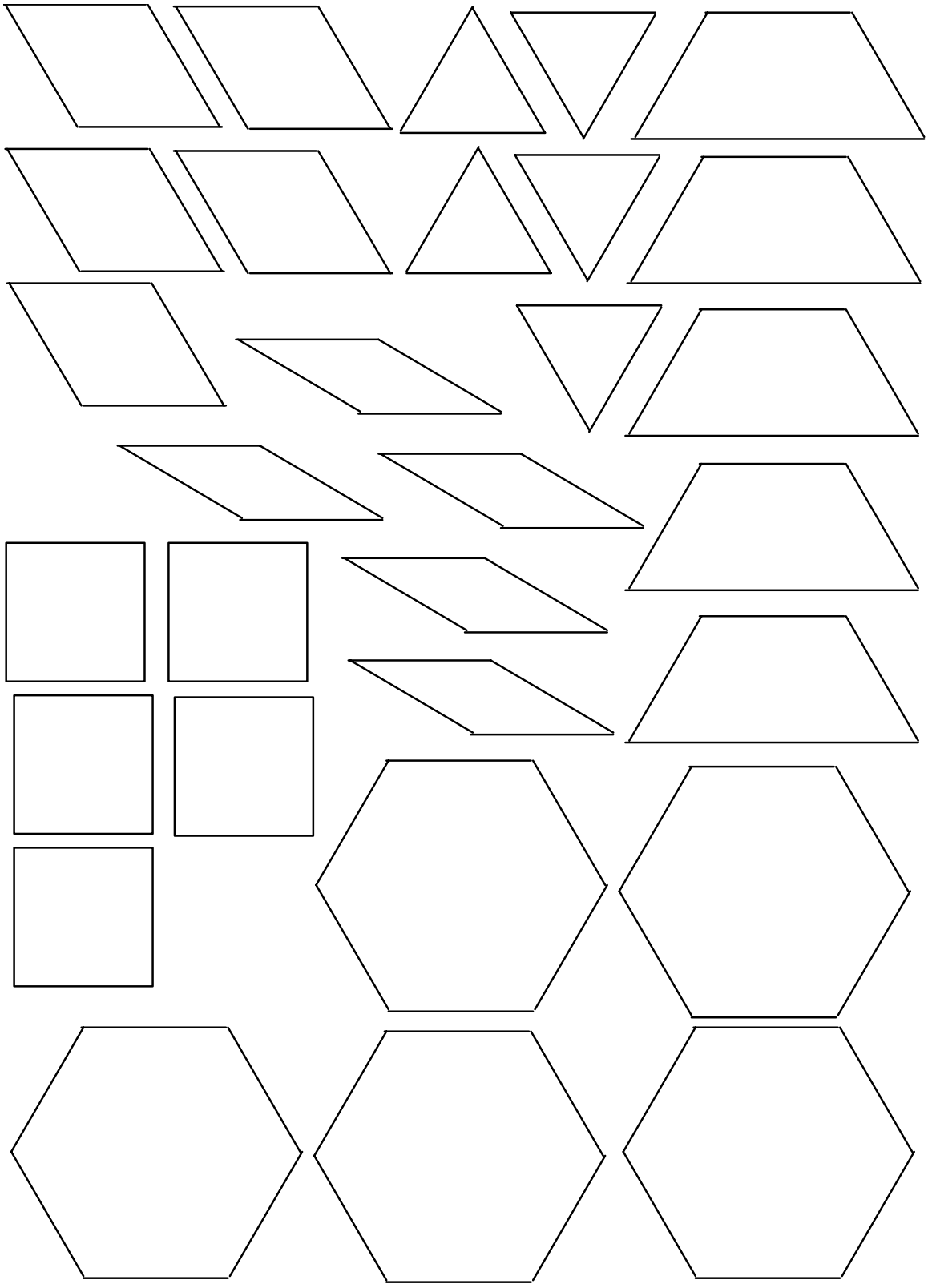
Limericks – 5 line humorous poems have rhyming patterns

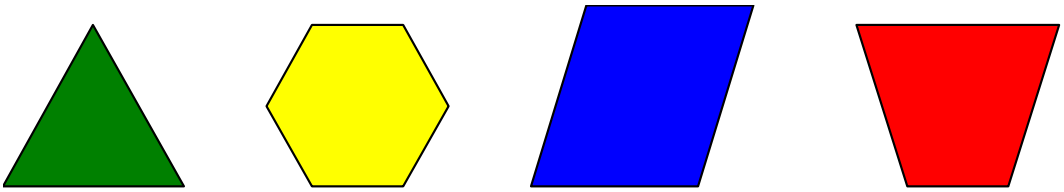
http://www.learner.org/teacherslab/math/patterns/limerick/limerick_acttxt.html

Pattern Block Art
Lesson 1



PATTERN BLOCKS

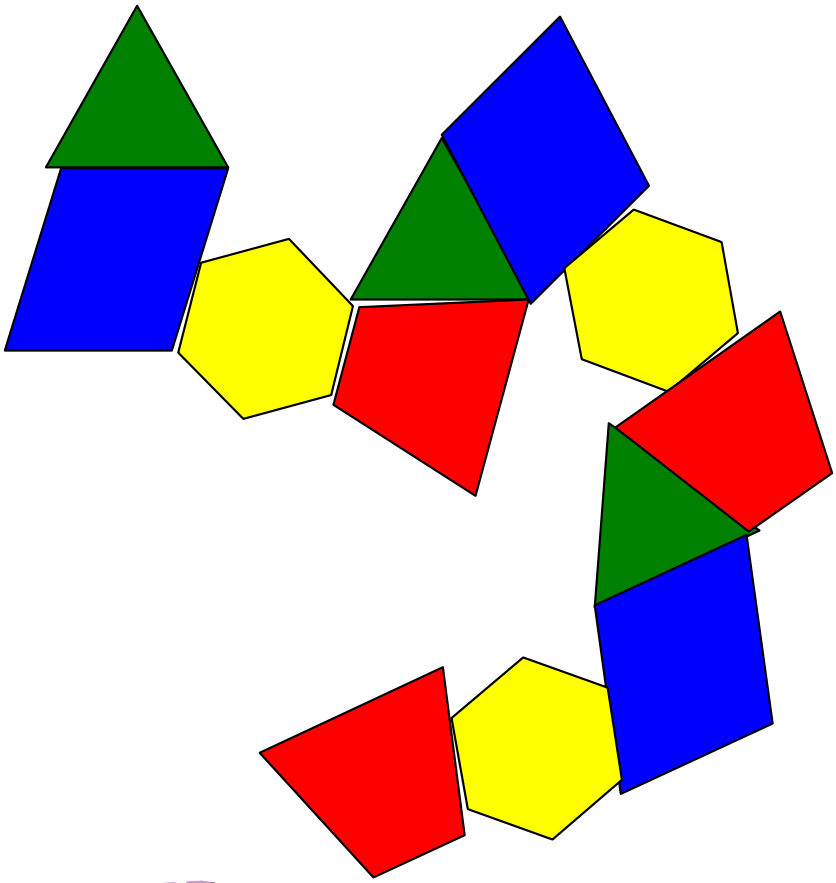




triangle=1 **hexagon=2** **rhombus=3** **trapezoid=4**

Number series pattern:

1,3,2,4,1,3,2,4,1,3,2,4



The Village

Coins

coins

Directions:
Use the coins below to create a pattern.
Use the value of the coins to create a pattern

Name _____

penny

nickel

dime

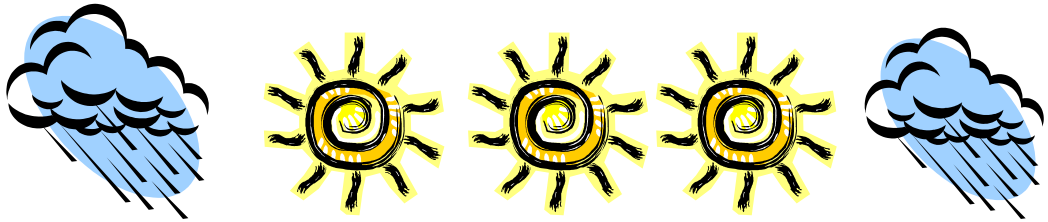
quarter

Name_____ **Date**_____

Pattern Practice Sheet

Directions: Tell or draw what will be the next picture letter or number in the pattern.

1.  ☐

2.  ☐

3. cat, dog, cat, dog, pig, cat, dog, ☐

4. 10, 15, 9, 12, 10, ☐

5. 1, 3, 5, 7, 

Using the following numbers for each letter to solve the following cryptograms.

Aa	**Bb**	**Cc**	**Dd**	**Ee**	**Ff**	**Gg**	**Hh**	**Ii**	**Jj**	**Kk**	**Ll**	**Mm**	**Nn**	**Oo**	**Pp**	**Qq**	**Rr**	**Ss**	**Tt**	**Uu**	**Vv**	**Ww**	**Xx**	**Yy**	**Zz**
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

6. 23 8 1 20 4 15 5 19 20 8 5 3 1 20 19 1 25 20 15 20 8 5 4 15 7 12 5 20 19 7 15

13 5 15 23 20 8 5 12 1 23 14

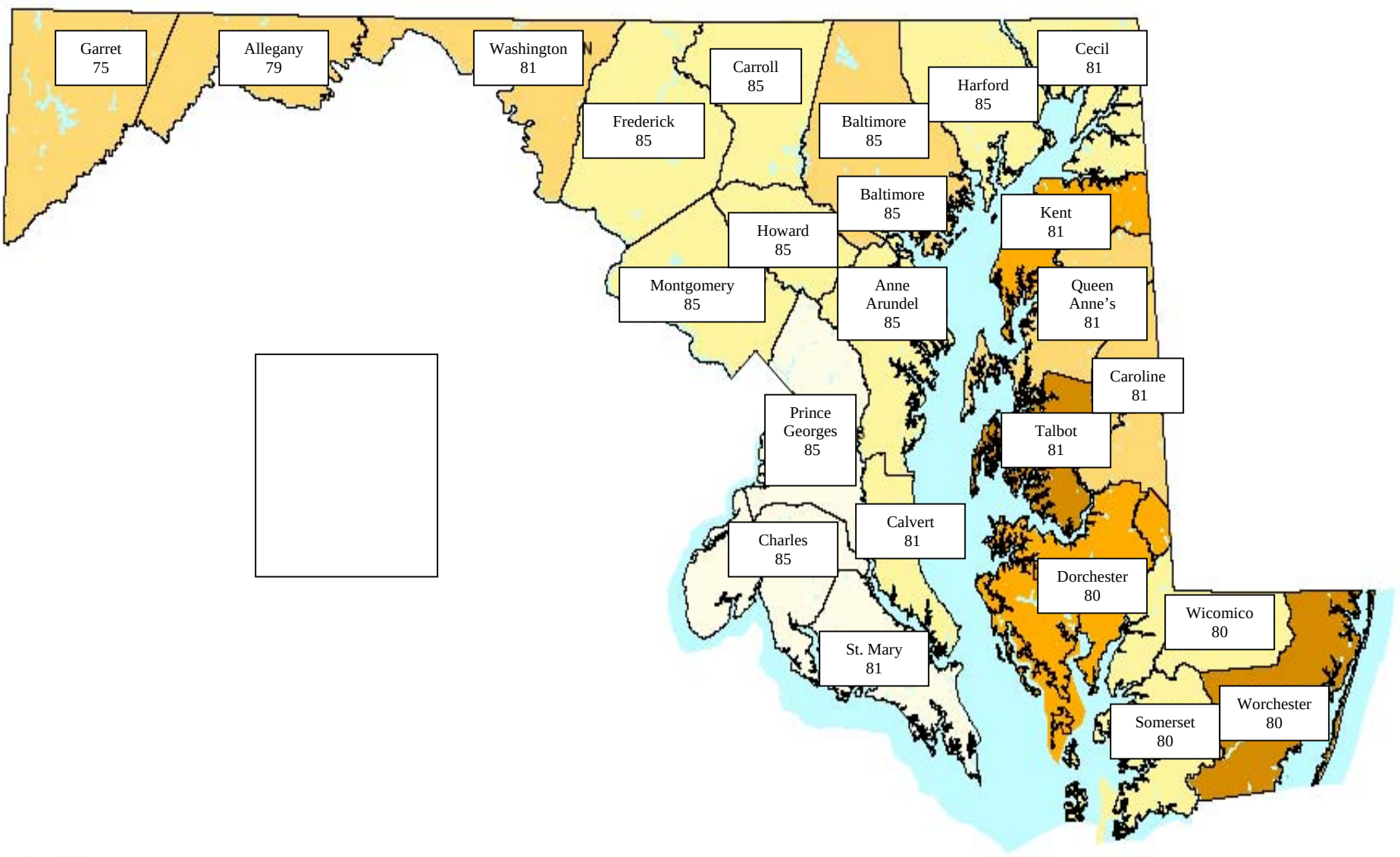
7. Now make up your own coded message.

Real Life Patterns

Directions: Find or think of patterns at school, in your travels or at home. Write them on this sheet. Let's see who has found the most.

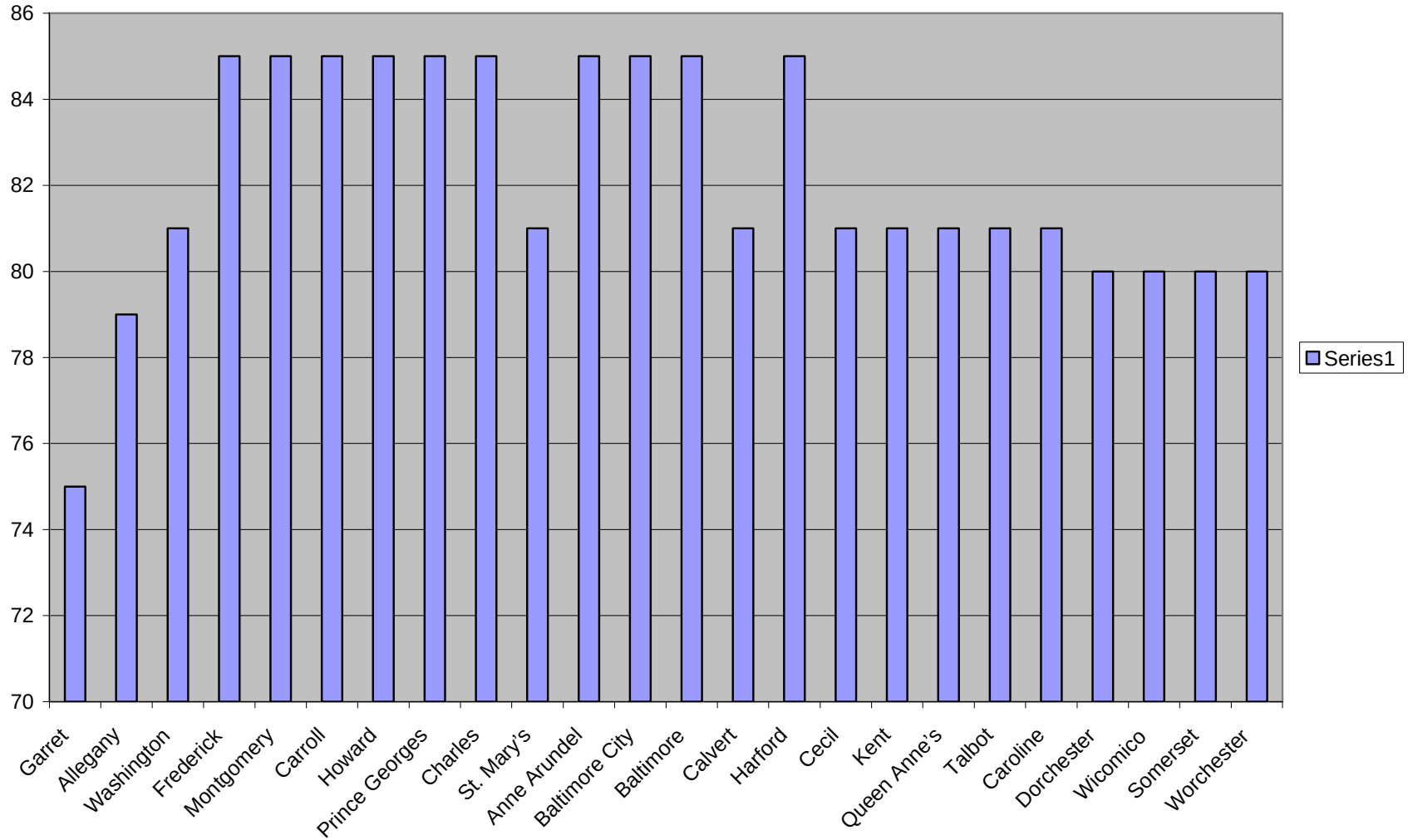
Place	Pattern

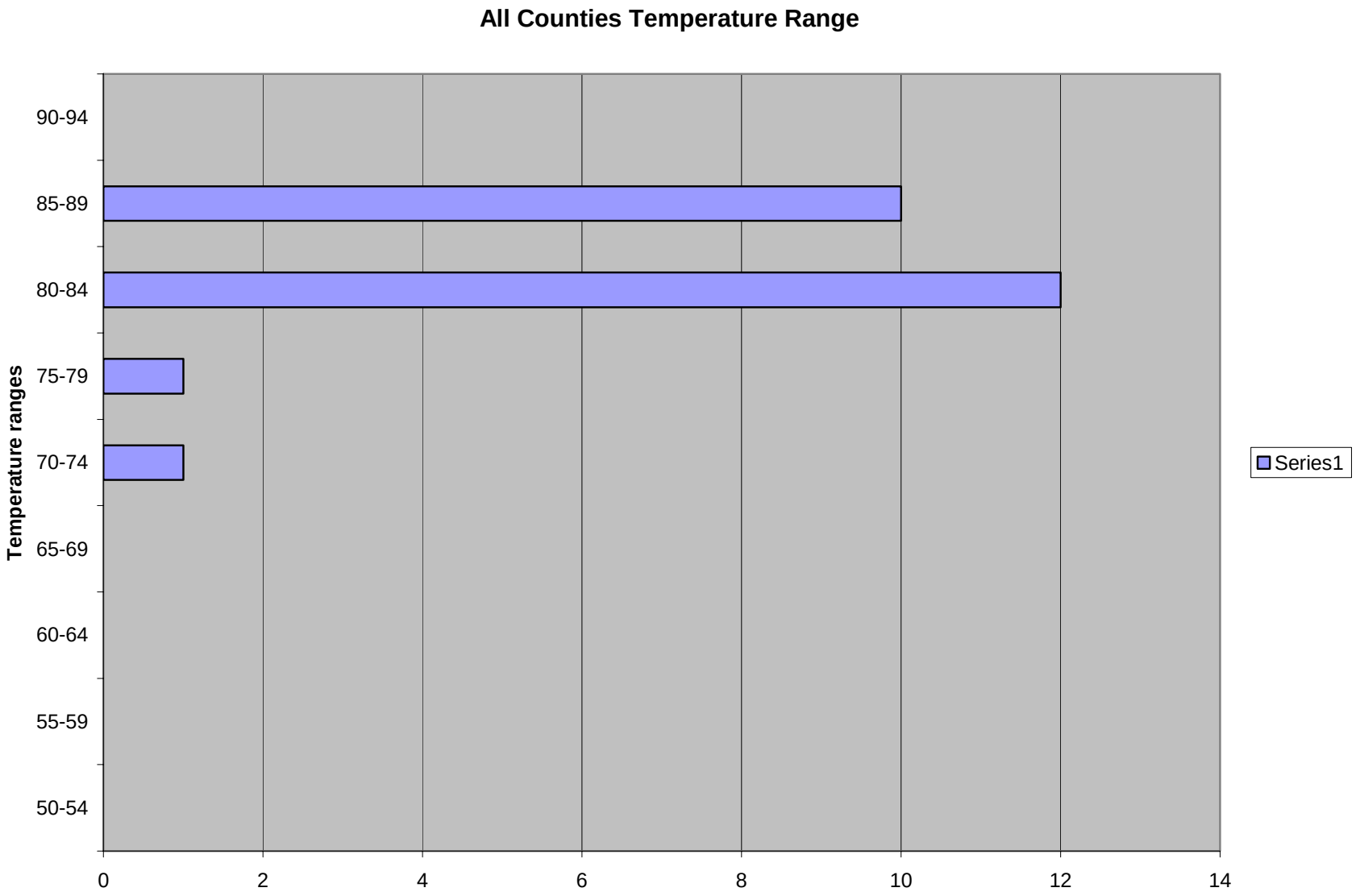
STATE OF MARYLAND COUNTIES



Source: U.S. Census Bureau
Maryland Department of Planning, Planning Data Services.

County Temperatures 6/29/04




All Counties Temperature Range
Temperature ranges
90-94
85-89
80-84
75-79
70-74
65-69
60-64
55-59
50-54
0
2
4
6
8
10
12
14
Series1

Weather Data Collection Grid

County	Temperature

Weather Data Collection Grid

County	Temperature
Garret	75
Allegany	79
Washington	81
Frederick	85
Montgomery	85
Carroll	85
Howard	85
Prince Georges	85
Charles	85
St. Mary’s	81
Anne Arundel	85
Baltimore City	85
Baltimore	85
Calvert	81
Harford	85
Cecil	81
Kent	81
Queen Anne’s	81
Talbot	81
Caroline	81
Dorchester	80
Wicomico	80
Somerset	80
Worchester	80

Weather Data Collection Sheet

Daily Temperature

Name_____ **Date** _____

Directions:
Record the daily temperature in the boxes

County

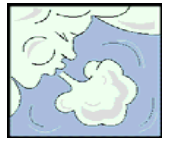
_____


spring


summer

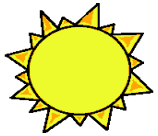

winter


fall


windy

week 1_____

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday


sunny


cloudy


partly sunny

week 2_____

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday


rain


snow

Name_____ Date _____

Pre Assessment #3

Directions: Complete the following questions.

1. Complete the in/out table.

IN	OUT
1	3
2	4
3	5
?	?
5	?

2. Write the rule for the above table.

Rule

3. Using the following rule fill out the in/out table starting with 0 as the first "In" number.

Rule: Add 3

In	Out
0	
1	
2	
3	
4	
6	
9	
10	
12	
15	
23	
24	

Pre Assessment #3 (answer sheet)

Directions: Complete the following questions.

1. Complete the in/out table.

IN	OUT
1	3
2	4
3	5
4	6
5	7

2. Write the rule for the above table.

Rule
• Add two to the in number to get the out number. • In number + 2 = out number

3. Using the following rule fill out the in/out table starting with 0 as the first in number.

Rule: Add 3

Examples:

In	Out
0	3
1	4
2	5
3	6
4	7
6	9
9	12
10	13
12	15
15	18
23	26
24	27

Summative Assessment

A. Create an example of a pattern, data collection display, and/or function table.

A. Using what you know about patterns, data collection, and /or functions, use appropriate terminology to explain why your example is correct.