



Creative Categorizing



Subject: Mathematics

K – Geometry/Patterns

Second – Money

Fourth/Fifth – Fractions

Algebra One – Equations

First – Addition

Third – Multiplication

Sixth/Seventh - Functions

Geometry – Theorems

Goals:

- Students will identify specific attributes of items they are studying in a strand of math and explain how these attributes relate to patterns, rules, and conditions concerning these items.
- Students will be able to use attributes as a way of looking at mathematical items differently.

Objectives:

- To identify as many different and varied attributes as possible of a given set of mathematical items.
- To group a set of mathematical items in as many different and varied ways as possible.

Materials

- K – pattern blocks
- First – sheet with set of addition facts
- Second – set of U. S. currency
- Third – sheet with set of multiplication facts
- Fourth/Fifth – sheet with set of fractions
- Sixth/Seventh – sheet with set of undetermined functions
- Algebra One – sheet with a set of equations (graph paper)

Procedure (General)

1. Put students into groups with identical sets of mathematical items.
2. Ask the groups to think of as many different ways they can to categorize the items within the set. Students should record each result, including the reasoning behind their decisions.
3. After an adequate amount of time, bring the students together. Have each group share its results, explaining the attributes the students used for their categorizations. Record these for the whole class to see.
4. As a whole group, have students brainstorm other attributes of each of the items that might best be used for categorizing.
5. Have the students work in groups again to try to devise new ways to group the items.

6. In a whole group, ask students to reflect on any insights they gained into patterns and relationships related to the mathematical properties of the items.

Procedure (Second Grade Example)

1. Put students into groups and give each group a set of money including a penny, a nickel, a dime, a quarter, and a one dollar bill. Students may also need extra coins to use for exchanging money as they continue to grasp the relationships between the various denominations of currency.
2. Ask the groups to think of as many different ways they can to categorize the pieces of money they have. As they do this they should record each different result.
3. After about 10 – 15 minutes, bring the groups together. Have them share the ways they categorized the items. Record each result as a group shares (unless it is a duplicate), having them explain the attribute the items in each category share.
4. Introduce the word “attribute” and explain that the students categorized the money around attributes the denominations shared. (For example, a group may have put the penny in one category, the nickel, dime and quarter in another, and the dollar bill in another. In this case, point out the attribute the students considered was the material used to make the denomination. Or the students might have put all of the items in one category except the quarter. In this case, point out that the attribute the items share is that all of them (except the quarter) comprise another denomination when multiplied by five.
5. Have the students get back in their groups and try to think of more ways they can categorize the items. Again, they should record each result.
6. After an adequate amount of time. Have the groups share their results.
7. Help students reflect on any patterns and relationships related to the mathematical properties of money that emerged during the lesson.

Procedure (Algebra One Example)

1. Students are put into groups and given a set of equations similar to the following:
 $4x-2y=7$ $2x-y=7$ $x=12$ $8x-y=4$ $2x+4y=10$
 $3x+3y=4$ $2x+2y=6$ $3x+2y=7$ $3/5x-2/3y=5$
2. Students are asked to think of as many different ways as they can to categorize the equations within the set. Students will need to graph the equations. Students should record their results for each categorization.
3. After the students have worked in their groups for a while, ask the groups to share their results with the whole class, recording them for all to see. Students should explain the attributes they used for categorizing. One result students may have is categorizing the equations by positive slope, negative slope, no slope, and slope undefined. Another possibility is equations that have negative y-intercept, positive y-intercept, and no y-intercept.
4. When all groups have shared their results, have the class brainstorm other attributes they might use for categorizing the equations. This might include fractions in the equations, all even numbers in the equations, or equations with exponents (non-linear).
5. Have students work in their groups again to generate new categorizations.
6. Ask students to reflect on any new patterns or relationships they learned about equations.

First Grade
Addition Facts

$3+8=$ _____ $2+5=$ _____ $8+4=$ _____ $3+1=$ _____

$3+4=$ _____ $8+6=$ _____ $3+3=$ _____ $1+6=$ _____

$4+7=$ _____ $5+5=$ _____ $5+4=$ _____ $9+9=$ _____

Third Grade
Multiplication Facts

$2 \times 6=$ _____ $5 \times 3=$ _____ $4 \times 9=$ _____ $6 \times 4=$ _____

$6 \times 5=$ _____ $2 \times 2 \times 5=$ _____ $7 \times 7=$ _____ $9 \times 2=$ _____

$8 \times 3=$ _____ $8 \times 6=$ _____ $7 \times 8=$ _____ $3 \times 4 \times 3=$ _____

Fourth/Fifth Grade (Fifth Grade should use a calculator)
Fractions

$1/3$ $1/5$ $3/6$ $2/5$ $5/8$

$3/8$ $3/10$ $2/7$ $2/4$ $11/15$

$4/12$ $3/9$ $12/18$ $4/4$ $1/2$

Sixth/Seventh Grade
Functions

X	Y
2	8
3	
4	14
5	

X	Y
2	6
5	
7	
13	17

X	Y
3	3
	4
1	5
	6

X	Y
10	1
	2
4	3
	4

X	Y
1	1
	2
27	3
	4

X	Y
4	3
8	6
12	
16	

X	Y
2	5
4	
6	13
8	