Money Maker Maps

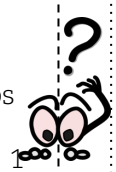
Work cooperatively to strategically place colors to make the least expensive map possible!

Strands:

Number & Quantity	
Algebra	
Functions	
Geometry	X
Statistics & Probability	

Materials Needed:

- 90 tokens per team
  - 20 first color
  - 20 second color
  - 20 third color
  - 20 fourth color
  - 10 fifth color
- Maps of Canada, South America, and USA, 1 per team
- Adjacency maps of Canada and South America, 1 per team (optional)



Where:

Outside	
Inside	X
On-line	
On-site	

Set-Up:

- Form teams of 2 to 4 players.
- Values of token colors: Red, $1; Orange, $2; Yellow, $5; Green, $10; Blue, $25. If your tokens are not these colors, agree on an order and value for each.

Object of the Game: Color a map using the least number of colors possible. Regions (states, provinces, countries, depending on the map) that share an edge may not be the same color. Regions that share only a vertex may share a color.

Playing the Game:

1. Begin with the map of Canada.
2. To assure that no two regions sharing a border are colored the same color:
   a. Using the first color, place as many tokens of this color as possible. Record how many tokens were used.
   b. Using the second color, place as many tokens on the map as possible. Record how many tokens were used.
   c. Repeat for the third, fourth, and fifth colors.
3. Deteremine how much your map costs: $1 for each of the first color used, $2 for each of the second color, $5 for each of the third, $10 for each of the fourth, $25 for each of the fifth. Add the amounts together.
4. Try to make your map less expensive. Find your new total.
5. The team with the least expensive map wins!
6. Repeat steps 1 through 5 for the map of South America, then for the USA map. Record the cost of each map.

To Win: The team with the lowest total after three rounds (all three maps) wins!

Think About It:

1. How did your map coloring compare with other teams' colorings for the same map?
2. How did the price of your map compare to prices found by the other teams?
3. Can you find a way to make your map less expensive? Show how.
4. What regions of your map are easier to color? What about the regions makes the coloring easier?
5. What regions of your map are more challenging to color? What about the regions makes the coloring more challenging?
6. Is it possible to use fewer colors on your map? If so, recolor your map.
7. Is it possible to use fewer tokens of your last color on your map? If so, do so!
8. How many colors are necessary to color a map? Why do you think so?

Variations:

Find Your Own Maps to Color: Look for 2 maps to color, one that you think will be simple to color and one that will provide you a challenge. Play the game with your maps.

Make Adjacency Maps: In graph theory, map coloring is an important topic. Graph theorists use vertices and lines, or circles and lines, to show which regions share a border with other regions. An adjacency map for Canada is shown below. Notice how the circles denoting each province or territory is connected by lines to another province or territory if they share a border.

1. Play the game with the adjacency map. Compare your cost to the cost you determined using the original map.
2. Choose your less challenging map from the above variation, make an adjacency map for it and play the game again.
3. Find an adjacency map for the USA at: http://mathworld.wolfram.com/ContiguousUSAGraph.html Play the game with this adjacency map. Compare your costs.
4. How helpful are adjacency maps? What do they help you see more clearly than typical maps?

Helpful Hints:

- Place as many of the first color as possible. You want the largest number of tokens of the same color to cost $1 each.
- Try starting at the region of the map with the most borders. See how few colors you can use to surround it.