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P.D.:7

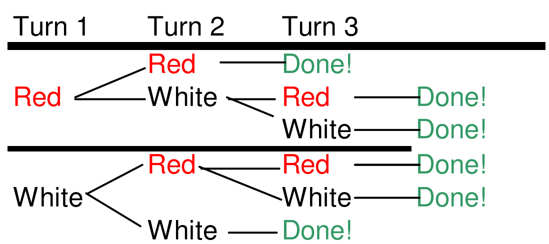
A Stick Gum Problem

POW # 4

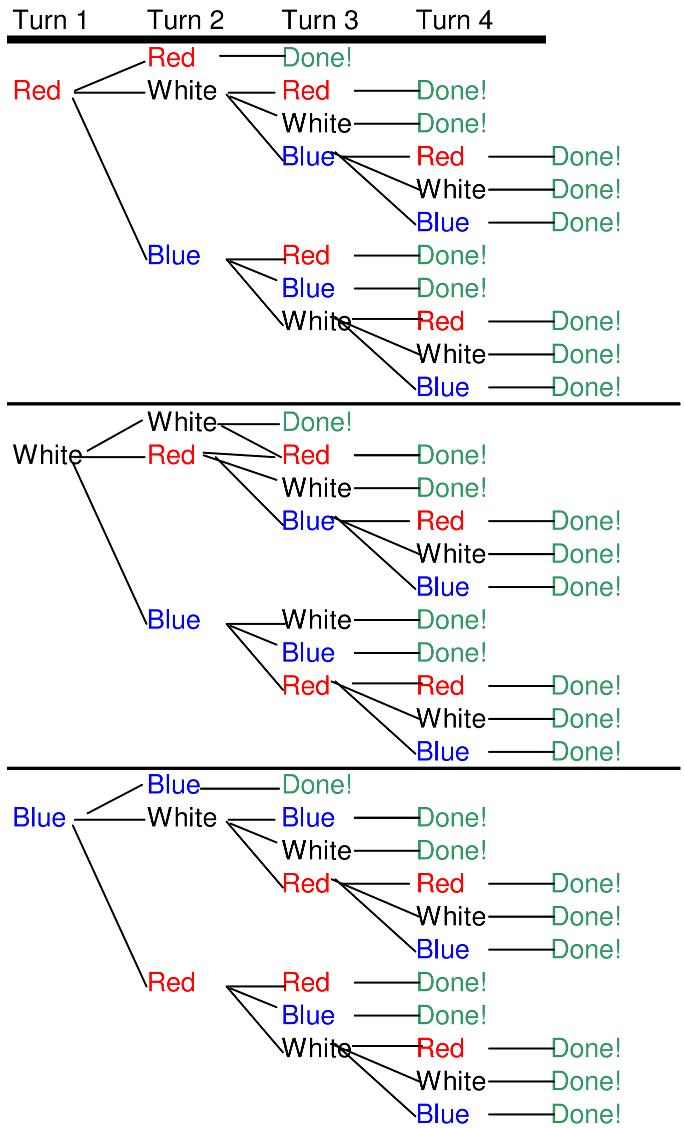
1. Problem Statement: Not necessary to do.

2. Process and answers to problems 1,2 & 3:

1. (2 colors, 2 people) Ms. Hernandez can only spend 3 cents, because on her first cent, she can get a white or a red gumball. On her second turn, she can also only get a red or white gumball. Now she can only have 4 combinations: Red and White Gumballs; Red and Red Gumballs; White and White Gumballs; White and Red Gumballs. With 2 of these possible combinations, she already has her goal of having 2 of the same color gumballs. On her third try, she gets another red or white gumball. Whatever the color, she already has one of them, which makes 2 of the same color.



2. (3 colors, 2 people) Ms. Hernandez now finds a machine that has 3 colors in it. The most that she will need to spend to get 2 of the same color is 4 cents. To find all of the possible strategies, look at the chart:



3. (3 colors, 3 people) It will take 7 cents to get 3 of the same color, as there are 108 possible combinations. Here is a chart showing the 1st third of them (if the first color is red)

Turn 1	Turn 2	Turn 3	Turn 4	Turn5	6	7
Red	Red	Red				
		White	Red			
			White	Red		
				White		
				Blue	Red	
					White	
					Blue	
			Blue	Red		
				White	Red	
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			White	Red		
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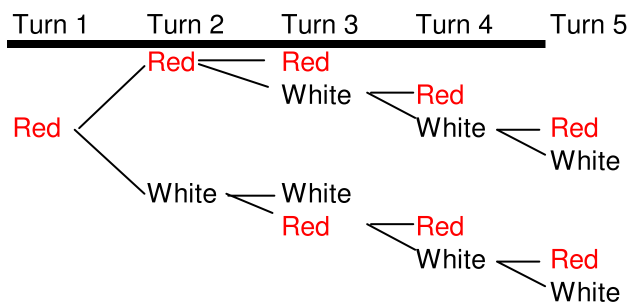
			Blue	Red		
				White	Red	
					White	Red
						White
						Blue
					Blue	
				Blue	Red	
					White	Red
						White
						Blue
					Blue	

I will now make a chart showing my findings so far.

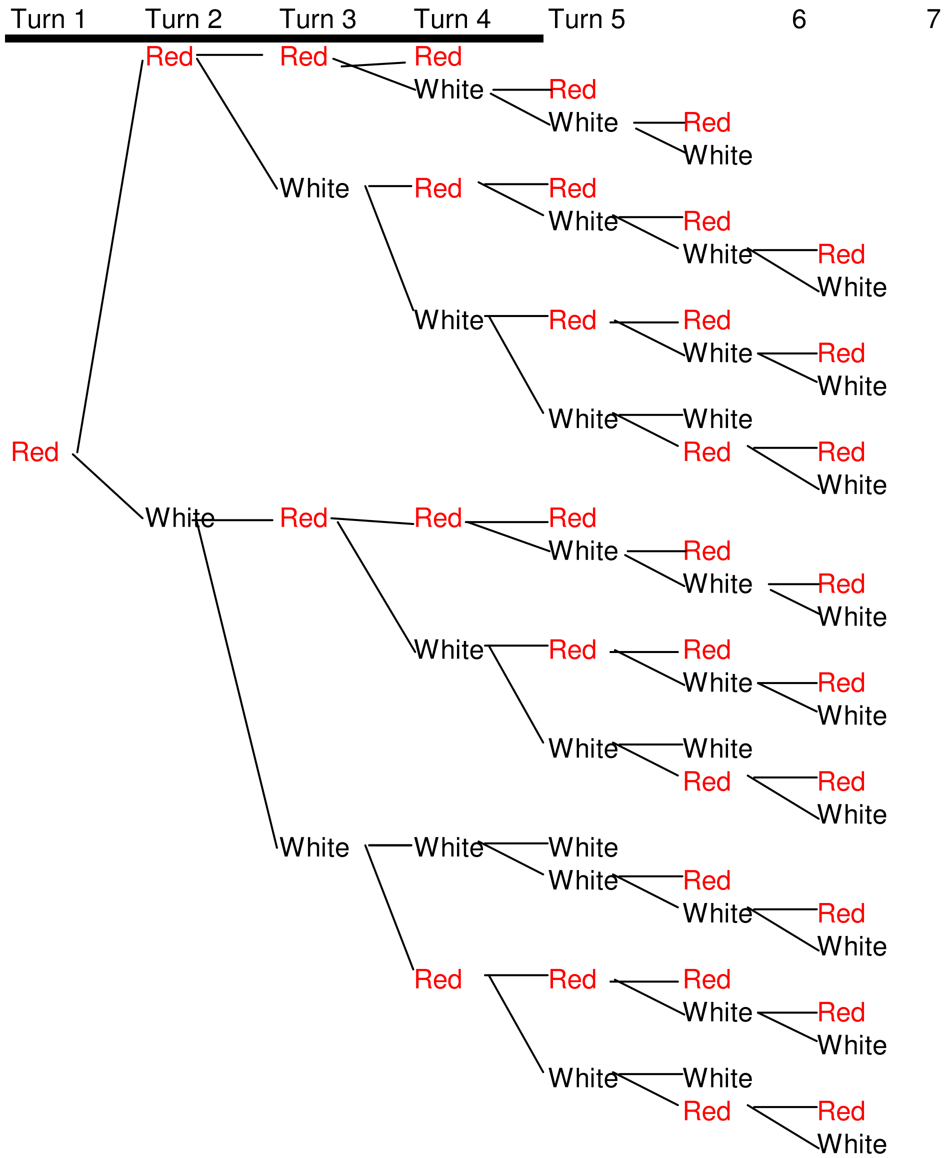
Colors	**Kids**	**Max Spend**	**Combos**
2	2	3 cents	6
3	2	4 cents	33
3	3	7 cents	108

Now I will make up some problems to help fill in the chart some more.

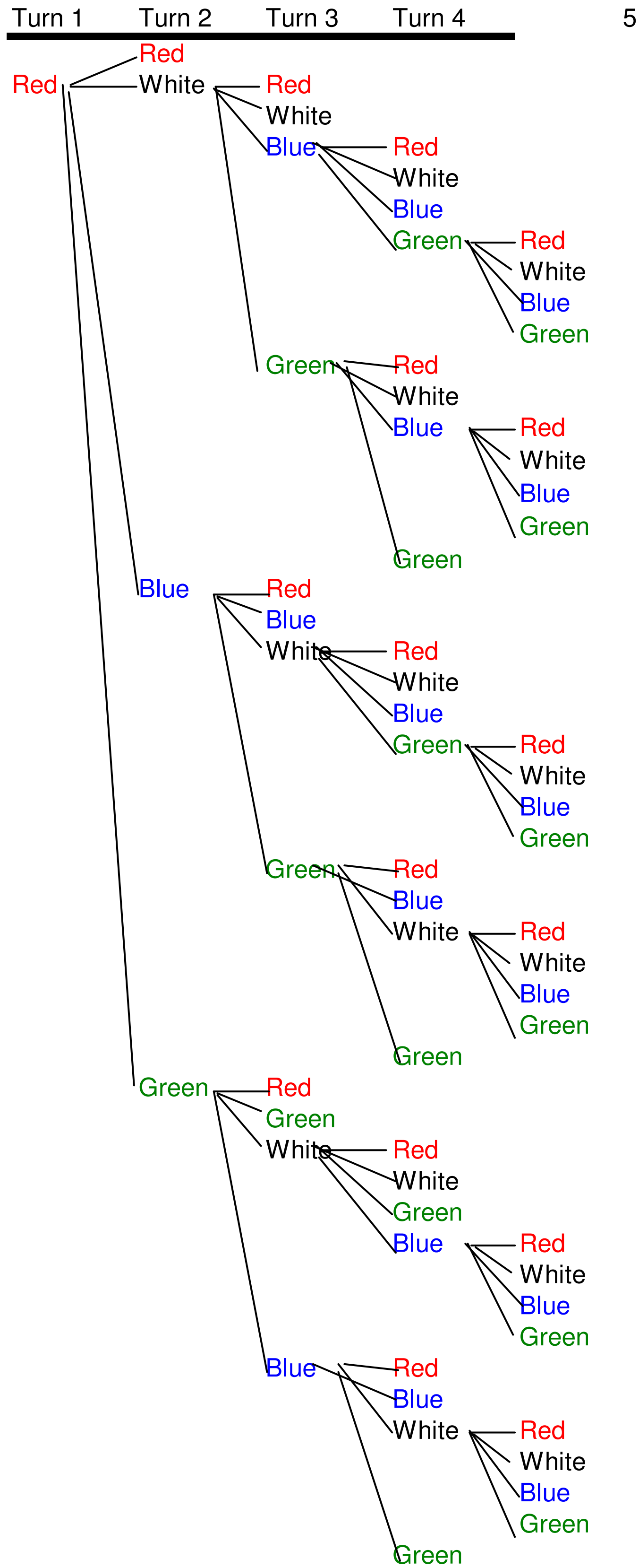
4. (2 colors, 3 kids) This chart shows the first half of needing 3 of the same color, with only 2 colors. It will take 5 cents and there are 16 combinations.



5. (2 colors, 4 kids) This shows the first half of getting 4 of 1 color and having 2 colors. You need 7 cents, and there are 68 combos.



6. (4 colors, 2 kids) This shows the first quarter of the chart, when you need 2 of the same, and there are 4 colors. You need 5 turns to get 4 of the same, and there are 200 combinations.



3. Solution (Ultimate Goal):

Let me make another chart. I have included 1 color and 1 kid for comparison.

Colors	Kids	Max Spend	Combos
1	1	1	1
1	2	2	1
2	1	1	2
2	2	3 cents	6
2	3	5	16
2	4	7	68
3	2	4 cents	33
3	3	7 cents	108
4	2	5	200

Overall, I have found that number of colors is ultimately responsible for combinations, but the number of kids is ultimately responsible for the maximum, you spend. Here is something interesting:

Colors	Kids	Max Spend
2	2	3
3		4
4		5

When you have 2 kids max spend is equal to number of colors plus 1. What about having 3 kids:

Colors	Kids	Max Spend
2	3	5
3		4

This chart shows so far that when you add a color, the max that you spend, goes down.

When you start adding a color, the number of cents goes down; when you then keep adding people, the number of cents goes up.

I have also found that this works [(# of colors) * (# of kids)] - [(# of colors) – 1]

4. Extension: Not necessary to do.

5. Evaluation: Not necessary to do.