

To more precisely state the problem that was described on the first day of class, you have a certain number of colours available to be used to colour the faces (or vertices, or edges) of the cube. When determining the number of possible colourings, note that it is not necessary to use each colour (so an all-red cube is allowed and should be counted when considering sets of colours that include red).

Also bear in mind that any natural motion of the cube from one position to another is to be taken into consideration. As an example of what this means, should the cube be coloured with white and black such that 5 faces are white and 1 black, then there is only one such colouring and not six (because the cube is not fixed in place).

So the questions to be answered are: How many different colourings of the cube are there when there are $i \in \{1, 2, 3, 4, 5, 6, 7\}$ colours available and it is the (a) faces, (b) vertices, or (c) edges that are being coloured? A tabular format for the answers might be helpful:

Number of Colours	To Be Coloured		
	Faces	Vertices	Edges
1			
2			
3			
4			
5			
6			
7			

Part of the idea behind this exercise is to get the class to engage in group discussion and to (hopefully) arrive at a consensus regarding the number of colourings, along with the underlying enumerative arguments.

It is also hoped that these tasks have enough challenge to them to allow for some appreciation for some of the techniques that we'll see later in the course.