

Counting

1. Draw a rectangular grid of squares which is 5 squares by 7 squares, then draw a diagonal line from one corner of the figure to the opposite corner. How many lines does it cross?

Questions:

- What does it mean to cross a line? Could there be different interpretations?
- Can you generalize to an m -by- n grid of cubes?

2. Raphael is decorating cubes by painting each face with the Jamaican flag:



How many different cubes can be made in this way?

Questions:

- What sort of symmetries does the Jamaican flag have?
- When are two cubes the same? When are they not the same?

3. Seven place mats are to be placed around a table. If each mat can be red, white, or blue, how many different arrangements are there?

Questions:

- When are two arrangements the same?
- How would you count arrangements if they were all different?
- How do you avoid recounting equivalent arrangements?
- Can you generalize to different numbers of mats and colors?

¹Problems 1 and 2 adapted from John Mason, *Thinking Mathematically*