

# Math 2101 (2016/17)

## Workshop 4: Counting Problems

Remember to not just give a number as an answer, but a calculation of the formula used. You should also give an explanation of what counting method needed to be used (giving examples if necessary), explaining why in each case repetition is allowed, partially or not, and whether order is important or not.

1. At a veterinary clinic during one day there were 6 dogs, 4 cats, 2 rabbits and an iguana to be treated by one particular vet. Explain why you are using the particular counting method you are using, how your numbers came about and give two examples of the things you are counting in each case.
  - (a) Differentiating between the animals of the same species, in how many ways could the last two animals waiting to be seen have been?
  - (b) How many sequences can the first three animals which were not dogs have been treated?
  - (c) Considering just the species now, how many different orders could there have been for the first four animals?
2. You are given a set of 12 coloured pencils, all different colours.
  - (a) How many ways are there for 5 pencils to have been selected as a group?
  - (b) One person splits the pencils into sets of three pencils each, then 7 people vote on their favourite set. How many different collections of votes could there be?
  - (c) Three of the pencils are blunt. List logically all the ways that a sequence of 4 pencils could be selected with respect to bluntness, ignoring colour.
3. In a canoeing race, there are 5 Canadians, 2 Germans, 2 Slovaks and a Hungarian. There are no ties and we don't distinguish between the canoeists from the same nation.
  - (a) How many different ways can the countries finish 1st, 2nd and 3rd?
  - (b) How many different sets of positions can the Canadians finish in?
  - (c) At the halfway point a Slovakian is leading the race, but that country does not end up winning. We are interested in how many different ways are there that the country at every position at halfway is different from the country in that position at the end of the race. List logically all the different patterns possible.
4. In a music room there are 7 instruments; three are different guitars, there are two different kinds of xylophones, one drum and one violin.
  - (a) How many different types of musical duos (groups of two that play together) can be made using this equipment, just considering the four types of instruments? List all ways.
  - (b) If the wish is now to form a group with 3 different types of instrument, but each of the guitars and xylophones make distinct noises, how many different groups of three instruments can there be? List all possible ways.
  - (c) One virtuoso musician wants to use the room to perform 3 different pieces in a sequence while using a different one of the 7 instruments each time. How many different ways are there to accomplish this, just considering the type of instrument?