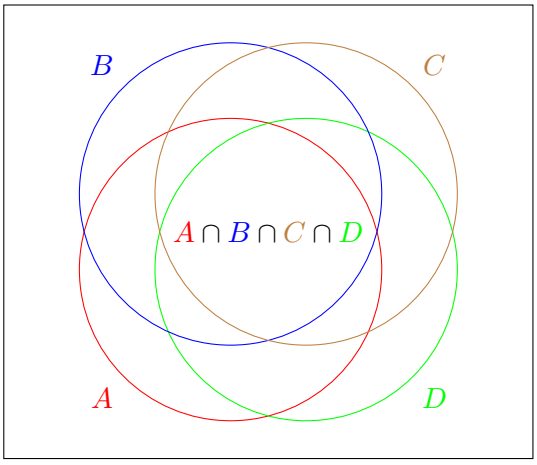
Math 2101 (2018/19) Workshop 1: Venn Diagrams

1. Create a Venn Diagram for sets E and F where $\mathcal{U}$ contains all of the digits in your registration number, E is the even numbers and F is the numbers less than 5. What sort of valid registration number would have $E \cap F = \varnothing$?
2. Using the general two set Venn Diagram for two sets S and T, identify the 4 different sub-regions using intersection ($\cap$) to combine pairs of sets from $\{S, T, \overline{S}, \overline{T}\}$.
3. Repeat the above exercise for the 8 distinct sub-regions of the 3 set Venn Diagram, using intersections of triples containing R, S and T or their complements.
4. Find sub-areas of the 3 set Venn Diagram containing between 0 and 8 of the different sub-regions found earlier by using R, S and T and intersection and union ($\cup$), trying to minimise the number of symbols used.
5. Work out the inclusion-exclusion formula for $|R \cup S \cup T|$ in terms of $|R|$, $|S|$, $|T|$, $|R \cap S|$, $|R \cap T|$, $|S \cap T|$ and $|R \cap S \cap T|$ by seeing which sub-regions are counted in each cardinality.
6. Which two sub-regions corresponding to the intersections of these 4 sets are not in this improper Venn Diagram?



7. Find a closed curve to add to the standard 3-set Venn Diagram that does pass through all 8 regions and so form a valid Venn Diagram for 4 sets.
8. Find a way to represent the 4 set Venn Diagram using equally sized rectangles or ellipses and check that all 16 different regions exist.
9. Can you work out the inclusion-exclusion formula for 4 sets or even in general?