

**Instructions**

- Answer each question completely; justify your answers.
  - This assignment is due at:
1. Exercise 5.1.10.
  2. Exercise 5.1.14.
  3. Exercise 5.1.22.
  4. Exercise 5.1.42.
  5. Exercise 5.2.4.
  6. Exercise 5.2.10.
  7. Exercise 5.2.12.
  8. Exercise 5.2.22.
  9. Exercise 5.2.28.
  10. Exercise 5.2.38.
  11. Exercise 5.2.46.
  12. (a) Consider a cube that is fixed in its position. How many ways are there to colour the six faces of the cube with 6 colours, given that no colour can be used more than once?  
(b) If the cube is no longer fixed in position but is now allowed to move freely, then several of the colourings that were considered distinct in part (a) now become equivalent. For each particular colouring  $\mathcal{C}$  from (a), what is the number of colourings from part (a) that are now equivalent to  $\mathcal{C}$ ?  
(c) How many non-equivalent ways are there to colour the six faces of a free-floating cube with exactly 6 colours (i.e. such that each colour is used exactly once)?