

## Worksheet 1 — Sets and counting

1.
  - (a) Write down any set  $A$  of size 5.
  - (b) What is the formal notation for all sequences of three elements from  $A$ ?
  - (c) How many such sequences are there, exactly?
2. How many binary sequences of length 500 are there?
3.  $A$  and  $B$  are sets with  $|A| = 3$  and  $|B| = 4$ .
  - (a) What is the largest size  $A \cup B$  could possibly have?
  - (b) What is the smallest size  $A \cup B$  could possibly have?
  - (c) Repeat for  $A \cap B$ .
4. A donkey, an ox, a goat, and a tiger need to cross a river. They have a boat that can only hold one animal, so they need to go one at a time. How many different orderings are there?
5. How many sequences of 5 English characters are there?
6. You have 10 good friends, and you want to choose 3 of them to accompany you on a trip. How many groups of three friends can you choose?
7. You have 10 different beer bottles, and you want to line 5 of them up on your mantelpiece. How many different arrangements can you make?