

## BETHUNE 1800: MATHEMATICS OF GAMBLING

ASSIGNED 26 NOVEMBER 2009, DUE 3 DECEMBER 2009

- (1) How large must a class be to make the probability of finding two people with the same birthday at least 75%? at least 90%?
- (2) What is the probability that among a group of people, two of them will have birthdays in the same *month*? Write down a general formula, and then compute the probabilities for 2 people, 3 people, 4 people, and so on.
- (3) A biologist wants to estimate the size of a population of turtles in a lake. She captures 10 turtles on her first visit to the lake, and marks their backs with paint. A week later she returns to the lake and captures 15 turtles. Five of these 15 turtles have paint on their backs, indicating that they are recaptured animals. Estimate the population of turtles in the lake.
- (4) (Hockey Card Collector) Many Canadians grow up watching hockey and some decide to collect hockey cards. The cards are sold in packaging that you cannot see through. Let us suppose that each package contains exactly one card.
  - (a) What is the probability that the first package contains a card that is not in your collection?
  - (b) What is the probability that the second package contains a card that is not in your collection?
  - (c) If your collection already contains  $k$  (different!) hockey cards, then what is the probability that the next package will contain a card that is not in your collection?
  - (d) If your collection already contains  $k$  (different!) hockey cards, what is the probability that you need to buy  $s$  packages to get a card that is not in your collection? (That is, you will draw  $s - 1$  cards that are in your collection *and* then you will draw a card that is not in your collection).