

# General Mathematics and Computational Science I

## Exercise 12

October 20, 2005

1. A card is drawn at random from a standard deck of 52 cards. What is the probability of drawing
  - (a) a king of spades?
  - (b) a king?
  - (c) not a king?
  - (d) a diamond?
  - (e) a face card (jack, queen, or king)?

2. In the game of Yahtzee (or Yacht), five dice are thrown. Show that the probability of throwing a *large straight* (5 numbers in a row, the order does not matter) is  $\frac{5}{162}$ .

Alternatively, you may solve the following, harder, problem. Show that the probability of throwing a *small straight* (4 numbers in a row) is  $\frac{10}{81}$ . Do not count small straights which are also large straights.

(The actual rules of the game allow to repeat throwing a selected subset of dice twice. This is considerably more complicated to analyze.)

3. Show that

$$\sqrt{a^2 + b^2} \leq a + b \leq \sqrt{2(a^2 + b^2)}$$

for arbitrary non-negative real numbers  $a$  and  $b$ .