MATH 1115, Mathematics for Commerce
WINTER 2011
Toby Kenney
Homework Sheet 5
Due: Wednesday 2nd March: 2:30 PM

Each multiple choice question is worth one mark, other questions are worth two marks.

1. The number of 3-element subsets of a set with 8 elements is given by

   (A) $\frac{8 \times 7 \times 6}{5!}$

   (B) $8 \times 7 \times 6$

   (C) $\frac{8 \times 7 \times 6}{3!}$

   (D) $\frac{8 \times 7 \times 6}{3}$

   (E) It depends on which 8-element set.

2. If we toss a fair coin 50 times. The probability that we get exactly 22 heads is:

   (A) $\frac{1}{51}$

   (B) $\frac{1}{2^{50}}$

   (C) $\frac{{}_{50}C_{22}}{2^{50}}$

   (D) $\frac{22}{50}$

   (E) $\frac{50 \times \cdots \times 29}{22! \times 2^{50}}$

3. Assuming the answers to each multiple-choice question on this homework (there are 6 multiple-choice questions) are independant, and each of the 5 answers A to E is equally likely for each question, what is the probability that each of the 5 possible answers occurs at least once?

   (A) $\frac{5 \times 6!}{2 \times 5^6}$

   (B) 1

   (C) $1 - \frac{4^6}{5^6}$

   (D) $\frac{6!}{2 \times 5^6}$

   (E) $\frac{5 \times 5!}{5^6}$

4. If 4 cards are drawn at random (without replacement) from a standard deck of 52 cards, the probability that no two are the same suit is: [A standard deck contains 4 suits each of which has 13 cards.]

   (A) $\left(\frac{3}{4}\right)^6$

   (B) $\frac{4!}{4^4}$

(C) $\frac{13^4}{52\times51\times50\times49}$

(D) $\frac{4!\times13^4}{52\times51\times50\times49}$

(E) $\frac{(13!)^4}{52!}$

5. A company has 3 warehouses. One of them can hold 3,000 items, one of them can hold 2,500, and one of them can hold 4,500 items. The company wants to store 10,000 items in these warehouses. The number of ways in which the company can divide the items between the three warehouses is:

(A) $2500\times3000\times4500$

(B) 3^{10000}

(C) $\frac{4500!}{2500!\times3000!}$

(D) $_{10000}C_{2500}\times_{7500}C_{3000}$

(E) $_{10000}C_3$

6. If in the previous question, the company discovers there is a problem with three of the items stored in the warehouses, what is the probability that all three are in different warehouses?

(A) $2500\times3000\times4500$ divided by the answer to the previous question.

(B) $\frac{2500\times3000\times4500}{_{10000}C_3}$

(C) $1-\frac{2500\times2500}{10000^3}-\frac{3000\times3000}{10000^3}-\frac{4500\times4500}{10000^3}$

(D) $\frac{3!}{3^3}$

(E) $\frac{_{2500}C_3+_{3000}C_3+_{4500}C_3}{_{10000}C_3}$

7. A bank makes loans to three customers. They estimate that the first customer has probability 0.01 of defaulting (not paying the money back), the second has probability 0.02, and the third has probability 0.05. Assuming that these events are independant:

(a) What is the probability that all three loans are paid back?

(b) What is the probability that at least two of the loans are paid back?

8. An insurance company sets it's premium for car insurance at \$500. They estimate that the probability of a customer making a claim is $\frac{1}{200}$, in which case they will pay out \$50,000. They sell policies to 100 customers. After costs, the premiums are enough for them to pay out up to 8 claims.

(a) For a given set of 8 customers, what is the probability that those 8 customers make claims, and the other customers do not (assume that the claims of different customers are independant)?

(b) What is the probability that the insurance company will have to pay out exactly 8 claims?