

QUEEN MARY, UNIVERSITY OF LONDON

MAS 108

Probability I

Assignment 6

For handing in on 7 November 2005

Write your name and student number at the top of your assignment before handing it in. Staple all the pages together. Post the assignment in the red post-box on the ground floor of the Maths building before 1600 on Monday.

This week's reading: (random variables) Devore, Chapter 3, Sections 3.1–3.3; *or* Hines and Montgomery, Chapter 3, Sections 3.1, 3.3 and 3.5; *or* Rice, Chapter 2, Section 2.1.

1 (20 marks) A random variable T has the following probability mass function:

n	−4	0	1	3	5
$P(T = n)$	0.2	0.3	0.2	0.2	0.1

Write down the set of values of T corresponding to each of the following events, and calculate its probability:

- (a) $T = 2$;
- (b) $T > 0$;
- (c) $|T| < 2$;
- (d) $T^2 > 0$;
- (e) $|T| = 4$ or $T \geq 1$.

2 (20 marks) Nine mathematicians run the London marathon. Each has probability $1/5$ of finishing the race, independently of all the others. Let X be the number of mathematicians who finish the race.

- (a) Calculate the probability mass function of X , giving the probabilities to 3 decimal places.
- (b) Draw the line graph for this probability mass function.

3 (20 marks) A baby has fifteen wooden blocks in a basket: five are yellow, five are red and five are blue. She takes out three blocks at random and builds a tower with them. Assume that every set of three blocks is equally likely to be chosen. Let Y be the number of yellow blocks in the tower.

(a) Write down the probability mass function for Y .

(b) Find $E(Y)$.

4 (20 marks) I throw two fair six-sided dice independently. Let Z be the sum of the numbers showing on the two dice. Write down the probability mass function for Z , explaining carefully how you have calculated it.

Find the expectation of Z .

5 (Continued from Assignment 5) (20 marks) John takes four resit exams. If he passes two or more then he chooses not to do any more resits. If he passes only one or none then he takes all his failed exams again at the second resit. He has probability $1/2$ of passing each exam, independently of all other exams and independently of how often he has failed it in the past.

Let X be the total number of exams that he takes during the first and second resits.

(a) Write down the probability mass function for X .

(b) Find $E(X)$ and $\text{Var}(X)$.

The in-term test will be held on **Friday, 11 November 2005** at **16:00**. Please present yourself to take the test as follows.

Surnames A–M	Skeel Lecture Theatre
Surnames N–Z	Chemistry Lecture Theatre

The test will cover material from the lectures in Weeks 1–6. Questions will be of a straightforward nature. Questions of a similar standard can be found in last year's test, which can be viewed on the course web page.

Remember that calculators, notes, dictionaries, personal organizers and mobile phones are not permitted in the test, and that phones must be switched off.