Exercise Sheet 2 - Lectures 2 and 3

1. Write down the Addition and Multiplication Laws of probability. Give an example of each.

2. From an ordinary pack of 52 playing cards the seven of diamonds has been lost. A card is dealt from the well-shuffled pack. Find the probability that it is (a) a diamond, (b) a queen, (c) a diamond or a queen, (d) a diamond or a seven.

3. The probability a student in a class has blue eyes is 0.37. The probability a student in a class has a bike is 0.2. The probability a student in a class has a bike or blue eyes is 0.45. What is the probability that a student has both a bike and blue eyes?

4. A bag of sweets contains 4 red and 5 green sweets. A child picks out 3 sweets and eats them one after the other. What is the probability that the first one is red, the second is green and the third is red.

5. Consider the experiment of tossing two dice. Let A denote the event of an odd total, B the event of an ace on the first die, and C the event of a total of seven.

   (a) Are A and B independent?

   (b) Are A and C independent?

   (c) Are B and C independent?

6. It is estimated that one-quarter of the drivers on the road between 11pm and midnight have been drinking in the evening. If a driver has not been drinking, the probability that they will have an accident at that time of night is 0.004%. If the driver has been drinking the probability of an accident goes up to 0.02%.

   (a) What is the probability that a car selected at random at that time of night will have an accident?

   (b) A policeman on the beat at 11.30pm sees a car run into a lamp-post, and jumps to the conclusion that the driver has been drinking. What is the probability that he is right?

7. Students on a management course are given a general aptitude test when they first start. Experience shows that 60% pass the test and 40% fail the test. Of those that pass the test 80% achieve high grades at the end of the course, whereas only 30% of those who fail the test achieve high grades. Plot a probability tree representing this. What is the probability that a student selected at random will achieve high grades?

8. A nutrition expert claims that they can easily taste the difference between two different types of artificial sweetener (A and B). To test the claim the expert is presented with three drinks containing sweetener A and three drinks

containing sweetener B, in random order. If the expert is told that 3 of the drinks contain sweetener A and that the remaining 3 drinks contain sweetener B, what is the probability that they will be able to correctly identify the sweetener in all six drinks, assuming that they have no such ability?

9. In a recent study of the determinants of fertility in Vietnam, N. Luc et al reported that the age at first birth to a woman depended upon her education. Of the women with no education, 38.9% had their first child at age 20 or earlier. The corresponding figures for women with primary education and secondary education were 31.5% and 13.6% respectively. If the number of women receiving secondary, primary and no education are in the ratio 1:3:2 respectively, what is the probability that: a) a woman will have her first birth at or before age 20; b) a woman who has given birth at or before age 20 will have received secondary education; c) a woman who has had her first birth over age 20 will have received no education?

10. Two balls are drawn from a box containing 2 white, 3 black and 5 green balls. What is the probability that both balls will be green? What is the probability that both balls will be the same colour?

11. Three letters are selected at random from the word BIOLOGY. Find the probability that the selection (a) does not contain the letter O, (b) contains both the letter O's?

Exam Paper Questions The table below lists past exam paper *question numbers* that involve probability calculations (useful for revision/tutorials).

	Human Sciences	Psychology		
Year	TT	MT	HT	TT
2001	1	-	8	1
2000	1	1	2	1
1999	1	1	2	1
1998	2	-	2	2
1997	2	-	2	2