

EC114 - INTRODUCTION TO QUANTITATIVE ECONOMICS

TEST

22-11-2007

Do not turn this sheet over until given permission to do so.

Time allowed: 90 minutes

Instructions:

1. Fill in the cover of your answer sheet;
2. answer all the questions, **making sure to show all your working**;
3. use of calculators is permitted (but make sure to write down the calculations);
4. do not leave your seat at the end of the test until all answer booklets have been collected and counted.

MAKE SURE TO SHOW ALL YOUR WORKING!

Question 1

1. A survey of 300 households in Colchester revealed that 80 households bought a digital camera last year, 108 bought a mobile phone, and 38 bought both products.
 - (a) [5 marks] What is the probability that a household purchased either a digital camera or a mobile phone?
 - (b) [5 marks] What is the probability that a household purchased a mobile phone, given that the household purchased a digital camera?
 - (c) [5 marks] In a follow-up survey, the 300 households were asked if they were satisfied with their purchases. The responses revealed that 240 households were satisfied overall. Among the 300 households, 64 households bought a digital camera and were satisfied. Are the events “being satisfied with the purchase” and “having purchased a digital camera” statistically independent? Explain.
2. [10 marks] EconTech is considering marketing a new model of digital camera. In the past, 40% of the digital cameras introduced by the company have been successful, and 60% have been unsuccessful. Before introducing the digital camera to the marketplace, the marketing research department conducts an extensive study and releases a report, either favourable or unfavourable. In the past, 80% of the successful digital cameras had received favourable market research reports, and 30% of the unsuccessful digital cameras had received favourable reports. For the new model of digital camera under consideration, the marketing research department had issued a favourable report. What is the probability that the digital camera will be successful?

Question 2

1. [6 marks] If Z is a standard normal variable, find $\Pr(Z > -0.93)$. Draw a normal curve and shade the desired area on your diagram.
2. [9 marks] A recent report in *The Guardian* indicated that a typical family of four spends £490 per month on food. Assume the distribution of food expenditures for a family of four follows the normal distribution, with a mean of £490 and a standard deviation of £90. What percent of the families spend more than £30 but less than £490 per month on food?

3. [10 marks] The management at EconElectronics is considering adopting a bonus system to increase production. One suggestion is to pay a bonus on the highest 5% of production, based on past experience. Past records indicate weekly production follows the normal distribution. The mean of this distribution is 4,000 units produced per week and the standard deviation is 60 units per week. If the bonus is paid on the upper 5% of production, the bonus will be paid on how many units produced or more?

Question 3

1. EconGame is going to spend £5,000 in advertising, trying to sell a computer game for £40 that can manufacture for £5. If X is the number of games that EconGame will sell, then $-5,000+35X$ is her profit. X is distributed as follows:

x	$p(x)$
0	0.10
50	0.40
100	0.30
500	0.10
1,000	0.10

- (a) [4 marks] Calculate her expected sales.
 (b) [4 marks] Calculate the standard deviation of sales.
 (c) [4 marks] Calculate her expected profits.
 (d) [3 marks] Calculate the standard deviation of profits.
2. [10 marks] Sixty percent of Essex Economics students read the Economics Handbook. Assume that the number of students who read every word of the Handbook can be modelled using the binomial distribution. For a group of five students, what is the probability that less than two will have read every word of the Handbook?

Question 4

1. The joint distribution of W and Z is represented in the table below:

	Z	
W	3	5
0	0.12	0.18
1	0.08	0.12
3	0.20	0.30

- (a) [5 marks] Find the marginal distribution of W and Z .

- (b) [5 marks] What is the probability that $W + Z$ is greater than 5?
- (c) [5 marks] Are W and Z independent? Explain.
2. Roy has a portfolio that includes 20 shares of EconInf and 30 shares of EconOrg. The value of each EconInf share is normally distributed with mean $\mu_X = 25$ and variance $\sigma_X^2 = 81$. The value of each EconOrg share is also normally distributed with mean $\mu_Y = 40$ and variance $\sigma_Y^2 = 121$. The share values have a negative correlation, $\rho_{X,Y} = -0.40$.
- (a) [5 marks] Calculate the expected value and the variance of the value of the portfolio.
- (b) [5 marks] What is the probability that Roy's portfolio value exceeds 2,000?