

GX 0400

Ollscoil na hÉireann, Gaillimh
National University of Ireland, Galway
Semester I Examinations 2005 / 2006

Exam Code(s)	1EK1, 1BA1, 1BA6
Exam(s)	H.Dip.Econ., B.A., B.A. (PSP)
Module Code(s)	EC229
Module(s)	Quantitative Methods in Economics
Paper No.	1
Repeat Paper	
External Examiner(s)	Professor Vincent Munley
Internal Examiner(s)	Mr. Brendan Kennelly Dr. Srinivas Raghavendra

Instructions: Answer ten questions in total by choosing at least five questions in each section.
Each question carries 10 marks.

Duration	3 hours
No. of Pages	Cover page + 5
Department(s)	ECONOMICS
Course Co-ordinator(s)	Dr. S. Raghavendra

Requirements:

MCQ
Handout
Statistical Tables
Graph Paper
Log Graph Paper
Other Material

EC 229: Quantitative Methods in Economics

Duration: 3 hours

Max Marks: 100

Answer ten questions in total by choosing at least five questions in each section. Each question carries 10 marks.

Section A: Mathematics

1. Define the following concepts using suitable examples:
 - (i) Union of two sets
 - (ii) Intersection of two sets
 - (iii) Complement of a set
 - (iv) If $S \cap V = S$ and $S \cup V = V$, then using Venn diagram show that $S \subseteq V$.
 - (v) Power set.

2. The demand and supply functions of a good are given by

$$P = -2Q_d + 50$$

$$P = 0.5Q_s + 25$$

where p , Q_d , Q_s denote the price, quantity demanded and quantity supplied respectively. Determine the equilibrium price and quantity.

3. Find the equilibrium price and quantity of the following demand and supply functions:

$$P + Q^2 + 3Q - 20 = 0 \qquad P - 3Q^2 + 10Q = 5$$

4. Consider the following demand function:

$Q_d = -30P + 0.05Y + 2P_s + 4T$ where P is the price of the good, Y is income, P_s is the price of the substitute good and T is the tax paid by the consumer and is defined as $T = t * Y$ and assume $t=0.2$.

Answer the following:

- (i) Draw the graph of the demand function assuming $Y=1000$, $P_s=25$, $t=0.2$.
- (ii) What happens to the demand function if the tax rate (t) doubles?
- (iii) What happens to the demand function if $P_s = 15$?

5. Given the demand function

$$P = -Q^2 - 4Q + 96$$

Find the price elasticity of demand when $P=51$. If this price rises by 2% calculate the corresponding percentage change in the quantity demanded.

6. If $f(x) = x^2 - 6x + 8$ evaluate $f'(3)$. What information does this provide about the graph of $y = f(x)$ at $x = 3$?

7. Maximize profits π for a firm, say Supermacs, given total revenue $R = 4000Q - 33Q^2$ and total cost $C = 2Q^3 - 3Q^2 + 400Q + 5000$, assuming $Q > 0$.
[Hint: $\pi = R - C$]
8. Simplify the following using the rules of logarithms and indices:
- (i) $\log_b(xy) - \log_b x - \log_b y$
 - (ii) $3\log_b x - 2\log_b y$
 - (iii) $\log_b y + 5\log_b x - 2\log_b z$
 - (iv) $\left[\frac{x^2 y}{xy^{-1}} \right]^{-2}$
 - (v) $\left[xy^{\frac{1}{2}} \right]^4$
9. Solve the following system of simultaneous equations:
- $$ax + by = e$$
- $$cx + dy = f$$
10. Define the following concepts:
- a. Infinitely elastic demand curve
 - b. Infinitely inelastic demand curve
 - c. Why does the elasticity change along the downward sloping demand curve?
 - d. Critical point of a function
 - e. What does the second derivative of a function signify?

Section B: Statistics

1. The following is the number of minutes to commute from home to work for a group of automobile executives.

28 25 48 37 41 19 32 26 16 23 23 29 36
31 26 21 32 25 31 43 35 42 38 33 28

- (i) How many classes would you recommend?
- (ii) What class interval would you suggest?
- (iii) What could you recommend as the lower limit of the first class?
- (iv) Organize the data into a frequency distribution.
- (v) Comment on the shape of the frequency distribution.

2. The following table lists the number of patents granted by the United States government to each company in a recent year. Calculate the measures of central tendency for this data.

General Motors	511	Mazda	210
Nissan	385	Chrysler	97
DaimlerChrysler	275	Porsche	50
Toyota	257	Mitsubishi	36
Honda	249	Volvo	23
Ford	234	BMW	13

Define the measures of central tendency and discuss the advantage and disadvantages of these measures.

3. A chain of sport shops catering to beginning skiers, headquartered in Aspen, Colorado, plans to conduct a study of how much a beginning skier spends on his or her initial purchase of equipment and supplies. Based on these figures, they want to explore the possibility of offering combinations, such as a pair of boots and a pair of skis, to induce customers to buy more. A sample of their cash register receipts revealed these initial purchases

\$140	82	265	168	90	114	172	230	142
86	125	235	212	171	149	156	162	118
139	149	132	105	162	126	216	195	127
161	135	172	220	229	129	87	128	126
175	127	149	126	121	118	172	126	

- Arrive at a suggested class interval. Use five classes, and let the lower limit of the first class be \$80. [2]
- What would be a better class interval? [2]
- Organize the data into a frequency distribution using a lower limit of \$80. [4]
- Interpret your findings. [2]

4. The Midland National Bank selected a sample of 40 student checking accounts. Below are their end-of-the-month balances

\$404	74	234	149	279	215	123	55	43	321
87	234	68	489	57	185	141	758	72	863
703	125	350	440	37	252	27	521	302	127
968	712	503	489	327	608	358	425	303	203

- Tally the data into a frequency distribution using \$100 as a class interval and \$0 as the starting point. [2]
- Draw a cumulative frequency polygon. [4]
- The bank considers any student with an ending balance of \$400 or more a "preferred customer". Estimate the percentage of preferred customers. [2]

- (iv) The bank is also considering a service charge to the lowest 10 percent of the ending balances. What would you recommend as the cutoff point between those who have to pay a service charge and those who do not? [2]

5. The Apollo space program lasted from 1967 until 1972 and included 13 missions. The missions lasted from as little as 7 hours to as long as 301 hours. The duration of each flight is listed below.

9	195	241	301	216	260	7	244	192	147
10	295	142							

- (i) Explain why the flight times are a population. [1]
(ii) Find the mean and median of the flight times. [4]
(iii) Find the range and the standard deviation of the flight times. [5]

6. The
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|--------|------|------|------|-------|-------|-------|------|--|
| \$0.09 | 0.13 | 0.41 | 0.51 | 1.12 | 1.20 | 1.49 | 3.18 | |
| 3.50 | 6.36 | 7.83 | 8.92 | 10.13 | 12.99 | 16.40 | | |
- mean

income of a group of sample observations is \$500; the standard deviation is \$40. According to Chebyshev's theorem, at least what percent of the incomes will lie between \$400 and \$600?

7. Following are the earnings per share for a sample of 15 software companies for the year 2005. The earnings per share are arranged from smallest to largest.

Compute the mean, median and standard deviation. Find the coefficient of skewness using Pearson's estimate. What is your conclusion regarding the shape of the distribution?

8. Bank of Ireland customers select their own three-digit personal identification (PIN) number for use at ATMs.

- (i) Think of this as an experiment and list four possible outcomes. [4]
(ii) What is the probability Mr. Smith and Mrs. Smith select the same PIN? [4]
(iii) Which concept of probability did you use to answer (ii)? [2]

9. A study of 200 grocery chains revealed these incomes after taxes:

Income after Taxes	Number of Firms
Under \$1 million	102
\$1 million to \$20 million	61
\$20 million or more	37

- (i) What is the probability a particular chain has under \$1 million in income after taxes? [5]
(ii) What is the probability of grocery chain selected at random has either an income between \$1 million and \$20 million, or an income of \$20 million or more? What rule of probability was applied? [5]

10. Refer the following table.

Second Event	First Event			
	A_1	A_2	A_3	Total
B_1	2	1	3	6
B_2	1	2	1	4
Total	3	3	4	10

- (i) Determine $P(A_1)$. [2]
(i) Determine $P(B_1|A_2)$. [4]
(ii) Determine $P(B_2 \text{ and } A_3)$. [4]