PRIFYSGOL ABERYSTWYTH UNIVERSITY

SEMESTER ONE 2026

ABERYSTWYTH BUSINESS SCHOOL

MODULE CODE: ABM1420 (Financial Research Methods)

Time allowed: **3 HOURS**

Answer four questions TWO from EACH SECTION

CALCULATORS ARE PERMITTED (Casio FX-991, FX83 or FX85 models only)

Statistical tables are provided.

Once seated, students may complete the front cover of the answer book(s) and the attendance slip ONLY.

DO NOT TURN THE EXAMINATION QUESTION PAPER OVER UNTIL INSTRUCTED TO DO SO.

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SECTION A

Question 1

a) Define and distinguish random, and quasi-random sampling. Use appropriate examples to illustrate your arguments. (30%)

b) From a complete list of all 200 students of Aberystwyth Business School, one name is picked at random: Samuel James. Last month, Samuel made 50 phone calls from his mobile phone. The following data are the recorded length (in seconds) for the 50 calls Samuel made last month (written in ascending order).

257.723	259.641	263.524	267.534	267.978
270.740	278.311	281.161	281.484	283.659
285.981	286.646	286.963	289.567	292.003
292.092	292.673	293.274	293.403	293.915
293.936	298.445	299.654	300.173	300.514
301.696	302.431	302.577	303.348	303.919
304.112	304.604	305.438	306.511	306.934
310.258	310.914	311.593	312.729	312.965
313.961	314.850	314.850	317.918	320.718
323.799	326.906	327.735	337.581	346.450

I. What sampling technique was used to select Samuel? (10%)

II. Construct a frequency table appropriate for these data and use this to construct a histogram. (30%)

III. Calculate the sample mean, and median of the data. (30%)

Question 2

a) A recent British Gas investigation examined factors which influenced the length of time it takes customers to pay their utility bills. Their report revealed that the size of a customer's bill (£X) was the most important factor influencing the time it took customers to pay this bill (Y, in days).

British Gas express the time it takes for customers to pay their bills as a linear function of the size of their bills:

$$Y = 6.85 + 0.07X$$

I. What are the intercept and gradient of this linear function? (25%)

II. If Sarah's gas bill is £450, how long can we expect it will take her to pay the bill? (25%)

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III. Suppose it took Zara 7 days to pay her gas bill. Solve the above linear equation for X to find out the size of Zara's gas bill. (25%)

b) A 529 Plan is a college-savings plan that allows relatives to invest money to pay for a child's future college tuition; the account grows tax-free. Lily wants to set up a 529 account for her new granddaughter and wants the account to grow to £40,000 over 18 years. She believes the account will earn 5% compounded semi-annually (twice a year). To the nearest dollar, how much will Lily need to invest in the account now? (25%)

Question 3

a) Do you think the following pairs of events are independent or dependent, and why? (30%)
   a. A1: The city of London having higher crime rate.
      A2: Netflix is screening increasing number of violent movies.
   b. B1: A student hosted a big birthday party recently.
      B2: A student tested positive for Covid-19.
   c. C1: An individual has lost her/his job due to Covid-19 pandemic.
      C2: An individual is allowed to extend her/his bank overdraft.

b) A company has installed a new computer system, and some employees are having difficulty logging on to the system. They have been given training and the problems which arose during training were recorded and their probabilities calculated as follows: an employee has a probability of 0.92 of logging on successfully on the first attempt; if the employee logs in successfully then the employee will also be successful on each later attempt with probability 0.9; if the employee tries to log in and is not successful then the employee loses confidence and the probability of a successful log-in on later occasions drops to 0.58.

Find the following probabilities: (70%)

I. An employee successfully logs on in each of the first three attempts.
II. An employee fails in the first attempt but is successful in the next two attempts.
III. An employee logs on successfully only once in three attempts.
IV. An employee does not manage to log on successfully in three attempts.

Question 4

a) Which of the following random variables could be modelled with a binomial distribution and which could be modelled with a Poisson distribution? In each case state the value(s) of the parameter(s) of the distribution. (20%)

I. A salesperson has a 30% chance of making a sale on a customer visit. She arranges 10 visits in a day. Let X be the number of sales she makes in a day.

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II. Calls to the British Passport Office in Durham occur at a rate of 7 per hour on average. Let Y be the number of calls at the passport office in a 1-hour period.

III. History suggests that 10% of eggs from a family–run farm are bad. Let Z be the number of bad eggs in a box of a dozen (i.e. 12) eggs.

b) Between 1896 when the Dow Jones Index was created and 2023, the index rose in 64% of the years. Based on this information, and assuming a binomial distribution, estimate the probability that the stock market will rise - (40%)

IV. In exactly four of the next five years.

V. In none of the next five years.

VI. What assumption of the binomial distribution might not be valid here?

c) A company promises delivery within 20 working days of receipt of order. However, they deliver according to a normal distribution with a mean of 16 days and a standard deviation of 2.5 days. (40%)

I. What proportion of customers receive their order late?

II. What proportion of customers receive their orders between 10 and 15 days of placing their order?

III. How many days should the delivery promise be adjusted to if only 3% of orders are to be late?

SECTION B

Question 5

a) A machine for filling cans of Coke has a process variance of 400ml. A sample of 100 cans is taken, and it is found that the average contents are 240ml. Is this consistent with the cans containing the stated weight of 250ml?

I. Use a 95% confidence interval to get your answer. (25%)

II. Perform an appropriate hypothesis test to see if the data are consistent with the cans containing the stated volume of 250ml. Use a two–tailed test. (25%)

b) A chain of record shops believes that its Great Dark Gate Street store (Shop 1) is more successful than its Penglais branch (Shop 2). The management take a random sample of daily takings and obtains the following summary statistics: (50%)

$$Shop1 \quad \overline{x_1} = £15000, \quad s_1^2 = 100{,}000, \qquad n_1 = 18$$

$$Shop2 \quad \overline{x_2} = £14500, \quad s_2^2 = 95{,}000, \qquad n_2 = 12$$

How would you check if the management's belief is correct? Explain.

Question 6

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a) "Northern Lights", the main electrical supplier to homes in Northern Sweden, believes that the time a customer takes to pay their electricity bill is related to the size of their bill. To investigate, their research team randomly selected 10 customers and recorded the size of their bill (x, in pounds) and the time it took to pay this bill (y, in days). The results are shown below.

x	400	105	205	150	460	250	315	420	100	300	
y	35	15	18	20	30	22	25	34	10	20	

The following summaries have been obtained for the above data:

$\sum x = 2705$, $\sum y = 229$, $\sum x^2 = 885275$, $\sum y^2 = 5839$, $\sum xy = 70720$

Using these summaries,

I. Calculate the sample correlation coefficient and comment. (20%)

II. Perform a linear regression analysis, obtain the linear regression equation and interpret the coefficients. (50%)

b) Northern Lights levy a "late–payment charge" if a customer takes longer than 30 days to pay their bill. Mr. Rana's bill for 2012 is £375. Will she/he incur this late payment charge? (15%)

c) Another customer, Miss Nicola, has a large electricity bill of £520. Why should we be cautious about using the regression equation obtained in part (a) (II) to predict how long she will take to pay her bill? (15%)

Question 7

You may be interested in studying effects of various firm-specific factors on the returns of a sample of 200 firms. You run cross-sectional regression with 200 firms and obtained the following results:

$$r_i = 0.08 + 0.80S_i + 0.32MB_i + 0.16PE_i - 0.08BETA_i + \hat{u}_i$$

(0.06) (0.15) (0.11) (0.42) (0.10)

$R^2 = 0.27$

where

r_i is return on stock.

S_i is the size of firm i, measured in terms of the natural log of sales revenue.

MB_i is market to book ratio of the firm.

PE_i is the price/earnings (P/E) ratio of the firm; and

$BETA_i$ is the stock's capital asset pricing model (CAPM) beta coefficient.

Standard errors of individual coefficients are reported in parentheses.

Answer the following questions:

I. Comment on the signs of the variables in the model. (15%)

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II. Interpret and explain individual coefficients. (25%)

III. Using t-tests check if individual coefficients are significantly different from zero at 5% level of significance. (35%)

IV. Comment on the value of R^2. (10%)

V. If Beta increases from 1.0 to 1.5, what is the expected effect on the stock's return? Is the sign of beta as you would have expected? (15%)

Question 8

Explain any FOUR concepts from the following list: (25% X 4)

I. Parameters, estimators and estimates.
II. Gauss-Markov Theorem.
III. Dummy variables.
IV. Goodness of fit.
V. Correlation, regression, and causation.
VI. Standard normal distribution.
VII. Quantitative vs Qualitative research.

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