



THE NCUK INTERNATIONAL FOUNDATION YEAR

IFYMB001 Mathematics Part 2 (Business) Examination

Examination Session
Semester Two

Time Allowed
2 Hours 10 minutes
(including 10 minutes reading time)

INSTRUCTIONS TO STUDENTS

- SECTION A** **Answer ALL questions. This section carries 40% of the exam marks.**
- SECTION B** **Answer 4 questions. This section carries 60% of the exam marks.**

The marks for each question are indicated in square brackets [].

Your School or College will provide a Formula Booklet.

- **Answers must not be written during the first 10 minutes.**
- Write your Candidate Number clearly on the answer books in the space provided.
- Write the answers in the answer books provided. Additional sheets will be provided on request.
- Write the section letter, the question number and numbers to parts of questions attempted clearly at the start of each answer.
- **No** written material is to be brought into the examination room.
- **No** mobile phones are allowed in the examination room.
- An approved calculator may be used in the examination.
- State the units where necessary.
- Where appropriate, working should be carried out to 4 significant figures and **answers given to 3 significant figures.**
- Full marks will only be given for **full and detailed answers.**

Section A

Answer ALL questions. This section carries 40 marks.

Question A1

Find the median, lower quartile and the upper quartile of the following set of data: [4]

11, 12, 16, 16, 18, 17, 19, 20, 21, 22, 23

Question A2

Using the quotient rule, differentiate: [3]

$$y = \frac{x^2 + \sin(x)}{e^{3x} + 5x}$$

Do **not** simplify.

Question A3

A random variable Y has mean 13 and variance 15. Find the mean and variance of $2Y + 5$. [4]

Question A4

Using matrices **only**, determine the solution to the following simultaneous equations: [5]

$$5x + 6y = 9$$

$$3x - y = 10$$

Question A5

Find the values of A, B and C in the identity: [5]

$$\frac{3 + 4x}{x(x + 2)^2} \equiv \frac{A}{x} + \frac{B}{x + 2} + \frac{C}{(x + 2)^2}$$

Question A6

Rainfall records collected over many years in a certain holiday resort in the UK show that the probability of rain is 0.3. Minjun is going on holiday for seven days and wants to calculate the probability that it will rain on exactly two days of her holiday. Define the distribution Minjun should use to calculate the probability it will rain during her holiday. Calculate the probability that it will rain on exactly two days of her holiday. [4]

Question A7

Use Integration by parts to determine the following indefinite integral:

[5]

$$\int x \cos(3x) dx$$

Question A8

Determine the coefficient of linear correlation between the variables X and Y presented in the data below:

X	1	3	4	6	8	9	11	14
Y	1	2	4	4	5	7	8	9

Comment on the meaning of the coefficient where:

[5]

$$\sum X = 56$$

$$(\sum X)^2 = 3136$$

$$\sum X^2 = 524$$

$$\sum Y = 40$$

$$(\sum Y)^2 = 1600$$

$$\sum Y^2 = 256$$

$$\sum XY = 364$$

Question A9

A module has three separate parts in the assessment: a final examination, coursework and a presentation. The final examination is worth three times more than each of the other two. A student has a final examination grade of 85, a coursework grade of 70 and a presentation grade of 90. Find the student's overall module grade.

[5]

Section B
Answer 4 questions. This section carries 60 marks.

Question B1

The following table shows the frequency distribution of the daily wages to the nearest pound of 73 employees at a company:

Wages (£)	Number of Employees
55-60	9
61-70	12
71-80	15
81-90	16
91-100	12
101-110	6
111-120	3

- a) Calculate an estimate for the mean daily wage of the employees to the nearest pound. **[4]**
- b) Find the standard deviation of the data. **[5]**
- c) By copying and extending the table in an appropriate manner, draw the graph of the cumulative frequency polygon. **[4]**
- d) Using your graph, estimate the median of the data. **[2]**

Question B2

In the USA, a study of 890 college students classified the students by whether they play tennis and at the same time classified whether their parents played football and tennis. The results were:

	Students playing of tennis			Total
	Never	Occasional	Regular	
Parents played neither football nor tennis	282	108	80	470
Parents played one	196	88	102	326
Parents played both football and tennis	34	22	38	94
Total	452	218	220	890

- a) Estimate the probability that a randomly chosen student:
- Never plays tennis. [1]
 - Has parents who played both football and tennis. [2]
 - Regularly plays tennis **and** has parents who played both football and tennis. [2]
 - Never plays tennis **or** neither parents played football or tennis. [2]
- b) i. Find the probability that a student regularly plays tennis. [1]
- Find the probability that a student regularly plays tennis **given that** his/her parents play both football and tennis. [2]
 - Find the probability that parents play at least one of the sports. [2]
 - Comment on whether the two following events are likely to be independent: [3]

Student regularly plays tennis.

Parents play both football and tennis.

Question B3

If $A = \{1,3,5,7,9\}$, $B = \{2,6,8\}$, $C = \{1,2,5,7\}$, $U = \{1,2,3,4,5,6,7,8,9,10\}$

Find:

- a) i. $(A \cup C) \cap B$ [2]
- ii. $(A \cup B) \cap (A \cup C)$ [2]
- iii. $\overline{A \cup B}$ [1]
- iv. $\overline{A} \cap \overline{B}$ [3]
- v. $\overline{A \cap B}$ [2]
- vi. $\overline{A} \cup \overline{B}$ [1]
- b) If a coin is thrown 5 times, find the following probabilities:
- i. $P(0 \text{ tails})$ [1]
- ii. $P(1 \text{ head})$ [1]
- iii. $P(2 \text{ tails})$ [1]
- iv. $P(3 \text{ tails})$ [1]

Question B4

The heights of adult males in the UK are normally distributed with mean 1.75m and standard deviation 0.2m.

- a) Find the probability that a man chosen at random will have a height:
- i. More than 1.80m. [4]
- ii. Less than 1.71m. [3]
- iii. Between 1.73m and 1.76m. [3]
- b) A shop has 150 visitors in a particular week.
- i. How many of these visitors would be expected to have heights between 1.73m and 1.76m? [1]
- ii. Calculate a 95% Confidence Interval for the average height of a shopper. [4]

Question B5

a) If $f(x) = x^2 - 3$ and $g(x) = x + 3$

Find:

- i. $f(g(x))$ [2]
- ii. $f(f(x))$ [2]
- iii. $g(g(x))$ [1]
- iv. $g(f(x))$ [1]
- v. $g^{-1}(x)$ [2]

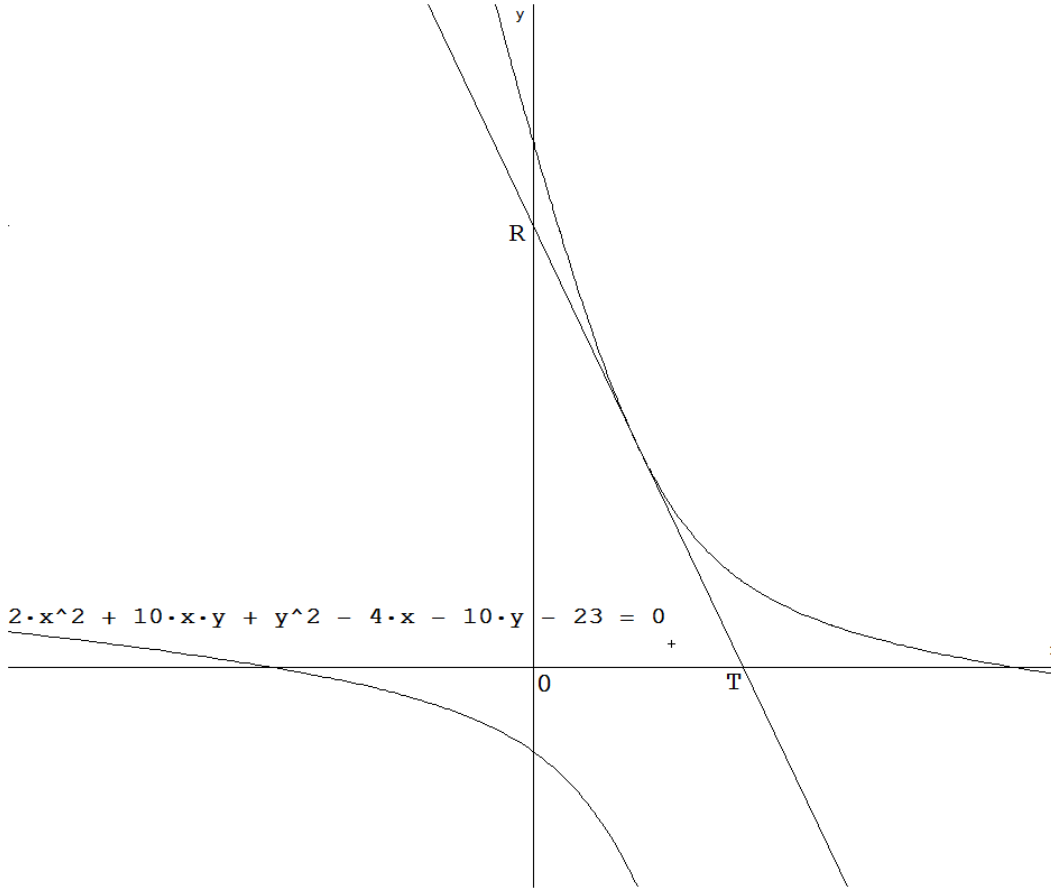
b) If $f(x) = x^2 + 1, x \geq 0$

- i. Write down the range for $f(x)$ [2]
- ii. Obtain an expression for $f^{-1}(x)$ [3]
- iii. Write down the domain and range for $f^{-1}(x)$ [2]

Section B continues on the next page.

Question B6

Below is a plot of $2x^2 + 10xy + y^2 - 4x - 10y - 23 = 0$



- a) Differentiate $2x^2 + 10xy + y^2 - 4x - 10y - 23 = 0$. [2]
- b) Find the x coordinate when the curve has a gradient of -5. [2]
- c) Find the corresponding y coordinates. [3]
- d) Find the tangent to the curve with the positive y coordinate as shown in the above plot. [2]
- e) Find the coordinates of T and R where the tangent crosses the x and y axes respectively. [2]
- f) Find the volume generated when section TR of the tangent is rotated about the x-axis. Give an **exact** answer. [4]