

Undergraduate Admissions Assessment March 2018

TEST 1 - (Sections A, B1 and D). Three Hour Assessment.



The UG Admissions Assessment (UGAA) gives Admissions Tutors the opportunity to see a sample of the applicant's original work, produced under examination conditions, and seeks to assess applicants from a variety of backgrounds in a fair and equitable manner.

The assessment has three sections: comprehension exercises (**Section A**); essay questions (**Section B**); and mathematical problems (**Section C or D**). The purpose is to assess the applicant's English language and mathematics abilities. *It is not an assessment of general knowledge.* The following criteria are of particular importance:

- Clarity and precision of language
- Sophisticated vocabulary
- Logical structure and argument
- Mathematical accuracy, techniques and conceptual understanding

Before beginning the assessment, please read the following guidance and instructions carefully.

Depending on the course to which you have applied, you have been entered for Test 1 or 2. Before beginning the assessment please check that you have received the correct paper. A list of courses and corresponding papers can be found overleaf.

The assessment lasts three hours and **all three sections must be completed**. The marks for each section are weighted according to the paper. More time should be spent completing the sections with more marks attached. However, please note that to pass the UGAA a minimum grade in *all three sections* is required, as well as a good grade overall.

Test 1: Section A (25%), Section B1 (25%), Section D (50%)

Test 2: Section A (25%), Section B2 (50%), Section C (25%)

Answer Booklets

You must use the **BLUE** booklet for Sections A and B (English Sections) and the **CREAM** booklet for Sections C or D (Maths Sections).

When answering the maths questions, you must show your working out, as well as your final answer.

- Dictionaries may **NOT** be used
- Hand-held calculators **MAY** be used.

If a calculator is used please indicate on the answer booklet the type used (e.g. TI.500)

Test Papers

TEST 1

BSc Actuarial Science (N321)	BSc Geography with Economics (L7L1)
BSc Economics (L101)	BSc Management (N200)
BSc Economics with Economic History (L1V3)	BSc Mathematics and Economics (GL11)
BSc Econometrics and Mathematical Economics (L140)	BSc Mathematics with Economics (G1L1)
BSc Economic History with Economics (VL31)	BSc Mathematics, Business, and Statistics (G0N0)
BSc Economics and Economic History (V3L1)	BSc Philosophy and Economics (LV15)
BSc Environmental Policy with Economics (F9L1)	BSc Philosophy, Politics and Economics (LOV0)
BSc Finance (N300)	BSc Social Policy and Economics (LLK1)
BSc Financial Mathematics and Statistics (GN13)	BSc Statistics with Finance (G3N3)
BSc Government and Economics (LL12)	

TEST 2

BSc Accounting and Finance (NN34)	LLB Law (M100)
BA Anthropology and Law (ML16)	BSc Philosophy, Logic, and Scientific Method (V503)
BSc Economic History (V300)	BSc Politics and Philosophy (LV25)
BSc Economic History and Geography (V3L7)	BSc Politics and International Relations (L290)
BSc Environment and Development (FK84)	BA Social Anthropology (L601)
BA Geography (L702)	BSc Social Anthropology (L603)
BSc Government (L230)	BSc Social Policy (L400)
BSc Government and History (LV21)	BSc Social Policy with Government (LL42)
BA History (V146)	BSc Social Policy and Sociology (LL34)
BSc International Relations (L250)	BSc Sociology (L301)
BSc International Relations and History (VL12)	

Please check you have received the correct paper. If you think you have received the wrong paper please notify the invigilator immediately.

The Undergraduate Admissions Assessment

TEST 1

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Section A

- **All** candidates should complete this section.
- This section has **one** question only.
- The marks achieved in this section account for **25%** of your final exam result.

Instructions:

Write a summary (précis) of the following passage, **in not more than 150 of your own words**. You must write a summary, not a discussion of the passage. No credit will be given for answers made up of sentences extracted from the original passage.

President Trump, whose first year in office saw near-constant turmoil and division, claimed Tuesday that he has ushered in an ebullient “new American moment” and issued a summons for “the unity we need to deliver for the people we were elected to serve.”

The conciliatory tone of Trump’s first State of the Union address was sharply at odds with the combative manner in which he has conducted his presidency — and with the tension evident between Republicans and Democrats in the Capitol, where he spoke....

The president set an ambitious agenda for his second year in office, from a \$1.5 trillion plan to rebuild the nation’s crumbling infrastructure to a four-pronged immigration package to a pledge to reduce prescription drug prices. His one-hour, 20-minute speech was the longest since Bill Clinton’s State of the Union address in 2000.

The president laid out details of his immigration package, offering citizenship for undocumented immigrants brought to the United States as children, who are known as “dreamers,” in return for increased spending on border security, including for his promised wall at Mexico’s border; an end to the visa lottery; and limits on family reunification policies.

Trump used some of his most polarizing language when lamenting crime from MS-13 and other gangs, which he blamed on “open borders.” He sought to repurpose the term “dreamer” by saying American citizens have seen their economic prospects dimmed and personal safety put at risk because of illegal immigration.

“Trump calls for unity, pushes GOP agenda in State of the Union speech,” *Washington Post*, 30 January 2018

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Section B1

- Complete Section B1 **ONLY** if you are completing Maths Section D.
- The marks achieved in this section account for **25%** of your final exam result.

Instructions:

Write **ONE** essay from the following three choices:

1. 'The voting age should be reduced to sixteen.' Discuss.
 - What are the strengths and weaknesses of reducing the voting age?
2. 'Ever since the advent of nuclear weapons, World War III between the great powers has been unthinkable.' Discuss.
 - Have nuclear weapons produced peace between the great powers?
3. 'Multinational corporations enjoy more power than states.' Discuss.
 - Are states able to control multinational corporations?

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Section D

- The marks achieved in this section account for **50%** of your final exam result.
- Full algebraic working out must be clearly shown.

Instructions:

This section has **eight questions**, with a total of **100 marks**. Answer **all** questions in this section.

Question 1

Simplify:

$$\left(\frac{2}{x-1} - \frac{1}{x-3}\right) \div \frac{2x^2 - 50}{x^2 - 4x + 3}$$

Total 7 marks

Question 2

$$f'(x) = 4x^3 - 12x + 8$$

- a) Find the equation for $f(x)$ given that $f(1) = 0$ *(3 marks)*
- b)
- i) show that $(x - 1)$ is a factor of $f'(x)$ *(2 marks)*
- ii) factorise $f'(x)$ fully *(3 marks)*
- c) **Hence** find any stationary points for $f(x)$ *(3 marks)*

Total 11 marks

Question 3

Solve the following equations for x giving your solutions exactly and in their simplest form. Show a full algebraic method.

- a) $\log_3 x = \log_x 81$ *(4 marks)*
- b) $4 \sin x = \sec x$ $0 \leq x \leq \pi$ *(4 marks)*
- c) $|3 - x^2| = 1$ *(4 marks)*

Total 12 marks

Question 4

- a) Sketch the curve

$$f(x) = \frac{ax + 6}{ax - 2}, \text{ where } a > 0$$

Show the equations of any **asymptotes** and the **coordinates of the points of intersection with the axes** clearly on your sketch.

(5 marks)

- b) Write $\frac{ax+6}{ax-2}$ in the form $A + \frac{B}{ax-2}$ where A and B are integers to be determined.

(3 marks)

- c) **Hence** find the **area** fully enclosed by the curve $f(x)$ and the x and y axes giving your answer in the form

$$\frac{C \ln 2 + D}{a}$$

where C and D are integers to be determined.

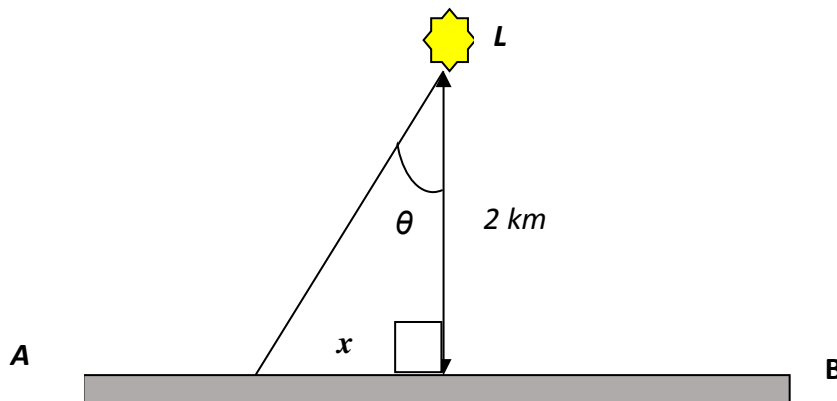
(6 marks)

Total 14 marks

Question 5

The light on a lighthouse is rotating at 3 revolutions per minute.

- a) What is the rate of rotation in radians per second (give your answer in terms of π) (1 mark)
- b) The lighthouse L is 2km from the centre of a straight breakwater AB as shown.



- i) Find an expression for the speed of the light $\frac{dx}{dt}$ in m/s as it passes along the breakwater, where x is the distance along the breakwater from the closest point on the breakwater. Give your answer in terms of θ .
- ii) Evaluate your expression to find the speed of the light when it passes the closest point to the lighthouse, giving your answer exactly.

(3 marks)

(1 mark)

Total 5 marks

Question 6

In this question give your numerical answers to an appropriate degree of accuracy.

Jamil is saving money.

At the start of **each** month he puts £50 into a savings account.

At the end of **each** month the savings account adds 0.5% interest to his account.

- a) If he starts saving by putting £50 in his account at the start of January 2018 how much money will he have in his savings account at the end of the 2nd month i.e. February 2018, after the interest has been added?

(2 marks)

- b) Derive a single expression in terms of n for the amount of money he will have in his account at the end of the n th month.

(2 marks)

- c) **Hence** calculate how much money he will have at the end of December 2018.

(3 marks)

- d) Use your answer to b) to find out the number of years it would take Jamil to have £1 million in his savings account if he continues saving in this way.

(5 marks)

Total 12 marks

Question 7

- a) Differentiate the following expressions with respect to x and simplify your answers:

i) e^{-x^2} ii) xe^x iii) $\frac{x}{e^x}$ iv) $\frac{x}{e^{(x^2)}}$

(7 marks)

- b) Find the following indefinite integrals:

i) $\int e^{-x} dx$ ii) $\int xe^{-x} dx$ iii) $\int xe^{(-x^2)} dx$

(6 marks)

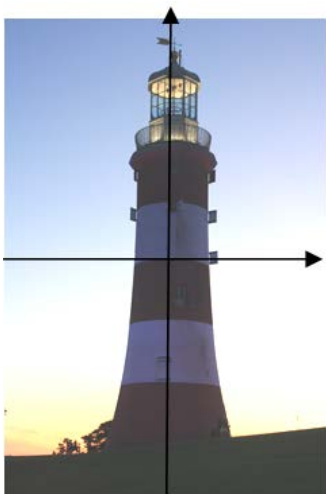
- c) On the same axes sketch $y = e^{-x}$ and $y = xe^{-x}$ for $x \in \mathbb{R}$

showing the intercepts with the axes and any points of intersection of the curves clearly.

(3 marks)

- d)
- Find an expression for the area between the curves from $x = 1$ to $x = n$ giving your answer in terms of n , where $n > 1$. *(4 marks)*
 - Explain why the area you have found can never exceed $1/e$ *(2 marks)*
- e) On the same axes sketch $y = xe^{-x}$ and $y = xe^{(-x^2)}$ for $x \geq 0$ showing the intercepts with the axes, any turning points and any points of intersection of the curves clearly. *(5 marks)*
- f) Calculate the area fully enclosed between the curves giving your answer exactly. *(3 marks)*
- Total 30 marks**

Question 8



The outside of this lighthouse (excluding the light) can be modelled by the following curve:

$$\frac{5x^2}{4} - \frac{y^2}{15} = \frac{9}{10}$$

for $-\frac{11}{2} \leq y \leq \frac{3}{2}$

- Find x when $y = -5.5$ *(2 marks)*
- Find the volume of revolution of the curve when rotated by 2π radians about the y -axis. Show a full algebraic method and give your final answer to 3 *sf*. *(4 marks)*
- The radius of the base is $4m$, use this and your answer to b) to calculate the volume of the lighthouse giving your answer to 3 *sf*. *(3 marks)*

Total 9 marks

End of Test