Undergraduate Admissions Assessment March 2020
TEST 2 - (Sections A, B2 and C). 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 **YELLOW** 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.

Permitted/not permitted items

- 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 Econometrics and Mathematical Economics (L140)
BSc Economics and Economic History (VL31)
BSc Economic History with Economics (V3L1)
BSc Economics (L101)
BSc Economics with Economic History (L1V3)
BSc Environmental Policy with Economics (F9L1)
BSc Finance (N300)
BSc Financial Mathematics and Statistics (GN13)
BSc Geography with Economics (L7L1)

BSc International Social and Public Policy and Economics (LLK1)
BSc Management (N200)
BSc Mathematics and Economics (GL11)
BSc Mathematics with Economics (G1L1)
BSc Mathematics, Statistics, and Business (G0N0)
BSc Philosophy and Economics (LV15)
BSc Philosophy, Politics and Economics (L0V0)
BSc Politics and Economics (LL12)

TEST 2

BSc Accounting and Finance (NN34)
BSc Anthropology and Law (ML16)
BSc Economic History (V300)
BSc Economic History and Geography (V3L7)
BSc Environment and Development (FK84)
BA Geography (L702)
BA History (V146)
BSc International Relations (L250)
BSc International Relations and Chinese (L2T1)
BSc International Relations and History (VL12)
BSc International Social and Public Policy (L400)

BSc International Social and Public Policy with Government (LL42)
BSc Language, Culture and Society (L3R9)
BSc Philosophy, Logic and Scientific Method (V503)
BSc Politics (L230)
BSc Politics and History (LV21)
BSc Politics and International Relations (L290)
BSc Politics and Philosophy (LV25)
BSc Psychological and Behavioural Science (C800)
BA Social Anthropology (L601)
BSc Social Anthropology (L603)
BSc Sociology (L301)

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 2

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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.

Donald Trump arrived in the UK to meet NATO allies who are fearful that he could pose a serious threat to the survival of the alliance if he wins re-election next year.

Days before Wednesday's leaders' meeting just outside London to mark NATO's 70th anniversary, the US announced it was cutting its contribution to joint NATO projects. NATO officials say the cut (which reduces the US contribution to equivalence with Germany's) was mutually agreed, but it comes against a backdrop of Trump's longstanding ambivalence about the value of the alliance, and suggestions that US security guarantees to allied nations were dependent on their military spending.

John Bolton, Trump's national security adviser until September, heightened fears among allies about the president's intentions in a private speech to a hedge fund last month, in which Bolton (according to a NBC report) warned that Trump could "go full isolationist" if he wins re-election next November, withdrawing from NATO and other international alliances.

Trump has continually complained about the defence spending of European allies who committed less than the agreed 2% to defence, particularly Germany. And he has cast doubt on US commitment to its obligations under article 5 of NATO's founding document, the Washington Treaty, under which an attack on one ally is considered an attack on all allies.

Julian Borger, 'Trump Re-election Could Sound Death Knell for NATO, Allies Fear,' *The Guardian*, December 3, 2019

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Section B2

- Complete Section B2 **ONLY** if you are completing Maths Section C.

- The marks achieved in this section account for **50%** of your final exam result.

<table>
<tr><td>Instructions:
Write ONE essay from the following three choices:</td></tr>
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1. What impact is social media having on democracy?

2. What role should universities play in society?

3. To what extent, and why, should governments regulate business?

Section C

- The marks achieved in this section account for **25%** of your final exam result.

- Full algebraic working out must be clearly shown.

> **Instructions:**
> This section has **four questions**, with a total of **100 marks**. Answer **all** questions in this section.
> Give all numerical answers to 3 significant figures.

Question 1

The table below concerns the world population and the number of internet users. All figures are given to 3 sf.

Year	2010	2011	2012	2013	2014	2015	2016
Millions of Internet users	2030	2240	*b)ii)*	2740	2970	3200	3440
Internet users as a Percentage of the World Population	29.2	*b)i)*	35.1	38.0	40.7	43.4	46.1
World Population in billions	*b)iii)*	7.04	7.13	7.20	7.30	7.38	7.46

a)   Use the figures for 2016 to decide whether the three sets of data are consistent for that year. Give a reason for your answer.

(4 marks)

b)   Use the figures given to find

   i) The percentage of internet users in 2011

   ii) The number of millions of internet users in 2012

   iii) The world population in 2010 in billions

(6 marks)

c)   Using the data from **2013 to 2016 only**

   i) Between which two years did the world population increase the most?

   ii) Between which two years was the **percentage** increase in the world population highest? Explain your reasoning carefully.

   iii) What is the average annual increase in the percentage of the world population that are internet users.

(5 marks)

d)   i) Use your answer to c)iii) and the data from 2016 to estimate when 100% of the world's
        population would be internet users.

        ii) Do you think that your answer to d)i) is reasonable? Give a reason for your response.

e)   Assuming the percentage increase in the world population between 2015 and 2016 remains
        constant after 2016 what would the estimated world population be in 2030?
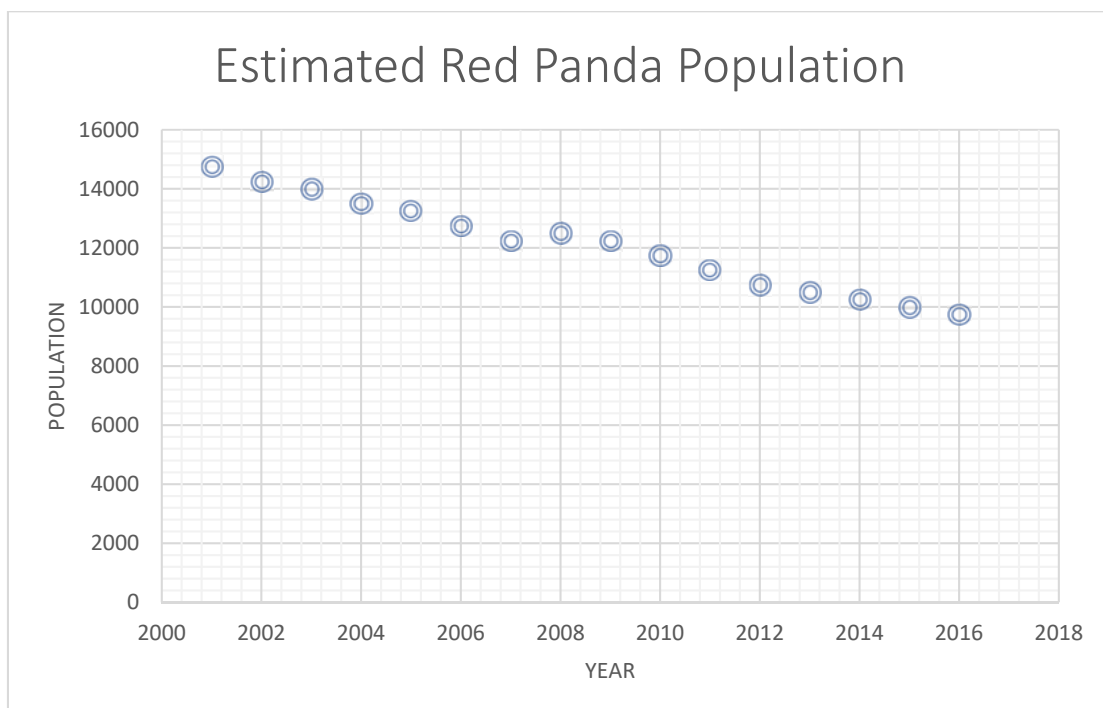
f)   In 2019 the world population reached 7.7 billion. Use your answer to c)iii) and assume that the
        average annual increase stayed constant after 2016 to estimate how many of these 7.7 billion are
        likely to be internet users.

Question 2

The graph above shows estimates of the red panda population from 2001.

a)   i) In which year was the estimate 14000?

        ii) Between which two years did the estimated population increase?

        iii) What was the estimated population in 2016?

b) i) Use your answers to a)i) and a)iii) to work out the equation of the line joining these two points. Give your answers in the form $y = mx + c$ where y is the population, and x the year.

ii) Use your answer to b)i) to work out an estimate for the population in 2020

iii) Jonathan uses **all** the points on the graph to obtain the equation of the trendline as
$$y = -331.25x + 677425$$

Comment on the numerical validity of this new equation compared with your equation in b)i)

(10 marks)

c) It has been claimed that *at the current rate the red panda population would fall to zero by 2065.*

i) Use your equation to estimate the year in which the population would fall to zero. Give your answer to the nearest year.

ii) Use the equation given in b)iii) to estimate the year in which the population would fall to zero. Give your answer to the nearest year.

iii) Does the evidence support the claim? Give a reason for your answer.

(4 marks)

d) Matthew finds a further model for the population again using all the points.

$$y = 1.6194x^2 - 6836.4x + 7210158$$

i) Use your answer to c)ii) with this new model to see if the population in that year has also fallen to zero under this further model.

ii) Environmentalists are concerned that the red panda is dying out more quickly than the claim of 2065. Whose model would best support the environmentalists? Give a reason for your answer.

(4 marks)

Total 21 marks

Question 3

Different modes of transport have different CO_2 emissions.

The table (right) shows estimated average CO_2 emissions **per km**.

Medium Sized Car	192g
Full Plane per passenger	133g
Full Coach per passenger	
Full Train per passenger	41g

a) Two cities A and B are about 400 miles apart. 1 mile is approximately 1.6 km. What are the CO_2 emissions for the whole journey between A and B for
   i)   a passenger on a full train
   ii)   a passenger in a full plane

(3 marks)

b)   If a medium sized car can carry 4 people, what would be the CO_2 emissions **per person** for the whole journey between A and B if the car is full?

(2 marks)

c)   The train between A and B is often only half full.

i) What would the total CO_2 emissions between A and B be for a passenger on such a train?

ii) What percentage of seats need to be filled on the train for the CO_2 emissions per passenger to be the same as those for a person in the full car?

(5 marks)

d)   The plane between A and B is generally 90% full. What would be the CO_2 emissions between A and B be for a passenger on a plane that is only 90% full?

(2 marks)

e)   A full coach has 60 passengers and its CO_2 emissions are 1.62kg per km. How much is this in **g per passenger** for the journey between A and B?

(3 marks)

f)   A coach company decides to make the journey more comfortable by using larger seats so that the same coach would only take 50 passengers. What would the percentage increase in CO_2 emissions per passenger for full coaches?

(3 marks)

g)   The 60-seater coach is on average 80% full. Would you recommend that the coach company goes over to the larger seats? Give a reason for your answer.

(2 marks)

Total 20 marks

Question 4

Volume and surface area are important when prescribing some medicines. In this question you are going to estimate the surface area of an average man. The average height of the average man is 70 inches and the average distance between his shoulders is 18 inches.

a)   Use the conversion factor of 1 inch = 2.54cm to change both these measurements into m.

(3 marks)

b)   The circumference of the man's head is 58cm. Use the formula for the circumference of a circle to find the diameter of the man's head in m.

(3 marks)

c)   In this view from above the man is shown inside a cylinder of height 70 inches and diameter 18 inches.
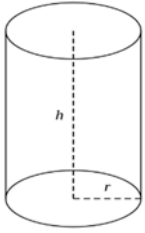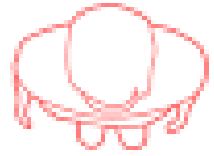
i) Use the formula $V = \pi r^2 h$ to where r is the radius of the cylinder and h is the height to find the volume of the cylinder in m³.

ii) Use the formula $S = 2\pi r^2 + 2\pi r h$ to calculate the **total** Surface Area of the cylinder in m². (The formula includes the top and the bottom as well as the curved side.)

iii) Do you think your answers to ci) and c)ii) are overestimates or underestimates for the volume and surface area of a man? Give reason for your answer for each of the volume and the surface area.

(8 marks)

d)   A new model visualises the man inside a cuboid. The height of the cuboid is 70 inches the width is 18 inches and the depth is the diameter of the man's head that you calculated in b).
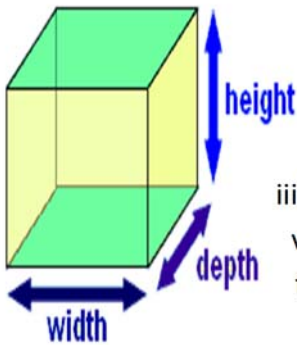
i) Find the volume of this cuboid in cm³.

ii) By finding the area of each of the **six** faces or otherwise find the surface area of this cuboid in m².

iii)   Do you think your answers to d)i) and d)ii) are better estimates for the volume and surface area of a man than your answers in c)i) and c)ii)? Give reasons for your answer for each of the volume and the surface area.

(9 marks)

e)   A direct formula for body surface area in m² is given by the formula $BSA = \sqrt{\frac{W \times H}{36}}$ where W is the weight of a man in kg and H is his height in m.

i) The tallest person in the world reached an average height of 2.72 m and a weight of 199kg what would the formula above give for his body surface area?

ii) Choose the answer that you think is the best estimate for the average man's surface area from c)ii) or d)ii) to find an estimate for the weight of the average man using the formula for BSA above.

iii) Now use your best estimate for the average man's volume from d)ii) and cii) to calculate an estimate for the weight using a **density** of 985kg/m³

iv) Compare your answers to e)ii) and e)iii) with the average weight of 83.6kg.

(10 marks)

Total 33 marks

End of Test