**Homework 8**

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1) Estimate the total amount of money the average Scot will pay in tax over their lifetime.

State any assumptions you make. (4)

2) Different musical instruments have different pitches. The pitch of a small trumpet is higher than that of a large tuba. The pitch of a musical note is determined by the frequency of the wave producing that note.

Frequencies are measured in Hertz (Hz), and this is the number of soundwaves per second. Brass instruments come in a variety of lengths. A bass tuba would be around 4 metres long if it was uncoiled. The larger the length of a brass instrument, the lower the pitch.

Based on the information above, what type of model would be the most appropriate for modelling the relationship between the length of a brass instrument and the frequency of its pitch? (1)

1. Linear
2. Exponential Growth
3. Exponential Decay
4. Quadratic

3) Martha takes random samples of S1 students and S6 students in her school. She asks each student whether they have a pet or not.

Martha wishes to perform a hypothesis test to determine whether there is a difference in the percentage of S1s and S6s who have a pet.

Which test might be appropriate? (1)

1. Z-test for two proportions
2. T-test
3. Paired t-test
4. Correlation test

4) A bank account has an effective rate of interest of 4.5% per year. The following payments are made in and out of a bank account:

800 paid in after 1 year;

250 paid out after 5 years;

800 paid in after 7 years.

Calculate the present value at time 4 years. (3)

£\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5) Heather wants to save up £4000 to pay for a holiday in 2 years' time. The effective rate of interest on her savings account is 4.3% per year.

She decides to make two equal payments into her savings account. She makes one payment now, and another payment in 1 year. Calculate the amount of each payment. (2)

£\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

6) Suppose that the effective rate of interest on your bank account are:

**3% per year between 1 January 2019 and 1 January 2020;**

**1.25% per half year between 1 January 2020 and 1 January 2021;**

**0.4% per month between 1 January 2021 and 1 January 2022.**

If you deposit £120 on 31st April 2019, calculate its accumulated value on 1st April 2021. (2)

£\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

7)

a) Briefly explain what bias is, in the context of sampling.

You must use the words "population" and "sample" in your answer. (1)

B) Give an example of a sample that would be biased. (1)

8) Lauren says "The number of lights on a Christmas tree is given by

https://lh6.googleusercontent.com/bssYrUktRYCVrMoGaLNBpFUfRLTzIeqA9WaRdFCvQz08Tzye5b_f33OvcICgQNXiQ6DDHPoaSvUjvz_cEWU11PxM5EIMlhg3VpE9s2gtqkTS2V52oVKmIgUESPqNMPpwi0SuHMHZxYYQAXXXEbfhNp_OTsTnF2bs_f-jyUQR_XrZw4NK9go1d7Hw9_9Jkg

Where Height is the height in feet."

For this to be a consistent model, what unit would the "200" need to have? (1)

Key:

1. Consider at least 3 different taxes, state assumptions about life expectancy and at least one other assumption (e.g. income earnt, amount spent (for VAT)), process calculations, present answer combining different calculations.

2. C

3. A

4. 1374.74, 1374.75, 1374.73

5. 1877.19, 1877.18, 1877.2

6. 126.98

7. Sample not representative of population, some people more likely to be represented than others etc. Any example without a random sample- online poll when not everybody has internet, fiction books sampled when all books considered for the population, choosing friends rather than sampling student population etc. etc.

8. Lights/Foot