Statistics 6 – Sampling methods

Please **complete** this homework by _____. Start it early. If you can't do a question you will then have time to ask your teacher for help or go to a drop in session.

Section 1 – Review of previous topics. Please complete all questions.

**Q1.** Make x the subject of the formula $a = \dfrac{x+4}{x+2}$

Q2. Show that

a) $64^{-\frac{2}{3}} =$

b) $\left(3\frac{1}{16}\right)^{-\frac{3}{2}}$

Q3. Simplify $\sqrt{192} - \sqrt{108}$

Q4. Make b the subject of the formula $\dfrac{1}{a} = \dfrac{1}{b} + \dfrac{1}{c}$

Q5. On a particular day, a scientist recorded the air temperature at 8 different heights above sea level. The scatter diagram shows the air temperature, $y\,°C$, at each of these heights, $x$km, above sea level.

Air temperature at different heights above sea level

Height above sea level (km)
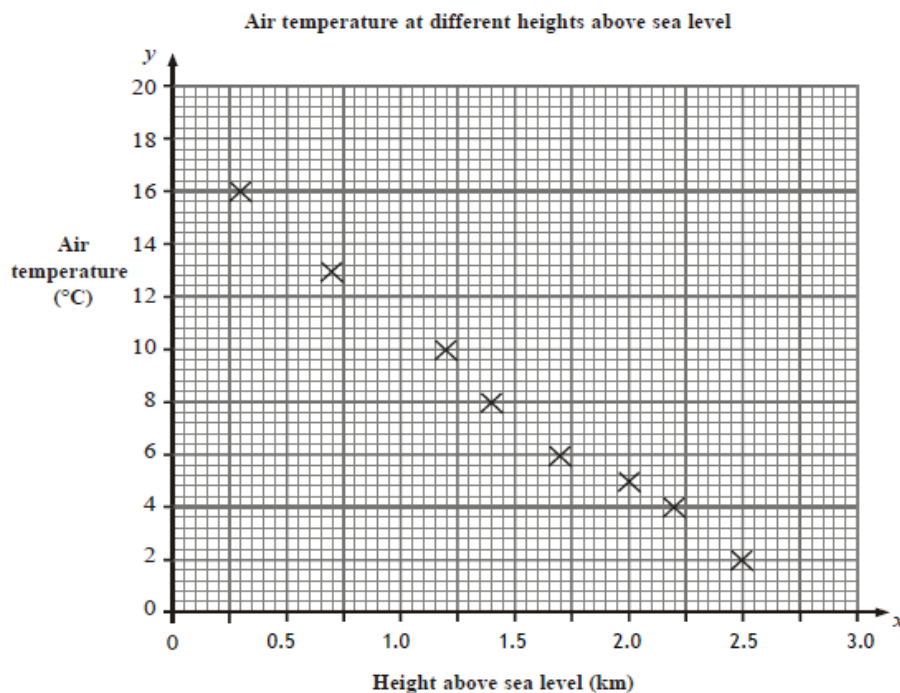
a) Using the scatter diagram, write down the air temperature recorded at a height of 2.5km above sea level.

b) Describe the correlation between the air temperature and the height above sea level.

c) Find an estimate of the height above sea level when the air temperature is $0\,°C$

Q1.

The table gives information about the number of 564 students doing extracurricular clubs at a secondary school to see how much time they spend on homework.

Club	Chess	Sports	Art	Music	Debating	Drama
Boys	24	85	43	36	25	54
Girls	16	80	50	41	28	82

A stratified sample is to be carried out of size 60.

a) How many Boys from chess club should be sampled?   *(3 marks)*

b) How many girls from drama should be sampled?   *(3 marks)*

Q2.

Harry is doing an investigation about Beijing and wants to take a random sample of 12 data points from the large data set.

He looks at the daily mean wind speed for Beijing in 2015. The list is enumerated from 1 to 184 and 12 three digit numbers are generated.

His list of random numbers are

192   138   289   986   004   103   736   420   075   602   387   138

a) State the name of the sampling method used by Harry.

b) Give one advantage of Harry using this sampling method

c) How many distinct data points do Harry's random numbers correspond to?

Harry wants to investigate the relationship between wind speed and cloud cover in Beijing in 2015.

d) Explain why Harry cannot use the large data set alone for this investigation.

(4 marks)

Q3.

a) Give an example of a discrete variable in the large data set.

James is studying the total amount of sunshine in Leeming in 2015
He wants a sample of 15 data points from the large data set.

b) Explain, in detail, how James can use simple random sampling to obtain a sample of size 15 from the large data set for his study.

James works out that the mean of his 15 data points is 5.6 hours.
He concludes that in 2015, Leeming had an average of 5.6 hours of sunshine each day.

c) Comment on the reliability of James' conclusion with reference to his sample size.

d) State one limitation of James using the large data set for his study.

(6 marks)

Q4. An inspector visits a large company to check their vehicles. The company has 4 large-load vehicles, 136 light vans and 21 cars.
The inspector decides to sample 10% of the vehicles. Each type of vehicle is to be represented in the sample.

(a) What is this kind of sampling procedure called? *(1 mark)*

(b) How many of each type of vehicle should be inspected? *(3 marks)*

Q5.

Louise is investigating the variation in daily mean temperature, t °C in Leuchars in July and August 2015.
She used the large data set to select a sample of size 20 from July and August data for 2015. Louise selected the first value using a random number from 1 to 4 and then selected every third value after that.

a) State the sampling technique Louise used.
b) From your knowledge of the large data set, explain why this process may not generate a sample of size 20. *(2 marks)*

Q6. Harriet is investigating the cost of return journeys by train. She plans to ask 10 passengers who are waiting at a station at midday the cost of their return journeys.
Give 2 reasons why she might get a biased result.

(2 marks)

Q7. Harry is going to ask 20 female and 20 male students at the college their opinion about the college ILC services.
a) What type of sampling method is Harry using?
b) Give one advantage of this method.
c) Suggest 2 improvements that Harry could make to the sampling method. *(4 marks)*

Section 3 –Large data set question. If you are aiming for a top grade, you should attempt these questions.

Using the' Large Data set' write down the number of days of 'moderate' and number of days of 'light' daily mean windspeed you would look at if you were taking a stratified sample of 20% of the data for Hurn from May – Oct 1987 and also for Hurn May – Oct 2015. Use a random sampling method to select this 20% from each category and find the average daily maximum gust speed for 1987 and 2015.