Problem Sheet 7

MA1202, Introductory Statistics

Due date - 08/05/2022, 23:59 BST

General information

Please upload your work to Blackboard as a single pdf document which is of good quality. Read the **Instructions on Scanning and Uploading handwritten work**. Please name your file *PS7*YourName.pdf.

Please submit to Blackboard only solutions to questions from Section 1.

Please prepare questions from Section 2 for Feedback Session - you are expected to participate in discussion of these questions, your input will contribute to the participation mark.

Section 1. [to be submitted to Blackboard by 08/05/22]

Question 1.

To assess the accuracy of a laboratory scale a standard weight that is known to weigh 1 gram is repeatedly weighed 4 times. The resulting measurements (in grams) are:

$$0.95,\ 1.02,\ 1.01,\ 0.98.$$

For the actual weight

i) write a pivot random variable that can be used for finding confidence interval, which distribution does this pivot have, explain your answer;

ii)find the 90% and 95% confidence intervals, state the intervals using notion of margin of error.

Question 2. The standard deviation of the heights of 16 male students chosen at random in a school of 1000 male students is 6 cm. Find the (a) 95% and (b) 99% confidence limits of the standard deviation for all male students at the school assuming that the heights of the students can be described by a normal distribution.

Section 2. [to be discussed in FS on 12/05/22]

Question 3

The management of a supermarket wanted to study the spending habits of its male and female customers. A random sample of 16 male customers who shopped at this supermarket showed that they spent an average of £55 with a standard deviation of 12. Another random sample of 25 female customers showed that they spent 85 with a standard deviation of 20.50. Assuming that the amounts spent at this supermarket by all its male and female customers were approximately normally distributed, construct a 90% confidence interval for the ratio of **variance** in spending for males and females, $\sigma^2_{male}/\sigma^2_{female}$.

Question 4

Of two similar groups of patients, A and B, consisting of 50 and 100 individuals, respectively, the first was given a new type of sleeping pill and the second was given a conventional type. For the patients in group A, the mean number of hours of sleep was 7.82 with a standard deviation of 0.24 h. For the patients in group B, the mean number of hours of sleep was 6.75 with a standard deviation of 0.30 h.

Find the 95% confidence limits for the difference in the mean number of hours of sleep induced by the two types of sleeping pills.