**West Coast Collaborative**

**Mathematics**

**Specialist Unit 4 2018**

**Investigation 3: Sample Means**

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Investigation 3: Sample Means (Calculator-assumed)**

**Extended investigation Part 2: In-class validation (33 marks) Time: 35 minutes**

Note: For .

For .

**Question 1 (3 marks)**

By determining the amount of fat for a random sample of 50 hamburgers of a particular fast food chain, it was determined that a 95% confidence interval for the population mean fat content  in hamburgers served by this fast food chain is grams.

Answer the following questions with “Yes,” “No,” or “Cannot tell” and justify your answer.

(a) Does the population mean lie in the interval ? (1)

(b) Does the sample mean lie in the interval ? (1)

(c) For a lesser confidence, say, 90%, will the confidence interval calculation from the same data produce an interval wider than ? (1)

**Question 2 (3 marks)**

Given that a 95% confidence interval for the population mean calculated using a sample of size 72 from a uniform distribution is , determine the sample mean and the population standard deviation.

**Question 3 (2 marks)**

The following diagrams illustrate the distribution of  for samples of different sizes taken from a population . Given , identify the distribution of  for samples of size 10, 25 and 50.

Diagram A Diagram B

Diagram C

**Question 4 (7 marks)**

Random samples of size ninety are taken from each of the following distributions and the sample mean is calculated. Find, in each case, the probability that the sample mean is less than .

(a)  is the number of ones observed on the uppermost face of an unbiased die after it is rolled eighteen times. (4)

(b)  is distributed uniformly throughout the range . (3)

**Question 5 (13 marks)**

(a) The distribution of the random variable  is and  is the mean of a random sample of size drawn from this distribution. Assuming that is large, find the value of given that . (7)

(b) The distribution of a random variable  is . A large number of random samples of size are taken from this distribution. Approximately 90% of the sample means are less than . Estimate . (6)

**Question 6 (5 marks)**

The time taken to admit each theatre-goer waiting in a queue for a show is a random variable with mean 11 seconds and a standard deviation of 4 seconds. Determine the probability that a random sample of 70 theatre-goers for this show will take between 12 and 13 minutes to all be admitted to the theatre.

**End of Questions**