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**Mathematics Specialist  
YEAR 12**

**Investigation 4 – Sample Means**

**Semester 2 2017**

**In-Class Validation Test**

**Time allowed:** 35 minutes

**Marks Available:** 33 marks

**Materials required:** Writing implements, correction fluid/tape or eraser, ruler, Scientific or CAS calculator, one double sided unfolded A4 page of notes.

**Instructions:**

1. Write your answers in the spaces provided in this Question/Answer Booklet.
2. **Show all your working clearly in preparation for the Validation Test**. Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks. If you repeat an answer to any question, ensure that you cancel the answer you do not wish to have marked.

Note: For .

For .

1. (3 marks)  
   By determining the amount of fat for a random sample of 64 hamburgers of a particular fast food chain, Patty 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.

1. Does the population mean lie in the interval ? [1]
2. Does the sample mean lie in the interval ? [1]
3. For a greater confidence, say, 99%, will the confidence interval calculation from the same data produce an interval narrower than ? [1]
4. (3 marks)  
   Given that a 95% confidence interval for the population mean calculated using a sample of size 30 from a uniform distribution is , determine the sample mean and the population standard deviation.
5. (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 5, 15 and 50.

Diagram A Diagram B

Diagram C

1. (7 marks)  
   Random samples of size forty 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 4.5.
2.  is the number of heads obtained when an unbiased coin is tossed ten times. [4]
3.  is distributed uniformly throughout the range . [3]

1. (13 marks)
2. 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)
3. 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 5.14. Estimate . (6)
4. (5 marks)  
   The time that customers take to complete their transaction at an ATM is a random variable with mean 3 minutes and standard deviation 0.6 minutes. Determine the probability that a random sample of 40 customers will take between 90 and 125 minutes to complete all their transactions.

**End of Validation Test**

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You may use this space to extend or re-attempt an answer to a question or questions and should you do so then number the question(s) attempted and cross out any previous unwanted working.

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