 Methods Unit 4 Test 5, 2017

(Calculator Free) Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time: 18 minutes Marks: 18

1. [1, 2 marks]

Using the 68%, 95%, 99.7% rule, determine the following probabilities:

1. P(-2 < X < 1) where XN(0, 12)
2. P(X < 16) where XN(10, 22)

2. [1, 3, 2 marks]

A Northern Districts football club has 1 200 members. Their ages are indicated below:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Age | 10 - 19 | 20 - 29 | 30 - 39 | 40 - 49 | 50+ |
| Number | 256 | 309 | 360 | 155 | 120 |

1. A sample of 60 members are to be surveyed about a change to the design on the Club jumper. The President uses an alphabetic list of members and selects every 20th member (i.e. 20, 40, 60 …..). Why is this sample not considered to be random?
2. Suggest another way this sample could be chosen such that it is random and more representative of the ages of members.
3. To be representative how many members from 30 to 39 years of age should be included in the sample?

3. [2, 1, 3, 1 marks]

To estimate the proportion of Perth’s population that has been to an AFL match this year, a sample of 100 people were surveyed. The confidence interval is 0.12 ≤ p ≤ 0.28.

1. State the margin of error.
2. State the sample proportion .



1. Show working to demonstrate that z = 2.

d) If the confidence interval was increased to 99% (that is, z = 2.576), would n need to increase or decrease?

4. [1, 1 marks]

The City of Joondalup is considering a change to the way rates are collected and wishes to gauge the opinion of ratepayers. Two methods are suggested. Explain why each may introduce bias.

a) Send a questionnaire to a randomly selected group of ratepayers, with a reply-paid envelope.

b) A person sets up a stall at Lakeside Joondalup over a week where people passing by are asked to fill in the questionnaire.



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Time: 36 minutes Marks: 36

5. [3 marks]

In a given normal distribution, P(x < 50) = 0.6

If the mean of this distribution is 48, determine the standard deviation, correct to 1 d.p.

6. [1, 1, 2, 2, 2, 2 marks]

The weights of eggs packaged by OzzieFresh Freerange Eggs are normally distributed with a mean of 50g and standard deviation of 4g.

1. What is the probability that an egg, chosen at random, will weigh more than 52g?
2. What is the probability that an egg, chosen at random, will weigh between 45g and 55g?
3. The heaviest 1% of eggs are called Jumbo and sold to restaurants. What is the minimum weight of an egg (to the nearest gram) for it to be called a Jumbo?
4. Ten eggs are chosen at random. What is the probability that they all weigh between 45g and 55g?
5. A further six eggs are chosen at random. What is the probability that at least 3 will weigh more than 52g?
6. A student wishes to simulate choosing 10 eggs (and recording their weight) using his calculator. He uses RandList(10, 40, 60) to do this. Comment on his method.

7. [2, 2, 2 marks]

1. For a sample of size 200 and a sample proportion of 0.3, determine the margin of error at the 99% confidence level.
2. Write the confidence interval.

c) Suppose we wished the margin of error to be below 0.05 instead of your answer above. Determine the minimum required sample size. (The confidence level is unchanged.)

8. [1, 2, 3 marks]

A survey is carried out to investigate the number of female teachers in Western Australian primary schools. In a survey of 1500 teachers, 969 are female.

a) Calculate the sample proportion of the teachers surveyed who were female.

b) Estimate the standard deviation of .

c) According to the Department of Education, the proportion of female teachers in WA primary schools is 68.1%. Comment on the survey results, based on a confidence level of 95%.

9. [2, 2 marks]

The speed limit on the freeway is 100 km/hr. When the speed of vehicles using the freeway on a particular day are compiled, it is found that the speed recorded is normally distributed with a mean of

97 km/hr and standard deviation of 3.5 km/hr.

a) Given 12 500 cars used the freeway that day, approximately how many were speeding?

b) It is found that the radar unit that was used to record the speed of vehicle that day was actually measuring 2 km/hr too high (that is, a car travelling at 100 km/hr was recorded as 102 km/hr) determine the probability that any given car on the freeway that day was actually travelling below the speed limit.

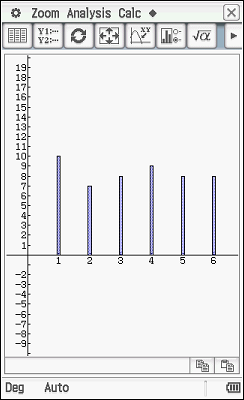
10. [3 marks]

A student creates a spinner where the long-term proportion of even numbers is 0.7

After 50 spins the student assumes that the sample distribution will approximate a normal distribution. Is she justified in making this assumption? Explain your answer.

11. [1, 1, 2 marks]

The screenshot below shows the result of a simulation of tossing a standard 6-sided die 50 times.



a) Describe the type of probability distribution related to this simulation.

b) Determine the proportion of even numbers recorded in this simulation.

c) This simulation is then repeated another 100 times, and the proportions *p* of even numbers for each simulation is graphed. Comment on the type of probability distribution involved and give a reason for your choice.