

2018 SAC 3 PREP 3

Question 1

The gestation period for pandas is approximately normally distributed with a mean of 135 days and standard deviation of 10 days.

- a. What percentage of pandas have a gestation period greater than 150 days. Give your answer to the nearest whole percent.

1 mark

- b. 80% of pandas have a gestation period greater than x days. Find the value of x to the nearest whole number. Include a diagram in your solution.

3 mark

It is known that 70% of people in a particular city are in favour of the pandas being kept in zoos. A random sample of 500 people was taken from this city and asked whether they were in favour of the pandas being kept in zoos.

- c. What is the probability, correct to four decimal places, that more than 360 people in the survey are in favour of the pandas being kept in zoos? (Do not use the normal approximation)

2 marks

- d. Find $\Pr(\mu - 2\sigma < X < \mu + 2\sigma)$. Give your answer correct to two decimal places. (Do not use the normal approximation).

3 marks

- f. The probability of selecting a person in favour of pandas being kept in zoos in another city is 0.45. What is the least number of people who should be asked their opinion, if we want to ensure that the probability of selecting at least one person in favour of pandas being kept in zoos is more than 0.8?

2 marks

It is known that 10% of a certain species has a gestation period of more than 200 days and 5% of the species less than 175 days. The gestation period is normally distributed.

- g. Find the mean and standard deviation of the gestation period for this species. Give your answer to the nearest whole number.

3 marks

Total 16 marks

Question 2

Xavier is a dental inspector. He has just opened a new dental practice and has been informed that in his local area, about 20% of young children have tooth decay. Xavier wants to conduct some of his own research.

- a. If Xavier randomly selected a sample of 100 children from his area:
- How many would be expected to have tooth decay?
 - Find the variance of the number of children with tooth decay.
 - What would be the probability, correct to three decimal places, of finding exactly the expected number of children with tooth decay in the sample?

1 + 2 + 2 = 5 marks

- b. Xavier would like to reduce the number of children with tooth decay.

Find the probability that the number of children in the sample with decay would be no more than 15. Give your answer correct to three decimal places.

1 mark

- c. Xavier examines all the children in the sample and finds 29 of them have tooth decay.

- i. Given 20% of students are thought to have tooth decay find $\mu \pm 2\sigma$ and interpret the interval $[\mu - 2\sigma, \mu + 2\sigma]$ Comment on whether Xavier could have cause to doubt the accuracy of information he was given.

2 marks

Total 8 marks

Question 3

A sample of six house elves is to be drawn from a large population in which 20% of the house elves are free.

- a. Find the probability that the sample contains:
- three free house elves
 - less than three free house elves

2 + 1 = 3 marks



- b. Another large population contains a proportion p of free house elves.
- Write down an expression in terms of p , for P , the probability that a sample of six contains exactly one or two free house elves.
 - Use a suitable method to determine a value of p for which P is greatest. Hence find the maximum value of P .

2 + 3 = 8 marks

Total 11 marks

Question 5

Suppose that, in flight, plane engines fail with probability q , independently of each other, and that a plane will complete the flight successfully if at least half of its engines are still working. For what values of q is a two-engine plane to be preferred to a four-engine plane?

MAKE SURE:

- You have included Assignment 3, the Probability test and SAC Prep 1 - 4 as part of your notes for the SAC.
- You have charged up your CAS calculator.
- Your bound notes DO NOT include worked solutions provided on go2. All revision solutions must be your own work.
- Good luck for the final SAC of 2018.