Exercises of Biostatistics for Animal science

2.1 In a barn thee are 9 cows. Their previous lactation milk records are:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Cow | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Milk(kg) | 3700 | 4200 | 4500 | 5300 | 5400 | 5700 | 6100 | 6200 | 6900 |

If we randomly choose a cow what is the probability: a) that it produced more than 5000 kg, b) that it produced less than 5000 kg? If we randomly choose two cows what is the probability: c) that both cows produced more than 5000 kg, d) that at least one cow produced more than 5000 kg, e) that one cow produced more than 4000 kg, and the other produced more than 5000 kg?

Solution: a) 2/3, b) 1/3, c) 5/12, d) 11/12, e) 3/4

3.1 The expected proportion of cows with more than 4000 kg milk in the standard lactation is 30%. If we buy 10 cows, knowing nothing about their previous records, what is the probability: a) that exactly 5 of them have more than 4000 kg milk yield, b) that at least two have 3.2 more than 4000 kg?

Solution: a) 0.10292, b) 0.38278

3.2 What is the ordinate of the standard normal curve for z=-1.05?

Solution: Ordinate=0.22988

3.3 assume a population of dairy cows with mean milk fat yield in a lactation of 180 kg, and standard deviation of 36 kg.

What are the theoretical proportion of cows: a) with less than 180 kg fat, b) with more than 250 kg fat, c) with less than 200 and more than 190 kg of fat, d) if the best 45% of cows are selected, what is the theoretical fat yield an animal would have to have to be selected, e) what is the expected mean of the best 45% of animals?

Solution: a) 0.5, b) 0.025921, c) 0.10133, d) 184.524, e) 211.664

3.4 Let the expected value of a variable y be E(y)=μ=50. Let the variance be Var(y)=σ2=10. Calculate the following expectations and variances:

a) E(2+y)= b) Var(2+y)=

c) E(2+1.3y)= d) Var(2+1.3y)=

e) E(4y+2y)= f) Var(4y+2y)=

Solution : a) 52, b) 10, c) 67, d) 16.9, e) 300, f) 360

3.5 assume a population of dairy cows with mean fat percentage of 4.1%, and standard deviation of 0.3%. What are the theoretical proportions of cows: a) with less than 4.0% fat, b) with more than 4.0% fat, c) with more than 3.5% and less than 4.5%, d) if the best 25% of cows are selected, what is the theoretical lowest value an animal would have to have to be included in the best 20%, e) what is the mean of the best 25% of cows?

Solution: a) 0.36944, b) 0.63055, c) 0.88604, d) 4.30235, e) 4.48133

5.1 Using the sample from the exercise 1.1, calculate the confidence interval for the population.

Solution: (26.0161; 27.2339)

5.1 Using the sample from the exercise 1.3, calculate the confidence interval for the population.

Solution: (19.0322; 21.1417)

5.1 Using the sample from the exercise 1.4, calculate the confidence interval for the population.

Solution: (25.1200572; 30.8799)

6.1 The mean of a sample is 24 and the standard deviation is 4. Sample size is n=50. Is there sufficient evidence to conclude that this sample dose not belong to a population with mean=25?

Solution: z=1.7678, P value=0.0833

6.2 For two groups, A and B, the following measurements have been recorded:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| A | 120 | 125 | 130 | 131 | 120 | 115 | 121 | 135 | 115 |
| B | 135 | 131 | 140 | 135 | 130 | 125 | 139 | 119 | 121 |

Is the difference between group means significant at the 5% level? State the appropriate hypotheses, test the hypotheses, and write a conclusion.

Solution: t=2.0202, df=16, P value=0.0605

6.3 Is the difference between the means of two samples A and B statistically significant if the following values are known:

|  |  |  |
| --- | --- | --- |
| Group | A | B |
| Sample size | 22 | 22 |
| Arithmetic mean | 20 | 25 |
| Sample standard deviation | 2 | 3 |

Solution: t=6.504

6.4 In q

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| The number of positive responses | 0 | 1 | 2 | 3 | 4 | 5 |
| Number of cows | 6 | 20 | 42 | 32 | 15 | 5 |

Solution: Chi-square=7.50, P value=0.0062

6.5 The progeny resulting from crossing two rabbit lines consist of 510 gray and 130 white rabbits. Is there evidence to conclude that the hypothetical ratio between gray and white rabbits is different than 3:1?

Solution: Chi-square=21.049, P value=0.0008

6.6 The expected proportion of cows with a defective udder is 0.2 (or 20%). In a sample of 60 cows, 20 have the udder defect. Is there sufficient evidence to conclude that the proportion in the sample is significantly different from the expected proportion?

Solution: z=2.582

6.7 Two groups of 60 sheep received different diets. During the experiment 18 and 5 sheep from the first and the second groups, respectively, experienced digestion problems. Is it appropriate to conclude that the number of sheep that were ill is the result of different treatments or the differences are accidental?

Solution: z=3.015

13.1 The objective of an experiment was to analyze the effects of four treatments on ovulation rate in sows. The treatments are PG600, PMSG, FSH and saline. A sample of 20 sows was randomly chosen and they were assigned to five pens. The treatments were randomly assigned to the four sows in each pen. Are there significant differences between treatments? The data are as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Pens | | | | |
| Treatment | Ⅰ | Ⅱ | Ⅲ | Ⅳ | Ⅴ |
| FSH | 13 | 16 | 16 | 14 | 14 |
| PG600 | 14 | 14 | 17 | 17 | 15 |
| PMSG | 17 | 18 | 19 | 19 | 16 |
| Saline | 13 | 11 | 14 | 10 | 13 |

Solution: MSA=26.6667; MSB=3.125; MSe=1.7917; F for treatment=14.88; P value=0.0002