ST2304 Exam 2020, marks scheme and comments on answers

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Problem 1: Lazy Mole Rats

Question 1

1 mark. Correct answer: The value of the parameter that makes the data most likely

Question 2

1 mark. Correct answer: -0.10 (about! I allow for some error)

Question 3

1 mark. Correct answer: 0.249

(not a well-calibrated question!)

Question 4

Up to 4 marks. Correct answer: No (2 marks) 2 marks for "insignificant p-value"

Question 5

1 mark. Correct answer: 0.39

Question 6

4 marks. Correct answer: 0.10 to 0.69

Question 7

1 mark. Correct answer: 41%

Question 8

1 mark. Correct answer: Confirmatory

Question 9

4 marks. Correct answer: 2 for "yes, there's an effect" 2 for quoting p-value and other statistics

Question 10

2 marks. Correct answer: energy~mass*caste

Question 11

4 marks. Correct answer:

1 for saying the effect is there + 1 for some judgement of size (at worst, it is statistically significant), better giving the effect, and some sort of context.

2 marks for justifying their answer, e.g. by comparison to mass effect, or (possibly) with R^2

Greek Sheep

Question 12

1 mark. Correct answer: Exploratory

Question 13

1 mark. Correct answer: AIC

Question 14

2 marks. Correct answer: Area + PropPasture + Gods

Question 15

4 marks. Correct answer: 1 mark for "it has the lowest AIC." (or equivalent), 1 mark for citing it

2 marks for comparison to R2 (e.g. although model Y has a higher R2, it also has more parameters), and/or saying how close it is to others (e.g. "model Z has and AIC that is only 1 higher, but is a bit simpler, so we could consider that).

Question 16

2 marks. Correct answers:

Error has equal variance along line The relationship is linear There are no outliers

Question 17

2 marks. Correct answer: Normally distributed error (residuals) There are no outliers

Question 18

4 marks. Correct answer: Not great (2 marks):

1. one outlier (2 marks)
2. heteroscedasticity (2 marks)
3. Linearity OK (2 marks)
4. Might be one influential point? (2 marks)

Question 19

4 marks. Correct answer:

1. remove outlier? (2 marks)
2. Box-Cox transformation (2 marks)
3. Possibly remove largest point, if it's influential (2 marks)

Question 20

4 marks. Correct answer: 1. 2 marks: plot against predictors, to check linearity of response to that predictor(& outliers?) 1. 2 marks: plot Cook's D to check if there are influential points 1. 2 marks for other sensible suggestions

Question 21

1 mark. Correct answer: cloglog

Question 22

4 marks. Correct answer: 0.14 0.68

Question 23

4 marks. Correct answer: 0.13 0.67

Question 24

4 marks.

Correct answer: 1 mark: island 2, because it has the smallest probability + 2 if "but the difference is small (<1%)" 1 mark: doesn't matter, + 2 because the difference is small (<1%) 1 marks: the largest island, only if +2 because the probabilities are about the same, but on a larger island there are more caves to hide in (or something equivalent!) Also, 1 mark for noting that the difference is smaller than the standard error, so any differences could just be noise (or some equivalent statement).

Or, if a different answer is given, but it makes some sense and relies on the predictions, up to 4 mark

Note: One student suggested that they would prefer Island 1 because the probabilities were almost the same, and on Island 1 there was more pasture, so it would be easier to see cyclops from a distance, and be able to throw sheep at them an run away. This was an excellent (if unexpected answer): they had assessed the data and used it to justify their answer.