S1 Revision Clock

1

1. (a) Write down two reasons for using statistical models.

(2)

(b) Give an example of a random variable that could be modelled by

(i) a normal distribution,

(ii) a discrete uniform distribution.

(2)

(Total 4 marks)

2

2. A fair die has six faces numbered 1, 2, 2, 3, 3 and 3. The die is rolled twice and the number showing on the uppermost face is recorded each time.

Find the probability that the sum of the two numbers recorded is at least 5.

(Total 5 marks)

3

3. A young family were looking for a new 3 bedroom semi-detached house. A local survey recorded the price x, in £1000, and the distance y, in miles, from the station of such houses. The following summary statistics were provided

$$S_{xx} = 113\,573,\ S_{yy} = 8.657,\ S_{xy} = -808.917$$

(a) Use these values to calculate the product moment correlation coefficient.

(2)

(b) Give an interpretation of your answer to part (a).

(1)

Another family asked for the distances to be measured in km rather than miles.

(c) State the value of the product moment correlation coefficient in this case.

(Total 4 marks)

4 & 5

4. The weights of bags of popcorn are normally distributed with mean of 200 g and 60% of all bags weighing between 190 g and 210 g.

(a) Write down the median weight of the bags of popcorn.

(1)

(b) Find the standard deviation of the weights of the bags of popcorn.

(5)

A shopkeeper finds that customers will complain if their bag of popcorn weighs less than 180 g.

(c) Find the probability that a customer will complain.

(3)
(Total 9 marks)

6

5. An experiment carried out by a student yielded pairs of (x, y) observations such that

$\bar{x} = 36, \quad \bar{y} = 28.6, \quad S_{xx} = 4402, \quad S_{xy} = 3477.6$

(a) Calculate the equation of the regression line of y on x in the form $y = a + bx$. Give your values of a and b to 2 decimal places.

(3)

(b) Find the value of y when $x = 45$.

(1)
(Total 4 marks)

7

6. A discrete random variable is such that each of its values is assumed to be equally likely.

(a) Write down the name of the distribution that could be used to model this random variable.

(1)

(b) Give an example of such a distribution.

(1)

(c) Comment on the assumption that each value is equally likely.

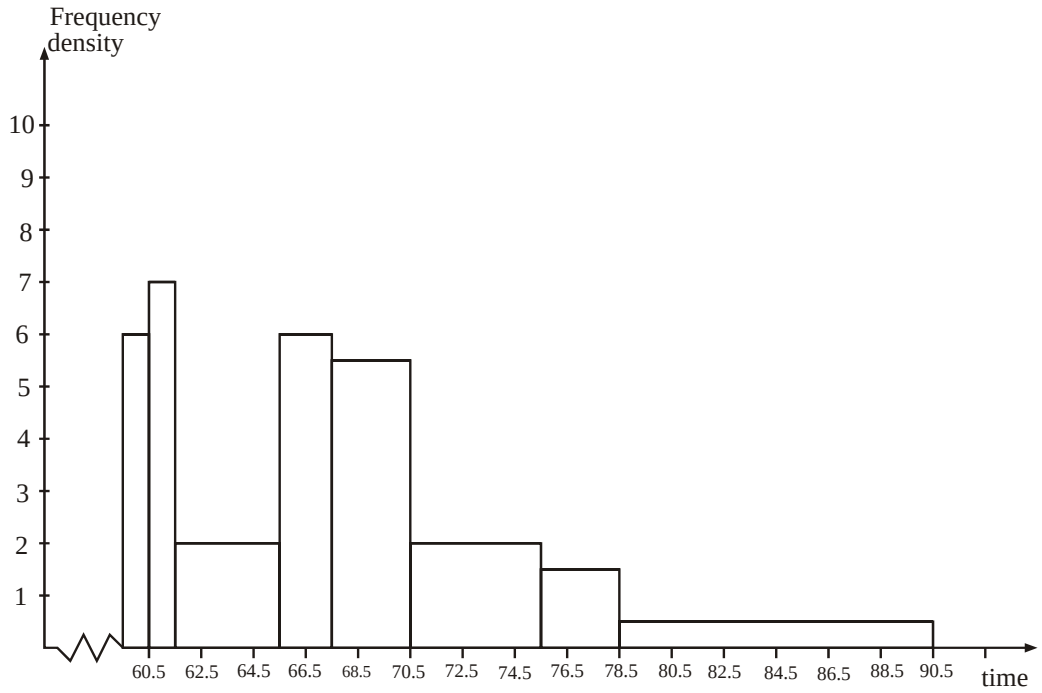
(2)

(d) Suggest how you might refine the model in part (a).

(2)
(Total 6 marks)

8

7. The histogram below shows the time taken, to the nearest minute, for 140 runners to complete a fun run.



Use the histogram to calculate the number of runners who took between 78.5 and 90.5 minutes to complete the fun run.

(Total 5 marks)

9

8. The random variable X has probability function

$$P(X = x) = kx, \qquad x = 1, 2, ..., 5.$$

(a) Show that $k = \frac{1}{15}$.

(2)

Find

(b) $P(X < 4)$,

(2)

(c) $E(X)$,

(2)

(d) $E(3X - 4)$.

(2)

(Total 8 marks)

10

9. The lifetimes of batteries used for a computer game have a mean of 12 hours and a standard deviation of 3 hours. Battery lifetimes may be assumed to be normally distributed.

Find the lifetime, t hours, of a battery such that 1 battery in 5 will have a lifetime longer than t.

(Total 6 marks)

11 & 12

10. A second hand car dealer has 10 cars for sale. She decides to investigate the link between the age of the cars, x years, and the mileage, y thousand miles. The data collected from the cars are shown in the table below.

Age, x (years)	2	2.5	3	4	4.5	4.5	5	3	6	6.5
Mileage, y (thousands)	22	34	33	37	40	45	49	30	58	58

[You may assume that $\sum x = 41, \sum y = 406, \sum x^2 = 188, \sum xy = 1818.5$]

(a) Find S_{xx} and S_{xy}.

(3)

(b) Find the equation of the least squares regression line in the form $y = a + bx$. Give the values of a and b to 2 decimal places.

(4)

(c) Give a practical interpretation of the slope b

(1)

(d) Using your answer to part (b), find the mileage predicted by the regression line for a 5 year old car.

(2)

(Total 10 marks)

Bonus

11. The events A and B are such that $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{3}$ and $P(A \cap B) = \frac{1}{4}$.

(a) Represent these probabilities in a Venn diagram.

(4)

Hence, or otherwise, find

(b) $P(A \cup B)$,

(1)

(c) $P(A \mid B')$

(2)

(Total 7 marks)