Solomon Practice Paper

Statistics S2 – B

Time allowed: 90 **minutes**

Question	Points	Score
1	5	
2	9	
3	13	
4	13	
5	17	
6	18	
Total:	75	

Centre: www.CasperYC.club

Name:

Teacher:

How I can achieve better:

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Last updated: July 14, 2025

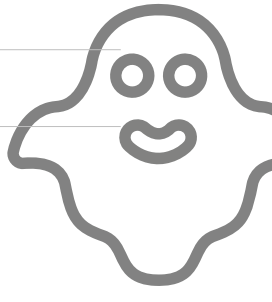
1. (a) Explain what you understand by the term sampling frame when conducting a sample survey. [1]

   (b) Suggest a suitable sampling frame and identify the sampling units when using a sample survey to study [4]

   i. the frequency with which cars break down in the first 3 months after being serviced at a particular garage,

   ii. the weight loss of people involved in trials of a new dieting programme.

Total: 5



2. An ornithologist believes that on average 4.2 different species of bird will visit a bird table in a rural garden when 50g of breadcrumbs are spread on it.

   (a) Suggest a suitable distribution for modelling the number of species that visit a bird table meeting these criteria. [1]

   (b) Explain why the parameter used with this model may need to be changed if [2]

      i. 50g of nuts are used instead of breadcrumbs,

      ii. 100g of breadcrumbs are used.

   A bird table in a rural garden has 50g of breadcrumbs spread on it.
   Find the probability that

   (c) exactly 6 different species visit the table, [2]

   (d) more than 2 different species visit the table. [4]

Total: 9

3. In a test studying reaction times, white dots appear at random on a black rectangular screen. The continuous random variable X represents the distance, in centimetres, of the dot from the left–hand edge of the screen. The distribution of X is rectangular over the interval $[0, 20]$.

   (a) Find $\Pr(2 < X < 3.6)$. [2]

   (b) Find the mean and variance of X. [3]

   The continuous random variable Y represents the distance, in centimetres, of the dot from the bottom edge of the screen. The distribution of Y is rectangular over the interval $[0, 16]$. Find the probability that a dot appears

   (c) in a square of side 4 cm at the centre of the screen, [4]

   (d) within 2 cm of the edge of the screen. [4]

Total: 13

4. It is believed that the number of sets of traffic lights that fail per hour in a particular large city follows a Poisson distribution with a mean of 3.
   Find the probability that

   (a) there will be no failures in a one–hour period, [1]

   (b) there will be more than 4 failures in a 30–minute period. [3]

   Using a suitable approximation, find the probability that in a 24–hour period there will be

   (c) less than 60 failures, [5]

   (d) exactly 72 failures. [4]

Total: 13

5. Six standard dice with faces numbered 1 to 6 are thrown together.
   Assuming that the dice are fair, find the probability that

   (a) none of the dice show a score of 6, [3]

   (b) more than one of the dice shows a score of 6, [4]

   (c) there are equal numbers of odd and even scores showing on the dice. [3]

   One of the dice is suspected of being biased such that it shows a score of 6 more often than the other numbers. This die is thrown eight times and gives a score of 6 three times.

   (d) Stating your hypotheses clearly, test at the 5% level of significance whether or not this die is biased towards scoring a 6. [7]

Total: 17

6. The continuous random variable X has the following probability density function:

$$\mathrm{f}(t) = \begin{cases} \frac{1}{6}x, & 0 \leq x \leq 2, \\ \frac{1}{12}(6-x), & 2 \leq x \leq 6, \\ 0, & \text{otherwise.} \end{cases}$$

(a) Sketch $\mathrm{f}(x)$ for all values of x. [4]

(b) State the mode of X. [1]

(c) Define fully the cumulative distribution function $\mathrm{F}(x)$ of X. [9]

(d) Show that the median of X is 2.536, correct to 4 significant figures. [4]

Total: 18