SAMPEL PERCUMA

Kertas Percubaan STPM Semester 3 Mathematics T

Set penuh: Kertas Percubaan STPM

Semester 3 · 10 subjek (2024)

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2024-3-MEL-MUNSHI ABDULLAH

PEPERIKSAAN PERCUBAAN SEMESTER 3 KOHORT 2024 : MATEMATIK T (954/3)

Duration time : One and a half hours

SECTION A *[45 marks] : Answer* ***all*** *questions in this section.*

1. The following back-to-back stem-and-leaf diagram shows the annual salaries of a group of 39 females and 39 males.

Females		Males
5 2 0 0	20	3
9 8 8 7 6 4 0 0 0	21	0 0 7
8 7 5 3 3 1 0 0	22	0 0 4 5 6 6
6 4 2 1 0 0	23	0 0 2 3 3 5 6 7 7
7 5 4 0 0 0	24	0 1 1 2 5 5 6 8 8 9
9 5 0 0	25	3 4 5 7 7 8 9
5 0	26	0 4 6

Key: 5|20 means RM20 500 Key: 20|3 means RM20 300

a) Find the median and the quartiles of the females' salaries. [3m]

You are given that the median salary of the males is RM24 000, the lower quartile is RM22 600 and the upper quartile is RM25 300.

b) Draw a pair of box-and-whisker plots in a single diagram on the graph paper to represent the data. [4m]

2. Given A and B are two events such that $P(A) = 0.42$, $P(B|A) = 0.23$ and $P(A' \cap B) = 0.35$.

a) Find $P(A \cap B)$ [1m]

b) Find $P(B)$ and hence, calculate $P[(A \cup B)']$. [4m]

3. At a flower pot kiln , 20 % of the pots produced are cracked .

(a) Find the smallest value of n if there is a probability of at least 0.85 that a random sample of n flower pots produced by the kiln, will contain at least one cracked pot. [5m]

(b) Using a suitable approximation, estimate the probability that there will be at most 349 cracked pots out of 2000 pots produced by the kiln. [4m]

4. A random sample of 100 mangoes is taken from a farm. The mass x, in g, of each mango is weighed. The results are summarized by $\sum x = 3425$ and $\sum x^2 = 124025$.

(a) Calculate unbiased estimates for the population mean and variance of the masses of the mangoes in the farm. [3m]

(b) Determine a 95% confidence interval for the mean mass of the mangoes in the farm. Interpret your answer. [5m]

5 An institute conducts a study of annual number of kilowatt-hours used by various homes appliances. It is claimed that an air conditioner uses an average of 520 kWh of electricity per year. A random sample of 50 homes indicates that an air conditioner uses an average of 495 kWh of electricity per year with a standard deviation of 132 kWh. At the 5% level of significance, test whether an air conditioner's annual electrical usage is less than 520 kWh considering that it is normally distributed. [7m]

6 In the Mendel's peas experiments, the results of a sample of 768 pea plants produced in the lab are observed and recorded. The colours and the shapes of the pea are grouped in the table below.

Round and Yellow	Wrinkled and Yellow	Round and Green	Wrinkled and Green
418	153	142	55

According to Mendel's Genetcs theory, the expected figures follows the ratio 9 : 3 : 3 : 1.

Perform a χ^2 goodness-of-fit test, at the 10% significance level whether the sample supports the claim. [9m]

***Section B** [15 marks] : Answer only **one** question in this section.*

7. A continuous random variable, X has the following probability density functions.

$$f(x)=\begin{cases} kx & , \quad 0 \le x < 2 \\ \frac{k}{2}(6-x) & , \quad 2 \le x < 6 \\ 0 & , \quad \text{otherwise} \end{cases}$$

a) Calculate the value of k. [3m]

b) Find the mean of X. [3m]

c) If $P(X \le m) = \frac{5}{8}$, determine the value of m. [5m]

d) By using the value of m obtained in (c), show that $P(| X - m | > 2) = \frac{1}{8}$. [4m]

8. A school management plans to install a water dispenser in the school to encourage the students to drink water. A teacher was assigned to conduct a survey to find the proportion of students who bring drinking water to school. In a random sample pf 400 students survey, 236 students brought drinking water to school.

a) Find the unbiased estimate for the population proportion of the students who brought drinking water to school. [1m]

b) Obtain a 95% confidence interval for the population proportion of the students who brought drinking water to school. [4m]

c) The school management will install a water dispenser if less than 60 % students bring drinking water to school. Perform a test, at 5 % significance level, to determine whether the school management should install a water dispenser. [6m]

d) Determine the smallest sample size which should be taken in order to obtain 95% confidence that the difference of the sample proportion and population proportion is within 0.04. [4m]

2. Given A and B are two events such that $P(A) = 0.42$, $P(B|A) = 0.23$ and $P(A' \cap B) = 0.35$.

   a) Find $P(A \cap B)$ [1m]

   b) Find $P(B)$ and hence, calculate $P[(A \cup B)']$. [4m]

No	Solution	Mark	Remark
2a	$P(B\|A) = \frac{P(B \cap A)}{P(A)}$ $0.23 = \frac{P(A \cap B)}{0.42}$ $P(A \cap B) = 0.23 \times 0.42 = 0.0966$	 A1	
2b	$P(B) = P(A' \cap B) + P(A \cap B)$ $= 0.35 + 0.0966$ $= 0.4466$ $P[(A \cup B)'] = 1 - P(A \cup B)$ $= 1 - (0.42 + 0.4466 - 0.0966)$ $= 0.23$	 M1 A1 M1 A1	
Q2	Total	5	

TAMAT SAMPEL

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