SAMPEL PERCUMA

Kertas Trial STPM Semester 3 Mathematics T Perlis 2024

Set penuh: Kertas Percubaan STPM

Semester 3 · 10 subjek (2024)

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Sampel bermula di muka surat sebelah

6 Two hundred adult smokers are asked whether they agree to quit smoking. The results are shown in the table below.

Response	Strongly agree	Agree	Disagree	Strongly disagree
Number of smokers	97	55	33	15

A researcher claims that the smokers' response towards quit smoking is in the ratio of $4:3:2:1$. Determine, at the 5% significance level, whether the researcher's claim is justified.

[8]

Section B (15 marks)

Answer **any one** *questions in this section.*

7. Three balls are chosen at random one by one from a box containing four red and three yellow balls.

(a) If the balls are chosen without replacement and X represents the number of yellow balls chosen.

(i) Construct a probability distribution table for X [4]

(ii) Calculate the mean and variance of X [5]

(b) If the balls are chosen with replacement and Y represents the number of yellow balls chosen,

(i) State the distribution of Y [2]

(ii) Calculate the mean and variance of Y [4]

8 A supermarket repacks 100 kg of green beans into small packets of 200 g each. The weights of the packets have a distribution with mean 202 g and standard deviation 3.5 g. It is known that 95% of the packets weigh at least 200 g. A random sample of 100 packets is selected from the latest batch of packaging.

(a) Determine the distribution of sample proportion of packets that weigh at least 200g [3]
(b) Find the probability that not more than 90 % of the packets that weigh at least 200 g [3]
(c) State with the reason the distribution of the sample mean for the weights of the small packets. [3]
(d) Find the probability that the mean weight of small packets of the sample is between 201 g and 203 g. [4]
(e) State the effect on the probability in (d) if the sample size is reduced. Justify your answer. [2]

2 Two events, M and W, are such that
$\mathrm{P}(M) = 0.3$,
$\mathrm{P}(W|M) = 0.5$ and
$\mathrm{P}(W|M') = 0.25$

(a) Find
(i) $\mathrm{P}(M \cap W)$ [1]
(ii) $\mathrm{P}(M' \cap W)$ [1]
(iii) $\mathrm{P}(W)$ [2]
(iv) $\mathrm{P}(M \cup W)$ [2]

(b) State a reason why the events *M* and *W* are
(i) Not mutually exclusive. [1]
(ii) dependent [1]

2	(a)	(i)	$\mathrm{P}(M \cap W) = P(M) \times P(W\|M)$	B1		**6**
			$= 0.3 \times 0.5 = 0.15$			
		(ii)	$\mathrm{P}(M' \cap W) = P(M') \times P(W\|M')$	B1		
			$= 0.7 \times 0.25 = 0.175$			
		(iii)	$P(W) = \mathrm{P}(M \cap W) + \mathrm{P}(M' \cap W)$	M1		
			$= 0.15 + 0.175$			
			$= 0.325$	A1		
		(iv)	$\mathrm{P}(M \cup W) = P(M) + \mathrm{P}(M' \cap W)$	M1		
			$= 0.30 + 0.175$			
			$= 0.475$	A1		
			Alternative			
			$\mathrm{P}(M \cup W) = P(M) + P(W) + \mathrm{P}(M \cap W)$	M1		
			$= 0.30 + 0.325 - 0.15$			
			$= 0.475$	A1		

2	(b)	(i)	Cause $\mathrm{P}(M \cap W) = 0.15\ (\neq 0)$	B1	either	**2**
			Cause $\mathrm{P}(M) + P(W) = 0.625\ [\neq \mathrm{P}(M \cup W)]$			
			Cause $P(W\|M) \neq 0$			
		(ii)	Cause $P(W\|M) \neq P(W\|M')$	B1	either	
			Cause $\mathrm{P}(M) \times P(W) = 0.0975\ [\neq \mathrm{P}(M \cap W)]$			
						8

3 The cumulative probability distribution of a discrete random variable, X is given by

$$\mathrm{P}(X \le x) = \begin{cases} 0, & x \le 0 \\ kr, & k \le x < k+2, \text{for } k = 1,3,5,7, \\ 8r & x \ge 9 \end{cases}$$

(a) Show that $\mathrm{r} = \frac{1}{8}$. [2]

(b) Find $\mathrm{P}(2 < X \le 5)$ and $\mathrm{P}(X \ge 3)$ [3]

(c) Determine the probability distribution of X, and deduce its mean. [4]

3	(a)	$8\,\mathrm{r} = 1$	M1		**2**
		$r = \frac{1}{8}$	A1		
	(b)	$P(2 < x \le 5) = P(x \le 5) - P(x \le 2)$			**3**
		$= 5\left(\frac{1}{8}\right) - \frac{1}{8}$	M1		
		$= \frac{1}{2}$	A1		
		$P(x \ge 3) = 1 - P(x < 3)$			
		$= \frac{7}{8}$	B1		
	(c)	x: 1, 3, 5, 7, 9 $P(X = x)$: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{4}$, $\frac{1}{4}$, $\frac{1}{8}$ or $P(X = x) = \begin{cases} \frac{1}{8} & x = 1,9 \\ \frac{1}{4} & x = 3,5,9 \end{cases}$	M1 M1 A1	1 st row correct At least two pairs correct All correct	**4**
		Mean $= 5$	B1	Calculation shown B0	
					9

4 The weight of male students of a certain college are normally distributed with mean of 63 kg and a standard deviation of 6.9 kg. A random sample size of 36 male students is chosen from the college.

(a) Determine the sampling distribution for the mean weight of the sample. [3]
(b) Find the probability that the mean weight of the sample is more than 65 kg. [3]

4	(a)	$\bar{x} \sim N\left(63, \frac{6.9^2}{36}\right)$	B1	$\bar{x}$ and normal distribution	**3**
			B1	Two parameter with $\mu = 63$ seen	
			B1	$\frac{6.9^2}{36}$ or $\frac{6.9}{\sqrt{36}}$ or 1.15^2 or 1.15 or 1.3225	

4	(b)	$P(\bar{x} > 65) = P\left(z > \frac{65-63}{1.15}\right)$	M1/	Standardization "his' parameter	**3**
		$= 1 - P(z < 1.7391)$	M1/		
		$= 0.04102$ @ 0.04101 @ 0.041	A1		
					6

If do not use $\bar{x}$ or Z then NWW-1

TAMAT SAMPEL

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