MODULE 2 STATISTICS

QUESTION 1

In a large restaurant an average of 2 out of every 5 customers ask for water with their meal.

1.1 A random sample of 10 customers is selected.

(a) Write down the probability mass function if the random variable X is the number of customers who ask for water with their meal. (5)

(b) Hence, calculate the probability that more than 3 ask for water with their meal. Give your answer to 3 decimal places. (10)

1.2 A second random sample of 50 customers is selected. The owner wants to determine the probability that more than 15 customers ask for water with their meal.

(a) Show that a normal approximation can be used to determine this probability. (2)

(b) Determine this probability using the normal approximation. (8)

1.3 How big a sample (n) should be used so that there is a 90% chance that at least 1 customer will want to order a bottle of water with their meal? (9)

[34]

QUESTION 2

The discrete random variable, *R*, has the following probability distribution.

r	-2	0	a	4
$P(R=r)$	$0{,}3$	b	c	$0{,}1$

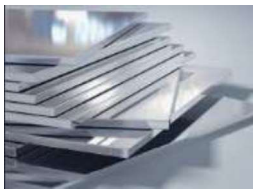
It is known that $E[R] = 0{,}2$ and $Var[R] = 3{,}56$. Find the values of a, b and c showing all your working out. (11)

[11]

QUESTION 3

A factory produces steel sheets whose weights Xkg, are such that $X \sim N(\mu; \sigma^2)$.

A random sample of these sheets is taken and a 95% confidence interval for μ is found to be $(29{,}74\,;\,31{,}86)$.



3.1 Find, to 2 decimal places, the standard error, $\frac{o}{\sqrt{n}}$ of the mean. (4)

3.2 Hence, find a 90% confidence interval for μ based on the same sample of sheets. Give your answers to 3 decimal places. (6)

[10]

QUESTION 4

The WHO decides to use an advertising campaign to encourage people to eat more healthily.

Before the campaign, the mean consumption of chocolate per person per week was known to be $66{,}5g$, with a standard deviation of $21{,}2g$.

After the campaign, a sample of 750 people revealed that the mean consumption of chocolate per person per week was $65{,}5g$.

Investigate, at the 10% level of significance, whether the advertising campaign has decreased the mean consumption of chocolate per person per week. Assume that an appropriate sampling method was used and that the consumption of chocolate is normally distributed.

(11)

[11]

QUESTION 5

5.1 Mrs Vermeulen has 7 different styles of jerseys in her cupboard for winter. The jerseys are all of a different colour, except for two, that are different styles but both are black.

(a) In how many different ways can she stack them on top of the other on a shelf? (2)

(b) In how many ways can she stack them so that there is **no** black jersey at the **bottom or the top or both**? (there can be a black jersey at the top **but not** the bottom, or at the bottom **but not** the top, or no black jersey at the **top and bottom**). (8)

5.2 Mrs Vermeulen has a secret jar containing her favourite Easter treats which she has saved and keeps in the cupboard behind her jerseys so that her family can't find them. The jar contains 20 marshmellow eggs, 15 mini Lindt bunnies, and 12 Cadbury Creme eggs.
If she removes three items from the jar at random, what is the probability that they are not all marshmellow eggs? Give your answer to 2 decimal places. (8)



[18]

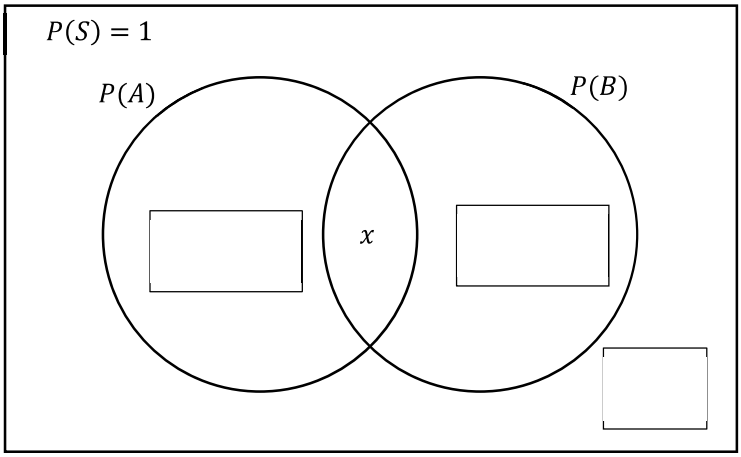
QUESTION 6

A sample of 200 households was obtained from a small town. Each household was asked to complete a questionnaire about their purchases of takeaway food.

A is the event that a household regularly purchases Indian takeaway food.
B is the event that a household regularly purchases Chinese takeaway food.

Of these households, 122 indicated that they did not regularly purchase Indian or Chinese takeaway food. It was observed that $P(B|A) = \frac{1}{4}$ and $P(A|B) = \frac{1}{10}$

6.1 **Using the above information**, complete the tree diagram below in terms of x. (12)



6.2 A household is selected at random from those in the sample. Find the probability that the household regularly purchases both Indian and Chinese takeaway food.

(4)
[16]

GRAND TOTAL: 100 marks