A-Level Applied Mathematics

Grade Grabber 2

Statistics Revision

Total Marks : 35

Question 1

Robin regularly plays disc golf at her local disc golf course.
On each visit, she models the number of holes where she scores above par, H, using a binomial distribution,

$$H \sim B(9,\ 0.7)$$

(a) From studying Robin's model,

(i) how many holes are there on the course ?

[1 mark]

(ii) what is the percentage probability that Robin scores above par on any given hole ?

[1 mark]

(b) Each time Robin plays, she tests to see if the probability that she scores above par has changed. Stating your hypotheses clearly, find the critical region for such a test at the 10% significance level.

[5 marks]

Question 2

S1 Examination Question from January 2013, Q7

Given that,

$$p(A) = 0.35, \qquad p(B) = 0.45 \qquad \textit{and} \qquad p(A \cap B) = 0.13$$

find

(a) $p(A \cup B)$

[2 marks]

(b) $p(A' \mid B')$

[2 marks]

The event C has $p(C) = 0.20$

The events A and C are mutually exclusive and the events B and C are independent.

(c) Find $p(B \cap C)$

[2 marks]

(d) Draw a Venn diagram to illustrate the events A, B and C and the probabilities for each region

[4 marks]

(e) Find $p([B \cup C]')$

[2 marks]

Question 3

The daily mean air temperature on the summit of Scotland's highest mountain, Ben Nevis, during April and May 2019 is summarised in the table below.

Daily mean temperature T, (°C)	Frequency
$-4 \leqslant T < 0$	8
$0 \leqslant T < 2$	16
$2 \leqslant T < 3$	12
$3 \leqslant T < 4$	14
$4 \leqslant T < 7$	9
$7 \leqslant T < 8$	2

A histogram was drawn.

The $0 \leqslant T < 2$ class interval was represented by a bar of width 1cm and height 12 cm

(a) Find the width and height of the bar representing the $4 \leqslant T < 7$ interval

[2 marks]

(b) Calculate an estimate for the mean and standard deviation of temperatures on the summit of Ben Nevis in April and May 2019

[3 marks]

(c) Use linear interpolation to find an estimate for the lower quartile of temperatures.

[2 marks]

(d) Estimate the number of days in April and May 2019 on which the temperature was higher than the mean plus one standard deviation.

[2 marks]

Question 4

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

$$p(X = x) = \begin{cases} k(5 - x) & x = 0,\ 1,\ 2,\ 3,\ 4 \\ 0 & \textit{otherwise} \end{cases}$$

(a) Determine the value of k

[2 marks]

(b) Determine,

(i)

$p(X = 0)$

[1 mark]

(ii)

$p(X \geqslant 3)$

[1 mark]

(iii)

$p(1 < X \leqslant 8)$

[1 mark]

(c) Explain why it would not be appropriate to draw a histogram of this distribution

[1 mark]

(d) Which one of the following describes the distribution,
Is it,

(i) Negatively Skewed ?

(ii) Symmetrical ?

(iii) Positively Skewed ?

[1 mark]