CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ

Autumn Examinations 2014/15

Module Title: Statistics &Probability

Module Code: **STAT 6000**

School: School of Computing & Mathematics

Programme Title:
B.Sc (Hons) in Software Development – Year 1
B.Sc (Hons) in Web Development – Year 1
B.Sc (Hons) in Software Development & Computer Networking – Year 1
B.Sc (Hons) in IT Management – Year 1
Bachelor of Science in Computing – Year 1
Higher Certificate in Science in Computing – Year 1

Programme Code:

KCOME_6_Y1	KCOMP_7_Y1	KITSP_7_Y1	KITMN_8_Y1
KWEBD_8_Y1	KSDEV_8_Y1	KDNET_8_Y1	

External Examiner(s): **Prof. E. Murphy**
Internal Examiner(s): **Dr. C. Carroll, Ms. P. Cogan, Mr. A. Daly, Mr. A. O'Connor, Ms. F. Wood**

Instructions: **Answer FOUR questions. All questions carry equal marks.**

Duration: **2 HOURS**

Sitting: Autumn 2015

Requirements for this examination:

Note to Candidates: Please check the Programme Title and the Module Title to ensure that you are attempting the correct examination.
If in doubt please contact an Invigilator.

Q.1

The data below shows the weekly amount spent by 32 employees of a company on fuel.

Weekly spend (€)

40	63	42	62	55	54	44	57
36	21	59	46	52	51	36	66
52	28	23	38	39	37	40	52
55	70	77	66	26	62	54	58

(a) Use a tally system to construct a cumulative frequency distribution table for the data, having 6 classes.

[4 marks]

(b) Draw an ogive to represent the data.

[7 marks]

(c) Use your ogive to estimate the median amount spent.

[3 marks]

(d) Verify your answer to part (c) using an appropriate formula for the median.

[5 marks]

(e) Use your ogive to estimate the percentage of people who spend between €50 and €65 on fuel each week.

[6 marks]

Q2.

Group A of students working on a project measured the amount of sugar in a variety of children's snacks. Their results are recorded in the table below.

Weight (g)	Frequency
10 but less than 20	6
20 but less than 25	4
25 but less than 35	16
35 but less than 50	18
50 but less than 55	6
55 but less than 65	5

(a) Calculate the mean and standard deviation of the distribution, correct to one decimal place.

[10 marks]

(b) Represent the data in a histogram using the graph paper provided.

[8 marks]

(c) Use the histogram to estimate the mode.

[3 marks]

(d) Group B performed a similar experiment. The mean of their data is 0.0276 kg with a standard deviation of 0.00966 kg. Comment on the spread of Group A's data versus the spread of Group B's data.

[4 marks]

Q.3

(a) John is looking for work he has applied for three different jobs, in three different companies named A, B and C. He will certainly accept one of the job offers he receives. He estimates the probability of a job offer from each company as follows:

$P(A) = \frac{1}{3}$ $P(B) = \frac{1}{5}$ $P(C) = \frac{1}{2}$

What is the probability that:

(i) John will get three job offers.
(ii) John gets only one Job offer.
(iii) John gets at least one job offer.

[10 marks]

(b) Marcin is interested in checking what proportion of websites visited by his employees, are work related. To do this he tracks their internet activity and has designed a site classifier to classify the sites as work related or not work related.

The classifier classifies 60% of sites as work related. 95% of the sites classified as work related are work related. However, 15% of the sites classified as not work related are actually work related.

(i) Using a tree diagram or otherwise, find the proportion of websites visited that are work related?

(ii) What is the probability that a work related site is classified as not work related?

[9 marks]

(c) A particular roulette wheel has 37 pockets numbered 0 to 36. The zero pocket is green, half the other pockets are red the remainder are black. The wheel is fair so the probability of the ball landing in any particular pocket is the same as any other.
A player makes two bets the first is a €1 bet that the ball will land on the 7 pocket, if he wins he will get €36 plus his stake back.
The second is a €1 bet that the ball will land on a black pocket, if he wins he will get €1 plus his stake back.

(i) What is the player's expected return on the first bet?
(ii) What is the player's expected return on the second bet?

[6 marks]

Q.4

(a) A recall of certain models of CAMKO cookers is taking place as they may have a design fault leading to production of dangerous levels of carbon monoxide. To date, 35% of cookers returned have been found to be faulty. Out of 10 cookers due for recall collection, what is the probability that

(i) 1 or 2 will be faulty?

(ii) more than 2 will be faulty?

[9 marks]

(b) Enquiries regarding these models of cookers are received by the manufacturers at an average rate of 16 per five-day week. Assuming a Poisson distribution, find the probability that on any given day the manufacturers receive

(i) 2 or 3 enquiries;

(ii) at most 3 enquiries. . **[7 marks]**

(c) Some customers have received compensation for damages caused by the faulty product. The level of compensation has been found to be approximately normally distributed with a mean of €5,800 and a standard deviation of €2,400.
Determine the proportion of claimants who receive

(i) between €5,000 and €7,000 in compensation;

(ii) €4000 at most.

[9 marks]

Relevant Formulae

Descriptive Statistics

Mean:

$$\bar{x} = \frac{\sum fx}{\sum f}$$

Standard Deviation:

$$s = \sqrt{\frac{\sum f(x-\bar{x})^2}{\sum f}} \qquad s = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$$

$$\text{Median} = L_M + C_M\left(\frac{\frac{1}{2}N - F_{M-1}}{f_M}\right) \qquad \text{Mode} = L_M + C_M\left[\frac{f_M - f_{M-1}}{2f_M - (f_{M-1} + f_{M+1})}\right]$$

Coefficient of Variation: $\frac{s}{\bar{x}} \times 100$ Coefficient of Skewness: $\frac{3(mean - median)}{st.dev}$

Expected Value: $E(x) = \sum_{i=1}^{n} x_i P(x_i)$

Binomial Distribution $\mathrm{P}(r,n) = {}^nC_r\, p^r q^{n-r} \equiv \binom{n}{r} q^{n-r} p^r$

Poisson Distribution $\mathrm{P}(r) = \frac{\lambda^r e^{-\lambda}}{r!}$: $\mathrm{P}(r) = \frac{\mu^r e^{-\mu}}{r!}$

Normal Distribution Standard Units $z = \frac{x-\bar{x}}{s} = \frac{x-\mu}{\sigma}$