

CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ

Autumn Examinations 2017/18

Module Title: Mathematics and Statistics for Marketing

Module Code: **STAT6012**

School: School of Business

Programme Title: Bachelor of Business (Hons) in Marketing
 Bachelor of Business (Hons) in International Business

Programme Code: **CR_MRKT_8**
 CR_BIBLA_8

External Examiner(s): **Prof. Michael Wallace**

Internal Examiner(s): **Dr. Mark Hartnett, Dr. Noreen Quinn and Ms. Grainne Read**

Instructions: **Answer ALL Questions.**

Duration: **2 HOURS**

Sitting: Autumn 2018

Instructions: Please ensure you write the name of your lecturer on the script.

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.

Question 1

a) Simplify the following:

$$\frac{(11x+7)}{3} \div \frac{5(11x+7)}{2x}$$

[4 marks]

b) A bottle of wine costs £9.95 in the UK and 11.15 Swiss Francs in Lausanne, Switzerland. How much cheaper is the wine in Switzerland? Give your answer in pounds to the nearest penny and use an exchange rate of £1 = CHF1.51. [3 marks]

c) The 60th percentile rank was 45 marks in an assessment. Explain. [3 marks]

d) Simplify the following

$$\frac{m+1}{n+1} \times \frac{x}{y}$$

[4 marks]

e) Round 1357.287 to ...

i) 3 significant figures

ii) 2 decimal places.

[4 marks]

f) In a sale a coat was reduced by 15%. The reduced sale price was €75 what was original price? [3 marks]

g) If event A is getting less than a 3 on a die, event B is getting at least a 4 on a die and event C is drawing a Jack from a deck of cards.

i) Are events A and C independent? Explain.

ii) Are events A and B mutually exclusive? Explain.

[6 marks]

h) Briefly explain the difference between a population and a sample. Give an example of each to illustrate the difference. [3 marks]

i) Calculate the mean, median and mode of the following data:

-9, -5, -2, 1, 5, 7, 7, 9, 15

[6 marks]

j) If $Q_3=67$ seconds, what does that mean.

[2 marks]

Total Marks = 40 marks

Question 2

- (a) Explain the key aspects of cluster sampling. [4 marks]
- (b) A box contains 20 marbles, 10 blue, 5 red, 3, green and 2 white. Three marbles are selected without replacement. What is the probability of selecting:
- (i) 3 red marbles? [4 marks]
- (ii) 3 white marbles? [4 marks]
- (c) 70% of house in a housing estate have a security alarm. It is found that 35% of owners of the alarmed houses also have a dog and 42% of the owners of the non-alarmed houses have a dog.
- (i) Construct a tree diagram showing all the outcomes and their probabilities. [4 marks]
- (ii) A house is selected at random. Calculate the probability that the house does not have a dog. [4 marks]
- (iii) If a randomly selected house is one of the houses that does not have a dog, what is the probability that the house does not have an alarm? [4 marks]
- (d) In a casino game, a player pays €6 to roll a single dice. If the player
- Rolls a 6, they win €8
 - Rolls a 5, they win €7
 - Rolls any other result, they win €4
- (i) Calculate the expected value of the game. [4 marks]
- (ii) If the game fair? [2 marks]

(Total 30 marks)

Question 3

(a) A group of 60 athletes had their resting pulse rates (in beats per minute) measured. The table summarises the results of the survey.

| Pulse Rate | 60-70 | 70-80 | 80-90 | 90-100 | 100-120 |
|------------|-------|-------|-------|--------|---------|
| Frequency | 5 | 8 | 22 | 20 | 5 |

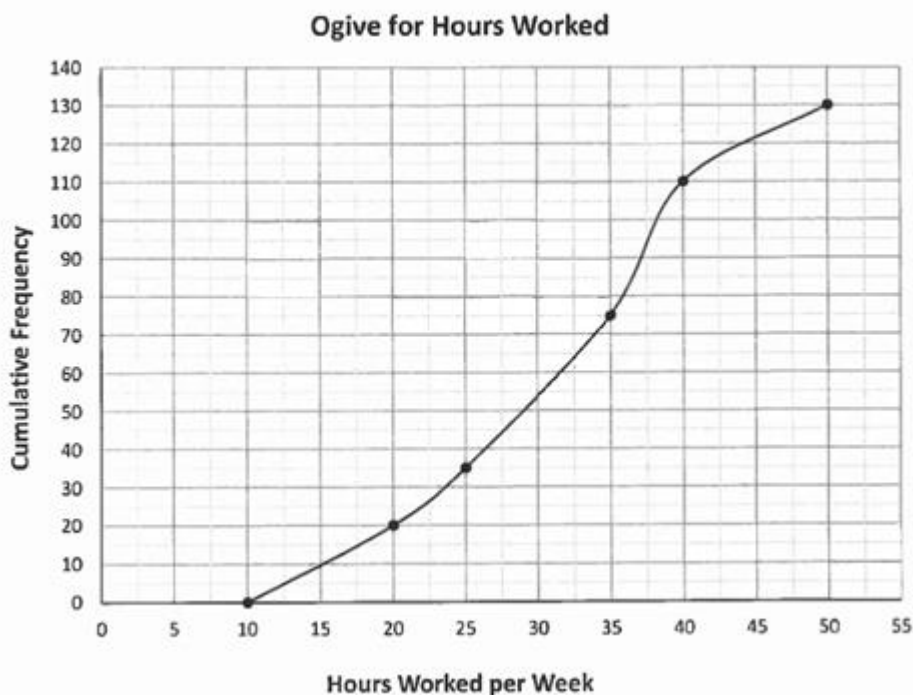
- Calculate the mean resting pulse rate, and the standard deviation from the mean. [8 marks]
- Represent the data on a histogram. [6 marks]
- Estimate the mode from the histogram, and use a formula to confirm your answer. [5 marks]
- Calculate the Coefficient of Variation. [2 marks]

(b) Topix Service stations has surveyed the number of hours worked per week by the employees in their Cork service stations. The results were used to draw the ogive in Figure 1, shown below:

Using Figure 1 and showing all your workings, answer the following:

- How many employees work in these Cork Topix service stations? [3 marks]
- Estimate the median number of hours worked by the employees. [3 marks]
- What percentage of employees work between 27.5 and 45 hours per week? [3 marks]

Figure 1:



Statistical Formulae

The Arithmetic Mean

$$\mu = \frac{\sum(fx)}{\sum f} \qquad \mu = a + c \left(\frac{\sum f \left(\frac{d}{c} \right)}{\sum f} \right)$$

Standard Deviation

$$\sigma = \sqrt{\frac{\sum f(x - \mu)^2}{\sum f}} \qquad \sigma = \sqrt{\frac{\sum(fx^2)}{\sum f} - \left(\frac{\sum(fx)}{\sum f} \right)^2} \qquad \sigma = a \sqrt{\frac{\sum f \left(\frac{d}{c} \right)^2}{\sum f} - \left(\frac{\sum f \left(\frac{d}{c} \right)}{\sum f} \right)^2}$$

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

$$\text{Mode} = L_M + C_M \left(\frac{f_M - f_{M-1}}{2f_M - (f_{M-1} + f_{M+1})} \right)$$

$$\text{Coefficient of Skewness} = \frac{3(\text{Mean} - \text{Median})}{\text{Standard Deviation}}$$

$$\text{Coefficient of Variation} = \left(\frac{\sigma}{\mu} \right) \times 100$$

Probability Formulae:

Conditional Probability:

$$P(A|B) = \frac{P(A, B)}{P(B)} = \frac{P(A \cap B)}{P(B)}$$

Expected Value:

$$E(x) = \sum_{i=1}^N x_i P(x_i)$$