

LOCATION SWANSEA

LLEOLIAD ABERTAWE

LEVEL 5

LEFEL 5

EXAMINATION PERIOD
MAY 2018

CYFNOD ARHOLIADAU
2018

MODULE CODE: M5X01771
RESEARCH METHODS & GIS

Environmental Conservation
(Statistical methods examination)

TIME: 2 HOURS

*Equipment or materials required – **formula booklets and calculators allowed***

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ALL answers and workings should be included in answer book

Answer ALL questions in section A and B

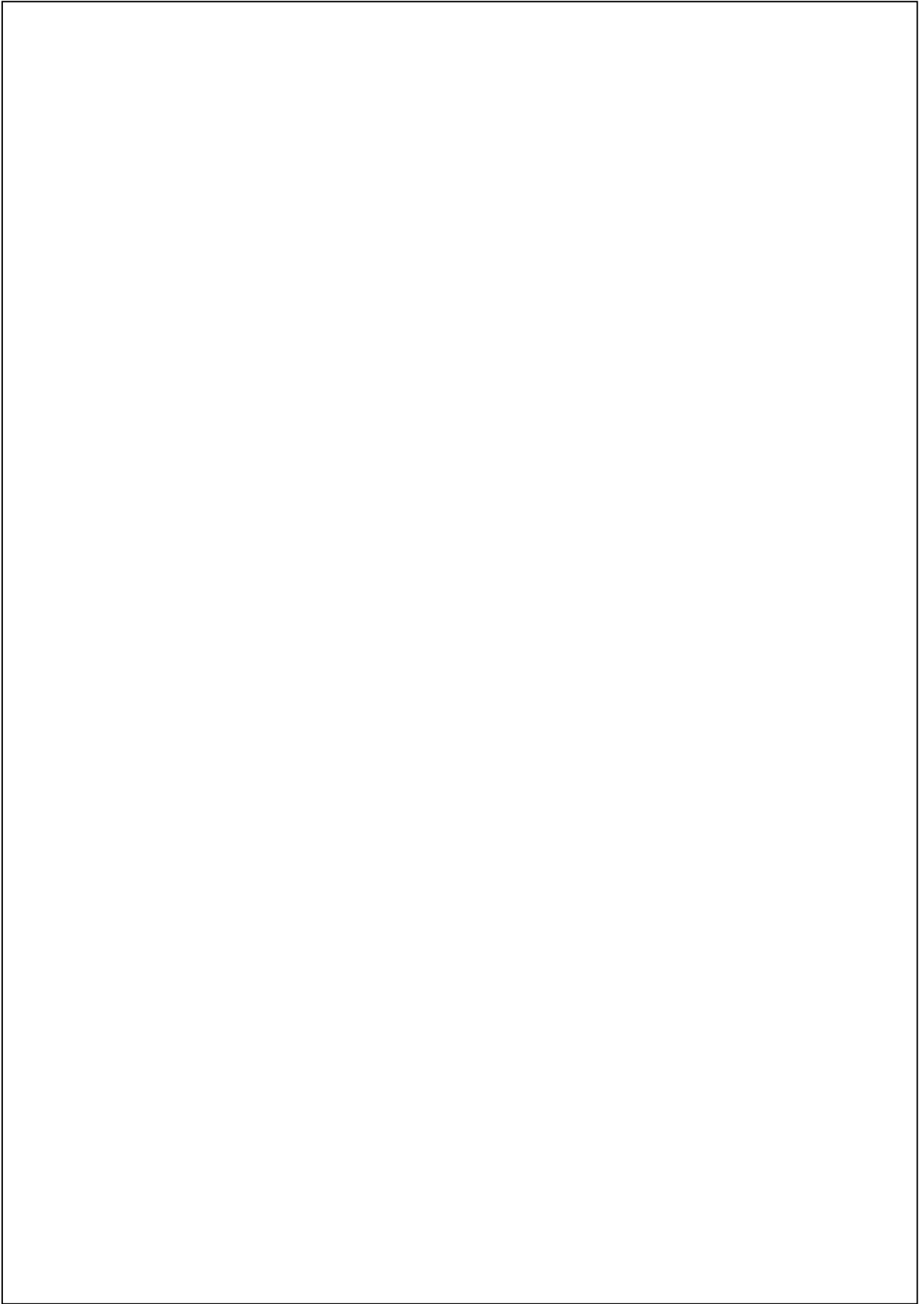
SECTION A (50%)**TICK ONE BOX per question (multiple ticks per question will receive no marks)**

QUESTIONS	MARKS TICK
1. Which one of the following is a non-parametric test?	2%
a) t-test	
b) ANOVA	
c) Chi-square	
d) Linear Regression	
2. Why do we use statistics to address research questions?	2%
a) Because academic law means we need to use statistics in research projects	
b) To help measure differences, relationships and associations of the data set	
c) To help measure the accuracy and precision of the data set	
d) Because undergraduates are expected to use statistics in their dissertations	
3. Which one of the following is a parametric test?	2%
e) Mann-Whitney	
f) ANOVA	
g) Wilcoxon	
h) Krukal-Wallis	
4. Which of the following is NOT a legitimate form of sampling	2%
a) Stipulated	
b) Random	
c) Stratified	
d) Systematic	

5. In probability how is 99% measured in a decimal?	2%
a) 99	
b) 0.05	
c) 0.01	
d) 9.9	
6. What is a bimodal distribution?	2%
a) A distribution with 2 peaks	
b) A data set with no distribution pattern	
c) A normal distribution	
d) Any distribution presented in a frequency graph	
7. Which of the following degrees of freedom statements is correct?	2%
a) There are not always $n-1$ degrees of freedom: the number depends on how many population parameters are estimated, which in turn depends on the statistical tests being used.	
b) There are always $n-1$ degrees of freedom: the number depends on how many population parameters are estimated, which in turn depends on the statistical tests being used.	
c) There are not always $n-1$ degrees of freedom: the number is chosen by the researcher based on their research parameters.	
d) There are always $n-1$ degrees of freedom: the number is chosen by the researcher based on their research parameters.	
8. Which data measurement type is the following definition? “***** scales employ equal units of measurement for the scale. ***** scales indicate the order of responses and distance between them.	2%
a) Nominal	
b) Ordinal	
c) Interval	
d) Ratio	

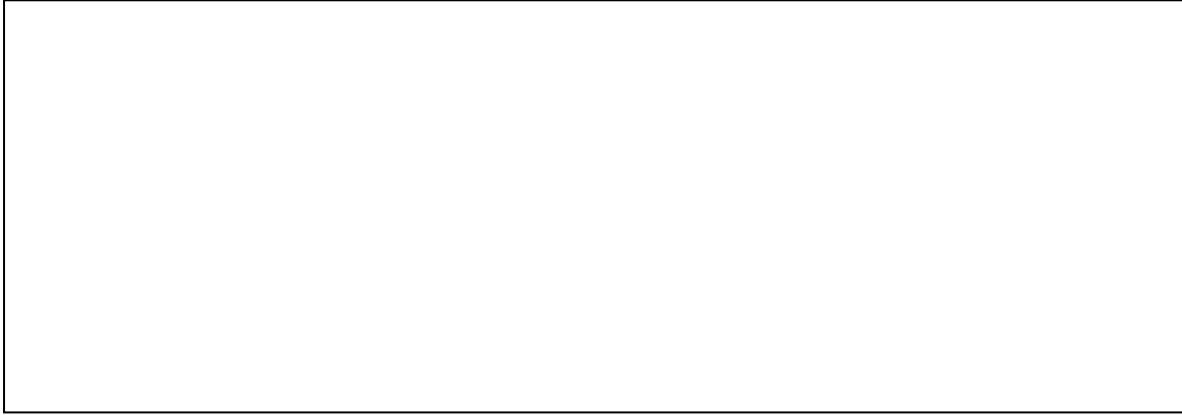
9. What are the 2 main types of error in analytical measurement?	2%
a) Systematic and no error	
b) Random and strategic	
c) Systematic and random error	
d) Strategic and no error	
10. What does the acronym GIS mean?	2%
a) Global Information Strategy	
b) Geographical Information System	
c) Gigabytes In Space	
d) Geographical Interrogation Strategy	
11. What is the researchers target population?	2%
a) The total UK population	
b) The population to which the researcher wants to generalise their findings	
c) The social demographic mix of the data set	
d) Any population that the researcher previously studied	
12. In statistic's what does ANOVA stand for?	2%
a) Analysis of assessment	
b) Average variable	
c) Analysis of variance	
d) Alternative variable	
13. What are the 2 main kinds of error in analytical measurement?	2%
e) Systematic and no error	
f) Systematic and random error	
g) Random and strategic	
h) Strategic and no error	

14. Use a diagram to demonstrate the sequence of procedures in conducting a statistical test (4%)

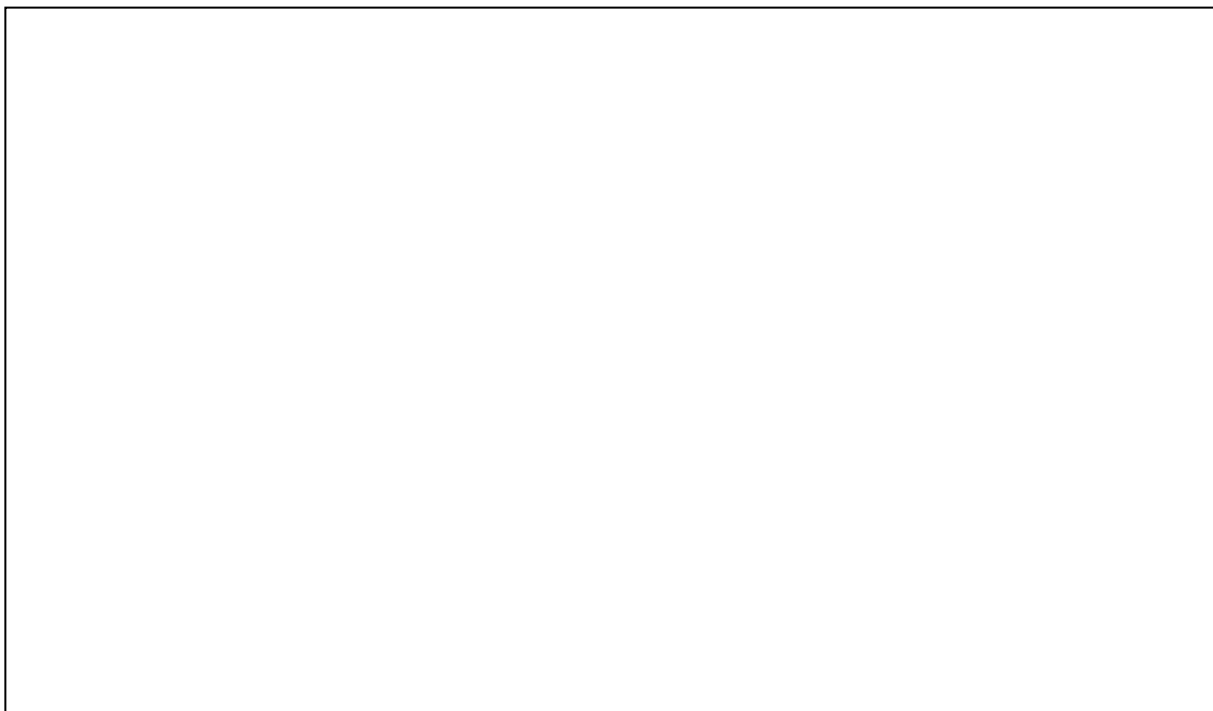


15. Using a diagram highlight the differences between
- Precise but inaccurate research
 - Precise and accurate research
 - Imprecise and inaccurate research
 - Briefly describe why this is important in research

(6%)



Draw a line graph that shows variability around the mean. Include small, moderate and large standard deviation? (6%)

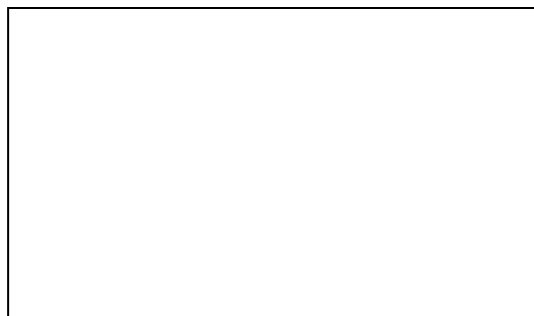
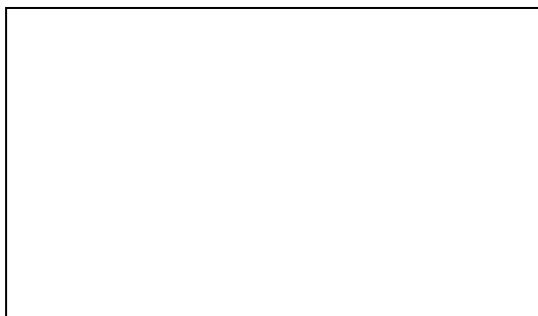


16. In the boxes below draw a hypothetical representation of a:

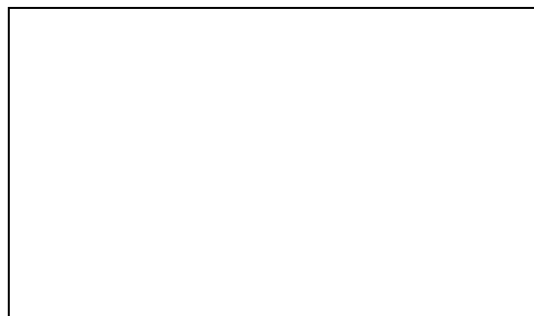
- a. histogram
- b. bar chart
- c. boxplot
- d. scatterplot.

Where appropriate, label the following:

- e. Continuous data
- f. Discrete data
- g. Median
- h. Y axis.



(8%)



TOTAL A

SECTION B (50%)

- Answer ALL questions.
- Put the answers to the questions in the BOX or LINES provided.
- Include all workings out in the space provided

1. The following table presents mean diameter of oak (*Quercus robur*) trees in an area near a BP chemical plant in Yorkshire and a site 20 miles away.

Yorkshire (oak) sample sites	A. Oak diameter cm 20 miles from chemical plant	Oak trees near chemical plant Diameter cm
1	7.7	6.1
2	8.8	6.3
3	9.0	4.9
4	7.0	5.4
5	9.9	5.2
6	8.2	4.8
7	10.2	5.7
8	6.1	7.9

Determine using the T Test within 95% & 99% confidence limits, whether there is a difference in oak tree diameter.

- (a) Construct a Null hypothesis based on oak diameter and potential pollution

(2%)

- (b) Calculate the following descriptive statistics

Mean diameter site A. (2%)

Mean diameter site B chem. (2%)

Standard Deviation for A. (1%)

Standard Deviation for B (1%)

- (c) Calculate the value of T (5%)

- (d) Interpretive statement (2%)

TOTAL 15%
Q.1

2. The following data set is from a survey of mean number of moths found at different types of street lighting in Swansea (2017):

- LED street lighting
- Sodium bulbs

Sites	Mean Moth numbers at Sodium street lighting	Mean Moth numbers at LED street lighting	Differences	Rank	Signed rank
1.	9.5	13.6			
2.	10.4	13.5			
3.	9.9	12.1			
4.	11.8	11.9			
5.	10.8	12.2			
6.	10.9	12.9			
7.	11.2	10.9			
8.	11.3	12.2			
9.	10.7	13.2			
10.	11.8	13.1			
TOTAL					

(a) Using the Wilcoxon test for matched pairs, determine any significant difference between the results.

Sum of the positive ranks (T^+) (3%)

Sum of negative ranks (T^-) (3%)

Critical value at $p=0.05$ (3%)

(b) Interpretive statement (3%)

Workings out

TOTAL (12%) Q. 2

3. A biologist collects samples of midges *Dixella pupae* from vegetation on the edge of a pond in Gower. Adult midges identified, counted and results input into Table below. (Assumption species were randomly distributed.)

	<i>Dixella autumnalis</i>	<i>Dixella aestivalis</i>	<i>Dixella amphibia</i>	<i>Dixella attica</i>	<i>Dixella fatica</i>	Total
Observed	40	35	5	10	10	100
Expected						

Perform a Chi square test to assess if there was any difference between the midge species identified. P 0.05 & P0.01. Is the distribution homogeneous?

- (a) Construct a Null hypothesis based on this research (2%)

- (b) Calculate the Chi statistic at p. 0.05 (6%)

- (c) Interpretative statement (2%)

TOTAL 10%
Q.3

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4. The following data set highlights expenditure and the visitor numbers on conservation projects in 8 National Nature Reserves (NNR) (2017) in Spain.

National Park	£ (000,s) expenditure	X^2	Visitor numbers (000,s)	Y^2	XY
1	38		20		
2	58		26		
3	41		18		
4	21		29		
5	48		24		
6	28		14		
7	26		19		
8	36		16		
SUMS	$\sum x$	$\sum x^2$	$\sum y$	$\sum y^2$	$\sum xy$

From linear regression analysis identify whether a prediction for expenditure can be calculated (First stages of linear regression) linking conservation project expenditure and visitor numbers. The following calculations need to be undertaken.

(a) Construct a Null hypothesis based for conservation project expenditure and visitors (2%)

(b) Calculate the value of **b** (gradient) (3%)

Calculate the value of **a** (Intercept) (3%)

(c) What would be the predicted visitor numbers for £46,000 expenditure (3%)

(d) Interpretative statement (2%)

Workings out

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TOTAL 13%
Q.4