



SSA EXAMINATION

PROGRAMME : HUMAN MOVEMENT STUDIES
MODULE NAME : RESEARCH METHODOLOGY
MODULE CODE : HMS 08X03 / SPB 01X7
DATE : 16 JANUARY 2017
DURATION : THREE (3) HOURS
TOTAL MARKS : 150 MARKS

EXAMINER : PROF. B.S. SHAW (RESEARCH THEORY)
: MR. V. VAN APPEL (STATISTICS)
EXTERNAL MODERATOR: DR. P. NONGOGO (TUT)
NUMBER OF PAGES : TEN (10) PAGES

INSTRUCTIONS TO CANDIDATES:

1. MAKE SURE THAT YOU HAVE THE COMPLETE PAPER.
 2. ANSWER ALL THE QUESTIONS.
 3. SECTION ONE IS RESEARCH THEORY.
 4. SECTION TWO IS STATISTICS.
 5. ANSWER SECTIONS ONE AND TWO IN SEPARATE BOOKLETS.
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SECTION 1
RESEARCH THEORY
(COMPLETE IN SEPARATE BOOKLET)

QUESTION 1.1

What are the unscientific methods of problem solving? [12]

QUESTION 1.2

Discuss what a researcher should look for when reading and recording the literature. [8]

QUESTION 1.3

Elaborate on the criteria for compiling a scientific introduction. [10]

QUESTION 1.4

When selecting and describing instruments, what are the questions to consider? [8]

QUESTION 1.5

Name and discuss the 7 (seven) areas of scientific dishonesty. [16]

QUESTION 1.6

When bearing in mind the questions not answered in a literature review, compare the dissimilarities between a meta-analysis and literature review. [17]

QUESTION 1.7

Discuss what occurs during the first and subsequent rounds of the The Dephi Method. [7]

QUESTION 1.8

Explain the pros and cons of longitudinal and cross-sectional design studies. [6]

QUESTION 1.9

When considering epidemiologic research, what are the main constituents? [11]

QUESTION 1.10

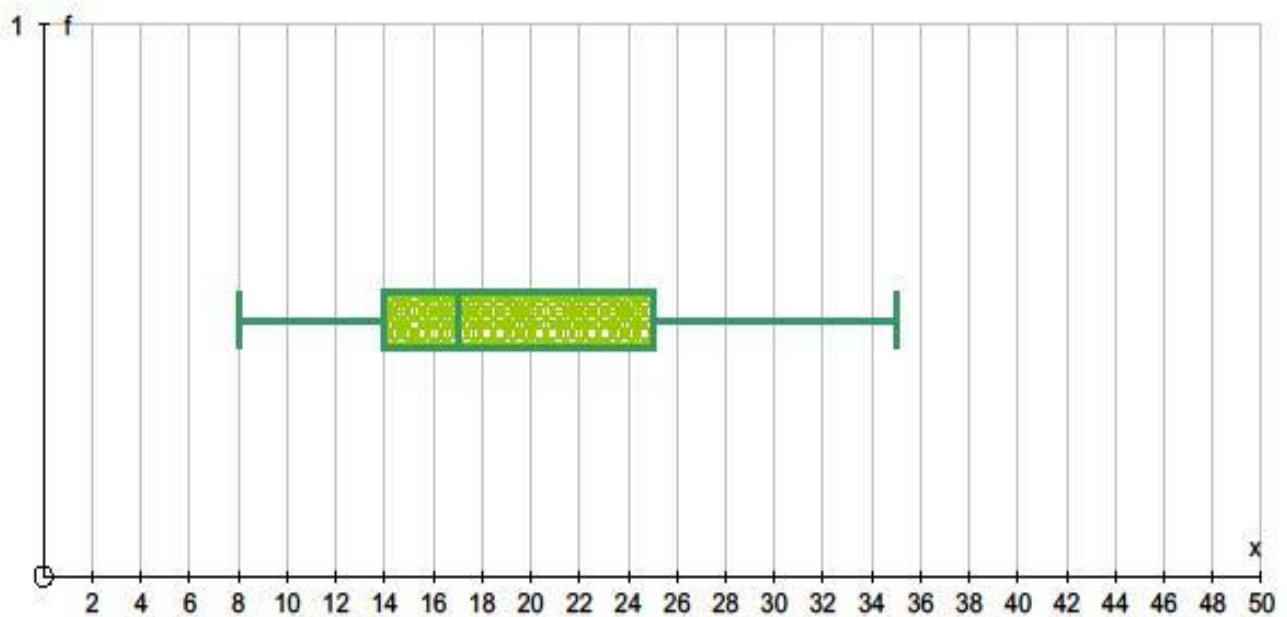
Internal validity has many threats, describe any five (5). [5]
[100]

SECTION 2
STATISTICS
(COMPLETE IN SEPARATE BOOKLET)

QUESTION 2**[10]**

Answer the following multiple choice questions and write your answer in the answer booklet.

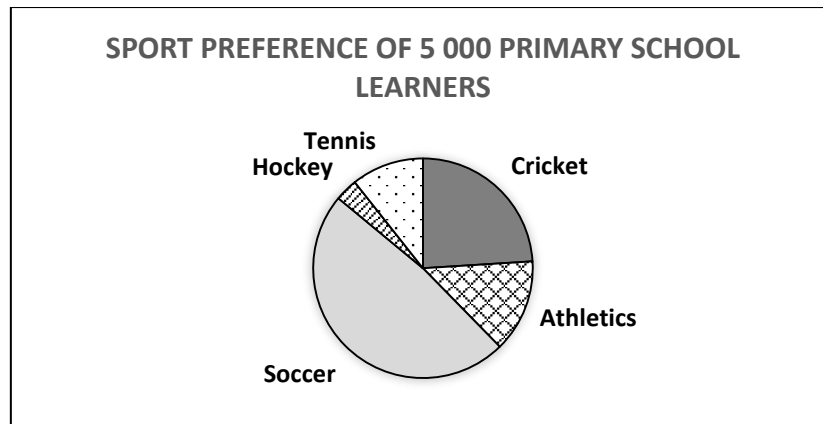
2.1) Consider the box-and-whisker plot below.



Which **one** of the following statements is **incorrect**?

- A) 50% of the observations are more than 17.
- B) 25% of the observations are less than 14.
- C) 25% of the observations are more than 25.
- D) The middle 50% of observations ranges over 11 units.
- E) The mean can be calculated from a box-and-whisker plot.

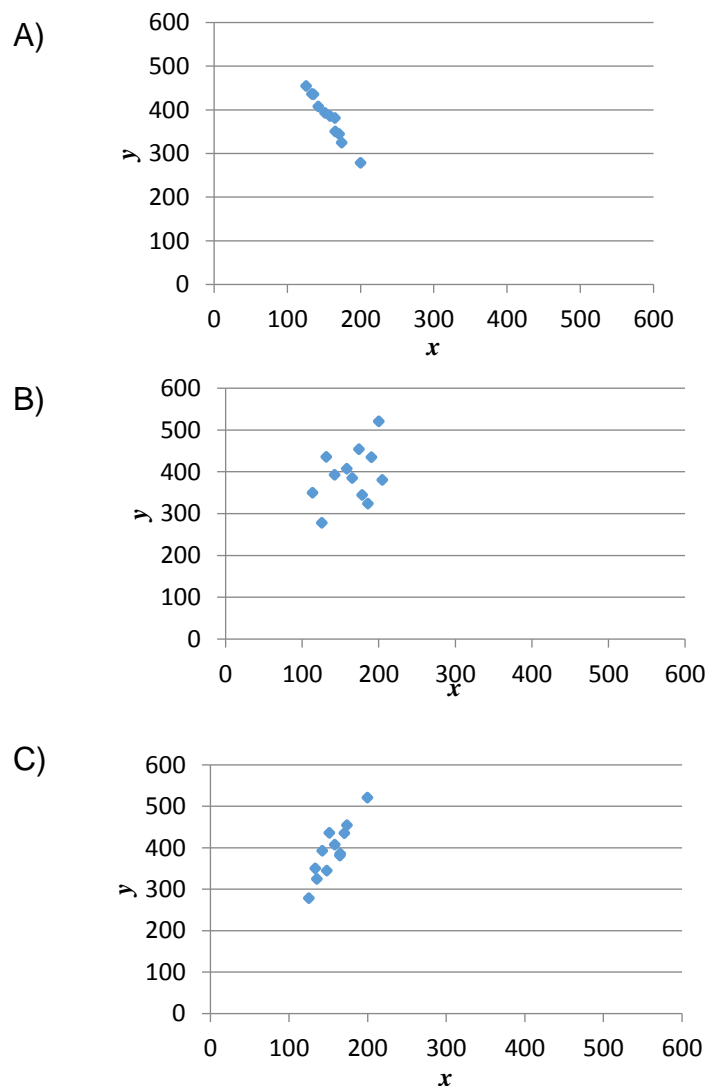
2.2) Consider the following graphical representation on the sport preference for primary school learners:

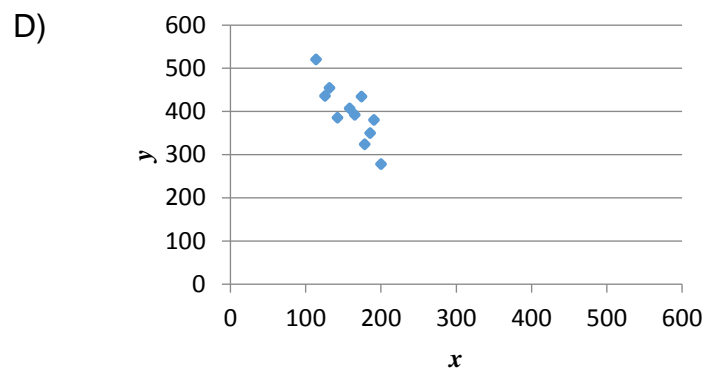


Which **one** of the following options is **incorrect**?

- A) Most learners prefer to play soccer.
- B) The least number of learners prefer to play hockey.
- C) Just less than 2 500 learners prefer to play soccer.
- D) Approximately 1250 learners prefer to play cricket.
- E) The preferred sport is a quantitative random variable that is measured on a ratio scale.

2.3) Which one of the following scatter plots describes the strongest correlation?





2.4) The first step in hypothesis testing is always

- A) formulating two opposing hypotheses, called the null and alternative hypotheses
- B) selecting a test statistic
- C) calculating the p-value
- D) determining the rejection region

2.5) The higher the level of significance, the less likely it becomes that H_0 will be rejected.

- A) True
- B) False

2.6) One-way ANOVA is used when:

- A) analysing the difference between more than two population means
- B) analysing the difference between two population variances
- C) analysing the difference between two sample means
- D) analysing the difference between two population proportions

2.7) Why would you use the Tukey multiple comparison?

- A) To test for normality
- B) To test for homogeneity of variance
- C) To test independence of errors
- D) To test for divergences in pairwise means

2.8) If the p -value is equal to 0.4975, the null hypothesis would be _____ at 2% significance, because _____.

- A) accepted; $0.00326 < 0.02$
- B) rejected; $0.00326 < 0.02$
- C) accepted; $0.49674 > 0.02$
- D) rejected; $0.49674 > 0.02$

2.9) Descriptive Statistics is the process of making an estimate, prediction, or decision about a population based on sample data.

- A) True
- B) False

2.10) A branch of the statistics discipline that is used to develop and utilize techniques for properly making inferences about population characteristics from information contained in a sample drawn from this population is called inferential statistics.

- A) True
- B) False

QUESTION 3

[5]

The data set "Body Fat.sav" contains body measurements of 252 individuals. The following output was obtained in SPSS:

		% body fat	Thigh circumference (cm)	Weight in pounds	Abdomen circumference (cm)
% body fat	Pearson Correlation	1	0.560**	0.612**	0.813**
	Sig. (2-tailed)		0.000	0.000	0.000
	N	252	252	252	252
Thigh circumference (cm)	Pearson Correlation	0.560**	1	0.869**	0.767**
	Sig. (2-tailed)	0.000		0.000	0.000
	N	252	252	252	252
Weight in pounds	Pearson Correlation	0.612**	0.869**	1	0.888**
	Sig. (2-tailed)	0.000	0.000		0.000
	N	252	252	252	252
Abdomen circumference (cm)	Pearson Correlation	0.813**	0.767**	0.888**	1
	Sig. (2-tailed)	0.000	0.000	0.000	
	N	252	252	252	252

3.1) Which two variables have the strongest sample correlation coefficient, and what is the sample correlation? [2]

3.2) What is the sample correlation between weight and thigh circumference? [1]

- 3.3) Does the strength of the sample correlation in 3.1 surprise you? Give a reason for your answer. [2]

QUESTION 4**[8]**

A group of Sports Science students ($n = 20$) are selected from the population to investigate whether a 12-week plyometric-training programme improves their standing long jump performance. In order to test whether this training improves performance, the students are tested for their long jump performance before they undertake a plyometric-training programme and then again at the end of the programme (i.e., the dependent variable is “standing long jump performance”, and the two related groups are the standing long jump values “before” and “after” the 12-week plyometric-training programme).

- 4.1) What is the appropriate hypothesis test to determine whether a 12-week plyometric-training programme improves their standing long jump performance? [2]
- 4.2) What assumption(s) must be made about the samples before carrying out the hypothesis test indicated in 4.1? [2]
- 4.3) State H_0 and H_a for this test. [2]
- 4.4) State your conclusion, i.e., does a 12-week plyometric-training programme improves their standing long jump performance? (Note: $\alpha = 5\%$). [2]

QUESTION 5**[10]**

A study was conducted to test whether males and females can do the same amount of push-ups in a one-minute period. The following SPSS output was obtained:

Tests of Normality

	Gender	Kolmogorov-Smirnov ^a		
Push Ups	Female	0.133	12	0.312*
	Male	0.162	12	0.312*

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Push Ups	Female	12	16.5000	8.93919	2.58052
	Male	12	23.8333	7.20900	2.08106

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Push Ups	Equal variances assumed	0.625	0.438	-2.212	22	0.038

- 5.1) Which hypothesis test was carried out to test whether males and females can do the same amount of push-ups in a one-minute period? Motivate your answer. [2]
- 5.2) Do the samples meet the requirements for the hypothesis test indicated in 5.1? Give a reason for your answer. [2]
- 5.3) State H_0 and H_a for this test. [2]
- 5.4) The P -value for this test is. [2]
- 5.5) Is there a significant difference in the mean number of push-up done in a one-minute period for males and females? Give a reason for your conclusion. (Note: $\alpha = 5\%$). [2]

QUESTION 6**[17]**

An experiment was conducted to examine the effect of age on heart rate when a person is subjected to a specific amount of exercise. Ten male subjects were randomly selected from four age groups: 10-19, 20-39, 40-59, and 60-69. Each subject walked on a treadmill at a fixed grade for a period of 12 minutes, and the increase in heart rate, the difference before and after exercise, was recorded.

To test whether there is sufficient evidence to indicate a difference in the mean increase in heart rate among the four age groups, the following SPSS output was obtained:

Tests of Normality

	Age	Kolmogorov-Smirnov ^a		
Heart_Rate	10-19	0.157	10	0.200*
	20-39	0.163	10	0.200*
	40-59	0.172	10	0.200*
	60-69	0.152	10	0.200*

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Test of Homogeneity of Variances

Heart_Rate

Levene Statistic	df1	df2	Sig.
0.147	3	36	0.931

ANOVA

Heart_Rate

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	67.475	3	22.492	0.866	0.468
Within Groups	935.500	36	25.986		
Total	1002.975	39			

Multiple Comparisons

Dependent Variable: Heart_Rate

Tukey HSD

(I) Age	(J) Age	Mean Difference (I-J)	Std. Error	Sig.
10-19	20-39	3.40000	2.27974	0.453
	40-59	1.40000	2.27974	0.927
	60-69	2.70000	2.27974	0.640
20-39	10-19	-3.40000	2.27974	0.453
	40-59	-2.00000	2.27974	0.817
	60-69	-.70000	2.27974	0.990
40-59	10-19	-1.40000	2.27974	0.927
	20-39	2.00000	2.27974	0.817
	60-69	1.30000	2.27974	0.940
60-69	10-19	-2.70000	2.27974	0.640
	20-39	0.70000	2.27974	0.990
	40-59	-1.30000	2.27974	0.940

- 6.1) State H_0 and H_a for this test. [2]
- 6.2) What are the assumptions required for a reliable ANOVA hypothesis test? [3]
- 6.3) Clearly state whether the assumptions in 6.2 have been satisfied by referring to the SPSS output. Be specific! [6]

- 6.4) If there is a significant difference in the mean heart rate for the four age groups, what post-hoc test can be conducted to test which age group(s) is/are significant different? [2]
- 6.5) Does the SPSS output provide sufficient evidence to indicate a difference in mean increase in heart rate among the four age groups? Give a reason for your answer, and, if applicable, state where the significant differences are with reasons. (*Note: $\alpha = 5\%$*). [4]
- [50]**

TOTAL: 150 MARKS