

**PYC3704**

( 494833)

May/June 2013

**PSYCHOLOGICAL RESEARCH**

Duration 2 Hours

70 Marks

**EXAMINATION PANEL AS APPOINTED BY THE DEPARTMENT**

Use of a non-programmable pocket calculator is permissible

Closed book examination.

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**EXAMINERS:**

<b>FIRST:</b>	<b>PROF P KRUGER</b>	<b>PROF HC JANEKE</b>
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This paper consists of 19 pages plus 2 blank pages for rough work (pp 20 & 21) plus 1 page (i) of formulae and 4 pages of tables( ii-v) as well as instructions for the completion of a mark reading sheet

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After completing your answers, you must hand in the following

- (i) The mark reading sheet
- (ii) The question paper (All the pages must be handed in )

This exam paper consists of seventy items Your mark will be converted to a mark out of 90 and 10% of your assignment mark will be added, to produce a mark out of 100 [Note that if your mark is less than 40% the assignment mark will not be added ]

**ENSURE THAT YOU HAVE WRITTEN YOUR STUDENT NUMBER AND COURSE CODE ON THE MARK READING SHEET**

**Please complete the attendance register on the back page, tear off and hand to the invigilator.**

[TURN OVER]

**ANSWER THE FOLLOWING SEVENTY MULTIPLE CHOICE QUESTIONS ON THE MARK READING SHEET. READ THE ATTACHED INSTRUCTIONS AND FOLLOW THEM CAREFULLY.**

The end goal of Psychological research is usually to - - - - human behaviour

1. collect data on
2. diagnose psychological problems in
3. develop hypotheses about
4. test theories of

**Question 2**

A researcher believes that there is a difference in the reasoning strategies used to solve puzzles between students who study physical sciences such as physics and chemistry and students who study social sciences such as psychology or sociology. She sets up a series of puzzles to be solved by students from different colleges or faculties at a university. This kind of research is referred to as - - - - research

1. statistical
2. theoretical
3. empirical
4. inferential

**Question 3**

Which of the following definitions best describe the meaning of 'measurement' in the context of psychological research? Measurement means to - - - -

1. find a way to observe a specific construct or phenomenon which is hidden
2. determine the extent to which a specific phenomenon is present on a numeric scale
3. specify the relationship that is believed to exist between two (or more) constructs or phenomena
4. calculate a summary value which describes an aspect of a specific construct or phenomenon

**Question 4**

A variable is described as 'manifest' because it is a(n) (a) - - - - measurement of a construct which is (b) - - - -

1. (a) latent (b) observable
2. (a) dependent (b) independent
3. (a) independent (b) dependent
4. (a) observable (b) latent

**Question 5**

When a specific psychological construct or phenomenon is measured on a quantitative scale, the resulting value is referred to as a - - - -

1. parameter
2. descriptive statistic
3. variable
4. test statistic

[TURN OVER]

**Question 6**

Operational definitions of a concept are definitions which define a concept in terms of - - - - -

- 1 other concepts
- 2 observable instances
- 3 latent variables
- 4 underlying constructs

**Question 7**

Which of the following is appropriate as a research or operational hypothesis?

- (a) Gender plays a role in determining employees' salaries in Winston & Johnson Inc.
  - (b) Male employees earn more than female employees in Winston & Johnson Inc
  - (c) Male employees at Winston & Johnson Inc earn higher annual salaries than female employees at the same company, at corresponding post levels
- 1 (a), (b) and (c)
  - 2 (b) and (c) but not (a)
  - 3 (c) only, but not (a) and (b)
  - 4 (a) only, but not (b) and (c)

**Question 8**

Quantities that summarise aspects of a population are called (a) - - - - -, while (b) - - - - - do the same for samples

- 1 (a) statistics (b) parameters
- 2 (a) parameters (b) statistics
- 3 (a) constructs (b) variables
- 4 (a) variables (b) parameters

**Question 9**

Values which are calculated to test hypotheses about relationships among variables are referred to as (a) - - - - - statistics, while values which summarise aspects of data such as the mean and standard deviation are referred to as (a) - - - - - statistics

- 1 (a) inferential (b) descriptive
- 2 (a) descriptive (b) correlational
- 3 (a) descriptive (b) inferential
- 4 (a) theoretical (b) empirical

[TURN OVER]

**Question 10**

A researcher believes that people who make eye contact with others when they speak to them are generally perceived to be more trustworthy than those who do not. She sets up an experiment where a group of 100 research participants are each interviewed by a research assistant. In half of the cases the interviewer makes a lot of eye contact with the participants during the interview and in half of the cases no or very little eye contact is made. Afterwards participants are asked to rate the research assistant for level of trustworthiness. In this scenario, whether eye contact was made or not is the (a) - - - - variable, while perceived level of trustworthiness is the (b) - - - - variable.

- |    |                 |                 |
|----|-----------------|-----------------|
| 1. | (a) independent | (b) dependent   |
| 2. | (a) hidden      | (b) latent      |
| 3. | (a) dependent   | (b) independent |
| 4. | (a) latent      | (b) manifest    |

**Question 11**

A researcher conducts an experiment with two groups of university students. The students in the first group are all given 125 ml of alcohol to drink, while the students in the second group are required to drink 350 ml of alcohol each. She then tests their motor coordination in a series of tests and finds that the subjects in the second group are significantly slower in these tests than the subjects in the first group.

Which of the following is the most appropriate formulation of the researcher's research hypothesis?

1. A study of the speed of motor coordination among students who use alcohol
2. Comparing two groups of students on alcohol consumption and motor performance
3. The level of alcohol consumption among the students has an effect on their motor performance
4. Some students can consume more alcohol than others before their motor coordination is affected

**Question 12**

Which of the descriptions given below is the most accurate description of the meaning of the word 'theory' in scientific research? It refers to a - - - -

1. synonym for hypothesis
2. reasonable guess about a relationship that may exist among two or more variables
3. best explanation of why a specific relationship that is observed among variables is as it is observed to be
4. careful description of the facts that have been observed in a specific situation

**Question 13**

A famous hypnotist performs at Meanie Hall before a crowd of 350 students and 180 non-students. The hypnotist knows from previous experience that one half of the students and two-thirds of the non-students are hypnotizable. What is the probability that a randomly chosen person from the audience will be hypnotizable?

1. 0.557
2. 0.340
3. 0.869
4. 0.670

[TURN OVER]

**Question 14**

The expression " $0.05 \leq p < 0.10$ " denotes a probability value - - - - -

- 1 smaller than or equal to 0.05 and smaller than 0.10
- 2 larger than or equal to 0.10 or smaller than or equal to 0.05
- 3 larger than or equal to 0.05 and smaller than 0.10
- 4 of exactly 0.05

**Question 15**

The probability of correctly guessing a two-digit number is

- 1 0.100
- 2 0.010
- 3 0.200
- 4 0.500

**Question 16**

Suppose that over the years 2 000 students wrote the examinations in PYC 304-C and that 1200 of them passed, of which 600 obtained exactly 50%. This means that for randomly selected students the probability of obtaining exactly 50% is - - - - - while the probability of obtaining 50% or more is - - - - -

- 1 0.60; 0.30
- 2 0.05; 0.60
- 3 0.30; 0.60
4. 0.60; 0.50

**Question 17**

The probability value "p is larger than or equal to 0.2" is - - - - - the probability value "p is smaller than or equal to 10%"

- 1 larger than
- 2 larger than or equal to
- 3 smaller than or equal to
- 4 exactly the same as

[TURN OVER]

**The following scenario applies to Questions 18 and 19 below.**

In a business management test the following sample scores were recorded:

<i>Individual</i>	A	B	C	D	E	F	G	H	I	J
<i>Test score</i>	12	12	7	10	9	12	13	8	9	8

**Question 18**

The mean of the test scores is:

- 1 12.00
- 2 10.00
- 3 9.00
- 4 8.00

**Question 19**

The standard deviation of the distribution of sample scores is 2.11. Therefore the z-score for individual E is:

- 1 0.47
- 2 1.42
- 3 -0.47
- 4 -1.42

**Question 20**

The proportion of scores less than  $z=0.00$  is:

1. 0.00
- 2 0.50
- 3 1.00
- 4 -0.50

**Question 21**

In a normal distribution, approximately - - - - of the scores fall within 1 standard deviation of the mean:

1. 14%
2. 95%
- 3 68%
- 4 83%

[TURN OVER]

**Question 22**

The sampling distribution of a test statistic - - - - -

- (a) gives all the values a test statistic can take
  - (b) gives the probability of getting each value of a test statistic under the assumption the results are due to chance alone
  - (c) is a probability distribution
1. (a) and none of the other options
  2. (b) and none of the other options
  3. (b) and (c) but not (a)
  4. (a) (b) and (c)

**Question 23**

Data analysis involving statistical inference basically involves - - - - -

- (a) first determining the standard deviation of the scores
  - (b) calculating the appropriate test statistic
  - (c) evaluating the test statistic based on the sampling distribution
1. (a) but not (b) or (c)
  2. (a) and then (c)
  3. (b) but not (a) or (c)
  4. (b) and (c) but not necessarily (a)

**Question 24**

A normally distributed set of population scores has a mean of 65 and a standard deviation of 10.2. A number of samples, each of size 48 is taken from this population. The mean of the sampling distribution of the mean for these samples equals - - - - -

1. 4.71
2.  $65/\sqrt{48}$
3. 65
4.  $10.2/\sqrt{48}$

**Question 25**

An alpha level of 0.05 indicates that - - - - -

1. if  $H_0$  is true, the probability of falsely rejecting it is limited to 0.05
2. 95% of the time, chance is operating.
3. the probability of a Type II error is 0.05
4. the probability of a correct decision is 0.05

[TURN OVER]

**Use the following scenario for Questions 26 – 28**

A researcher believes that women today weigh less than in previous years. To investigate this belief she randomly samples 41 adult women and records their weights. The scores have a mean of 51 kg and a standard deviation of 5.6. A local census taken several years ago shows the mean weight of adult women was 52.6 kg at that time.

**Question 26**

Given the data above, what would be the most appropriate statistical approach to establish whether there is a statistically significant difference between the average weight of the women in the sample and the weight of the women recorded in the census?

- 1 A correlational study focusing on the linear increase in weight
- 2 A study of the group differences using a single sample t-test
- 3 A study of the group differences using the t-test for independent groups
- 4 The z-test

**Question 27**

If the population standard deviation was available instead of the sample standard deviation, which technique would then have been the most appropriate for the statistical analysis of the data?

- 1 A correlational study focusing on the linear increase in weight
- 2 A study of the group differences using a single sample t-test
- 3 A study of the group differences using the t-test for independent groups
- 4 The single-sample z-test

**Question 28**

Suppose the obtained value of the appropriate statistic is -2.07, and subsequently a p-value of 0.025 was found. What can be concluded based on these results if a significance level of  $\alpha = 0.01$  (one-tailed) is used?

- 1 Accept  $H_1$
- 2 Do not accept  $H_0$
- 3 Reject  $H_0$
- 4 Do not reject  $H_0$

**Question 29**

The normal distribution is useful for interpreting psychological measurements because - - - - -

- 1 many psychological variables are approximately normally distributed
- 2 it has a mean of zero and a standard deviation of 1
- 3 it represents an arbitrarily large population of scores
- 4 it is symmetrical in shape

[TURN OVER]

**Question 30**

If examination scores are approximately normally distributed with a mean of 60% and a standard deviation of 8% and Pete's score is 66%, he did better than about - - - - of the candidates

- 1 27%
- 2 23%
- 3 77%
- 4 13%

**Question 31**

After finding that a significant difference exists between male and female participants on a test which tests level of creativity, a researcher decides to also calculate an effect size, using Cohen's  $d$ . This is used to determine - - - -

- 1 the size of the error that would be made if the null hypothesis is rejected
- 2 the ability of a statistical test to detect a significant relationship between variables
- 3 the level of confidence one can have that the test is valid
- 4 whether a significant effect is meaningful from a practical point of view

**Question 32**

Transforming variables to z-scores is useful because it - - - -

- 1 is used to calculate the test statistic
- 2 enables one to compare variables with different means and standard deviations from scores with different original units
- 3 can be used to test whether a score is normally distributed
- 4 is easy to calculate the mean and standard deviation of most scores

**Question 33**

A probability of an event occurring which depends on something else occurring, such as passing a test when you do not understand your course, can be described as - - - -

- 1 conditional probability
- 2 an independent event
- 3 mutually exclusive events
- 4 a multiplicative probability

**Question 34**

The sampling error of the mean will be smaller in cases where - - - -

- 1 the sample is larger and the standard deviation of the population smaller
- 2 the population is larger and the variability of the scores in the sample is smaller
- 3 the sample mean is smaller
- 4 a medium-size rather than a large sample is used

[TURN OVER]

**Base your answers to Questions 35 to 37 on the following scenario.**

Suppose that the memory span of adults is normally distributed with a mean of 7 items and a standard deviation of 2 items. A researcher predicts that "dyslexic adults have a shorter memory span than adults in general"

**Question 35**

Which of the following is an appropriate null hypothesis for testing the above prediction?

1. The mean memory span of the population of dyslexic adults is smaller than 7
2. The mean memory span of the population of dyslexic adults equals 7
3. The mean memory span of the population of adults equals 7
4. The mean memory span of the population of adults does not equal 7

**Question 36**

Which of the following is an appropriate alternative hypothesis for testing the above prediction?

1. The mean memory span of the population of dyslexic adults is smaller than 7
2. The mean memory span of the population of adults is not equal to 7
3. The mean memory span of the population of dyslexic adults equals 7
4. The mean memory span of the population of adults does not equal 7

**Question 37**

Testing the above prediction will require a - - - - - statistical test

1. non-directional
2. two-tailed
3. directional
4. (1) and (2) are both correct

**Question 38**

When applying a statistical test, the p-value represents the probability of observing the - - - - -.

1. sample statistic under the alternative hypothesis
2. population parameter under the null hypothesis
3. sample statistic under the null hypothesis
4. population parameter under the alternative hypothesis

**Question 39**

The hypothesis " $H_1: \mu < 30$ " is a - - - - - hypothesis and requires a - - - - - statistical test

1. non-directional, one-tailed
2. directional, two-tailed
3. directional, one-tailed
4. non-directional, two-tailed

[TURN OVER]

**Question 40**

An alpha level of 0.05 indicates that - - - - -

1. if  $H_0$  is true, the probability of falsely rejecting it is limited to 0.05
2. 95% of the time chance is operating
3. the probability of a Type II error is 0.05
4. the probability of a correct decision is 0.05

**Question 41**

If alpha is changed from 0.05 to 0.01, the - - - - -

1. probability of a Type II error decreases.
2. probability of a Type I error increases
3. error probabilities stay the same but the probability that we will retain a false  $H_0$  increases
4. probability that we will retain a false  $H_0$  increases

**Question 42**

If the alternative hypothesis states that alcohol affects short-term memory, the null hypothesis states that - - - - -

1. alcohol does not decrease short-term memory
2. alcohol has no effect on short-term memory
3. alcohol decreases short-term memory
4. all of the above

**Question 43**

When the results are statistically significant, this means that - - - - -

- (a) the obtained probability is equal to or less than alpha
  - (b) the independent variable has had a large effect
  - (c) we can reject  $H_0$
1. (a) is correct but neither of the other statements
  2. (b) and (c) are correct but not necessarily (a)
  3. (a) and (b) are correct but not (c)
  4. (a) and (c) are both correct but not necessarily (b)

**Question 44**

A researcher draws a single random sample from a population to test his hypothesis about the mean population score on a psychological test. Scores on this test are distributed normally in the general population with a known mean but an unknown standard deviation. Which test statistic should the researcher calculate to test his hypothesis?

1. The t-statistic for the mean of a single sample
2. The z-statistic for the mean of a single sample
3. The standard deviation of the sampling distribution of the mean of a single sample
4. The t-statistic for independent groups

[TURN OVER]

**Base your answers to Questions 45 to 48 on the following scenario:**

A researcher hypothesizes that chess-playing students are better at non-verbal reasoning than students in general. He draws a random sample of 25 students from the members of the chess clubs of South African universities and measures their non-verbal reasoning ability by means of a test developed for this purpose. The scores of a large group of students on this test were found in earlier research to be distributed normally with a mean of 20. Suppose the researcher finds that the mean score of his sample is 22.3 and the standard deviation of the scores is 6.0.

**Question 45**

Which research design did the researcher use?

1. Single-sample groups design
2. Two-groups design
3. Two-groups design with a known population mean
4. A correlational design

**Question 46**

Which are the appropriate statistical hypotheses for testing the researcher's hypothesis?

1.  $H_0: \mu$  is not equal to 20,  $H_1: \mu$  is larger than 20
2.  $H_0: \mu$  equals 20,  $H_1: \mu$  is larger than 20
3.  $H_0: \mu$  equals 20,  $H_1: \mu$  is not equal to 20
4.  $H_0: \mu$  equals 20,  $H_1: \mu$  is smaller than 20

**Question 47**

Which is the appropriate test statistic to calculate?

1. The z-statistic for the mean of a single sample
2. The t-statistic for the difference between the means of two independent samples
3. The t-statistic for the mean of a single sample
4. The Chi Square test statistic

**Question 48**

Which of the following values most accurately reflects the correct result when calculating the test statistic?

1.  $2 \frac{3}{12}$
2.  $2 \frac{3}{5}$
3.  $-2 \frac{3}{12}$
4.  $-2 \frac{3}{5}$

[TURN OVER]

**Question 49**

Two samples can be considered independent when - - - - -

- 1 the composition of one sample is not systematically related to the composition of the other one
2. the samples are drawn under different experimental conditions
- 3 one sample comes from a treatment or experimental group while the other comes from a control group
- 4 care was taken that the samples are drawn at random

**Base your answers to Questions 50 and 51 on the following scenario:**

A researcher wants to validate a new depression scale where a high score indicates a high incidence of depression. She applies it to a sample of 40 patients diagnosed with depression and a control group of 40 persons who were judged not to suffer from depression by a panel of clinical psychologists.

**Question 50**

Which is an appropriate alternative hypothesis to test the validity of the depression scale based on group mean values?

- 1  $\mu_{\text{Depression}} \neq \mu_{\text{Control}}$
- 2  $\mu_{\text{Depression}} > \mu_{\text{Control}}$
- 3  $\mu_{\text{Depression}} < \mu_{\text{Control}}$
4. The population mean of the difference scores equals zero

**Question 51**

Which of the following would be the most appropriate statistical test to determine whether a significant difference exist between the scores for the two groups (measuring depression and non-depression scores)?

- 1 A test for a correlation coefficient
- 2 The t-test for dependent samples
- 3 The t-test for independent samples
4. The chi-square ( $\chi^2$ ) test

**Question 52**

A researcher wants to determine whether a significant difference exists in the scores on a test of creativity between a group of students who are studying for a BSc degree and a group of students who are studying for a BA degree. She finds a mean score of  $\bar{x}_1 = 20.4$  for the BSc students and a mean score of  $\bar{x}_2 = 22.3$  for the BA students. A t-test shows that this difference is statistically significant. In spite of the significant difference, the researcher feels that the difference between the two means is too small to be really important. What calculation can she do to confirm this suspicion?

- 1 Level of significance
- 2 Variance
- 3 Degrees of freedom
- 4 Effect size

[TURN OVER]

**Question 53**

A researcher plans to use the t-test to compare two independent samples of data with 20 individuals each. Consider the following assumptions that may be relevant here:

- (a) The sample standard deviations have to be equal
- (b) The data from both samples has to come from populations that are normally distributed

What minimum assumptions from the ones given above needs to be met before she may proceed?

1. At least one of (a) or (b) must be true
2. (a) and (b) must both be true
3. Neither (a) nor (b) is relevant but other assumptions exist that will have to be considered
4. The t-test should never be used with such a small sample

**Question 54**

In which of the following cases should the scores being investigated be regarded as dependent when a test for significance is selected?

1. The variables represent exam scores of children from two schools, matched on demographic criteria like grade and gender
2. The variables represent scores from subjects on a motivational scale, who were tested before and after listening to a presentation by a motivational speaker
3. The scores on a test for mathematical ability and a test for attention span
4. The variables represent frequency counts for gender and favourite colour, cross-classified in a contingency table

**Base your answers to Questions 55 to 57 on the following scenario:**

A psychologist develops a series of workshops providing assertiveness training to a group of persons who suffer from low self esteem. To test the efficacy of the workshops, she applies a psychometric test which measures level of self esteem to 50 persons at the start and again after the end of the series of workshops, predicting that the latter scores will be higher (reflecting higher self esteem). The self esteem scale was standardised on the general population with a mean score of 30 and a standard deviation of 10.

**Question 55**

Which constructs are related to one another by the research hypothesis?

1. Attending a workshop of assertiveness training, self esteem
2. Self esteem before a workshop; self esteem after a workshop
3. Self esteem in the treatment group, self esteem in the general population
4. Level of assertiveness; level of self esteem

[TURN OVER]

**Question 56**

Which is an appropriate null hypothesis for the analysis of the results?

- 1  $\mu = 30$
- 2  $\mu_1 = \mu_2$
- 3 The population mean of the difference scores equals zero
- 2  $\mu_1 \neq \mu_2$

**Question 57**

Which is the appropriate test statistic to calculate?

- 1 The z-statistic for the difference between the means of two independent samples
- 2 The t-statistic for the difference between the means of two dependent samples
- 3 The t-statistic for the difference between the means of two independent samples
- 4 A test of the correlation coefficient for the two sets of scores

**Question 58**

A researcher wants to compare the cognitive development of two groups of children using the mean score of each group to test the following hypotheses

$$H_0: \mu_1 = \mu_2$$

$$H_1: \mu_1 > \mu_2$$

Her results derived from a random sample from each group of children shows that the mean sample score on a scale which measures level of cognitive development for the first group is less than the mean sample score for group two (i.e.  $\bar{x}_1 < \bar{x}_2$ ). What may she conclude?

1. She needs to find the relevant p-value before making any conclusion
2. She can reject  $H_0$
3. She will not be able to reject  $H_0$
4. She needs to calculate a t-test before any conclusion is made

**Question 59**

A researcher wants to test the following hypotheses

$$H_0: \mu_1 = \mu_2$$

$$H_1: \mu_1 > \mu_2$$

On the basis of data provided, the output from a computer programme indicates that a t-value of  $t = -2.3$  was found, with the p-value for a nondirectional test (two-tailed) given as  $p=0.07$ . What should the researcher do to evaluate this result?

1. Divide 0.07 with 2 before comparing it with the pre-selected alpha level
2. Multiply 0.07 by 2 before comparing it with the pre-selected alpha level
3. Compare the computed p-value as given with the pre-selected alpha level
4. A calculation error was made since a t-value cannot be less than 0

[TURN OVER]

**Question 60**

Correlation is used in data analysis when one investigates the relation between - - - - -

- 1 the mean of a single sample of subjects and a population mean
- 2 two groups of subjects, with respect to a single variable
- 3 two variables measured on the same group of subjects
- 4 two variables from independent samples

**Question 61**

A positive correlation between variables X and Y implies that persons scoring low on X will generally score - - - - - on Y

- 1 high
- 2 low
- 3 either high or low
- 4 in a totally unpredictable way

**Question 62**

Which of the values given below is the best estimate of the Pearson correlation coefficient between the following values of X and Y?

<b>X</b>	-2	-1	0	1	2
<b>Y</b>	2	1	0	-1	-2

- 1 -1
- 2 0
- 3 +1
- 4 0.5

**Question 63**

A researcher hypothesizes that the drug treatment of hospitalised schizophrenic patients improves their mental alertness. He studies a random sample of 27 such patients and finds a correlation coefficient of 0.6 between the number of days of drug treatment and patients' scores on the Mental Alertness Test.

Which is an appropriate null hypothesis for this research?

- 1  $\rho = 0$
- 2  $\mu = 0$
3.  $r = 0$
4.  $\mu_1 = \mu_2$

[TURN OVER]

**Question 64**

The table below gives the number of persons *observed* to be in each of the categories in a cross classification of gender (male/female) and place of residence (rural/urban) What would the *expected* value be for persons classified as both 'urban' and 'male', if no relationship exists between gender and place of residence?

	Male	Female	Row total
Urban	6	4	10
Rural	6	8	14
Column total	12	12	24

- 1 24
- 2 6
- 3 10
- 4 5

**Question 65**

A researcher wants to determine whether a relationship exists between students' general level of anxiety and their exam marks. He presents each student from a random sample with a general anxiety scale just before they are to write an important exam. Which of the following is the most appropriate test statistic to use to determine whether a relationship exists between the two variables (anxiety level and exam results)?

- 1 t-test for independent samples
- 2 Pearson's r test statistic
- 3 t-test for dependent samples
- 4 chi-square test ( $\chi^2$ )

**Question 66**

Which of the following is the appropriate formula for the chi square test?

- 1  $\sum \frac{(O_i - E_i)^2}{E_i}$
- 2  $\frac{(\bar{x} - \mu_{\bar{x}})}{s_{\bar{x}}}$
- 3  $\frac{cov(x,y)}{\sqrt{var(x)var(y)}}$
- 4  $\frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$

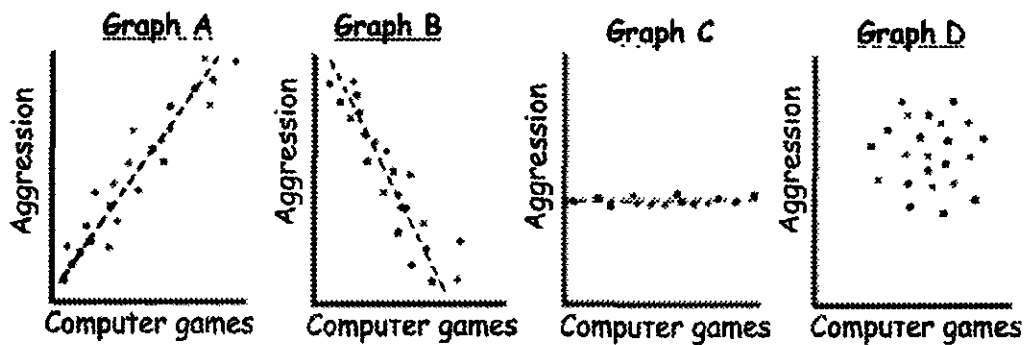
[TURN OVER]

**Base your answers to Questions 67 and 68 on the following scenario:**

A psychologist reads an article in which the author claims that playing computer games leads to higher levels of aggression in children. She decides to test this by asking a sample of children to report the number of computer games they play per month and measuring the aggression level of each child with an appropriate psychometric test. She expects to find that a positive correlation will exist in her sample between level of aggression and number of computer games played.

**Question 67**

The researcher draws a graph of the relationship between aggression and number of computer games. Which of the scatterplots below give the most probable representation of the data if the expected relationship exists?



- 1 Graph A
- 2 Graph B
- 3 Graph C
- 4 Graph D

**Question 68**

The researcher calculates the Pearson product moment correlation coefficient of the relationship between level of aggression and number of computer games played. Which of following expressions best represent the relationship if the expectations of the researcher about the relationship are true?

- 1  $r \neq 0$
- 2  $r = 0$
- 3  $r < 0$
- 4  $r > 0$

[TURN OVER]

**Base your answers to Questions 69 and 70 on the following scenario:**

A sample of 300 clients are drawn from three community mental health centres (indicated in the table as A, B and C). Counts are made of those clients who are diagnosed as having social adjustment problems, those with problems related to anxiety, and the remaining clients are classified under 'other problems'. Counts of the number of clients from the different centres which fall in each of the categories are supplied below.

Mental Health Centre (columns) by Type of Problem (rows)	A	B	C	Row totals
Social adjustment problems	50	40	40	130
Anxiety related	26	34	20	80
Other	24	26	40	90
<b>Column totals</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>300</b>

**Question 69**

What is the type of arrangement of data above called?

- 1 Histogram
- 2 Contingency table
- 3 Correlation matrix
4. Classification table

**Question 70**

A researcher wants to establish whether the types of diagnoses made differ significantly among the different mental health centres or not. Which of the following would be the most appropriate statistical test to use?

- 1 The chi-square ( $\chi^2$ ) test
- 2 A test of the correlation coefficient
- 3 The t-test for two samples
- 4 The z-test for two samples

[TOTAL: 70]

**END OF EXAM PAPER**

[TURN OVER]





Appendix: List of formulas

$$\frac{\bar{x} - \mu_{\bar{x}}}{\sigma_{\bar{x}}} = \frac{(\bar{x} - \mu)}{\frac{\sigma}{\sqrt{n}}}$$

$$\frac{(\bar{x} - \mu)}{s_{\bar{x}}} = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$$

$$\frac{(\bar{x}_1 - \bar{x}_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$$\frac{\bar{d} - \bar{D}}{s_{\bar{d}}/\sqrt{n}} = \frac{\bar{d}}{s_{\bar{d}}/\sqrt{n}} \quad (\text{if } \bar{D} = 0)$$

$$\frac{\text{cov}(x,y)}{\sqrt{\text{var}(x)\text{var}(y)}} = \frac{n \sum xy - (\sum x)(\sum y)}{\sqrt{[n \sum x^2 - (\sum x)^2][n \sum y^2 - (\sum y)^2]}}$$

$$\sum_{ij} \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

Appendix: Probabilities associated with the standard normal distribution (z)

z	Mean to z	Larger portion	Smaller portion	z	Mean to z	Larger portion	Smaller portion
0.00	0 0000	0 5000	0.5000	0 51	0 1950	0.6950	0.3050
0.01	0 0040	0.5040	0.4960	0 52	0 1985	0.6985	0.3015
0.02	0 0080	0.5080	0.4920	0.53	0 2019	0 7019	0.2981
0.03	0.0120	0.5120	0.4880	0 54	0 2054	0 7054	0.2946
0.04	0.0160	0.5160	0.4840	0.55	0 2088	0 7088	0.2912
0.05	0.0199	0.5199	0.4801	0.56	0 2123	0.7123	0.2877
0.06	0.0239	0.5239	0.4761	0.57	0 2157	0.7157	0.2843
0.07	0 0279	0.5279	0.4721	0.58	0.2190	0.7190	0.2810
0.08	0 0319	0 5319	0 4681	0.59	0.2224	0.7224	0.2776
0.09	0.0359	0 5359	0 4641	0.60	0.2257	0.7257	0.2743
0.10	0.0398	0 5398	0.4602	0.61	0 2291	0.7291	0.2709
0.11	0 0438	0.5438	0.4562	0 62	0.2324	0 7324	0.2676
0.12	0 0478	0.5478	0.4522	0 63	0.2357	0 7357	0.2643
0.13	0.0517	0.5517	0.4483	0.64	0.2389	0 7389	0 2611
0.14	0.0557	0.5557	0.4443	0.65	0.2422	0 7422	0 2578
0.15	0.0596	0.5596	0.4404	0.66	0.2454	0.7454	0.2546
0.16	0 0636	0 5636	0 4364	0.67	0 2486	0.7486	0.2514
0.17	0.0675	0 5675	0.4325	0.68	0.2517	0.7517	0.2483
0.18	0.0714	0 5714	0.4286	0 69	0.2549	0.7549	0.2451
0.19	0 0753	0 5753	0.4247	0 70	0.2580	0 7580	0.2420
0.20	0 0793	0.5793	0.4207	0.71	0 2611	0 7611	0 2389
0.21	0.0832	0.5832	0.4168	0.72	0.2642	0 7642	0.2358
0.22	0.0871	0.5871	0.4129	0.73	0 2673	0 7673	0.2327
0 23	0.0910	0.5910	0.4090	0.74	0 2704	0.7704	0.2296
0 24	0.0948	0 5948	0.4052	0.75	0 2734	0.7734	0.2266
0.25	0.0987	0 5987	0.4013	0 76	0 2764	0.7764	0.2236
0.26	0.1026	0.6026	0.3974	0.77	0 2794	0.7794	0.2206
0.27	0.1064	0.6064	0.3936	0.78	0 2823	0.7823	0 2177
0.28	0 1103	0.6103	0.3897	0.79	0 2852	0.7852	0.2148
0.29	0 1141	0 6141	0.3859	0 80	0.2881	0.7881	0.2119
0.30	0 1179	0 6179	0.3821	0 81	0.2910	0.7910	0.2090
0.31	0.1217	0.6217	0.3783	0 82	0.2939	0 7939	0.2061
0.32	0.1255	0.6255	0.3745	0.83	0.2967	0 7967	0.2033
0 33	0 1293	0 6293	0.3707	0.84	0 2995	0.7995	0.2005
0.34	0 1331	0.6331	0.3669	0 85	0.3023	0.8023	0.1977
0.35	0.1368	0.6368	0.3632	0 86	0 3051	0.8051	0.1949
0.36	0.1406	0.6406	0.3594	0 87	0 3078	0 8078	0 1922
0.37	0.1443	0.6443	0.3557	0.88	0.3106	0.8106	0 1894
0.38	0.1480	0.6480	0.3520	0.89	0 3133	0.8133	0 1867
0.39	0.1517	0 6517	0 3483	0.90	0 3159	0.8159	0.1841
0.40	0 1554	0 6554	0 3446	0.91	0 3186	0.8186	0.1814
0.41	0 1591	0 6591	0.3409	0.92	0 3212	0.8212	0.1788
0.42	0 1628	0.6628	0.3372	0 93	0.3238	0.8238	0.1762
0.43	0 1664	0 6664	0 3336	0.94	0 3264	0.8264	0.1736
0.44	0 1700	0 6700	0.3300	0 95	0.3289	0 8289	0.1711
0.45	0.1736	0 6736	0.3264	0.96	0.3315	0.8315	0.1685
0.46	0.1772	0 6772	0.3228	0 97	0 3340	0 8340	0.1660
0.47	0.1808	0.6808	0.3192	0 98	0 3365	0 8365	0.1635
0.48	0.1844	0.6844	0.3156	0.99	0 3389	0 8389	0.1611
0.49	0.1879	0.6879	0.3121	1.00	0.3413	0 8413	0.1587
0.50	0.1915	0 6915	0.3085	1.01	0 3438	0.8438	0.1562

[TURNOVER]

Appendix: Probabilities associated with the standard normal distribution (z) continued

z	Mean to z	Larger portion	Smaller portion	z	Mean to z	Larger portion	Smaller portion
1.02	0.3461	0.8461	0.1539	1.53	0.4370	0.9370	0.0630
1.03	0.3485	0.8485	0.1515	1.54	0.4382	0.9382	0.0618
1.04	0.3508	0.8508	0.1492	1.55	0.4394	0.9394	0.0606
1.05	0.3531	0.8531	0.1469	1.56	0.4406	0.9406	0.0594
1.06	0.3554	0.8554	0.1446	1.57	0.4418	0.9418	0.0582
1.07	0.3577	0.8577	0.1423	1.58	0.4429	0.9429	0.0571
1.08	0.3599	0.8599	0.1401	1.59	0.4441	0.9441	0.0559
1.09	0.3621	0.8621	0.1379	1.60	0.4452	0.9452	0.0548
1.10	0.3643	0.8643	0.1357	1.61	0.4463	0.9463	0.0537
1.11	0.3665	0.8665	0.1335	1.62	0.4474	0.9474	0.0526
1.12	0.3686	0.8686	0.1314	1.63	0.4484	0.9484	0.0516
1.13	0.3708	0.8708	0.1292	1.64	0.4495	0.9495	0.0505
1.14	0.3729	0.8729	0.1271	1.65	0.4505	0.9505	0.0495
1.15	0.3749	0.8749	0.1251	1.66	0.4515	0.9515	0.0485
1.16	0.3770	0.8770	0.1230	1.67	0.4525	0.9525	0.0475
1.17	0.3790	0.8790	0.1210	1.68	0.4535	0.9535	0.0465
1.18	0.3810	0.8810	0.1190	1.69	0.4545	0.9545	0.0455
1.19	0.3830	0.8830	0.1170	1.70	0.4554	0.9554	0.0446
1.20	0.3849	0.8849	0.1151	1.71	0.4564	0.9564	0.0436
1.21	0.3869	0.8869	0.1131	1.72	0.4573	0.9573	0.0427
1.22	0.3888	0.8888	0.1112	1.73	0.4582	0.9582	0.0418
1.23	0.3907	0.8907	0.1093	1.74	0.4591	0.9591	0.0409
1.24	0.3925	0.8925	0.1075	1.75	0.4599	0.9599	0.0401
1.25	0.3944	0.8944	0.1056	1.76	0.4608	0.9608	0.0392
1.26	0.3962	0.8962	0.1038	1.77	0.4616	0.9616	0.0384
1.27	0.3980	0.8980	0.1020	1.78	0.4625	0.9625	0.0375
1.28	0.3997	0.8997	0.1003	1.79	0.4633	0.9633	0.0367
1.29	0.4015	0.9015	0.0985	1.80	0.4641	0.9641	0.0359
1.30	0.4032	0.9032	0.0968	1.81	0.4649	0.9649	0.0351
1.31	0.4049	0.9049	0.0951	1.82	0.4656	0.9656	0.0344
1.32	0.4066	0.9066	0.0934	1.83	0.4664	0.9664	0.0336
1.33	0.4082	0.9082	0.0918	1.84	0.4671	0.9671	0.0329
1.34	0.4099	0.9099	0.0901	1.85	0.4678	0.9678	0.0322
1.35	0.4115	0.9115	0.0885	1.86	0.4686	0.9686	0.0314
1.36	0.4131	0.9131	0.0869	1.87	0.4693	0.9693	0.0307
1.37	0.4147	0.9147	0.0853	1.88	0.4699	0.9699	0.0301
1.38	0.4162	0.9162	0.0838	1.89	0.4706	0.9706	0.0294
1.39	0.4177	0.9177	0.0823	1.90	0.4713	0.9713	0.0287
1.40	0.4192	0.9192	0.0808	1.91	0.4719	0.9719	0.0281
1.41	0.4207	0.9207	0.0793	1.92	0.4726	0.9726	0.0274
1.42	0.4222	0.9222	0.0778	1.93	0.4732	0.9732	0.0268
1.43	0.4236	0.9236	0.0764	1.94	0.4738	0.9738	0.0262
1.44	0.4251	0.9251	0.0749	1.95	0.4744	0.9744	0.0256
1.45	0.4265	0.9265	0.0735	1.96	0.4750	0.9750	0.0250
1.46	0.4279	0.9279	0.0721	1.97	0.4756	0.9756	0.0244
1.47	0.4292	0.9292	0.0708	1.98	0.4761	0.9761	0.0239
1.48	0.4306	0.9306	0.0694	1.99	0.4767	0.9767	0.0233
1.49	0.4319	0.9319	0.0681	2.00	0.4772	0.9772	0.0228
1.50	0.4332	0.9332	0.0668	2.01	0.4778	0.9778	0.0222
1.51	0.4345	0.9345	0.0655	2.02	0.4783	0.9783	0.0217
1.52	0.4357	0.9357	0.0643	2.03	0.4788	0.9788	0.0212

[TURNOVER]

## Appendix: Probabilities associated with the standard normal distribution (z) continued

z	Mean to z	Larger portion	Smaller portion	z	Mean to z	Larger portion	Smaller portion
2.04	0.4793	0.9793	0.0207	2.55	0.4946	0.9946	0.0054
2.05	0.4798	0.9798	0.0202	2.56	0.4948	0.9948	0.0052
2.06	0.4803	0.9803	0.0197	2.57	0.4949	0.9949	0.0051
2.07	0.4808	0.9808	0.0192	2.58	0.4951	0.9951	0.0049
2.08	0.4812	0.9812	0.0188	2.59	0.4952	0.9952	0.0048
2.09	0.4817	0.9817	0.0183	2.60	0.4953	0.9953	0.0047
2.10	0.4821	0.9821	0.0179	2.61	0.4955	0.9955	0.0045
2.11	0.4826	0.9826	0.0174	2.62	0.4956	0.9956	0.0044
2.12	0.4830	0.9830	0.0170	2.63	0.4957	0.9957	0.0043
2.13	0.4834	0.9834	0.0166	2.64	0.4959	0.9959	0.0041
2.14	0.4838	0.9838	0.0162	2.65	0.4960	0.9960	0.0040
2.15	0.4842	0.9842	0.0158	2.66	0.4961	0.9961	0.0039
2.16	0.4846	0.9846	0.0154	2.67	0.4962	0.9962	0.0038
2.17	0.4850	0.9850	0.0150	2.68	0.4963	0.9963	0.0037
2.18	0.4854	0.9854	0.0146	2.69	0.4964	0.9964	0.0036
2.19	0.4857	0.9857	0.0143	2.70	0.4965	0.9965	0.0035
2.20	0.4861	0.9861	0.0139	2.71	0.4966	0.9966	0.0034
2.21	0.4864	0.9864	0.0136	2.72	0.4967	0.9967	0.0033
2.22	0.4868	0.9868	0.0132	2.73	0.4968	0.9968	0.0032
2.23	0.4871	0.9871	0.0129	2.74	0.4969	0.9969	0.0031
2.24	0.4875	0.9875	0.0125	2.75	0.4970	0.9970	0.0030
2.25	0.4878	0.9878	0.0122	2.76	0.4971	0.9971	0.0029
2.26	0.4881	0.9881	0.0119	2.77	0.4972	0.9972	0.0028
2.27	0.4884	0.9884	0.0116	2.78	0.4973	0.9973	0.0027
2.28	0.4887	0.9887	0.0113	2.79	0.4974	0.9974	0.0026
2.29	0.4890	0.9890	0.0110	2.80	0.4974	0.9974	0.0026
2.30	0.4893	0.9893	0.0107	2.81	0.4975	0.9975	0.0025
2.31	0.4896	0.9896	0.0104	2.82	0.4976	0.9976	0.0024
2.32	0.4898	0.9898	0.0102	2.83	0.4977	0.9977	0.0023
2.33	0.4901	0.9901	0.0099	2.84	0.4977	0.9977	0.0023
2.34	0.4904	0.9904	0.0096	2.85	0.4978	0.9978	0.0022
2.35	0.4906	0.9906	0.0094	2.86	0.4979	0.9979	0.0021
2.36	0.4909	0.9909	0.0091	2.87	0.4979	0.9979	0.0021
2.37	0.4911	0.9911	0.0089	2.88	0.4980	0.9980	0.0020
2.38	0.4913	0.9913	0.0087	2.89	0.4981	0.9981	0.0019
2.39	0.4916	0.9916	0.0084	2.90	0.4981	0.9981	0.0019
2.40	0.4918	0.9918	0.0082	2.91	0.4982	0.9982	0.0018
2.41	0.4920	0.9920	0.0080	2.92	0.4982	0.9982	0.0018
2.42	0.4922	0.9922	0.0078	2.93	0.4983	0.9983	0.0017
2.43	0.4925	0.9925	0.0075	2.94	0.4984	0.9984	0.0016
2.44	0.4927	0.9927	0.0073	2.95	0.4984	0.9984	0.0016
2.45	0.4929	0.9929	0.0071	2.96	0.4985	0.9985	0.0015
2.46	0.4931	0.9931	0.0069	2.97	0.4985	0.9985	0.0015
2.47	0.4932	0.9932	0.0068	2.98	0.4986	0.9986	0.0014
2.48	0.4934	0.9934	0.0066	2.99	0.4986	0.9986	0.0014
2.49	0.4936	0.9936	0.0064	3.00	0.4987	0.9987	0.0013
2.50	0.4938	0.9938	0.0062	3.01	0.4987	0.9987	0.0013
2.51	0.4940	0.9940	0.0060	3.02	0.4987	0.9987	0.0013
2.52	0.4941	0.9941	0.0059	3.03	0.4988	0.9988	0.0012
2.53	0.4943	0.9943	0.0057	3.04	0.4988	0.9988	0.0012
2.54	0.4945	0.9945	0.0055	3.05	0.4989	0.9989	0.0011

[TURNOVER]

**Appendix: Probabilities associated with the standard normal distribution (z) continued**

<b>z</b>	<b>Mean to z</b>	<b>Larger portion</b>	<b>Smaller portion</b>	<b>z</b>	<b>Mean to z</b>	<b>Larger portion</b>	<b>Smaller portion</b>
3.06	0.4989	0.9989	0.0011	3.19	0.4993	0.9993	0.0007
3.07	0.4989	0.9989	0.0011	3.20	0.4993	0.9993	0.0007
3.08	0.4990	0.9990	0.0010	3.21	0.4993	0.9993	0.0007
3.09	0.4990	0.9990	0.0010	3.22	0.4994	0.9994	0.0006
3.10	0.4990	0.9990	0.0010	3.23	0.4994	0.9994	0.0006
3.11	0.4991	0.9991	0.0009	3.24	0.4994	0.9994	0.0006
3.12	0.4991	0.9991	0.0009	3.25	0.4994	0.9994	0.0006
3.13	0.4991	0.9991	0.0009	.	...	...	...
3.14	0.4992	0.9992	0.0008	3.50	0.4998	0.9998	0.0002
3.15	0.4992	0.9992	0.0008	.	...	...	...
3.16	0.4992	0.9992	0.0008	3.75	0.4999	0.9999	0.0001
3.17	0.4992	0.9992	0.0008	..	...	...	...
3.18	0.4993	0.9993	0.0007	4.00	0.5000	1.0000	0.0000

**PART 1 (GENERAL/ALGEMEEN) DEEL 1**

STUDY UNIT e.g. PSY100 X  
 STUDIE-EENHEID bv. PSY100-X

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PAPER NUMBER  
 VRAESTELNOMMER

STUDENT NUMBER  
 STUDENTENOMMER

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c4	c4	c4	c4	c4	c4	c4	c4
c5	c5	c5	c5	c5	c5	c5	c5
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c8	c8	c8	c8	c8	c8	c8	c8
c9	c9	c9	c9	c9	c9	c9	c9

INITIALS AND SURNAME  
 VOORLETTERS EN VAN

DATE OF EXAMINATION  
 DATUM VAN EKSAMEN

EXAMINATION CENTRE (E.G. PRETORIA)  
 EKSAMENSENTRUM (BV. PRETORIA)


UNIQUE PAPER NO  
 UNIEKE VRAESTEL NR

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
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c2	c2	c2	c2	c2	c2	c2	c2
c3	c3	c3	c3	c3	c3	c3	c3
c4	c4	c4	c4	c4	c4	c4	c4
c5	c5	c5	c5	c5	c5	c5	c5
c6	c6	c6	c6	c6	c6	c6	c6
c7	c7	c7	c7	c7	c7	c7	c7
c8	c8	c8	c8	c8	c8	c8	c8
c9	c9	c9	c9	c9	c9	c9	c9

For use by examination invigilator  
 Vir gebruik deur eksamenopsiener

**IMPORTANT**

- USE ONLY AN HB PENCIL TO COMPLETE THIS SHEET
- MARK LIKE THIS 
- CHECK THAT YOUR INITIALS AND SURNAME HAS BEEN FILLED IN CORRECTLY
- ENTER YOUR STUDENT NUMBER FROM LEFT TO RIGHT
- CHECK THAT YOUR STUDENT NUMBER HAS BEEN FILLED IN CORRECTLY
- CHECK THAT THE UNIQUE NUMBER HAS BEEN FILLED IN CORRECTLY
- CHECK THAT ONLY ONE ANSWER PER QUESTION HAS BEEN MARKED
- DO NOT FOLD

**BELANGRIK**

- GEBRUIK SLEGS 'N HB POTLOOD OM HIERDIE BLAD TE VOLTOOI
- MERK AS VOLG 
- KONTROLEER DAT U VOORLETTERS EN VAN REG INGEVUL IS
- VUL U STUDENTENOMMER VAN LINKS NA REGS IN
- KONTROLEER DAT U DIE KORREKTE STUDENTENOMMER VERSTREK HET
- KONTROLEER DAT DIE UNIEKE NOMMER REG INGEVUL IS
- MAAK SEKFR DAT NET EEN ALTERNATIEF PER VRAAG GEMERK IS
- MOENIE VOU NIE

**PART 2 (ANSWERS/ANTWOORDE) DEEL 2**

1	c1	c2	c3	c4	c5
2	c1	c2	c3	c4	c5
3	c1	c2	c3	c4	c5
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137	c1	c2	c3	c4	c5
138	c1	c2	c3	c4	c5
139	c1	c2	c3	c4	c5
140	c1	c2	c3	c4	c5

**Specimen only**