UNISA

PSYCHOLOGICAL RESEARCH

Department of Psychology

PAPER CODE: PYC304-C

TUTORIAL LETTER: 102/3/2004

PSYCHOLOGY RESEARCH
PYC304-C
TUTORIAL LETTER 102/2004

CONTENT		Page
1	The exam paper	2
2	The mock exam	3
2.1	The mock exam	4
2.2	List of formulae	23
3	Answers to the mock exam	25
4	Additional mock exam	34
4.1	Answers to the additional mock exam	52
5	Example of examination answering sheet	66

1 The exam paper

Please reed Tutorial Letter 101 again on the examination paper. It is namely a 2-hour paper consisting of 70 multiple choice items and each item consisting of three alternative answers of which only one is correct (or the ***most*** correct). Your task is thus to study each of the three alternatives and then to decide which alternative is the ***most*** correct.

Remember that the examination paper will be marked using a correction factor for blind guessing. Please read again in Tutorial Letter 101 what we wrote on this issue and what we advised you to do.

In this tutorial letter we also give you two mock exams to do and which you must score at home.

You should remember to apply the correction factor for guessing when you calculate the percentage score.

The 70 items in the exam will represent the learning material the study guide more or less as follows:

Topic 1: 12 items
Topic 2: 13 items
Topic 3: 21 items
Topic 4: 4 items
Topic 5: 12 items
Topic 6: 8 items

2 The mock exam

In the exams the general instructions will look more or less as follows:

This paper consists of 21 pages included 2 blank pages for rough work (pp. 20 & 21) plus 2 pages (i-ii) of formulae and tables (iii-vi) as well as instructions for the completion of a mark reading sheet.

This examination paper remains the property of the University of South Africa and may not be removed from the examination room.

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.)

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

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

The instruction above is merely an example which you can expect in the exam. Now do the mock exam in section 2.1 below.

2.1 The mock exam

Questions 1 to 3 are based on the following case study

A psychologists want to determine the effect of locus of control on productivity in an information technology company. She divides the personnel into two groups, those with an internal locus of control and those with an external locus of control. She then uses job evaluation forms to assess the actual work performance of the personnel in the two groups.

Question 1

The dependent variable in the study is - - - - -.

1. measured job performance
2. locus of control
3. job evaluation forms

Question 2

The independent variable in the study is - - - - -.

1. job performance
2. locus of control
3. job evaluation forms

Question 3

The study in the example illustrates a - - - - - design.

1. correlational
2. groups
3. combination of a groups and correlational

Question 4

Which of the following are advantages of studying statistical methods in psychology?

(a) It leads to a better understanding of the content of psychological theories.
(b) It helps us to evaluate the ethical claims of researchers.
(c) It helps us to interpret the statistical significance of research results.
(d) It gives insight into the nature of the scientific process.

1. (a) & (c)
2. (c)
3. (c), (b) & (d)

Question 5

Consider the following statement: "That phase of sleep during which brain rhythms resemble those of an alert person is called paradoxical sleep or rapid eye movement (REM) sleep". This statement is a - - - - -

1. conclusion based on empirical research
2. operational definition
3. research hypothesis

Question 6

A psychologist studies the effect that age has an attitude towards AIDS. She selects a sample of subjects divided into three different age groups, 20-30 years, 30-40 years and 40-50 years. The three age groups are:

1. different values of the variable age
2. operationalised definitions of the variable age
3. three different theoretical constructs

Question 7

Which is of the following statements gives the best description of the **goal** of psychological research?

1. Logical reasoning based on controlled observation and measurement of human behaviour
2. Testing theories of human behaviour
3. Finding out what previous investigators have achieved with respect to a research problem about human behaviour

Question 8

Consider the following statement: "The experience of strong emotion is accompanied by physiological reactions such as an increase in heart rate". This statement can be viewed as a research hypothesis because it:

(a) predicts a relationship between variables
(b) makes and empirical prediction

1. (a) and not (b)
2. (a) & (b)
3. (b) and not (a)

Question 9

A sport psychologist hypothesises that children with high levels of motivation will be more willing to participate in soccer practice sessions (participation) than children with low levels of motivation.

In this study, the hypothesis is best described as expressing a - - - - -

1. relationship between two variables, ‘high motivation' and ‘low participation’.
2. A relationship between ‘low participation’ and ‘high participation’.
3. rule relating values of ‘motivation' to ‘participation’.

Question 10

A psychologist uses a psychometric test to study the intelligence of school children. Intelligence is the (a) - - - - - variable and the psychometric test represents the (b) - - - - - variable in this study.

1. (a) latent (b) theoretical
2. (a) manifest (b) operational
3. (a) latent (b) manifest

Question 11

In the process of psychological research, researchers try to - - - - -.

1. prove that a theory is true
2. account for theoretical assumptions
3. obtain empirical support for a theory

Question 12

In the PYC304-C guide, constructs are defined as:

1. concepts used to account for observations
2. the building blocks of theories
3. hypothetical or theoretical concepts

1. (a) & (b)
2. (b)
3. (a), (b) & (c)

Question 13

The examination marks of statistics course yielded a normal distribution with a mean of 50 and a standard deviation of 10. If you were to select the score of one student at random, what is the probability that the score would be 60 or above?

1. 0,16
2. 0,34
3. 0,84

Question 14

A ball is drawn at random from a box containing 6 red balls, 4 white balls and 5 blue balls. What is the probability that it is red?

1. 2/5
2. 1/3
3. 0,5

Question 15

Fill in the missing words to the quote: "Statistical methods may be described as methods for drawing conclusions about - - - - - based on - - - - - computed from the - - - - -."

1. samples, parameters, population
2. parameters, statistics, population
3. populations, statistics, sample

Question 16

The sampling distribution of means refers to:

1. the distribution of the means of all possible samples of a particular size randomly selected from the same population
2. the distribution of the different possible values of the sample means together with their respective probabilities of occurrence
3. the distribution of the values of the items in the population

Question 17

A standard normal distribution has a mean of (a) - - - - - and a standard deviation of (b) - - - - -.

1. (a) 1, (b) 16
2. (a) 50, (b) 1,5
3. (a) 0, (b) 1

Question 18

Which best describes the frequency distribution of the ages of students attending a particular class?

1. A graph of the ages of the students arranged from young to old
2. The total of all ages, divided by the number of students
3. The standard deviation of ages, indicating the width of the age distribution

Question 19

A - - - - - Z score is above the mean while a - - - - - Z score is below the mean.

1. negative; positive
2. positive; negative
3. positive; zero

Question 20

What test score corresponds to a Z score of 1 if the mean and standard deviation of the scores are 5 and 2 respectively?

1. 7
2. 2
3. 5

Question 21

The Z score corresponding to a raw score represents the number of - - - - - that the raw score differs from the mean of the raw score distribution.

1. points
2. standard deviations
3. percentiles

Question 22

A table or graph showing how many subjects in a sample obtained each possible score on a test is called a - - - - -.

1. probability sample
2. probability distribution
3. frequency distribution

Use the following summary of marks to answer Questions 23 and 24.

Subject	Student X	Mean of class	Standard deviation of class
A	50%	40%	5%
B	55%	50%	5%
C	60%	50%	10%
D	65%	65%	5%

Question 23

In which subject did Student X do best, relative to his class?

1. A
2. C
3. D

Question 24

In which subject(s) did Student X do worst, relative to the rest of his class?

1. A
2. B
3. D

Question 25

The normal curve is asymptotic. This means that - - - - -.

1. it is symmetrical
2. it is bell shaped
3. the two tails never touch the horizontal axis

Answer Questions 26 to 30 on the basis of the following scenario:

Sally claims that workers in large companies are less work motivated than workers in small companies and plans to test her claim. In a previous study involving all large companies in South Africa, it was found that the average motivation score on a work motivation questionnaire was 50 and that the standard deviation was 15. The higher a worker's score on this questionnaire, the higher the work motivation of the worker.

Question 26

What are the population parameters of interest?

1. μ and $\bar{x}$
2. μ and σ
3. μ and s

Question 27

Which of the statistical hypotheses below reflect the research hypothesis to be tested?

1. $H_0 : \mu = 50$
   $H_1 : \mu > 50$

2. $H_0 : \mu < 50$
   $H_1 : \mu > 50$

3. $H_0 : \mu = 50$
   $H_1 : \mu < 50$

Question 28

In order to test the research hypothesis, Sally must compare two population distributions. Which are these two distributions?

1. small companies and large companies
2. work motivation scores of small companies and large companies
3. work motivation scores of a sample of small companies and large companies

Question 29

What assumptions must Sally make?

1. The population distributions involved have the same shape
2. Both population distributions have the same standard deviation and shape
3. Both population distributions are normal and have the same variance

Question 30

What is the sample statistic of interest?

1. The sample mean
2. The sample variance
3. The sample z-value

Question 31

Peter stated the following hypothesis:

H_0: $\mu = 100$
H_1: $\mu < 100$

He drew a random sample of 50 and obtained a mean score of 105. Given that the null hypothesis is true, what is the reason why the mean of the sample is not exactly 100?

1. A type I error could have occurred
2. This is due to chance
3. The standard deviation caused this.

Questions 32 and 33 are based on the of the following scenario:

Jennifer is testing whether certain food supplements increases the endurance of long distance athletes. She randomly selects 20 athletes to take the supplements. She tests them with an exercise routine for which the general long distance population has a mean score of 50 minutes. She obtains a mean score of 65 minutes for her test group.

Question 32

Which of the following statements represents the null hypothesis?

1. the mean score of the all long distance athletes is 50 minutes
2. the mean score of the athletes taking the supplements is 65 minutes
3. the mean score of the athletes taking the supplements is 50 minutes

Question 33

If Jennifer rejects H_0, it implies - - - - -

1. an acceptance of H_1
2. that $\mu > 50$
3. that a difference between sample means is a chance outcome

Question 34

What does the H_1: $\mu > 50$ imply?

1. A relationship between two variables
2. A difference between two populations
3. Both 1 and 2.

Question 35

How does one test an alternative hypothesis?

1. Decide whether H_0 should be rejected or not on the basis of observations.
2. Compute the p-value for H_1 and compare to the level of significance.
3. Consider whether the alternative hypothesis makes sense from a theoretical perspective.

Question 36

When is the null hypothesis equivalent to the research hypothesis?

1. When the research hypothesis implies no difference between the populations being compared
2. When the null hypothesis states a difference in the means of the populations being compared
3. When the research hypothesis is about the comparison of two population means

Question 37

The size of the level of significance depends on - - - - -

3. a choice made by the researcher
2. conventional rules
3. the p-value under H_0

Question 38

A p-value is some value between - - - - -

1. 0 and 100
2. 0 and 0,05
3. 0 and 1

Question 39

The null hypothesis is rejected if

1. the p-value is smaller than the level of significance
2. the p-value is larger than the level of significance
3. the p-value is smaller than the probability under H_0

Question 40

Suppose study A and study B tests the same H_0 and H_1 and find the same z-test statistic value. Study B consisted of a larger sample size however. We will probably find that - - - - -.

1. the p-value of study B is smaller
2. the p-value of study B is larger
3. the p-value of study A is equal to the p-value of study B

Question 41

Which one of the following is a way of increasing the power of a statistical test?

1. Increasing the sample size
2. Increasing the p-value in the decision rule
3. Decreasing the p-value in the decision rule

Question 42

A p-value gives the probability of a sample result under - - - - -.

1. H_0
2. H_1
3. The research hypothesis

Question 43

Whether a p-value is directional or non-directional depends on - - - - -.

1. the null hypothesis
2. the alternative hypothesis
3. null and the alternative hypothesis

Question 44

When analysing results, what do we call the hypothesis that the mean scores for two populations are equal?

1. The scientific hypothesis
2. The null hypothesis
3. The alternative hypothesis

Question 45

Using a significance level of 0,05 in statistical hypothesis testing means that the probability of - - - - - is at most 0,05.

1. making a Type I error
2. not making a Type I error
3. making a Type II error

Question 46

Which is true of the null and alternative hypotheses?

1. They can be both true, but not both false
2. They can be both false, but not both true
3. If one is true, the other must be false.

Question 47

Which is a Type II error in statistical significance testing?

1. Rejecting the null hypothesis when it is in fact true
2. Not rejecting the null hypothesis when it is in fact false
3. Rejecting the alternative hypothesis when it is in fact true

Question 48

Which of the following alternative hypotheses requires a two-tailed test of significance?

1. The correlation coefficient between test marks and examination marks for boys is different from the same correlation for girls
2. The mean verbal ability score for boys is lower than the mean score for girls
3. The mean depression score after treatment will be lower than before treatment.

Question 49

The t test statistic is appropriate when - - - - -

1. The null hypothesis is about a sample mean and the population mean is unknown.
2. The null hypothesis is about a population mean and the population standard deviation is unknown.
3. The null hypothesis is about a sample mean and the population standard deviation is unknown.

Question 50

Suppose a researcher is of the opinion that the proportion of Unisa students who are in favour of group lectures are 0,5. He/she selects a single random sample of 144 Unisa students and find that 50 of these students are in favour of group lectures. If P = 0,5, what is the value of p, the sample proportion?

1. 50/144
2. 144/50
3. (50/144 - 0,5)

Question 51

Suppose the z_p value for the data in item - - - - - above is found to be 2,50. What is the value of the p-value?

1. 0,4938
2. 0,0062
3. 0,0124

Question 52

Suppose the null hypothesis for the research problem in item 50 is rejected, what should the research conclusion be?

1. The proportion of Unisa students that favour group lectures is not different from 0,5.
2. The proportion of Unisa students that favour group lectures is different from 0,5.
3. The proportion of Unisa students that favour group lectures is less than 0,5.

Question 53

An alternative hypothesis is described as: $H_1: \mu_1 > \mu_2$

What does μ_2 signify?

1. the sample mean of the second group sampled
2. the population mean of the second group sampled
3. the unknown parameter to be tested for under the null hypothesis

Question 54

The difference score d = X2 - X1 is used in the case of calculating - - - - -.

1. the t-test for comparing two independent samples
2. the t-test for comparing two dependent samples
3. the chi-square test

Question 55

To investigate the effectiveness of a motivational speaker, 50 members of his audience are randomly chosen, and tested on a motivation scale before and after listening to his presentation. Which of the following is the most appropriate statistical procedure to determine whether the motivational talk made a difference?

1. the t-test for independent samples
2. the t-test for dependent samples
3. the chi-square test

Question 56

In which of the following cases is it **not** appropriate to use the t-test for comparing means from two samples?

1. the samples are large (200 cases each) but are not normally distributed
2. the samples are small (15 cases each) but are known to be normally distributed
3. the sample are small (10 cases each) but the distribution of the scores in the population is unknown.

Question 57

A group of clerical workers are compared with a group of technical workers in a large company to determine whether they differ in their levels of job satisfaction, using a t-test. Which would be the dependent variable?

1. job category
2. job satisfaction
3. workers

Question 58

Which of the following test statistics may be used to compare proportions?

1. the z-statistic (z_C)
2. the t-test statistic for independent samples (t_C)
3. the t-test statistic for dependent samples ($t_{\bar{d}}$)

Question 59

Two samples may be regarded as independent when - - - - -.

1. there is no systematic relationship between the composition of one sample and the other
2. they were drawn at different occasions
3. they are both totally random

Question 60

The size of the t-statistic for independent samples (t_c) depends on - - - - -.

1. the two sample means of the variable being compared
2. the standard deviations from the two samples of the variable being compared
3. both of the above

Question 61

Pearson's correlation coefficient r represents - - - - -

1. the size of the relationship between two variables
2. the shape of the relationship between two variables
3. both of the above

Question 62

Pearson's correlation coefficient r can take values ranging between - - - - -

1. 0 to 1
2. 1 to 10
3. -1 to 1

Question 63

A variable that can take only one of two possible values is called - - - - -

1. binomial
2. dichotomous
3. nominal

Question 64

If there is no relationship at all between two variables, what would be the most likely value of Pearson's correlation coefficient r, out of the following:

1. -1,0
2. 0,5
3. 0,0

Question 65

Which of the following does not represent a valid value for Pearson's r?

1. -0,72
2. 0,00
3. -1,01

Question 66

A Pearson's correlation coefficient of r = 0,65 has been found. What kind of relationship between two variables X and Y is implied?

1. as X gets larger, Y gets smaller
2. as X gets smaller, Y gets smaller
3. as X gets smaller, Y gets larger

Question 67

A Pearson's correlation of r = 1,00 was found. What does this tell one about the relationship between two variables X and Y?

1. they exhibit a strong absolute relationship
2. the relationship is perfectly linear
3. a relationship of r = 1,0 is impossible to achieve

Question 68

Which of the following tests are appropriate for determining whether a relationship exists between two variables if both are measured on the nominal scale of measurement?

1. the t-test for two independent samples
2. testing the significance of the Pearson correlation coefficient
3. the chi-square test

Question 69

The chi-square test is used to compare which aspect of data for two samples?

1. the distributions of the data as classified in terms of a variable
2. the sample means of the variable for each sample
3. the variance of the variable as measured for each sample

Question 70

A graphical representation of the relationship between two variables X and Y is called a - - - -

1. histogram
2. graph
3. scatter plot

[END OF THE MOCK EXAM]

2.2 List of formulae

For the purposes of the mock exam the necessary tables are not provided since they are given in the study guide. The list of formulae that will be given in the exams is given below. Note that the formulae for the calculation of the mean, the standard error and the z-value is not given. It is expected of you to know the latter formulae. Keep in mind that although this list of formulae is given, it does not necessarily mean that each of these formulae will feature in the exam paper. The examination will actually require few calculations.

List of formulae:

$$Z_{\bar{X}} = \frac{\left(\bar{X} - \mu_{\bar{X}}\right)}{\frac{\sigma}{\sqrt{n}}}$$

$$t_c = \frac{\left(\overline{X_1} - \overline{X_2}\right)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$$t_{\bar{d}} = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2} - 2r\, s_1\, s_2}}$$

$$z_c = \frac{\left(p_1 - p_2\right)}{\sqrt{\frac{p_1\left(1-p_1\right)}{n_1} + \frac{p_2\left(1-p_2\right)}{n_2}}}$$

$$r = \frac{\operatorname{cov}(X,Y)}{\sqrt{\operatorname{var}(X)\operatorname{var}(Y)}}$$

$$r = \frac{N\sum XY - \left(\sum X\right)\left(\sum Y\right)}{\sqrt{\left[N\sum X^2 - \left(\sum X\right)^2\right]\left[N\sum Y^2 - \left(\sum Y\right)^2\right]}}$$

$$t_r = \frac{r\sqrt{N-2}}{\sqrt{1-r^2}}$$

$$\chi_p^2 = \sum_{ij} \frac{\left(O_{ij} - E_{ij}\right)^2}{E_{ij}}$$

$$t_{\overline{X}} = \frac{\left(\overline{X} - \mu_{\overline{X}}\right)}{s_{\overline{X}}}$$

$$z_p = \frac{\left(p - P_O\right)}{\sqrt{P_O\left(1 - P_O\right)\ n}}$$

3 Answers to questions in mock exam

Question 1

Alternative 1 is correct. The dependent variable is the one that is predicted or explained. In this study the researcher tries to predict work performance with the aid of locus of control.

Question 2

Alternative 2 is correct. Locus of control is the independent variable because it is used to predict the dependent variable (work performance).

Question 3

Alternative 2 is correct. In this study two groups (internal locus of control and external locus of control) are compared with one another. It is therefore a groups design.

Question 4

Alternative 2 is correct. The other alternatives are more general aspects of research and go beyond the statistical analysis of the results.

Question 5

Alternative 2 is correct. The statement gives a definition of REM sleep.

Question 6

In this study the variable 'age' is divided into three values. Alternative 1 is therefore correct.

Question 7

Alternative 2 is correct. As explained on page 2 in the Guide. Psychological research is mainly concerned with testing theories.

Question 8

Alternative 2 is correct. A psychological hypothesis is a relation between variables, and formulates a testable empirical claim which usually involves postulating a relationship between two or more variables.

Question 9

As explained in the Guide for PYC304-C, page 13 a hypothesis formulates rule expressing a relationship between two or more variables. In this case the independent variables has two values, high and low motivation. Alternative 3 is therefore correct.

Question 10

Alternative 3 is correct. Intelligence is a latent variable because it cannot be observed directly. The results of the psychometric test can however be observed directly and can therefore be regarded as the manifest variable.

Question 11

Alternative 3 is correct. Theories can never be proved, research psychologists are trying instead to find empirical support for a theory.

Question 12

Alternative 3 is correct, because all three statements are true (see Guide for PYC304-C, pp. 3-5).

Question 13

Alternative 1 is correct. The Z-score associated with 60 is (60-50)/10 = 1. The probability of a mark having 1 standard (i.e. Z-score) above the mean is 0,16 (see Figure 2.5 on p. 34 of the guide).

Question 14

There are 6 + 4 + 5 = 15 balls and 6 of them are red. P(Red) = 6/15 = 2/5. Alternative 1 is therefore correct.

Question 15

Alternative 3 is correct. Populations are abstract and can usually not be studied directly. In research, samples are analysed and inferences are then drawn about populations on the basis of the statistics obtained from samples.

Question 16

Alternative 1 is correct. Read the discussion of the distribution of sample means in the guide (Guide for PYC304-C, pp.39-42).

Question 17

Alternative 3 is correct (see Figure 2.5 on p. 34).

Question 18

Alternative 1 is correct. A frequency distribution will represent the number of students falling under each age group.

Question 19

Alternative 2 is correct. Consider the formula for calculating a z-score on page 35 in the guide. For a score that is larger than the mean a positive z-score will be obtained. A score that is less than the mean will give a negative z-scores.

Question 20

(7-5)/2 = 1. Alternative 1 is correct.

Question 21

Alternative 2 is correct. Z-scores are standard deviations on the standard normal distribution.

Question 22

Alternative 3 is correct. It is a frequency distribution.

Question 23

Alternative 1 is correct. In the case of subject A the student's mark is 2 standard deviations above the mean. In the other subjects the student's marks are 1 standard deviation or less above the mean.

Question 24

Alternative 3 is correct. The student obtained marks higher than the mean for all the other subjects.

Question 25

Alternative 3. The term 'asymptotic' is defined on page 33 in the Guide for PYC304-C.

Question 26

Alternative 2 is correct as the population of small companies's mean score (μ is unknown) is compared to the population means of the large companies (μ = 50). It is accepted that the populations have the same standard deviation of 15.

Question 27

The correct alternative is 1. The claim is being made that small companies have a work motivation greater (>) than 50.

Question 28

The correct alternative answer is 2. The terms "distribution" implies the distribution of "scores" or "numbers". Also note that populations are being compared with each other and not samples.

Question 29

The correct alternative answer is 3. Both population distributions are normal (which of course implies that they have the same form) and have the same variance. Note that the standard deviation is merely the square root of the variance.

Question 30

The correct alternative answer is 1. The sample mean provides us here with an estimate of the population mean of small companies.

Question 31

The correct alternative is 2. Because our sample is selected randomly, there is always, a chance that the sample may not be precisely representative of the population. We refer to this as sampling error.

.

Question 32

The correct alternative is 3. Note that alternative 2 is incorrect since 65 minutes is a sample result which is still unknown at the stage when the null hypothesis is formulated. Note that alternative 1 is incorrect because it does not refer to athletes who take supplements.

Question 33

The correct alternative is 1. Note that alternative 2 does not correspond to the research hypothesis. Jennifer expects that the endurance of her athletes will be better and therefore that their average time will be less than 50 minutes and not more than 50 minutes.

Question 34

Alternative 3 is correct. Note that all research attempt to establish whether a relationship exists between two or more variables. Although we cannot infer from a statement such as H_1: $\mu > 50$ what two variables are being referred to, we know that the researcher would have to have had such variables in mind if he/she were to arrive at statistical hypotheses.

Question 35

The correct alternative is 1. H_0 and H_1 are formulated in such a way that the rejection of H_0 implies the acceptance of H_1.

Question 36

Alternative 1 is correct. The research hypothesis usually translates to the alternative hypothesis because it usually suggests a difference between the population means. It does happen though that the researcher wishes to suggest no differences between the populations in which case the research hypothesis translates directly to the null hypothesis.

Question 37

Alternative 1 is correct. The researcher may choose any level of significance in advance and need not be led by conventional rules.

Question 38

The correct alternative is 3. If the p-value is expressed as a percentage, it may be a value between 0 and 100. It is not customary to do so however.

Question 39

Alternative 1 is correct.

Question 40

Alternative 3 is correct. The p-value is read from the z-tables for a specific z-value and the size of the sample does not play a role here. In the calculation of the z-value, the size of the sample has already been taken into account.

Question 41

The correct alternative is 1. The p-value may not be changed by the researcher and is determined by the data.

Question 42

The correct alternative is 1.

Question 43

The correct alternative is 2.

Question 44

The correct alternative is 2.

Question 45

The correct alternative is 1.

Question 46

Alternative 3 is correct.

Question 47

Alternative 2 is correct. Alternative 1 refers to the Type I error while alternative 3 is irrelevant because the statistical decision rules applies only to the null hypothesis.

Question 48

The correct alternative is 1. Note that the statistical test procedure for comparing two correlations is not included in the present syllabus but we can still judge that all that is proposed here is that two populations do not differ with respect to their correlations between the same two variables. We are therefore only able to formulate an alternative hypothesis that suggests a difference between the correlations and therefore a two-tailed test of significance is indicated.

Question 49

Alternative 2 is correct. If the population standard deviation was known, a z-test would have been needed.

Question 50

Sample proportion = 50/144. Alternative 1 is therefore correct.

Question 51

The correct alternative is 3. The alternative hypothesis in Question 50 is clearly non-directional. The p-value for a directional test can be read directly from the z-tables as the area under the normal distribution to the right of a z-value equal to 2,50 (Look under the column "smaller portion" in the z-tables). This p-value is 0,0062. The non-directional p-value is therefore 2 x 0,0062 = 0,0124.

Question 52

Alternative 2 is correct. If the null hypothesis is not rejected, alternative 1 would be correct. Alternative 3 cannot be correct because the alternative hypothesis is non-directional.

Question 53

Alternative 2 is correct. The Greek character 'mu' or μ is used to indicate a population mean, as distinct from a sample mean, which is indicated by $\bar{x}$. Note that one uses data from a sample to make inferences about the population, so it is the population mean being tested for.

Question 54

Alternative 2 is correct.

Question 55

Alternative 2 is correct. The t-test is appropriate, and there is an implicit interdependence in data derived from repeated measurements of the same variable for the same sample of subjects.

Question 56

Alternatives 1 and 2 both describe conditions under which the t-test may be used, so 3 is correct.

Question 57

Alternative 2 is correct. The way in which job category influences job satisfaction is being investigated, so it is job satisfaction that depends on job category. While the whole population consists of workers, this is not relevant to the research question.

Question 58

Alternative 1 is correct, the z-statistic (z_C) being the correct statistic for comparing proportions.

Question 59

Alternative 1 is correct. It is a definition of independence for samples. Alternative 2 does not guarantee independence, and alternative 3 is irrelevant.

Question 60

Alternative 3 is correct, since computation of the t-statistic depends on both means and standard deviations.

Question 61

Alternative 3 is correct. Pearson's r indicates the extent to which a relationship is linear, so both size and shape is relevant.

Question 62

Alternative 3 is correct.

Question 63

Alternative 2 is correct.

Question 64

Alternative 3 is correct. If Pearson's r = 0, there is no indication at all of a linear relationship. If there is 'no relationship at all', there won't be any linear relationship either.

Question 65

Alternative 3 is correct. The smallest possible value of r is -1.

Question 66

Alternatives 1 and 3 describe negative relationships. Since 'as X gets smaller, Y gets smaller' implies that as X gets bigger, Y gets bigger, 2 is the correct alternative.

Question 67

Alternative 2 is correct.

Question 68

Alternative 3 is correct. The chi-square (χ^2) test is to be used because the variables are nominal scale measurements.

Question 69

Alternative 1 is correct. The chi-square test looks at the distribution of data over categories that may represent measurements on the nominal level, and neither means nor variances is relevant to its use.

Question 70

Alternative 3 is correct.

4 Additional mock exam

Question 1

Having read a recent publication of Watson's theory about the nature of consciousness, a student decides to conduct an experiment to critically examine aspects of the theory. The main aim of the research will probably be to empirically - - - - -

1. test predictions based on Watson's theory
2. test Watson's theory so that it can be accepted or rejected as a whole
3. study consciousness with a view to understanding, predicting and controlling it

Question 2

A theory can be described as an interdependent set of - - - - - relations between - - - - -

1. proposed; constructs
2. empirical; hypotheses
3. verified; variables

Question 3

Constructs are sometimes called - - - - -

1. indicators
2. referents
3. intervening variables

Questions 4

Which of the following best describes “latent”?

1. observable
2. manifest
3. hidden

Question 5

A measurement model of attention deficit disorder relates this - - - - - to its - - - - -

1. construct; intervening variables
2. hypothetical variable; observable instances
3. referent; manifestations

Question 6

An operational definition defines a - - - - - in terms of - - - - -

1. manifest variable; observable behaviour
2. theoretical construct; observable consequences
3. observable construct; other constructs

Question 7

Which best describes “research hypothesis”?

1. An empirically observed relation between two constructs
2. A proposed relation between two variables
3. A network of postulated relations between constructs

Use the following scenario to answer **Questions 8 to 12**:

“My explanation of acute stress disorder indicates how the intensity of stress is affected by patients’ anxiety proneness, whether or not they received psychotherapy, and the nature of the traumatic stressor. My research will investigate whether such patients’ level of anxiety is actually reduced by psychotherapy. More specifically, patients receiving therapy are expected to score lower on the Manifest Anxiety Scale than patients not receiving therapy.”

Question 8

“My explanation of acute stress disorder” is a - - - - -

1. scientific hypothesis
2. theory
3. postulated relation between two constructs

Question 9

“Patients’ level of anxiety is reduced by psychotherapy” is - - - - -

1. an observed relation between two variables
2. a theoretical hypothesis
3. an operational hypothesis

Question 10

The dependent variable(s) in my research is/are - - - - -

1. anxiety proneness, nature of the traumatic stressor, and psychotherapy
2. whether or not psychotherapy is received
3. level of anxiety experienced by patients

Question 11

The independent variable in my research is - - - - -

1. whether or not psychotherapy is received
2. level of anxiety experienced by patients
3. the intensity of stress

Question 12

When interpreting the results of this research I will assume that anxiety proneness and the nature of the traumatic stressor - - - - -

1. do affect level of anxiety, but their effects more or less cancel out over all my patients
2. do not affect level of anxiety
3. do affect level of anxiety, but according to the central limit theorem their average effect will be zero

Question 13

A class of 10 boys and 11 girls, including Mary and her friend Elizabeth, chooses a class representative by writing their names on slips of paper, putting these into a box and asking their teacher to draw one name blindly.

What is the probability that Mary will be selected?

1. 1/11
2. 1/20
3. 1/21

Question 14

Which statement best represents an application of the law of large numbers? If I flip a coin 1000 times it will fall heads up - - - - - 500 times.

1. approximately
2. exactly
3. at least

Question 15

Which of the following does **NOT** represent a probability?

1. 99%
2. 0
3. -0,05

Question 16

The expression “0,05 ≤ p ≤ 0,10" denotes a probability value - - - - -

1. somewhere in the range 0,05 to 0,10
2. larger than or equal to 0,10; or smaller than or equal to 0,05
3. larger than 0,05 and smaller than 0,10

Question 17

If 5000 students wrote an exam, 3000 passed with 50% or more and 250 obtained exactly 50%, what is the value of p (% score greater or equal to 50|pass) for randomly selected students?

1. 0,025
2. 1/12
3. 1

Question 18

Use the following frequency distribution of 1000 scores on a subscale of an intelligence test to answer the question.

Score (X):	11	12	13	14	15	16	17	18
Relative frequency (%):	4	11	13	22	18	17	9	6

The value of p(X larger than or equal to 18) is - - - - -

1. 0,06
2. 0
3. 94%

Question 19

During the interpretation of psychological measurements the normal distribution is - - - - -

1. adapted to fit the observed frequency distribution of scores
2. used as a theoretical model for interpreting the observed distribution of scores
3. used to calculate the relative frequency of observed scores

Question 20

The scale along the X-axis of the standard normal distribution indicates - - - - -

1. probabilities
2. the mean of the distribution
3. the number of standard deviations below and above the mean

Question 21

The area under the standard normal curve equals - - - - -

1. its mean
2. its standard deviation
3. one

Question 22

The mean and standard deviation of a set of test scores are 20 and 8 respectively. What is the z-score corresponding to a test score of 14?

1. 6
2. 0,75
3. -0,75

Question 23

Joseph scores 60% in a History test (class mean 65%, standard deviation 10%) and 50% in a Biology test (class mean 53%, standard deviation 12%). Use z-scores to decide which statement is true: Relative to the rest of his class Joseph does - - - - -

1. better in Biology than in History
2. better in History that in Biology
3. equally well in History and Biology

Question 24

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

1. sample is larger and the standard deviation of the population smaller
2. population is larger and the variability of the scores in the sample is smaller
3. sample mean is smaller

Question 25

The central limit theorem implies that, for large samples from non-normal populations, - - - - -

1. the sampling distribution of the mean will be approximately normal
2. the distribution of sample values will be approximately normal
3. the observed relative frequency of an event will approach its theoretical probability

Base your answers to Questions **26 to 28** 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 26

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

Question 27

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

Question 28

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

1. non-directional
2. two-tailed
3. directional

Question 29

Statistical hypotheses are statements about - - - - -

1. population parameters
2. sample statistics
3. both of the above

Question 30

The sampling distribution of a statistic (e.g. of the sample mean) can be calculated if we assume that the - - - - - hypothesis is true, but not if we assume that the - - - - - hypothesis is true.

1. null; alternative
2. alternative; null
3. statistical; research

Question 31

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

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

Question 32

When a statistical test yields a large p-value, which of the following statements is most correct?

1. The alternative hypothesis is probably true
2. The null hypothesis is probably false
3. The null hypothesis is probably true

Question 33

Suppose we have stated H_0: $\mu = 10$, and H_1: $\mu < 10$, and find that the sample mean corresponds to a z-score of -3. This means that the corresponding p-value - - - - -

1. need not be found to reach a decision
2. is 0,0026
3. is 0,0013

Question 34

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

Question 35

When applying a z-test to compare a sample mean to a known population mean, what do we call the calculated z-value?

1. A test statistic
2. A sample statistic
3. A population parameter

Question 36

When applying a z-test to compare a sample mean to a known population mean, the p-value represents the probability of - - - - -

1. correctly rejecting the null hypothesis
2. obtaining the sample mean under the alternative hypothesis
3. obtaining the sample mean under the null hypothesis

Question 37

Which statement is true of the level of significance of a statistical test?

1. It is based on the p-value of the test statistic
2. It is often selected in advance by the researcher
3. It is the probability of obtaining the sample statistic under the null hypothesis

Question 38

When applying a statistical test a decision is reached by comparing the - - - - - to the - - - - -

1. p-value; level of significance
2. test statistic; population parameter
3. test statistic; level of significance

Question 39

When applying a statistical test, if the p-value is larger than the level of significance we - - - - - the null hypothesis.

1. accept
2. do not reject
3. reject

Question 40

When applying a statistical test, if the p-value is larger than the level of significance we - - - - - the alternative hypothesis.

1. do not accept
2. fail to reject
3. accept

Question 41

When applying a statistical test, the probability of a type I error is equal to - - - - -

1. 0,05 or 0,01
2. the p-value of the test statistic under the null hypothesis
3. the p-value of the test statistic under the alternative hypothesis

Question 42

The lower we set the level of significance, the greater the probability of - - - - -

1. rejecting the null hypothesis
2. a type I error
3. a type II error

Question 43

The nature of the research process and of statistical analysis are such that statistically significant results are - - - - -

1. also psychologically important
2. psychologically important if a high level of significance was used
3. not necessarily psychologically important

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

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

You wish to test the hypothesis that the majority of persons aged 70 years or more are females. Using registers of pensioners you obtain a random sample of 250 persons aged 70 or more and find that 150 of them are female.

Question 45

Which are the appropriate statistical hypotheses for the analysis of your result?

1. H_0: P equals 0,5; H_1: P is larger that 0,5
2. H_0: μ equals 70; H_1: μ is larger than 70
3. H_0: P equals 0,5; H_1: P is not equal to 0,5

Question 46

Which research design did you use?

1. A correlational design with variables measured on a nominal scale
2. A two-groups design with measures of age and gender
3. A single-sample groups design

Question 47

Which is the appropriate test statistic to calculate?

1. The z-statistic for a sample proportion
2. The z-statistic for the mean of a single sample
3. The t-statistic for the mean of a single sample

Question 48

What are the requirements with regard to statistical testing of the results?

1. A one-tailed statistical test should be performed
2. A two-tailed statistical test should be performed
3. No statistical test is required

Base your answers to Questions **49 to 51** on the following scenario:

To validate a new depression scale a researcher applies it to 50 patients diagnosed with depression and 50 patients diagnosed with stress. She predicts that the depression sample will score higher (more depression) than the stress sample. The mean scores of the two samples are found to be 30 (standard deviation 10) and 25 (standard deviation 10) respectively.

Question 49

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

1. $\mu_1 = \mu_2$
2. $\mu = 25$
3. The population mean of the difference score equals zero

Question 50

Which research design did the researcher use?

1. Single-sample groups design
2. Two-sample groups design
3. Two-sample correlational design

Question 51

Which of the following assumptions underlies the calculation of the test statistic?

1. The population standard deviation is known
2. The two populations have different means
3. The two populations have the same variance

Question 52

To test the efficacy of psychotherapy aimed at relieving depression, a researcher applies a depression scale to 50 depressed patients at the start and again at the end of their treatment, predicting that the latter scores will be lower (reflecting less depression). Scores on his depression scale among the general population have a mean of 30 and a standard deviation of 10. Which research design is appropriate to test the research hypothesis?

1. A two-sample groups design with independent groups
2. A two-sample groups design with dependent groups
3. A one-sample groups design

Base your answers to Questions **53 to 54** on the following scenario:

A teacher investigates the effect of extra classes on the performance of pupils in mathematics. A group of 20 pupils receives the extra classes while a control group of 20 pupils receives singing lessons. For each of the 40 pupils the teacher calculates the increase or decrease in his or her mathematics performance by comparing the marks obtained in an examination before the extra classes to the marks obtained in an examination after the extra classes.

Question 53

Which is the most appropriate research hypothesis for the teacher to test?

1. The mean mathematics score after the extra classes is larger than before the extra classes for the experimental group
2. The mean mathematics difference score (after minus before) of the experimental group is larger than that of the control group
3. The mean mathematics score after extra classes is higher for the experimental group than for the control group

Question 54

Which is the appropriate test statistic to be calculated when analysing the results of this research?

1. The t-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 mean difference score of a single sample

Question 55

The probability under the null hypothesis of obtaining a t-value of 2,5 or higher in the case of a one-tailed test is - - - - - that for a two-tailed test.

1. the same as
2. twice
3. half

Base your answers to Questions **56 to 57** on the following scenario:

A marriage counsellor expects that second marriages more often end in divorce than first marriages. She tests this hypothesis by following up 200 marriages that were all registered five years ago, 50 in which at least one partner had been married before and 150 in which neither partner had been married before. Of the 150 first marriages 30 ended in divorce; of the 50 second marriages 10 ended in divorce.

Question 56

Which constructs feature in the researcher's hypothesis?

1. Type of marriage (first/second); divorced (yes/no)
2. First marriage; second marriage; divorced (yes/no)
3. First marriage; second marriage; divorced; not divorced

Question 57

A politician asks his audience of 100 whether they will vote for him, and 60 say yes. He then delivers his speech and repeats the question. Now 70 persons say yes. When analysing these results the two sets of answers should be regarded as - - - - -

1. dependent
2. independent
3. having been drawn from the same population

Question 58

In correlational research 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

Question 59

A scatter plot is a graphical representation of the relation between - - - - -

1. two variables measured on a nominal scale within a single group
2. two variables measured on a ratio or interval scale within a single group
3. two groups of subjects with regard to a single variable measured on an interval or ratio scale

Question 60

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

Question 61

Which of the following can take on a value of -0,5?

1. a probability
2. a level of significance
3. a correlation coefficient

Question 62

What is the correlation coefficient between the following values of X and Y?
X -2 -1 0
Y -2 -1 0

1. -1
2. 0
3. +1

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. $P = 0$

Question 64

A researcher obtains a correlation coefficient of 0,40 between IQ scores and examination marks in a random sample of 10 PYC 304 students, and again a correlation coefficient of 0,40 between the same two variables on another random sample of 100 PYC 304 students. Which of these two correlation coefficients is the more likely to differ significantly from zero under the null hypothesis?

1. That obtained on the smaller sample
2. Both are equally likely to be significant
3. That obtained on the larger sample

Question 65

A contingency table is used to summarize the relationship between two variables measured on - - - - - scale.

1. a nominal
2. an ordinal
3. an interval or ratio

[END OF THE MOCK EXAM]

4.1 Answers to the additional mock exam

Question 1

Alternative 1 is correct because the experiment is aimed at testing Watson's specific theory and not consciousness in general (alternative 3). Alternative 2 is incorrect because in the question it is explicitly stated that the aim is to test aspects of the theory (and therefore not the whole theory).

Question 2

Alternative 1 is correct because a theory is defined on page 3 of the study guide as a "network of postulated relations between constructs". Alternative 2 is wrong because one does not test relations between hypotheses, but between variables. The relations are postulated (and therefore not verified) so that alternative 3 is also incorrect.

Question 3

Alternative 3 is correct.

See Study guide, page 4 where some synonyms of the term 'construct' are mentioned.

Questions 4

Alternative 3 is correct because 'latent' variables are not observable, but hypothetical or 'hidden'. Alternatives 2 and 3 are incorrect because 'manifest' and 'observable' mean the opposite of 'latent' (i.e. variables that are NOT latent are manifest or observable).

Question 5

Alternative 2 is correct because (a) 'attention deficit disorder' is a hypothetical variable used to refer to a cluster of observable symptoms, and (b) the symptoms are the observable instances (of behaviour) which are used to measure (e.g. indicate the severity) of the disorder. Alternative 1 is incorrect because one requires manifest, not latent variables for measurement, and alternative 3 is also incorrect because a model is not just a referent, but a theory of the relationship between 'referents' (or hypothetical entities).

Question 6

Alternative 2 is correct, because operational definitions are used to cross the gap between theory and empirical research. It does this by describing theoretical constructs in terms of observable instances, which can be measured and used to test a theory (see the study guide, page 7).

Question 7

Alternative 2 is correct because a hypothesis posits a relation between two sets of variables, the independent and the dependent variables (see page 11 in the study guide). Alternative 1 is incorrect because the relation is theoretical or 'hypothetical' and not yet empirically investigated. Alternative 3 is also incorrect because it defines the concept of a theory rather than just a hypothesis (see Study guide page 3).

Question 8

Alternative 2 is correct.

The explanation is a theory because it presents a postulated relation between a set of constructs (i.e. type of stressor, intensity of stress, anxiety proneness) - Study guide, pages 3 and 9. Alternative 2 is incorrect because the scenario provides a general explanation of the relations, but not a specific hypothesis that has been formulated for testing. Alternative 3 is also incorrect because the explanation involves a relation between more than two constructs.

Question 9

Alternative 2 is correct, because a specific hypothesis is now derived from the theory presented in the scenario. Alternatives 1 and 3 is incorrect because the terms 'level of anxiety' and 'psychotherapy' have not been operationally defined in the statement given.

Question 10

Alternative 3 is correct.

In the hypothesis mentioned in Question 9 it is indicated the level or intensity of anxiety experienced 'depends' on other variables such as anxiety proneness and psychotherapy received, showing that it functions as a dependent or Y-variable which is to be predicted or explained in the study (Study guide, page 11).

Question 11

Alternative 1 is correct.

In the study it is predicted that psychotherapy will have an effect on the level (i.e. intensity) of anxiety experienced. It is therefore an independent variable which can be placed in the position of the variable X in diagram 1.5 (Study guide, page 11).

Question 12

Alternative 1 is correct.

It is obvious that the type of stressor may have an effect on the level of anxiety experienced, but if an unbiased (e.g. random) sample is selected from the population, the influence of the type of stressor will be averaged over the sample. Alternative 2 is incorrect because there is no grounds for assuming that the type of stressor will not affect anxiety. Alternative 3 is also incorrect because the central limit theory is not applicable here (it refers to the nature of the sampling distributions of sampling statistics and not to the value of specific variables).

Question 13

Alternative 3 is correct.

We need to calculate P(Mary is elected) = favourable outcomes/possible outcomes = 1/(11+10) = 1/21. See Study guide pages 26-27.

Question 14

Alternative 1 is correct because the law of large number states that the number of heads will converge on (i.e. approach) the theoretical probability of 0,5., and not that it will reach it exactly (alternative 2). See Study guide, page 27.

Question 15

Alternative 3 is incorrect because by definition probabilities fall within the range 0,00 and 1,00 and can therefore never have a negative value (Study guide, page 28).

Question 16

Alternative 1 is correct because the expression states that p can be equal to or larger than 0,05, and equal to or smaller than 0,10, indicating that the range includes 0,05 and 0,10. Alternative 2 is incorrect because it allows p to be larger than 0,10 and smaller than 0,05. Alternative 3 is also incorrect because it does not specify that p can be equal to either 0,05 or 0,10 as well.

Question 17

Alternative 3 is correct.

The formula p (% score greater or equal to 50|pass) should be read as the conditional probability of someone obtaining 50% or more and that someone passing (see Study guide, page 28). It is clear from the example that any student selected from the given population who obtained 50% or more, has necessarily also passed. The probability is therefore 1.

Question 18

Alternative 1 is correct.

Looking at the table we notice that only 6% of the students obtained a score of 18 (and none higher than this). The probability of obtaining a score equal to or higher than 18 is therefore 6%, which is equal to 6/100 or 0,06.

Question 19

Alternative 2 is correct.

The normal distribution is a theoretical distribution which is used to determine the probability of a given score provided the mean and standard deviation are known. It is not dependent on observed frequencies (alternative 1), nor is it used to calculate the relative frequency of observed scores (alternative 3) which can only be obtained empirically.

Question 20

Alternative 3 is correct.

The standard normal distribution is a normal distribution divided up into intervals of standard deviation on the X-axis as indicated in figure 2.5 (Study guide, page 34).

Question 21

Alternative 3 is correct.

The standard normal curve defines a probability distribution ranging from 0 to 1 inclusive. See figure 2.5 in the study guide and the explanation on pages 34 and 35.

Question 22

Alternative 3 is correct.

To calculate the z-score, we use the formula on page 35 in the study guide. If we insert the values given into the formula, we obtain (14-20)/8 = - 6/8 = - 0,75.

Question 23

Alternative 1 is correct.

Joseph's z-score for History is (60-65)/10 = -0,5, and for Biology it is (50-53)/12 = -0,25. His marks for both subjects were below the mean, but because -0,5 < -0,25 it is clear Joseph's z-score for History places him further to **left** of the mean on the standard normal distribution than his z-score for Biology. This means that he did worse in History than in Biology relative to the rest of the pupils in his class.

Question 24

Alternative 1 is correct.

As mentioned on page 40 in the study guide, the sampling error involves dividing the population standard deviation by the sampling size, which means that the error will decrease necessarily when the standard deviation becomes smaller (the numerator), and the sampling size increases (the denominator).

Question 25

Alternative 1 is correct.

See the definition and brief explanation of the central limit theory on page 40 in the study guide.

Question 26

The correct alternative is 2.

The null hypothesis here is $\mu = 7$.

Question 27

The correct alternative is 1.

The alternative hypothesis here is $\mu < 7$ because that would imply that the "dyslectic adults" score worse than the normal adults and this is what the researcher is predicting will be the case.

Question 28

The correct alternative is 3 because of the symbol "<" in the alternative hypothesis statement. If this symbol had been "≠" then a non-directional test would be required.

Question 29

The correct alternative is 1.

Note that the alternative and null hypotheses here are about the value of μ which of course is a population parameter. See also top of page 39 in guide.

Question 30

The correct alternative is 1.

We derive the sampling distribution of the statistic under H_0 (as if H_0 is true). See page 63, the first paragraph in the block.

Question 31

The correct alternative is 3.

The p-value is an area below the sampling distribution of the statistic (or test statistic). We saw that such a sampling distribution can only be derived under H_0.

Question 32

The correct alternative is 3.

Note first of all that the p-value is concerned with how probable the sample result is given that the null hypothesis is true. Now if the p-value is small, we begin to suspect that the null hypothesis may be false and should be rejected. If the p-value is large on the other hand, the null hypothesis is probably true.

Question 33

The correct alternative is 1.

We know that a z-scores of -3 (look in the z-tables) are extremely unlikely. We also know that the negative sign indicates that H_1 has a logical chance of being correct instead of H_0 (the result is in the correct direction). This result of -3 is highly unlikely under H_0 and H_0 should be rejected in favour of H_1. This all means that we need not find the p-value because we know it will be very small.

Question 34

The correct alternative is 3.

See answer to question 28.

Question 35

The correct alternative is 1.

See page 66 in guide.

Question 36

The correct alternative is 3.

See answer to question 31.

Question 37

The correct alternative is 2.

The level of significance is a kind of "benchmark" p-value against which the researcher will compare the acual p-value of his test statistic.

Question 38

The correct alternative is 1.

See answer to question 37.

Question 39

The correct alternative is 2.

We also sometimes say "fail to reject H_0" or "retain H_0". This may appear to be the same as "accepting H_0" but is not. The reason is that the testing of the null hypothesis begins by accepting H_0. We can now either reject it or fail to reject it but we cannot, on the basis of the sample result, accept it. In practise many researchers do not make a distinction between "accept" and "not reject". We need not go into the precise philosophical reasons.

Question 40

The correct alternative is 1.

We can only accept the alternative hypothesis if we reject the null hypothesis. The null hypothesis can only be rejected for p-values smaller than the level of significance. For a p-value larger than the level of significance we cannot reject H_0 which means we cannot accept H_1.

Question 41

The correct alternative is 2.

The researcher sets the level of significance in advance. Although it is often 0,05 or 0,01 it can be any value. The level of significance gives directly the maximum type I error the researcher is willing to risk. He/she may perform several statistical tests with associated p-values. These p-values give the exact probabability of a type I error for a particular statistical test performed whereas the level of significance gives the maximum probability of a type I error the researcher is willing to make. When the question asks about the probability of a type I error of a study in general, the answer is given by the level of significance. But when the question ask about the probability of the type I error of a specific statistical test performed, the answer is given by the p-value.

Question 42

We know that the type I error that a researcher is willing to make is controlled by the researcher by setting the level of significance (α) in advance. The probabily of a type II error (β) is not controlled in advance by the researcher except for the fact that we know that the lower (smaller) the probability of a type I error (α) the greater (larger) the probability of a type II error (β) . See page 69.

Question 43

The correct alternative is 3. See top of page 71.

Question 44

The correct alternative is 1.

As a single sample mean is involved but the population standard deviation is unknown, the appropriate test statistic is a t-statistic for a singe sample mean.

Question 45

The correct alternative is 1.

Note that H_0 states that half of the population (70 year olds) are female (P= 0,05) which implies that half (P= 0,05) are men. H_1 simply states that more than half (P = 0,5) of the population (of 70 year olds) are female.

Question 46

The correct alternative is 3.

Only a single variable is involved namely gender. A single sample is selected and the statistic of interest is “the proportion of females”. In a correlation design a single sample is also selected but there will be at least two variable between which the researcher whishes to show a relationship.

Question 47

The correct alternative is 1.

Question 48

The correct alternative is 1.

A one-tailed test is required as the alternative hypothesis suggests that the proportion of females is greater than 0,5. The sample proportion is 150/250 = 0,6, the result is therefore in the right direction (as indicated by the alternative hypothesis) and a one-tailed statistical test will be required to find out if the result is statistically signficant.

Question 49

Alternative 1 is correct.

The null hypothesis is the hypothesis which state that there is no group effect, in other words, no difference between the two groups. Alternative 2 refer to the testing of a single sample size, and is not relevant to comparing two samples. The difference score as referred to in Alternative 3 is used when the two samples are dependent, for example, testing a sample of subjects before and after some event, which is not the case in this example.

Question 50

Alternative 2 is correct.

There are two samples, each drawn from a different group (people suffering from stress and people with depression). Correlations are used to show the degree of linear relationship between two variables from a single sample, so Alternative 3 is not appropriate.

Question 51

Alternative 3 is correct.

That the two populations from which the samples were drawn have the same variance is a general assumption of the t-test for independent samples. It is, however, not necessary for the population standard deviation to actually be known (as suggested in alternative 1). The possibility that the two populations have different means (Alternative 2) is not an assumption, it is this that is being tested for by performing a statistical test.

Question 52

Alternative 2 is correct.

The two sets of measures obtained are dependent measures and therefore the design is for dependent groups. See appendix C, pages 144 and 145.

Question 53

Alternative 2 is the only hypothesis that takes account of all the information. The before and after scores are summarized into a difference score (after minus before), and the two groups are then compared with regard to the change in difference scores. The intervention (extra classes) can be judged as being successful if the difference scores of the control group does not change much (so the difference score should be close to zero), but the experimental group should show a positive change in the difference score due to the effect of the extra classes. Alternative 1 looks only at change in the scores of the experimental group, and alternative 3 compare the two groups only after the intervention. Note that the hypothesis stated in alternative 3 would be equivalent to that stated in alternative 2 if we knew that the two groups were equal in there mathematics performance before extra classes commenced. But we do not know this of course.

Question 54

Alternative 1 is correct.

There are two samples (experimental and control group) which can be regarded as independent (there is no particular relationship between them).

Question 55

The correct Alternative is 1.

A two-tailed p-value (used in the case of a *non-directional* hypothesis) is twice the size of a one-tailed p-value (see page 66 of the study guide); or, conversely, a one-tailed p-value (used in the case of a *directional* hypothesis) is half the size of a two-tailed probability.

Question 56

Alternative 1 is correct.

A *construct* is a single meaningful unit or concept that can be measured on some kind of a scale (when it becomes a variable). The researcher in the example is comparing a single construct with two possible states (type of marriage) with a second construct, also with two possible states (divorced or not). The alternative 2 implies that the first and second marriage are two separate things (variables), and alternative 3 extends this to having been divorced or not.

Question 57

Alternative 1 is correct.

The measurements can be regarded as a repeated measurements within the same overall sample, which implies a systematic relationship. See appendix C pages 144 and 145.

Question 58

A correlation is a statistic that shows the size of a relationship between two variables for a sample of subjects, so alternative 3 is the correct answer. It cannot be used to show the relationship between two groups of subjects on a single variable as suggested in alternative 2, nor is it related to the comparison between sample and population means, as suggested by alternative 1.

Question 59

The correct answer is alternative 2.

Alternative 1 cannot be true because, in the case of nominal scale measurements, numbers are allocated to subjects on the basis of their membership to a category (for example, diagnostic categories in psychopathology like 'schizophrenic', 'depressive', 'bipolar', etc.), but the actual numbers allocated are arbitrary. It is not possible to represent this on a continuous measurement scale as is required for a scattergram. Alternative 3 is also false, because a scattergram shows a graphical representation of a relationship between two variables for a single group of subjects, not between two groups of subjects.

Question 60

The correct answer is alternative 2.

A positive correlation implies that as one variable changes, the other changes in the same direction. A high value on X will imply a high value on Y, while a low value on X will be matched by a low value on Y.

Question 61

The correct answer is 3.

Probabilities and levels of significance cannot take on a negative value.

Question 62

The correct alternative is 3.

X and Y are the same, which implies a perfect positive (+) correlation, and the highest possible value that a correlation coefficient can reach is 1.

Question 63

The correct alternative is 1.

The symbol 'ρ' represents the population parameter being tested when you calculate the Pearson's correlation coefficient 'r'; that is you calculate r for the sample, then have to decide whether this is likely to represent a significant correlation for the whole population, by looking at the level of significance (the p-value). In a similar way 'μ' represents the population parameter (statistic) for a mean, and 'P' the population parameter for a proportion.

Question 64

Alternative 3 is correct.

The larger the sample, the less likely that the variables will be correlated *purely by chance* (see pages 121-2 in the Study Guide). So a smaller value of the correlation coefficient (Pearson's r) is needed in order to reach significance for a larger sample.

Question 65

Alternative 1 is the correct answer.

Contingency tables are used to represent frequency counts of data that have been classified in terms of 2 nominal variables (e.g., gender and occupational category). It is possible to fit ordinal, interval or ratio scale measurements into such a table, but then have to be transformed into a classification system, that is, the data have to be treated as if they represent nominal scale measurements.

5 Example of examination answering sheet

Study the answering sheet below and answer the mock exam on it so that you may get use to it. Read the instructions for the completion of this answering sheet in **Services and Procedures** 2003, Section 4.10.

UNIVERSITY OF SOUTH AFRICA — **UNIVERSITEIT VAN SUID-AFRIKA**

EXAMINATION MARK READING SHEET — UNISA — EKSAMEN-MERKLEESBLAD

PART 1 (GENERAL/ALGEMEEN) DEEL 1

STUDY UNIT e.g. PSY100-X
STUDIE-EENHEID bv. PSY100-X — 1

PAPER NUMBER
VRAESTELNOMMER — 2

INITIALS AND SURNAME
VOORLETTERS EN VAN — 3

DATE OF EXAMINATION
DATUM VAN EKSAMEN — 4

EXAMINATION CENTRE (E.G. PRETORIA)
EKSAMENSENTRUM (BV. PRETORIA) — 5

STUDENT NUMBER
STUDENTENOMMER — 6 — 7

UNIQUE PAPER NO
UNIEKE VRAESTEL NR — 8 — 9

For use by examination invigilator
Vir gebruik deur eksamenopsiener

IMPORTANT

1. USE ONLY AN HB PENCIL TO COMPLETE THIS SHEET
2. MARK LIKE THIS: ●.
3. CHECK THAT YOUR INITIALS AND SURNAME HAS BEEN FILLED IN CORRECTLY
4. ENTER YOUR STUDENT NUMBER FROM LEFT TO RIGHT
5. CHECK THAT YOUR STUDENT NUMBER HAS BEEN FILLED IN CORRECTLY.
6. CHECK THAT THE UNIQUE NUMBER HAS BEEN FILLED IN CORRECTLY
7. CHECK THAT ONLY ONE ANSWER PER QUESTION HAS BEEN MARKED.
8. DO NOT FOLD

BELANGRIK

1. GEBRUIK SLEGS 'N HB-POTLOOD OM HIERDIE BLAD TE VOLTOOI
2. MERK AS VOLG: ●.
3. KONTROLEER DAT U VOORLETTERS EN VAN REG INGEVUL IS.
4. VUL U STUDENTENOMMER VAN LINKS NA REGS IN
5. KONTROLEER DAT U DIE KORREKTE STUDENTENOMMER VERSTREK HET
6. KONTROLEER DAT DIE UNIEKE NOMMER REG INGEVUL IS.
7. MAAK SEKER DAT NET EEN ALTERNATIEF PER VRAAG GEMERK IS.
8. MOENIE VOU NIE

PART 2 (ANSWERS/ANTWOORDE) DEEL 2

10

1	36	71	106
2	37	72	107
3	38	73	108
4	39	74	109
5	40	75	110
6	41	76	111
7	42	77	112
8	43	78	113
9	44	79	114
10	45	80	115
11	46	81	116
12	47	82	117
13	48	83	118
14	49	84	119
15	50	85	120
16	51	86	121
17	52	87	122
18	53	88	123
19	54	89	124
20	55	90	125
21	56	91	126
22	57	92	127
23	58	93	128
24	59	94	129
25	60	95	130
26	61	96	131
27	62	97	132
28	63	98	133
29	64	99	134
30	65	100	135
31	66	101	136
32	67	102	137
33	68	103	138
34	69	104	139
35	70	105	140