

UNISA

UNIVERSITY OF SOUTH AFRICA

PYC304-C/102/3/2005

**PSYCHOLOGICAL
RESEARCH**

**Department
of
Psychology**

PAPER CODE: PYC304-C

TUTORIAL LETTER: 102/3/2005

PSYCHOLOGICAL RESEARCH

PYC304-C

TUTORIAL LETTER 102/2005

CONTENT	Page
1 Additional explanation	2
2. The exam paper	3
3 The mock exam	4
3.1 The mock exam	5
3.2 List of formulae	24
4 Answers to the mock exam	26

1 Additional explanation

On top of page 52 in the guide for this module (**Psychological research: Only study guide for PYC304-C**) the population standard deviation, σ , is calculated. We did not explain how the population standard deviation is calculated because we assumed that students learned this in the second year course. However, since a number of students were confused by the calculation on page 52, a short a short explanation is appropriate.

In the example, the variance is computed for the 5 items in the population (33, 28, 45, 43, 47). The result obtained (272,72) is based on rather precise calculations using a statistical program. If you compute the variance using a calculator to two decimal figures you will find that it becomes $38,44 + 125,44 + 33,64 + 14,44 + 60,84$ which simplifies to 272,8. This number only differs in terms of decimals from the one shown on page 52. Having determined the variance, we can

now find the population standard deviation indicated by σ . The population standard deviation is obtained using the formula:

$$\sigma = \sqrt{\frac{\sigma^2}{n}}$$

In other words, we compute the square root of the variance divided by the population size, denoted by n , which is 5 in the example. Note that we are dealing with a population here so using $n-1$ does not apply. The formula that you learned in the second year course uses $n-1$ as a divisor because it tries to ESTIMATE the population standard deviation and $n-1$ provides a better estimate than n (for technical reasons). In this case we do not have to estimate because we can calculate the standard deviation of the population directly.

Please note also that you will not be required to calculate either the sample or the population variance in the examination. You may be given the sample or population variance and then be asked to use the sample or population standard deviation in a formula. However, since the standard deviation can be obtained from the variance by just taking the square root, the latter type of calculation is straightforward and should not pose any problem in the examination.

2 The exam paper

Please read Tutorial Letter 101 again on the examination paper. It is a 2-hour paper consisting of 70 multiple choice items and each item consists 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 refer to Tutorial Letter 101 what we wrote on this issue and what we advised you to do.

In this tutorial letter we give you a 'mock' exam paper which you can do to test your knowledge and understanding. When you calculate your mark for the paper, remember to apply the correction factor for guessing when you calculate the percentage score. Note that a list of formulae is provided in the mock exam paper. These formulae will also be provided in the examination paper.

The 70 items in the exam will represent the learning material in 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

3 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.

3.1 The mock exam

Questions 1 to 3 are based on the following case study

A psychologist wants 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 on 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 an 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 $d = X_2 - X_1$ 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_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]

3.2 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:

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

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

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

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

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

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

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

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

$$t_{\bar{X}} = \frac{(\bar{X} - \mu_{\bar{X}})}{S_{\bar{X}}}$$

$$Z_p = \frac{(p - P_o)}{\sqrt{P(1 - P_o)/n}}$$

4 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 2.6 on p. 45 of the guide).

Question 14

There are $6 + 4 + 5 = 15$ balls and 6 of them are red. $P(\text{Red}) = 6/15 = 2/5$. 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.51-53).

Question 17

Alternative 3 is correct (see Figure 2.6 on p. 45).

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 46 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 44 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 ($\mu = 50$). 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 attempts 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 $2 \times 0,0062 = 0,0124$.

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.

[END OF THE MOCK EXAM]