**Assessment 1 (Autumn Semester 2022)**

Assessment 1 contains THREE research scenarios. For each scenario, you are assuming the role of a researcher (employed by various commercial and government organisations) for the purpose of helping them find solutions to questions they have about their business practice.

Each scenario is worth 20 marks (meaning the overall assessment is out of 60, which is then divided by 2 to total 30% of the unit’s mark).

Each scenario consists of THREE tasks, detailed as follows;

**TASK 1: Draft results and associated questions**

**For Task 1 in each scenario, analyse the data provided in the table using the relevant statistical technique (using SPSS, or perhaps even “by hand” if a *z*-test is appropriate).**

**Read the scenario carefully – the analysis required will be *either* a one-sample *z*-test, a one sample *t*-test, a dependent samples *t*-test, an independent samples *t*-test or a one-way ANOVA, or their non-parametric equivalents (and because there are only three scenarios, some of the analysis styles you’ve learned about will *not* be applicable to this assessment).**

**As a first step, use the e-tutorial demonstration exercises, e-topics, and the relevant “results” exemplar in the foolproof guide (e.g., for an independent samples *t*-test) to help you write a *DRAFT* results section incorporating your statistical findings. This draft results section will contain the necessary statistical values required to answer subsequent *specific* questions (and can be anywhere between 150 and 300 words, depending on the analysis you use; simply use as many words as you require to successfully complete the draft based on the class exemplar).**

**In the draft results you should include;**

(a) An opening sentence describing the hypothesis.

(b) Participant number, mean age and standard deviation of age.

Make sure you provide the number of participants IN EACH GROUP. This is straightforward if you are performing a *z*-test, one-sample *t*-test, dependent samples *t*-test, or Wilcoxon *T*-test, because there is only *one* group of participants. You should report the number of females and males for each group and calculate *means* and *standard deviations* of the *age* of males and females separately for each group.

However, be aware there will be *two* groups for an independent samples *t*-test or Mann-Whitney *U* test, and three or more groups for ANOVA or Kruskal-Wallis.

So, for example, if the scenario involves two groups of participants (i.e., two levels of the IV, for example an independent samples t-test), for GROUP 1 calculate the number of *females*, their mean age and standard deviation; then calculate the number of *males*, their mean age and standard deviation. Then for GROUP 2, calculate the number of *females*, their mean age and standard deviation and separately the number of *males*, their mean age and standard deviation.

(**Hint**: if you find participants with missing data, remove them completely from the data before you perform any analysis, including mean age and number of participants).

(c) Tests of parametric assumptions (outliers and normality)

*OUTLIERS*

Investigate outliers separately for each group, if you identify a “between” design is used. For a “within” design, investigate outliers for each level of the independent variable (e.g., if it is a “before-and-after” repeated measures design, test outliers separately for the *before* data set, and for the *after* data set).

If you *do* discover (and then change) an outlier for a data set, you *do not* have to re-run the outlier analysis again to find more. One analysis is enough!

*NORMALITY*

For one-sample *z* and *t*-tests, there’s only one column of data for the single group, so you only need to perform a single normality test.

For a dependent samples *t*-test involving two columns of data for each participant, examine normality for each column separately.

Test normality separately for *each group*. That is, if the scenario has two groups (an independent samples *t*-test or Mann-Whitney *U* test), then test normality for each of the two groups. If the scenario has *three or more* groups (e.g., a between-subjects ANOVA design) then test normality separately for each group.

(d) The appropriate statistical findings (e.g., *t*-test results)

(e) A brief interpretation of the statistical findings

(f) Effect sizes and confidence intervals (only include for a scenario if appropriate, i.e., if it is something we include in a results section in the relevant tutorial demonstration exercise).

Following the draft results, there is a list of additional questions to answer. Once you have written the draft results section, the additional questions should be straightforward to answer.

**TASK 2: Describe your research findings.**

For this task you will need to choose the SINGLE correct statement (from four provided) which best describes your statistical findings.

**TASK 3: Identify a design flaw in the scenario.**

Each scenario has a major experimental design flaw, potentially affecting your statistical finding and leading to an inaccurate or invalid conclusion. For this task, name this flaw *as a single word, phrase or single sentence ONLY.*

**Write your answers in the “Assessment 1 submission document” (it is an abbreviated version of this full assessment document) and submit through Turnitin. The Turnitin Link will be in your Assessment Folder.**

**You do \*not\* have to include SPSS outputs, or any tables, in your submission**

**TYPE YOUR ANSWERS INTO THIS WORD DOCUMENT, IN THE SPACE PROVIDED UNDER EACH TASK, AND THEN TRANSFER YOUR ANSWERS INTO THE “ASSESSMENT 1 SUBMISSION DOCUMENT” AND SUBMIT THAT FILE TO TURNITIN.**

**(The Foolproof Guide will be valuable assistance in completing each of these six tasks – however note that the results section applicable to each of the three assessment scenarios will not necessarily match “word for word” the examples shown in the Foolproof guide. For example, assumptions met in the Foolproof guide example might *not* be met in the corresponding Assessment 1 scenario, or vice versa. Be aware of these differences and adapt your results sections accordingly).**

**Scenario 1**

A casino manager is concerned that the latest batch of “two-up” coins received from their supplier may be biased to land “heads” more often than 50% of the time. To test whether this is the case, the manager took the first 20 coins from the latest batch and randomly selected a group of 50 employees to flip coins for him. The manager noted down how many of the 20 coins landed “heads” for each of the 50 employees. If the coins are unbiased, then the number of times that “heads” is observed should not differ from a mean of 10 (out of 20 coin flips). You use the data that the manager collected to determine whether the batch of coins is biased towards “heads” or “tails”.

**Scenario 1**

**Task 1**

**(1)** Write a results section (“draft answer”). *2 marks for this “working out”*

**(2)** What is the name of the statistical analysis you used? *1 mark*

**(3)** What is the *mean age* of male and female participants respectively? *1 mark*

Female =

Male =

**(4)** What is the *standard deviation* of the number of heads for male and female participants respectively? *1 mark*

Female =

Male =

**(5)** Which (if any) participants were outliers? (Provide their ID number, or write “no outlier” if you didn’t identify anyone. Do this for the entire sample – do not split by Sex from this question onwards). *1 mark*

**(6)** If there *was* an outlier, what number did you change their score to? Write “Not applicable” if there was no outlier. *1 mark*

**(7)** Was the assumption of normality met? (Yes/No). *2 marks*

**(8)** What were the *degrees of freedom* for the test statistic? (if applicable). *1 mark*

**(9)** What was the *value* of the test statistic? *2 marks*

**(10)** What was the *probability* value associated with the test statistic? *2 marks*

**(11)** What was the value of the Cohen’s *d* effect size? Write “Not applicable” if effect size is not relevant to the Scenario 1 analysis. *1 mark*

**TASK 2**

Circle the number next to the statement which most *accurately* summarises the research findings. *2 marks*

**(1)** The number of heads observed was significantly higher than would be expected by chance.

**(2)** The number of heads observed was significantly lower than would be expected by chance.

**(3)** The number of heads observed was no different from the number that would be expected by chance.

**(4)** Not enough information provided to determine an answer.

**TASK 3**

You’ve mistakenly allowed a single, obvious design flaw to potentially affect the validity of your results. What is it? (only write a single word, phrase or short sentence; for example, “lack of reliability” or “experimenter effect”). *3 marks*

**Table 1**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ID | Sex | Age | Num\_Heads | ID | Sex | Age | Num\_Heads |
| 1 | M | 40 | 9 | 26 | M | 55 | 11 |
| 2 | F | 20 | 11 | 27 | M | 56 | 12 |
| 3 | M | 43 | 14 | 28 | F | 34 | 11 |
| 4 | F | 60 | 11 | 29 | F | 55 | 11 |
| 5 | F | 18 | 12 | 30 | M | 32 | 11 |
| 6 | M | 19 | 10 | 31 | F | 18 | 13 |
| 7 | F | 34 | 12 | 32 | F | 20 | 11 |
| 8 | F | 22 | 10 | 33 | M | 30 | 10 |
| 9 | F | 44 | 13 | 34 | F | 55 | 9 |
| 10 | M | 33 | 13 | 35 | F | 43 | 12 |
| 11 | F | 25 | 10 | 36 | F | 22 | 9 |
| 12 | M | 63 | 13 | 37 | M | 19 | 10 |
| 13 | F | 22 | 12 | 38 | M | 22 | 13 |
| 14 | M | 19 | 15 | 39 | F | 24 | 13 |
| 15 | M | 25 | 10 | 40 | M | 27 | 10 |
| 16 | F | 27 | 9 | 41 | F | 37 | 12 |
| 17 | M | 33 | 11 | 42 | F | 66 | 11 |
| 18 | M | 22 | 0 | 43 | M | 43 | 10 |
| 19 | F | 27 | 12 | 44 | F | 55 | 11 |
| 20 | F | 28 | 11 | 45 | F | 66 | 11 |
| 21 | M | 21 | 12 | 46 | M | 32 | 12 |
| 22 | M | 44 | 14 | 47 | F | 18 | 13 |
| 23 | F | 23 | 10 | 48 | F | 23 | 9 |
| 24 | F | 32 | 10 | 49 | F | 27 | 0 |
| 25 | M | 42 | 8 | 50 | F | 28 | 9 |

**Scenario 2**

A large accounting firm wants to know if their employees are more alert in the morning or afternoon. To test this, you devise reaction-time task. On each trial of the task, participants see an object on the screen and press the space bar if the object is an animal. If the object is not an animal, they do not respond. You are interested in how quickly, on average, participants respond that the picture is an animal.

To determine whether the time of day makes a difference to employees’ alertness, you randomly select 40 employees from the company. Each employees completes the test twice, once in the morning and then a second time in the afternoon. You compare their mean reaction times at each time of day. If there is a difference between their reaction times, you can conclude that they are more alert at one time of day than the other.

**Scenario 2**

**TASK 1**

**(1)** Write a results section (“draft answer”). *2 marks for this “working out”*

**(2)** What is the name of the statistical analysis you used? *1 mark*

**(3)** Was there any missing data? If so, what did you about it? *1 mark*

**(4)** What is the *standard deviation* of the reaction time scores in the morning and in the afternoon? *1 mark*

Morning =

Afternoon =

**(5)** Which (if any) participants were outliers? (Provide their ID number, or write “no outlier” if you didn’t identify anyone. Check for outliers separately for each time of day). *2 marks*

**(6)** Was the assumption of normality met? (Yes/No/Not applicable). *1 mark*

Morning:

Afternoon:

**(7)** Was the assumption of homogeneity of variance met? (Yes/No/Not applicable). *1 mark*

Morning:

Afternoon:

**(8)** What were the *degrees of freedom* for the test statistic? (if applicable). *2 marks*

**(9)** What was the *value* of the test statistic? *2 marks*

**(10)** Were there *any* significant differences between the reaction times in the morning versus the afternoon? *1 mark*

**(11)** If there was a statistical difference found, which time of day showed the slowest reaction time? (write “Not applicable” if no differences were found in Question 10). *1 mark*

**TASK 2**

Circle the number next to the statement which most accurately summarises the research findings. *2 marks*

**(1)** Reaction times were longer in the afternoon than in the morning.

**(2)** Reaction times were shorter in the afternoon than in the morning.

**(3)** There was no significant difference between the mean reaction time in the morning versus the afternoon.

**(4)** Not enough information provided to determine an answer.

**TASK 3**

You’ve mistakenly allowed an obvious design flaw to potentially affect the validity of your results. What is it? (write a short phrase or simple sentence only; for example, “lack of reliability” or “experimenter effect”). *3 marks*

**Table 2**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ID | Sex | Age | RT Morning | RT Afternoon | ID | Sex | Age | RT Morning | RT Afternoon |
| 1 | F | 64 | 483 |  | 21 | F | 22 | 630 | 681 |
| 2 | M | 43 | 650 | 607 | 22 | M | 37 | 482 | 608 |
| 3 | F | 32 | 417 | 500 | 23 | M | 64 | 464 | 498 |
| 4 | M | 29 | 501 | 584 | 24 | F | 28 | 534 | 425 |
| 5 | F | 39 | 571 | 658 | 25 | M | 54 | 554 | 502 |
| 6 | M | 31 | 502 | 726 | 26 | F | 64 | 461 | 515 |
| 7 | M | 56 | 618 | 493 | 27 | M | 55 | 562 | 705 |
| 8 | F | 56 | 498 | 679 | 28 | M | 30 | 587 | 537 |
| 9 | M | 25 | 456 | 640 | 29 | F | 38 | 542 | 431 |
| 10 | F | 29 | 563 | 526 | 30 | M | 31 | 453 | 714 |
| 11 | F | 34 | 535 | 446 | 31 | F | 54 | 607 | 590 |
| 12 | F | 31 | 508 | 561 | 32 | F | 39 | 594 | 508 |
| 13 | M | 19 | 568 | 402 | 33 | M | 31 | 516 | 474 |
| 14 | M | 64 | 513 | 471 | 34 | M | 60 | 569 | 523 |
| 15 | F | 37 | 555 | 671 | 35 | F | 39 | 538 | 572 |
| 16 | M | 36 | 563 | 555 | 36 | M | 28 | 654 |  |
| 17 | M | 63 | 429 | 556 | 37 | F | 49 | 511 | 584 |
| 18 | F | 20 | 594 | 680 | 38 | F | 49 | 488 | 625 |
| 19 | M | 43 | 556 | 617 | 39 | M | 40 | 566 | 662 |
| 20 | F | 42 | 480 | 411 | 40 | F | 49 | 546 | 734 |

“RT Morning” = Mean reaction time in the morning in milliseconds, “RT Afternoon” = Mean reaction time in the morning in milliseconds. Empty cells are for employees were not able to participate in the afternoon session.

**Scenario 3**

At a large Australian university, the coordinator of *Designing Experiments and Analysing Results* wanted to know if student performance in the unit was equivalent across the three campuses where the subject was taught. There was one class at each campus, each with 25 students. Classes at the Fundsborough and Sans Souci campuses were held on a Monday. The class at Monarch’s Grove is held on a Thursday.

To find out how the students are performing, the coordinator gives the students a surprise quiz on the subject content that had been covered in the previous week’s class. The quiz was scored out of 100.

Compare the students’ marks to determine whether there are any differences in performance across the three classes. The data are provided in Table 3.

**Scenario 3**

**TASK 1**

**(1)** Write a results section (“draft answer”). *2 marks for this “working out”*

**(2)** What is the name of the statistical analysis you used? *1 mark*

**(3)** What is the *standard deviation* of the *age* of female and males at the Monarch’s Grove campus? *1 mark*

Male =

Female =

**(4)** Which (if any) participant was an outlier? (Provide their ID number, or write “no outlier” if you didn’t identify anyone. Remember to check for outliers separately for each group). *2 marks*

**(5)** Was the assumption of normality met for *all three* groups? (Yes/No/Not applicable). *1 mark*

**(6)** If the assumption of normality was NOT met for one of the groups, which group was this? (write either *Kenyan*, *Australian*, or *not applicable*). *1 mark*

**(7)** Was the assumption of homogeneity of variance met? (Yes/No/Not applicable). *1 mark*

**(8)** What were the *degrees of freedom* for the test statistic? (if applicable) *2 marks*

**(9)** What was the *value* of the test statistic? *1 mark*

**(10)** Was an overall difference found between the three campuses? *1 mark*

**(11)** If there was an overall difference, the marks of students from which campus(es) differed from the others? Say what test used to determine the differences and explain why you chose that test. (write “Not applicable” if no differences were found). *2 marks*

**TASK 2**

Circle the number next to the statement which most accurately summarises the research findings. *2 marks*

**(1)** There was a significant difference in the marks between the three campuses.

**(2)** There was no significant difference in the marks between the three campuses.

**(3)** It was not possible to run the analysis because the assumptions of the test were violated.

**(4)** Not enough information provided to determine an answer.

**TASK 3**

You’ve mistakenly allowed an obvious design flaw to potentially affect the validity of your results. What is it? (write a short phrase or simple sentence only; for example, “lack of reliability” or “experimenter effect”). *3 marks***Table 3**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ID** | **Sex** | **Age** | **Campus** | **Mark** | **ID** | **Sex** | **Age** | **Campus** | **Mark** |
| 1 | M | 19 | 1 | 50 | 26 | F | 19 | 2 | 64 |
| 2 | F | 46 | 1 | 80 | 27 | F | 20 | 2 | 80 |
| 3 | M | 20 | 1 | 74 | 28 | M | 27 | 2 | 71 |
| 4 | F | 19 | 1 | 55 | 29 | F | 19 | 2 | 85 |
| 5 | F | 20 | 1 | 54 | 30 | M | 20 | 2 | 61 |
| 6 | F | 20 | 1 | 65 | 31 | F | 19 | 2 | 77 |
| 7 | F | 21 | 1 | 53 | 32 | F | 20 | 2 | 32 |
| 8 | F | 32 | 1 | 87 | 33 | M | 19 | 2 | 87 |
| 9 | M | 19 | 1 | 70 | 34 | M | 19 | 2 | 87 |
| 10 | F | 25 | 1 | 64 | 35 | F | 19 | 2 | 59 |
| 11 | F | 19 | 1 | 72 | 36 | M | 19 | 2 | 59 |
| 12 | F | 22 | 1 | 77 | 37 | F | 22 | 2 | 64 |
| 13 | M | 19 | 1 | 57 | 38 | M | 19 | 2 | 83 |
| 14 | F | 20 | 1 | 59 | 39 | F | 19 | 2 | 69 |
| 15 | F | 19 | 1 | 51 | 40 | M | 20 | 2 | 78 |
| 16 | M | 19 | 1 | 67 | 41 | M | 19 | 2 | 71 |
| 17 | M | 19 | 1 | 65 | 42 | F | 20 | 2 | 65 |
| 18 | M | 20 | 1 | 58 | 43 | M | 20 | 2 | 60 |
| 19 | M | 19 | 1 | 56 | 44 | F | 21 | 2 | 69 |
| 20 | M | 20 | 1 | 75 | 45 | M | 18 | 2 | 53 |
| 21 | F | 20 | 1 | 67 | 46 | F | 19 | 2 | 71 |
| 22 | M | 19 | 1 | 65 | 47 | F | 19 | 2 | 84 |
| 23 | M | 20 | 1 | 84 | 48 | M | 20 | 2 | 64 |
| 24 | F | 19 | 1 | 67 | 49 | F | 19 | 2 | 69 |
| 25 | M | 19 | 1 | 61 | 50 | M | 19 | 2 | 84 |

**Table 3 (continued)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ID** | **Sex** | **Age** | **Campus** | **Mark** |
| 51 | F | 19 | 3 | 55 |
| 52 | F | 18 | 3 | 92 |
| 53 | F | 18 | 3 | 85 |
| 54 | F | 19 | 3 | 62 |
| 55 | F | 20 | 3 | 59 |
| 56 | F | 19 | 3 | 73 |
| 57 | F | 19 | 3 | 59 |
| 58 | F | 18 | 3 | 95 |
| 59 | M | 19 | 3 | 79 |
| 60 | F | 20 | 3 | 73 |
| 61 | M | 19 | 3 | 82 |
| 62 | F | 18 | 3 | 89 |
| 63 | F | 18 | 3 | 64 |
| 64 | F | 18 | 3 | 66 |
| 65 | F | 19 | 3 | 57 |
| 66 | F | 19 | 3 | 76 |
| 67 | F | 19 | 3 | 73 |
| 68 | F | 18 | 3 | 64 |
| 69 | F | 18 | 3 | 62 |
| 70 | F | 18 | 3 | 86 |
| 71 | F | 18 | 3 | 76 |
| 72 | F | 19 | 3 | 74 |
| 73 | F | 19 | 3 | 97 |
| 74 | F | 19 | 3 | 77 |
| 75 | M | 19 | 3 | 69 |

“Campus” refers to Fundsborough (1), Sans Souci (2), and Monarch’s Grove (3). The Mark is a score out of 100.