## Second year research methods

## Name-

## Prep work pack

Create your own revision booklet
Revision guide
What goes in a report? ..... page 3
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## Welcome to your pack-how will you use this?

This pack is to be filled out with the use of your research methods pack, film clips, the internet and your brains.

Fill it in carefully because once complete it will form a revision booklet, that will be invaluable for your exams (but only if filled in properly!). It will contain simple instructions/reminders of everything you need to know to be successful at statistics including lots of practice questions and links to exam. It won't just cover the statistics; it will also include the trickier bits of research methods.


All of the clips and links are on the website follow the information below-

## Go to psych205.com

Find Linear a-level tab
Then paper2
Then Research methods year 2

## Can't get on to the website to load the clips?

Go to you tube and type in "angie F" in the search engine. The correct channel with all of the clips you will need is the "angie $F$ " with the picture to the right with a bald baby sucking a dummy.


## Report writing-Prep 1(a)

So how do we write up a psychology report? Using page 31 of the pack

1. write in each heading of a report in correct boxes below and then fill in brief details of what goes in each section of the report. This will form a revision sheet for you so do it in any way you likepictures, diagrams.
2. Then have a go at the first exam question on the next page about referencing.

Exam question-In 1993, a book about gender was published in
New Haven. The book was written by Sandra L Bem from Cornell university. The title was "the lenses of gender: transforming the debate on sexual inequality". The book was published by Yale university press.

A researcher needs to modify the above information to include Bem's book in the references section of the researchers report. (2 marks)
Your answer

## The actual answer (if different)

DO NOT ANSWER THIS UNTIL THE LESSON
Exam question 2-In 1992, a book about human relationships was published in London. The book was written by Steve Duck from the university of lowa. The title was "human relationships". The book was published by Sage.

A researcher needs to modify the above information to include Duck's book in the references section of a scientific report.

## Answer

## Project writing and analysing data-Prep 1 (b)

## Collecting data

We will be investigating whether people's reaction times differ throughout the day in order to show you how to carry out and write up a psychology report (see back of pack). You will do this by seeing if you and your, classmates have faster reaction times after they wake up or before they go to bed.

## What do you need to do?

Use the web address below to take you to the reaction time test. You need to use it to test yourself $\mathbf{3 0}$ minutes after you wake up and $\mathbf{3 0}$ minutes before you go to sleep. Record your scores in the table below and then work out a mean to bring to lesson 2 (so 2 lessons time).

Make sure the measurements are taken in the same day.
http://www.humanbenchmark.com/tests/reactiontime - reaction time test
Raw data table

| Morning - before 30 minutes <br> after waking |  | Evening - 30 minutes before <br> sleeping |  |
| :---: | :---: | :---: | :---: |
| session | Reaction time <br> (ms) | session | Reaction time (ms) |
| morning 1 |  | evening 1 |  |
| morning 2 |  | evening 2 |  |
| Morning (if there <br> is time) |  | evening 3 (if <br> there is time) |  |
| Total |  | Total |  |
| Mean average |  | Mean average |  |

## *Also for prep 1 (b)*

Task-Use the internet to search for research studies that have previously been carried out into the area of reaction times or concentration etc. at different times of the day. Find at least 2 studies and summarise below-

Study one-

Study two-

## Peer review-Prep 2

Using pg 6 of your research methods packs answer questions 1-4. Do not do anything on page 7.

Describe the peer review process (up to 6 marks)

1. What do we mean by peer review?
2. What does peer review involve?
3. Why is peer review important?

Evaluate the peer review process (up to 6 marks)
4. Fully explain 2 criticisms of peer review.


Fill in the gaps and highlight every time the word economy is mentioned!

## Implications for the economy

## Using two examples briefly discuss the implications for psychological research for the economy (6 marks)

P-Some attachment research has had $\qquad$ implications for the economy. E- $\qquad$ 's concept of monotropy in a world health organisation report suggested that babies need constant care of the mother for healthy social development which has encouraged women to stay at home rather than returning to work after having children. E - It would seem that this research is still having a negative impact on mothers and the economy today as only $\qquad$ \% of mothers are working full time and $\qquad$ \% not at all. L- This then means the majority of women are not economically active having negative financial implications for them due to loss of potential earnings and for society in a loss of often trained labour in the work force having a huge negative impact on the economy. $P$-Research into mental health has had a $\qquad$ effect on the economy.
E-For example, psychological research, which has shown a link between low levels of some neurochemicals, such as serotonin and depression, has led to the development of antidepressant drugs, e.g. $\qquad$ , which have been very effective at quickly reducing the symptoms of depression in some people and means that lots of people who would otherwise have been unable to function or work, are able to get back on track. E - Another psychological therapy, $\qquad$ , is one of the most successful treatment for depression in the country with $50 \%$ of people improving after only $\qquad$ sessions and so also able to return to work.
L- This shows then how psychological research helps to improve productivity in the workplace, reducing levels of disability benefits claimed, reducing number of sick days and thus having a beneficial effect on the economy.

## Statistics introduction and basics-Prep 3(a)

You need to answer all the questions 1-7 and complete the exam question just using the clip (and pack).

## Descriptive statistics

1. What are they? Name all the different types.
2. Why do we use descriptive statistics?

## Inferential statistics

3. What are they?
4. Why do we use inferential statistics?
5. Statistics key terms-what do the following terms mean? Write in your own words, don't copy! Hint- do the far right hand column after you've done activity 7. You'll need to use your pack and clip two for this last column.

| Observed value | Critical value | Degree of freedom |
| :--- | :--- | :--- |
| Significant | Alternative hypothesis | Type I error |
| Null hypothesis | Value of N |  |
| One or two tailed | Level of significance | Pype II error |

6. Critical value tables and how do you use one (From 8 mins 30)

To work out a critical value you need to know the following-but what are they?

## Value of N -

## one tailed or two tailed-

## level of significance-

## 7. Levels of significance-what's all that about?

Using clip 2 "levels of significance clip". Answer the following questions

1. Why aren't we ever $100 \%$ sure of our findings in Psychology?

2. How sure do we tend to be then and why?
3. How is $5 \%$ expressed in terms of probability?
4. What are the following written as decimals?
5\% -
1\%-
10\%-
0.1\%-
5. When do we use a $1 \%$ level of significance in Psychology?
6. Which phrases link to type 1 errors and which to type II. Write the correct phrases underneath the correct term.
Occurs when too lenient, occurs when too stringent, incorrectly accepted null hypothesis, incorrectly accepted alternative hypothesis, too optimistic, too pessimistic, False negative, false positive

Type I
Type II

## Critical value and level of significance exam practice.

Using the critical value tables at the back of this prep pack answer (and then mark) the following questions

## Sign test

1. For a one tailed test at 0.05 for 13 participants what is the critical value? $\qquad$
2. You have 20 participants initially but when you carry out your sign test you find that 3 participants came out as no difference, there has been no previous research and level of significance is 0.01 . What is the critical value? $\qquad$
3. Previous research, 5 minus's 15 plus's, level of significance 0.05 . What is the critical value? $\qquad$ -

## Wilcoxon T test

4. $\quad \mathrm{N}=15$, a two-tailed test with $\mathrm{p}=0.05$ ? $\qquad$
5. There were 12 participants with a directional hypothesis with a significance level of 1\% $\qquad$
6. $\mathrm{N}=8$ for a one-tailed test with $\mathrm{p}=0.005$ $\qquad$
7. There were 20 participants with a non-directional hypothesis and the standard significance level adopted $\qquad$

## Level of significance questions

8. What level of significance do we tend to adopt in Psychology?
9. What level of significance do we use if the research is socially sensitive?
10. When we use a level of significance of $10 \%$ what type of error are we in danger of making and why?
(Total- 10 marks)
I scored $\qquad$ /7

## Remembering the sign test-Prep 3 (B)



You should be able to answer most of these questions without any help at all but you may need a bit of support from the clip (see qr code).

1. How do you know when to use the sign test? i.e. what three things are we looking for.

| Participant | Energy drink | Water |
| :---: | :---: | :---: |
| 1 | 110 | 122 |
| 2 | 59 | 45 |
| 3 | 206 | 135 |
| $4<$ | 89 | 90 |
| 5 | 76 | 42 |
| 6 | 141 | 87 |
| 7 | 152 | 131 |
| 8 | 98 | 113 |
| 9 | 198 | 129 |
| 10 | 57 | 62 |
| 11 | 267 | 176 |
| 12 | 282 | 240 |
| 13 | 134 | 157 |
| 14 | 103 | 103 |
| 15 | 88 | 108 |
| 16 | 201 | 121 |
| 17 | 267 | 231 |
| 18 | 322 | 200 |
| 19 | 249 | 207 |
| 20 | 90 | 104 |

2.This is not nominal data so how would you make it nominal?
3. Does it matter which way round you subtract it? Why?
4. What happens if the answer is 0 when you do the subtracting?
5. What letter is the observed value know as?
6. How do you work out the observed value then?

Sign test exam question practice (remember you will need the critical value table on page 15 of your pack).

A psychologist hypothesised that the time of day affect memory. She asked participants to learn and recall a list of ten words in the morning and again in the evening. Her results are shown in the table below.


|  | Participants | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{4}$ | $\mathbf{5}$ | $\mathbf{6}$ | $\mathbf{7}$ | $\mathbf{8}$ | $\mathbf{9}$ | $\mathbf{1 0}$ | $\mathbf{1 1}$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathbf{1 2}$ |  |  |  |  |  |  |  |  |  |  |  |  |
| Number <br> of <br> words <br> recalled | Morning | 2 | 3 | 8 | 6 | 7 | 9 | 10 | 3 | 9 | 8 | 9 |
| 10 |  |  |  |  |  |  |  |  |  |  |  |  |

## Remember to show all of your workings

1. What is the value of $S$ for this data? (3 marks)
2. What is the value of $N$ for this data? (1 mark)
3. What is the critical value for this data at the $5 \%$ level? (2 marks)
4. Are the results significant, for $p \leq 0.05$ ? ( 3 marks)

Total- /9 marks

## Levels of measurements-prep 4.

Watch the clip and then answer the questions and complete the exam activities.

1. Why is it important that you know your levels of measurement?

2. Psychologists argue about what two types of data and why doesn't it matter which one you choose in the end?
3. Briefly describe the different types of data in your own words.

Nominal

Ordinal

Interval
3. What type of data would scores on a memory test be and why?

Practice questions- answer these and mark them using the answers at the back of the pack.
I. A researcher measures how quickly participants can run 50 metres $\qquad$
2. A researcher measures the temperature at which people feel most aggressive $\qquad$
3. A psychologist counts the number of items out of 20 that students can remember from a memory test.
4. A researcher asks five year olds what their favourite flavours of ice cream are $\qquad$
5. A psychologist measures the attachment style of children: secure or insecure $\qquad$
6. A researcher asks participants to put ten photographs of faces in order from most to least attractive $\qquad$
For the following you need to justify why you have chosen the type of data you have. The justification isn't in the back your teacher will check this.
7. A psychologist wanted to see if verbal fluency is affected by whether people think they are presenting information to a small group of people or to a large group of people.
The participants were told that they would be placed in a booth where they would read out an article about the life of a famous author to an audience. Participants were also told that the audience would not be present, but would only be able to hear them and would not be able to interact with them.
The psychologist recorded each presentation and then counted the number of verbal errors made by each participant.

The results of the study are given in the table.

|  | Condition A <br> (believed audience <br> of 5 listeners) | Condition B <br> (believed audience <br> of 100 listeners) |
| :--- | :--- | :--- |
| Mean | 11.1 | 17.2 |
| Standard <br> deviation | 1.30 | 3.54 |

a) What type of data is this and why? (3 marks)
8. Psychologists were interested in looking at how parents interacted with their children in controlled observations. They were looking at the differences between mothers and fathers and whether they spent more time looking at the child or away from the child. Their results are shown below.

|  | Looked away | Looked at |
| :--- | :--- | :--- |
| Mothers | 2 | 23 |
| Fathers | 4 | 21 |

a) What type of data is this and why? (3 marks)

Total /12

## Choosing a stats test-prep 5(a)

Use the choosing a statistics clip and pages 22-30 of the pack complete the activities and answer and mark all of the exam questions.

1. You need to know the following to choose a stats test. Using page23 of the pack and the first 1 minutes 30 of the clip fill the relevant sections of the "picking the test" table in below.
a- Type of data-i.e. level of measurement
b- Is it a test of difference or correlation?
c- Is it related orndependent data? Repeated measures, matched pairs?

2. What is the acronym for remembering these stats test in order?
S
C
W
M
S
R
U
P
3. Now come up with a different/better one of your own in case you don't like ours.
$\begin{array}{llllllll}S & C & W & M & S & R & U & P\end{array}$
4. Watch the clip till 1 min 40 and try this example

Research has found that people like things that are familiar. In one study Zajonc (1968) told participants that he was conducting a study on visual memory and showed them photographs of 12 different men (face only). Some photos were shown only once and some more than once. Then participants were asked to rate how much they liked the 12 different men on a scale from 0-6.

Alternative hypothesis- People rate the more frequently seen face as more likeable than the less frequently seen face.
Null hypothesis-There is no difference in the likeability score for more and less familiar faces.
a-is it a test of difference or correlation? $\qquad$
b-What type of data is it? $\qquad$
c-Is it related or unrelated and what experimental design is it? i.e. independent groups or matched pairs? $\qquad$ -

So what stats test would you use then? $\qquad$
(Answers are in the research pack, page 25)
5. Choosing statistical tests-example questions (answers at back of this pack)
a) A piece of research was looking at the relationship between the attractiveness of people in long term relationships. They investigated this by getting participants to rate individual pictures of couples (they didn't know they were couples though) on a scale of 1-20. These scores were then ranked and compared to see if couples in fact had long term relationships with people of similar attractiveness as themselves.
What statistical test should the researcher use? Justify your answer (4 marks)
-is it a test of difference or correlation? $\qquad$
-What type of data is it? $\qquad$
-Is it related or unrelated and what experimental design is it? $\qquad$
So what stats test would you use then? $\qquad$

B) A scientist wanted to know whether rats performed better in a memory test when they were tested in low light conditions than when they were tested in high light conditions. He tested 8 rats, each under both low and high light conditions.
What statistical test should the researcher use? Justify your answer (4 marks)
C) A psychologist was investigating the relationship between temperature and reaction time, i.e. how the temperature of a room influences people's reaction times and if there was a relationship between the two. She collected the data shown in the table.


A psychologist wanted to know whether left of right handed people were more likely to suffer from OCD. She used a questionnaire to collect information from 40 people on which hand they wrote with and included a test that she used to decide if they were had OCD or not. Data is shown below.

|  | OCD | Not OCD |
| :--- | :--- | :--- |
| Left handed | 22 | 3 |
| Right <br> handed | 4 | 11 |

What stats test should she use and why? (4 marks)

## Total score on all questions-

## Interpreting a statistical test-prep 5 (b)

Using the "interpreting statistics clip and pages 25-30 of the pack complete the activitıes and answer the exam questions. For the first two questions just use your brain-you should know these answers!

1. What do the following terms mean again?

Observed value-
Significant-

Critical value-

2-What three things do you need to know to work out a critical value?

3-Why do we have a critical value, what do we do with it?

4-What letters do we use for the following-
Sign test-
Wilcoxon-
Chi squared-
5. For the example in the clip then,
a) The observed value $\mathrm{T}=$ $\qquad$
b) The critical value was= $\qquad$
(directional or non-directional?, $\mathrm{N}=$ $\qquad$ level of significance- $\qquad$ )
C) So what do you do with these two values to work out if it is significant then?
d) So for this example was the result significant? Write this as a full statement justifying your answer.

## Interpreting statistical tests exam questions-*use the critical value tables in

 the back of this pack to answer these questions1. A researcher wanted to test the hypothesis that attending a motivational course would decrease the number of cigarettes that smokers smoked in a day. He collected data on how many cigarettes on average 8 smokers smoked the week before the course and in the week after. His results are shown in the table. On conducting a Wilcoxon test, he calculated an observed value of $\mathrm{T}=4$. He used a significance level of $5 \%$. T must be $\leq \mathrm{CV}$ to be significant.
a) Did smokers significantly reduce their smoking in the week following the course? Fully justify your answer (4 marks)

2. A psychologist was investigating whether a new drug reduces symptoms of anxiety. He recruited 12 participants who showed similar levels of anxiety. Half of these12 participants were administered the drug and the other half were given a placebo. Half an hour after administering the drug he measured anxiety levels of all 12 participants. The critical value was 7 . U is significant if $\leq$ Critical value.
a) The critical value was 7, how would this have been worked out? (3 marks)
b) He got a value of $U=4$. Are his results significant at the 0.05 level? Explain your answer ( 4 marks)
3. A psychologist hypothesises that people who take longer to run 2 km have slower reaction times. She records the time 10 participants take to run 2 km and each participant then completes a reaction time experiment and their scores are noted. She conducts a Pearson's $r$ test on the data, calculating $r=-0.152$.
a) Describe the correlation between running time and reaction time shown by the correlation coefficient of -0.152
b) Is the correlation significant at the 0.01 level? Justify your answer (4 marks)

## Reliability and validity-prep 6

Using pages 2-5 of your second year research pack complete the following activities before the lesson.

1. Read carefully through the pages, highlighting if you want (remember to highlight by adding why you've highlighted that particular bit) until you think you have a good understanding of the information. You will have a test on this first thing! Including how you assess and improve validity and reliability.
2. Create a mind-map, flow diagram or any type of visual representation of the info. Do one for validity and one for reliability in the space below. We'll be showing each other our creations in lessons and I'll be checking.
3. Over the page answer the stretch exam questions on validity and reliability.

Draw your
diagram in
this space

## Validity and reliability exam questions

1. Define validity ( 2 marks)
2. Explain what is meant by face validity and concurrent validity ( $2+2$ marks)
3. Explain the term ecological validity using an example from a research study (3 marks)
4. Explain why temporal validity might be a problem in research (2 marks)
5. Explain two ways in which validity can be assessed ( $2+2$ marks)
6. A research wants to improve the validity of their interview, explain two ways this can be achieved ( $2+2$ marks)

## Designing a self-report practice

You must do a plan of how you would answer the following "design your own study questions" for an interview AND questionnaire.

## YOU MUST-

- Addressing each bullet point one at a time, miss a bullet point, lose 3 marks
- Be realistic and sensible-don't say you are going to interview of 1000 students as not realistic!
- Include justification for each decision- so why are you using an opportunity sample for example
- Be detailed i.e. don't just write random sample- size? How you'd gather? Why you'd do it?

Design a questionnaire to investigate how A-level students revise.

In your answer you will be awarded credit for providing appropriate details of:

- Sampling
- Materials including types of questions used with justification
- Control over extraneous variables
- Ethical considerations
(12 marks)- so imagine 3 marks per bullet-point.

Design an interview to investigate how A-level students revise.

In your answer you will be awarded credit for providing appropriate details of:

- Sampling
- Type of interview used with justification
- Examples of questions that you could use in the interview that produce qualitative data
- Ethical considerations
(12 marks)- so imagine 3 marks for each bullet point


## Practical section

In the exam you will be asked to design research, analyse data, write up practical's and more! This section gives you space to design your own research, collect and analyse data and write it all up in preparation for the exam. You can't revise this as it's a skill you need to practice so use these sections wisely. If they are blank by the time you come to revise you'll be in trouble!

## Research practical exam question practice

The psychologist focused on fluency in spoken communication in her study. Other research has investigated sex differences in non-verbal behaviours such as body language and gestures.

Design an observation study to investigate sex differences in non-verbal behaviour of males and females when they are giving a presentation to an audience.

In your answer you should provide details of:

- the task for the participants
- the behavioural categories to be used and how the data will be recorded
- how reliability of the data collection might be established
- ethical issues to be considered.
[12 marks]



## Biopsychology practical

## Design brief

We will be investigating whether people's reaction times differ throughout the day. In a simple study, we will see whether people have faster reaction times after they wake up or before they go to bed. Other variables may also affect this, so other information will be gathered about sleeping patterns and activity throughout the day.

## Abstract

People often talk about being "morning people" known as larks or "evening people" known as owls but are there really these differences and if there are does that mean that performance and concentration also differs? This study investigates specifically reaction times in sixth form students in the morning and in the evening using a repeated measures design. Students were asked to complete a reaction times test within 30 minutes of waking and 30 minutes before going to sleep over 3 days. Preliminary analysis using a
$\qquad$ statistical test suggests that $\qquad$
and our $\qquad$ hypothesis was accepted. These findings $\qquad$ previous research that showed that $\qquad$

## Introduction- Aims and hypothesis

Some research has been found on $\qquad$

Other research on this has been. $\qquad$

## Method

Design
Participants
Materials
Ethics

## Procedure

Explain what you had participants do, how you collected data, and the order in which steps occurred. It must be concise but detailed.

## Results

## Descriptive statistics

Results table to show the measures of central tendency and dispersion of reaction times 30 minutes before sleeping and 30 minutes after waking.

Graph to show reaction times 30 mins after waking and 30 minutes before sleeping

|  | 30 mins <br> after <br> waking | 30 mins <br> before <br> sleeping |
| :--- | :--- | :--- |
| Mode |  |  |
| median |  |  |
| mean |  |  |
| range |  |  |
| Standard <br> deviation |  |  |

Inferential Statistics
a) Identification of correct test
b) Justification of correct test
c) Identification and justification of Critical Value
d) Treatment of results

| e)Supported <br> hypothesis, <br> restated |  |
| :--- | :--- |
|  |  |
| Conclusion <br> based on <br> Inferential <br> statistics |  |

## Discussion

## Summary of results

## Relationship to background research

## Limitations and modifications

Implications and suggestions for further research

## References

## In class activities

## Stretch yourself/exam questions- Can you?

1. The psychologist found the results were significant at $p<0.05$. What is meant by 'the results were significant at $p<0.05^{\prime}$ ? ( 2 marks)
2. Define what is meant by the critical value in statistical testing (2 marks)
3. What is meant by the term type I error (1 mark?)
4. What is the probability of making a type I error at $p \leq 0.1$ (1 mark)
5. How can you reduce the risk of having a type I or type all error? (2 marks)
6. A researcher is testing the effectiveness of a new drug to reduce depression. What level of significance should be used and why? (3 marks)
7. Distinguish between a Type I error and a Type II error (4 marks)

## Choosing the right statistical test questions

1. Two psychologists investigated the relationship between age and recall of medical advice. Previous research had shown that recall of medical advice tended to be poorer in older patients. The study was conducted at a doctor's surgery and involved a sample of 30 patients aged between 18 and 78 years. They all saw the same doctor, who made notes of the advice that she gave during the consultation. One of the psychologists interviewed each of the patients individually, immediately after they had seen the doctor. The psychologist asked each patient a set of questions about what the doctor had said about their diagnosis and treatment. The patients' responses were recorded and then typed out. Working independently the psychologists compared each typed account with the doctor's written notes in order to rate the accuracy of the accounts on a scale of 1-10. A high rating indicated that the patient's recall was very accurate and a low rating indicated that the patient's recall was very inaccurate.
a) What statistical test should the psychologists use, fully justify your answer. (4 marks)

## Extension questions

b) The psychologists decided to propose a directional hypothesis. Why was this appropriate in this case? (1 mark)
C) Write a suitable directional hypothesis for this investigation (3 marks)

The psychologists were careful to consider the issue of reliability during the study.
d) what is meant by reliability (1 mark)

This study collected both qualitative and quantitative data.
e) From the description of the study above identify the qualitative data and the quantitative data (2 marks)
2. In a laboratory experiment involving a medical consultation role-play, participants were randomly allocated to one of two conditions. In Condition A, a doctor used diagrams to present to each participant a series of facts about high blood pressure. In Condition B, the same doctor presented the same series of facts about high blood pressure to each participant but without the use of diagrams. At the end of the consultation, participants were tested on their recall of facts about high blood pressure. Each participant was given a score out of ten for the number of facts recalled.
a) Identify an appropriate statistical test that the psychologists could use to analyse the data from the follow-up study. Fully justify your answer. (4 marks)
$\qquad$
$\qquad$

## Extension questions

In this case, the psychologists decided to use a laboratory experiment rather than a field experiment.
b) discuss advantages of carrying out this experiment in a laboratory (4 marks)
3. Psychological research suggests an association between birth order and certain abilities. For example, first-born children are often logical in their thinking whereas later-born children tend to be more creative. A psychologist wonders whether this might mean that birth order is associated with different career choices. She decides to investigate and asks 50 artists and 65 lawyers whether they were the first-born child in the family or not.

The psychologist found the following results:

- 20 of the 50 artists were first-born children
- 35 of the 65 lawyers were first-born children.
a) Construct a $2 \times 2$ contingency table using the results above (4 marks)
b) Identify an appropriate statistical test for this investigation and give three reasons for your choice (1 and 3 marks)


## Extension questions

C) Write a suitable non-directional hypothesis for this study (2 marks)

She analysed her data using the statistical test and calculated a value of $x^{2}=2.27$. She then looked at the relevant table to see whether this value was statistically significant. An extract from the table is provided below.

| Level of significance for a one tailed test |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
|  | 0.10 | 0.05 | 0.025 | 0.01 |  |
| Level of significance for a two tailed test |  |  |  |  |  |
|  | 0.20 | 0.10 | 0.05 | 0.02 |  |
| DF | 1.64 | 2.71 | 3.84 | 5.41 |  |
| 1 |  |  |  |  |  |

Calculated value of $x^{2}$ must be equal to or exceed the table (critical) values for significance at the level shown.

## Practice question

d) Imagine you are writing a reports section of the report on this investigation. Using information form the description of the study above and the relevant information from the statistical table, provide contents suitable for the results section. You must provide all of the following:

- A sketch of an appropriately labelled bar chart
- Identification of the appropriate statistical test with justification (you've done this)
- Indentification of an appropriate level of significance
- A statement of results of the statistical test in relation to the hypothesis.

Total- /12

## Level 5 exam questions on assessing and improving reliability and validity

1. Joanna is planning to research the experiences of girls in a secondary school in Uganda. She wants to collect quantitative and qualitative data using a questionnaire. She is writing a questionnaire to find out 'What their views are on the importance of homework and helping with domestic tasks such as cooking and caring for younger siblings?
a) Describe one way that Joanna could assess the reliability of her questionnaire? (2)
b) Describe one way that Joanna could improve the reliability of her questionnaire? (2)

The results of the study are given in the table below.
A researcher compared the number of errors P's made when believing they were being listened to by 5 people compared to 100 people as a way of measuring verbal fluency.

Mean number of verbal errors and standard deviations for both conditions

|  | Condition A <br> (believed audience <br> of 5 listeners) | Condition B <br> (believed audience <br> of 100 listeners) |
| :--- | :---: | :---: |
| Mean | 11.1 | 17.2 |
| Standard <br> deviation | 1.30 | 3.54 |

2. Briefly explain one method the psychologist could use to assess the validity of the data she collected in this study. (2)

Researchers used a test to measure the mathematical reasoning ability of pairs of identical and non-identical twins. If both members of a pair had a similar score on the test, they were said to be 'concordant'. This type of study is known as a concordance study.

Outcome of the research with the concordance rates expressed as a percentage

| Genetic relationship <br> group | Concordance rate <br> for mathematical <br> reasoning ability |
| :--- | :---: |
| Identical twins <br> (100\% shared genes) | $58 \%$ |
| Non-identical twins <br> $(50 \%$ shared genes) | $14 \%$ |

3. Some ways of establishing validity involve the use of a statistical test.

Outline how these researchers could have used a statistical test to establish concurrent validity of the mathematical reasoning ability test.

Hint- state what concurrent validity is in this context- what do you have to do?

Then this question is asking you to pick an appropriate stats test to do this!

## Critical value questions

1) 3,2$) 2,3) 5,4) 25,5) 9,6) 0,7) 52$
2) $5 \% 0.05$ 9) $p=0.01$ Or 1\% 10) Type I error as being too lenient

## Sign test questions

a) $6-, 3+$ so $\mathrm{S}=3$
b) $\mathrm{N}=9$
c) Non-directional so $\mathrm{CV}=1$
d) No, S must be less than the critical value but 3 is bigger than 0 so the results are not significant and so time of day does not affect memory.
e)

Levels of measurement

1) interval, 2)interval, 3) treat as ordinal, 4) nominal, 5) nominal, 6) ordinal
2) ordinal 8) Nominal

## Choosing stats tests

a) correlation as relationship between attractiveness of each partner, ordinal as ranked in order of attractivenss, related data, so spearmans
b) Two potential answers IF justified (although the first one is technically correct!)

Difference as difference in memory with low and high light, related data-repeated measures as the same rat was tested in both conditions, should be treated as ordinal data as a memory test so can't be sure questions are of equal weighting- Wilcoxon
(Difference, related data-repeated measures design, interval data as should assume the test questions are of equal weighting-related t-test)
c) Correlation as relationship between temp and reaction, interval data as seconds and temp and related data so Pearsons
d) Test of difference between right and left handed people, independent data/independent groups design as either in left handed or right handed group and Nominal data as they didn't have an individual score were simply put in OCD or no OCD so frequency, so Chi squared

Interpreting a statistics test
1 a) At $5 \%$, for 8 participants with a one tailed test using Wilcoxon then the critical value is 5.

T must be $\leq$ CV to be significant
$T=4,4 \leq 5$ therefore is significant so smokers did smoke significantly fewer cigarettes per fay in the week after the motivational course.
2. $N=12,0.05$ and one tailed or equals 7 .
b) As $U=4$ and critical value is 74 less than 7 so is significant and so we can say that the new drug does significantly reduce anxiety.
3. 12-negative correlation and fairly weak as -0.152

Not significant as 0.152 is $\leq \mathrm{CV}(0.549)$ and so we can say there is no relationship between speed of running and reaction time.

## Critical values tables

Appendix 3: The critical values of $\mathbf{T}$ for the Wilcoxon Matched Pairs Signed Ranks test

| Level of significance for a one-tailed test |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | . 05 | . 025 | . 01. | . 005 |
| Level of significance for a two-tailed test |  |  |  |  |
| $N$ | . 10 | .05. | . 02 | . 002 |
| 5 | 0 |  |  | - |
| 6 | 2 | 0 |  |  |
| 7 | 3 | 2 | 0 |  |
| 8 | - 5 | 3 | 1 | 0 |
| 9. | 8 | 5 | 3 | 11 |
| 10 | 10 | 8 | 5. | 3 |
| 11 | 13 | 10 | 7 | 5 |
| 12 | 17. | 13 | 9 | 7 |
| \% 13 | 21 | 17 | 12 | 9 |
| \% 14 | - 25 | 21 | 15 | 12 |
| 15. | 30 | 25 | 19 | 15 |
| .16 | 35 | - 29 | 23 | 19 |
| 笭 17 | 41 | 34 | 27 | 23 |
| 生 18 | 47 | 40 | 32 | 27 |
| 19 | 53 | 46 | 37 | 32 |
| 20 | 60 | 52 | 43 | 37 |
| \% 21 | 67 | 58 | 49 | 42 |
| \% 22 | . 75 | 65 | 55 | :--48 |
| 23 | 83 | . 73 | 62 | 54 |
| 24 | 91 | 81 | 69 | 61 |
| - 25 | 100 | 89 | 76 | 68 |

Value of $T$ that is equal to or less than the tabled value is significant at or beyond the level indicated.
Source: Taken from Table 1 of McComack (1965) With permission of the publisher.

Appendix 4: Critical values of Spearman's Rank Order Correlation Coemment ( $r_{s}$ )
Level of significance for two-tailed test
Level of significance for one-talled test

|  | 1.000 |  |  |  |
| ---: | ---: | ---: | ---: | ---: |
| 5 | .900 | 1.000 | 1.000 |  |
| 6 | .829 | .886 | .943 | 1.000 |
| 7. | 714. | 786 | .893 | .929 |
| 8. | 643. | 738 | .833 | .881 |
| 9 | .600 | .700 | .783 | .833 |
| 10 | .564 | .648 | .745 | .794 |
| 11. | .536 | .618 | .709 | .755 |
| 12 | .503 | .587 | .671 | .727. |
| 13 | .484 | .560 | .648 | .703 |
| 14 | .464 | .538 | .622 | .675 |
| 15 | .443 | .521 | .604 | .654 |
| 16 | .429 | .503 | .582 | .635 |
| 17 | .414 | .485 | .566 | .615 |
| 18 | .401 | .472 | .550 | .600 |
| 19 | .391 | .460 | .535 | .584 |
| 20 | .380 | .447 | .520 | .570 |
| 21 | .370 | .435 | .508 | .556 |
| 22 | .361 | .425 | .496 | .544 |
| 23 | .353 | .415 | .486 | .532 |
| 24 | .344 | .406 | .476 | .521 |
| 25 | .337 | .398 | .466 | .511 |
| 26 | .331 | .390 | .457 | .501 |
| 27 | .324 | .382 | .448 | .491 |
| 28 | .317 | .375 | .440 | .483 |
| 29 | .312 | .368 | .433 | .475 |

Table 7.15 Critical value tables for Pearson's product moment correlation test. The $P$ value of Pearson's product is significantí if it is equal to or.greater than the table vaiue. Degrees of freedom = pairs of scores minus 2


Table 3: Critical values of $U$ for a one-tailed test at $p=.025$; two-tailed test at $p=.05^{\star}$ (Mann-Whitney)

|  |  |  |  | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{N}_{2}$ |  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |  |  |  |  | - | - | - | - | - | - | - |
|  | 1 | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 |
|  | 2 | - | -- | - | - | 0 | 1 | 1 | 2 | 2 | $3$ | 3 | $4$ | $4$ | $5$ | $5$ | 6 | 6 | 7 | 7 | 8 |
|  | 4 | - | - | - | 0 | 1 | 2 | 3 | 4. | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 11 | 12 | 13 | 13 |
|  | 5 | - | - | 0 | 1 | 2 | 3 | 5 | 6 | 7 | 8 | 9 | 131 | 12 | 13 | 14 | 15 | 17 | 18 | 19 | 20 |
|  | 6 | - | - | 1 | 2 | 3 | ' 5 | 6 | 8 | 10 | 131 | 13 | 14 | 16 | 17 | 19 | 21 | 22 | 24 | 25 | 27 |
|  | . 7 | - | - | 1 | 3 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | - 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 |
|  | 8 | - | 0 | 2 | 4 | 6 | 8 | 10 | 13 | 15 | 17 | 19 | 22 | 24 | 26 | 29 | 31 | 34 | 36 | 38 | 41 |
|  | 9 | - | 0 | 2 | 4 | 7 | 10 | 12 | 15 | 17 | 20 | 23 | 26 | 28 | 31 | 34 | 37 | 39 | 42 | 45 | 48 |
|  | 10 | - | 0 | 3 | 5 | 8 | 11 | 14 | $17^{\circ}$ | 20 | 23 | 26 | 29. | 33 | 36 | 39 | 42 | 45 | 48 | 52 | 55 |
|  | 11 | - | 0 | 3 | . 6 | $9{ }^{-}$ | 13 | 16 | 19 | 23 | 26 | 30 | ३3 | 37 | 40 | 44 | 47 | 51 | 55 | 58 | 62 |
|  | 12 | - | 1 | 4 | 7 | 11 | 14 | 18 | 22 | 26 | 29 | 33 | 37 | 41 | 45 | 49 | 55 | 57 | 61 | 65 | 69 |
|  | 13 | - | 1 | 4 | 8 | 12 | 16 | 20 | 24 | 28 | 33 | 37 | 41 | 45 | 50 | 54 | 59 | 63 | 67 | 74 | 76 |
|  | 14 | - | 1 | 5 | 9 | 13 | 17 | 22 | 26 | 31 | 36 | 40 | 45 | 50 | 55 | 59 | 64 | 67 | 74 | 78. | 83 90 |
|  | 15 | - | 1 | 5 | 10 | 14 | 19 | 24 | 29 | 34 | 39 | 44 | 49 | 54 | 59 | 64 | 70 | 76 | 80 | 85 | 98 |
|  | 16 | - | 1 | 6 | 11 | 15 | 21 | 26 | 31 | 37 | 42 | 47 | 53 | 59 | 64 | 70 | 75 | 81 | 86 | 92 | 105 |
|  | 17 | - | 2 | 6 | 11 | 17 | 22 | 28 | 34 | 39 | 45 | 51 | 57 | 63 | 67 | 75 | 81 | 87 | 93 | 6 | 112 |
|  | 18 | - | 2 | 7 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 55 | 61 | 67 | 74 | 80 | 86 | 93 | 99 | 3 | 119 |
|  | 19 | - | $2 \%$ | 7 | 13 | 19 | 25 | 32 | :38 | 45 | 52 | 58 | 65 | 72 | 78 | 85 | 92 | 99 |  |  | 127 |
|  | 20 |  | 2 | 8 | 13 | 20 | 27 | 34 | 41 | 48 | 55 | 62 | 69 | 76 | 83 | 90 | 98 |  | 112 |  | 12 |




Table of critical values of the sign test (S)
Calculated value of $S$ must be $\leq$
than the critical value to be significant.

Level of significance for a one tailed test

|  | .05 | .025 | .01 | .005 |
| :--- | :--- | :--- | :--- | :--- |

Level of significance for a two-tailed test

|  | .10 | .05 | .02 | .01 |
| :---: | :---: | :---: | :---: | :---: |
| N |  |  |  |  |
| 5 | 0 |  |  |  |
| 6 | 0 | 0 |  |  |
| 7 | 0 | 0 | 0 |  |
| 8 | 1 | 0 | 0 | 0 |
| 9 | 1 | 1 | 0 | 0 |
| 10 | 1 | 1 | 0 | 0 |
| 11 | 2 | 1 | 1 | 0 |
| 12 | 2 | 2 | 1 | 1 |
| 13 | 3 | 2 | 1 | 1 |
| 14 | 3 | 2 | 2 | 1 |
| 15 | 3 | 3 | 2 | 2 |
| 16 | 4 | 3 | 2 | 2 |
| 17 | 4 | 4 | 3 | 2 |
| 18 | 5 | 4 | 3 | 3 |
| 19 | 5 | 4 | 4 | 3 |
| 20 | 5 | 5 | 4 | 3 |
| 25 | 7 | 7 | 6 | 5 |
| 30 | 10 | 9 | 8 | 7 |
| 35 | 12 | 11 | 10 | 9 |

