Write your name here

Surname: StemUp Model Solution | Other names:

Pearson Edexcel
International Advanced Level

Centre Number | Candidate Number

Psychology

International Advanced Level
Paper 4: Clinical Psychology and Psychological Skills

Friday 8 June 2018 – Morning
Time: 2 hours

Paper Reference
WPS04/01

You do not need any other materials.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 96.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- The list of formulae and statistical tables are printed at the start of this paper.
- Candidates may use a calculator.

Advice

- Read each question carefully before you start to answer it.
- Check your answers if you have time at the end.

Turn over ▶

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FORMULAE AND STATISTICAL TABLES

Standard deviation (sample estimate)

$$\sqrt{\left(\frac{\sum(x-\bar{x})^2}{n-1}\right)}$$

Spearman's rank correlation coefficient

$$1-\frac{6\sum d^2}{n(n^2-1)}$$

Critical values for Spearman's rank

	Level of significance for a one-tailed test				
	0.05	**0.025**	**0.01**	**0.005**	**0.0025**
	Level of significance for a two-tailed test				
N	**0.10**	**0.05**	**0.025**	**0.01**	**0.005**
5	0.900	1.000	1.000	1.000	1.000
6	0.829	0.886	0.943	1.000	1.000
7	0.714	0.786	0.893	0.929	0.964
8	0.643	0.738	0.833	0.881	0.905
9	0.600	0.700	0.783	0.833	0.867
10	0.564	0.648	0.745	0.794	0.830
11	0.536	0.618	0.709	0.755	0.800
12	0.503	0.587	0.678	0.727	0.769
13	0.484	0.560	0.648	0.703	0.747
14	0.464	0.538	0.626	0.679	0.723
15	0.446	0.521	0.604	0.654	0.700
16	0.429	0.503	0.582	0.635	0.679
17	0.414	0.485	0.566	0.615	0.662
18	0.401	0.472	0.550	0.600	0.643
19	0.391	0.460	0.535	0.584	0.628
20	0.380	0.447	0.520	0.570	0.612
21	0.370	0.435	0.508	0.556	0.599
22	0.361	0.425	0.496	0.544	0.586
23	0.353	0.415	0.486	0.532	0.573
24	0.344	0.406	0.476	0.521	0.562
25	0.337	0.398	0.466	0.511	0.551
26	0.331	0.390	0.457	0.501	0.541
27	0.324	0.382	0.448	0.491	0.531
28	0.317	0.375	0.440	0.483	0.522
29	0.312	0.368	0.433	0.475	0.513
30	0.306	0.362	0.425	0.467	0.504

The calculated value must be equal to or exceed the critical value in this table for significance to be shown.

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Chi-squared distribution formula

$$X^2 = \sum \frac{(O-E)^2}{E} \qquad df = (r-1)(c-1)$$

Critical values for chi-squared distribution

	Level of significance for a one-tailed test					
	0.10	**0.05**	**0.025**	**0.01**	**0.005**	**0.0005**
	Level of significance for a two-tailed test					
df	**0.20**	**0.10**	**0.05**	**0.025**	**0.01**	**0.001**
1	1.64	2.71	3.84	5.02	6.64	10.83
2	3.22	4.61	5.99	7.38	9.21	13.82
3	4.64	6.25	7.82	9.35	11.35	16.27
4	5.99	7.78	9.49	11.14	13.28	18.47
5	7.29	9.24	11.07	12.83	15.09	20.52
6	8.56	10.65	12.59	14.45	16.81	22.46
7	9.80	12.02	14.07	16.01	18.48	24.32
8	11.03	13.36	15.51	17.54	20.09	26.12
9	12.24	14.68	16.92	19.02	21.67	27.88
10	13.44	15.99	18.31	20.48	23.21	29.59
11	14.63	17.28	19.68	21.92	24.73	31.26
12	15.81	18.55	21.03	23.34	26.22	32.91
13	16.99	19.81	22.36	24.74	27.69	34.53
14	18.15	21.06	23.69	26.12	29.14	36.12
15	19.31	22.31	25.00	27.49	30.58	37.70
16	20.47	23.54	26.30	28.85	32.00	39.25
17	21.62	24.77	27.59	30.19	33.41	40.79
18	22.76	25.99	28.87	31.53	34.81	42.31
19	23.90	27.20	30.14	32.85	36.19	43.82
20	25.04	28.41	31.41	34.17	37.57	45.32
21	26.17	29.62	32.67	35.48	38.93	46.80
22	27.30	30.81	33.92	36.78	40.29	48.27
23	28.43	32.01	35.17	38.08	41.64	49.73
24	29.55	33.20	36.42	39.36	42.98	51.18
25	30.68	34.38	37.65	40.65	44.31	52.62
26	31.80	35.56	38.89	41.92	45.64	54.05
27	32.91	36.74	40.11	43.20	46.96	55.48
28	34.03	37.92	41.34	44.46	48.28	56.89
29	35.14	39.09	42.56	45.72	49.59	58.30
30	36.25	40.26	43.77	46.98	50.89	59.70
40	47.27	51.81	55.76	59.34	63.69	73.40
50	58.16	63.17	67.51	71.42	76.15	86.66
60	68.97	74.40	79.08	83.30	88.38	99.61
70	79.72	85.53	90.53	95.02	100.43	112.32

The calculated value must be equal to or exceed the critical value in this table for significance to be shown.

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Wilcoxon Signed Ranks test process

- Calculate the difference between two scores by taking one from the other
- Rank the differences giving the smallest difference Rank 1

  Note: do not rank any differences of 0 and when adding the number of scores, do not count those with a difference of 0, and ignore the signs when calculating the difference
- Add up the ranks for positive differences
- Add up the ranks for negative differences
- T is the figure that is the smallest when the ranks are totalled (may be positive or negative)
- N is the number of scores left, ignore those with 0 difference

Critical values for the Wilcoxon Signed Ranks test

	Level of significance for a one-tailed test		
	0.05	0.025	0.01
	Level of significance for a two-tailed test		
n	0.1	0.05	0.02
N=5	0	-	-
6	2	0	-
7	3	2	0
8	5	3	1
9	8	5	3
10	11	8	5
11	13	10	7
12	17	13	9

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SECTION A BEGINS ON THE NEXT PAGE.

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SECTION A

CLINICAL PSYCHOLOGY

Answer ALL questions. Write your answers in the spaces provided.

1 The Health and Care Professions Council (HCPC) guidelines outline the standards of conduct, performance and ethics that clinical practitioners must follow.

Describe what is meant by 'fitness to practise'.

Fitness to practise means a practitioner has the skills, knowledge, health and character to practise safely and effectively. This includes keeping high standards of personal and professional conduct and keeping their skills and knowledge up to date.

(Total for Question 1 = 2 marks)

2 Melissa conducted an investigation into the effect of drug treatments on patients with schizophrenia. She wrote up her research paper and submitted it for a peer review.

Explain **one** reason for a peer review of Melissa's research paper about drug treatments for schizophrenia.

Several experts in the field would critically review Melissa's paper on drug treatments for schizophrenia before publication, checking the quality of her methods and conclusions. This decides whether her research is valid and contributes enough to knowledge about treating schizophrenia to be published.

(Total for Question 2 = 2 marks)

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3 In clinical psychology, you will have studied one of the following contemporary studies in detail:

- Hans and Hiller (2013)
- Ma, Quan and Liu (2014)
- Becker et al. (2002)
- Reichel et al. (2014)

Explain **three** strengths and/or weaknesses of the procedure used in your chosen contemporary study.

(6)

Chosen study *Becker et al. (2002)*

Becker et al. (2002) used a standardised 26-item Eating Attitudes Test (EAT-26) to measure the disordered eating attitudes of the Fijian schoolgirls in both 1995 and 1998. This is a strength because the same questions and scoring were used with every girl in each wave, so the data are comparable and the procedure can be replicated, which increases reliability.

However, the EAT-26 and the questions about behaviours such as self-induced vomiting are self-report measures of a sensitive topic. The girls may have given socially desirable answers or under-reported their eating behaviours, so the data may not reflect their real eating attitudes, which reduces validity.

A strength is that semi-structured interviews were also carried out with some of the girls in 1998 to gather qualitative data about their experiences of television. This gave rich, detailed data showing how the girls themselves felt television affected their body image and eating, which increases the validity of the conclusions.

A weakness is the small sample, with 63 girls in the first wave in 1995, one month after television arrived, and 65 in 1998, all from secondary schools in one region of Fiji. This limits representativeness, so the results cannot easily be generalised to other girls or cultures.

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(Total for Question 3 = 6 marks)

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4 Give **two** features of a positron emission tomography (PET) scan.

1 *Images are produced from the concentration of a radioactive tracer (FDG) absorbed by active areas of the brain.*

2 *A PET scan can produce three-dimensional, colour-coded images showing brain activity.*

(Total for Question 4 = 2 marks)

5 Daichi has been diagnosed with schizophrenia using the ICD. He decides to ask a different clinician to provide a second clinical diagnosis using the ICD.

Explain how a second clinical diagnosis may improve the reliability of Daichi's original diagnosis of schizophrenia.

If the second clinician also diagnoses Daichi with schizophrenia, the original diagnosis can be seen as more reliable. This is because a different clinician using the same ICD criteria reached the same diagnosis, showing inter-rater reliability, so Daichi's symptoms have been consistently and accurately assessed.

(Total for Question 5 = 2 marks)

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6 Sabina conducted research into negative attitudes of people towards schizophrenia. Participants watched a video clip of pseudo-patients. One group watched a pseudo-patient talking about their experience of having schizophrenia and the other group watched a pseudo-patient talking about having an anxiety disorder.

The participants were then asked if they thought the pseudo-patients were aggressive or non-aggressive.

The results of the study are shown in **Table 1**.

	Pseudo-patient is **aggressive**	Pseudo-patient is **non-aggressive**
Schizophrenia pseudo-patient	41	13
Anxiety disorder pseudo-patient	12	28

Table 1

(a) Calculate chi-squared for this data by completing **Table 2**.

Your answers should be correct to two decimal places.

(4)

		Observed	**Expected**	**O–E**	**$(O–E)^2$**	**$(O–E)^2/E$**
Schizophrenia pseudo-patient	**Aggressive**	41	30.45	10.55	111.30	3.66
	Non-aggressive	13	23.55	−10.55	111.30	4.73
Anxiety disorder pseudo-patient	**Aggressive**	12	22.55	−10.55	111.30	4.94
	Non-aggressive	28	17.45	10.55	111.30	6.38
					chi-squared =	19.71

Table 2

Space for calculations

$O - E = 41 - 30.45 = 10.55$ $(O - E)^2 = 10.55^2 = 111.30$

$111.30 \div 30.45 = 3.66$ $111.30 \div 23.55 = 4.73$

$111.30 \div 22.55 = 4.94$ $111.30 \div 17.45 = 6.38$

$\chi^2 = \Sigma(O - E)^2/E = 3.66 + 4.73 + 4.94 + 6.38 = 19.71$

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(b) State the critical value for chi-squared for this data, with df = 1 at p = 0.05 for a one-tailed test.

The formulae and statistical tables can be found at the front of the paper.

(1)

Critical value 2.71

(c) Justify, with reference to the data, whether this result is significant.

(1)

The calculated value of 19.71 is greater than the critical value of 2.71 (p = 0.05, one-tailed), so the result is significant.

(Total for Question 6 = 6 marks)

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7 Rosenhan (1973) conducted research to investigate the reliability of the DSM-IV when used to diagnose schizophrenia.

Suggest **three** improvements that could be made to the research by Rosenhan (1973).

1 *To improve the ethics of the study, Rosenhan could have gained consent from the management of the hospitals before sending in the pseudo-patients.*

2 *Rosenhan could have used hospitals in different countries, not just the USA, to increase the generalisability of the results.*

3 *Independent observations of the pseudo-patients' experiences could have been made, rather than relying only on their self-reported notes, to triangulate the data.*

(Total for Question 7 = 3 marks)

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8 In your studies of clinical psychology, you will have conducted a practical investigation.

(a) Describe the procedure you used in your practical investigation.

(4)

We carried out a content analysis to explore attitudes to schizophrenia. Each member of the class found two sources about schizophrenia: one newspaper article and one article from a mental health support organisation, such as a charity website.

Before analysing, we agreed coding categories (themes) such as 'negative stereotype', 'dangerous or violent', 'recovery' and 'support'. Each source was read and every time a theme appeared it was tallied, giving quantitative data. The tallies for newspaper sources and support organisation sources were then compared to find the dominant themes, and two of us coded the same articles to check inter-rater reliability.

(b) Describe the conclusion(s) you made in your practical investigation.

(2)

Newspaper articles mostly portrayed schizophrenia negatively, with themes such as 'dangerous' tallied most often, reinforcing negative stereotypes. Support organisation sources presented a more positive attitude, with themes of recovery and support, so popular media emphasises negative stereotypes of mental health.

(Total for Question 8 = 6 marks)

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9 Marianne and Harrison studied the success of drug therapy as a treatment for schizophrenia compared to the combined use of drug therapy and family therapy.

Each patient provided a self-reported score as a measure of their symptoms of schizophrenia once a week for eight weeks. The score ranged from 0 to 25, with 0 being no symptoms and 25 being high levels of symptoms.

Marianne and Harrison compared their results to a patient with schizophrenia who did not have therapy.

The results of their study are shown in **Figure 1** below.

A line diagram to show the self-reported symptom scores for schizophrenic patients over eight weeks

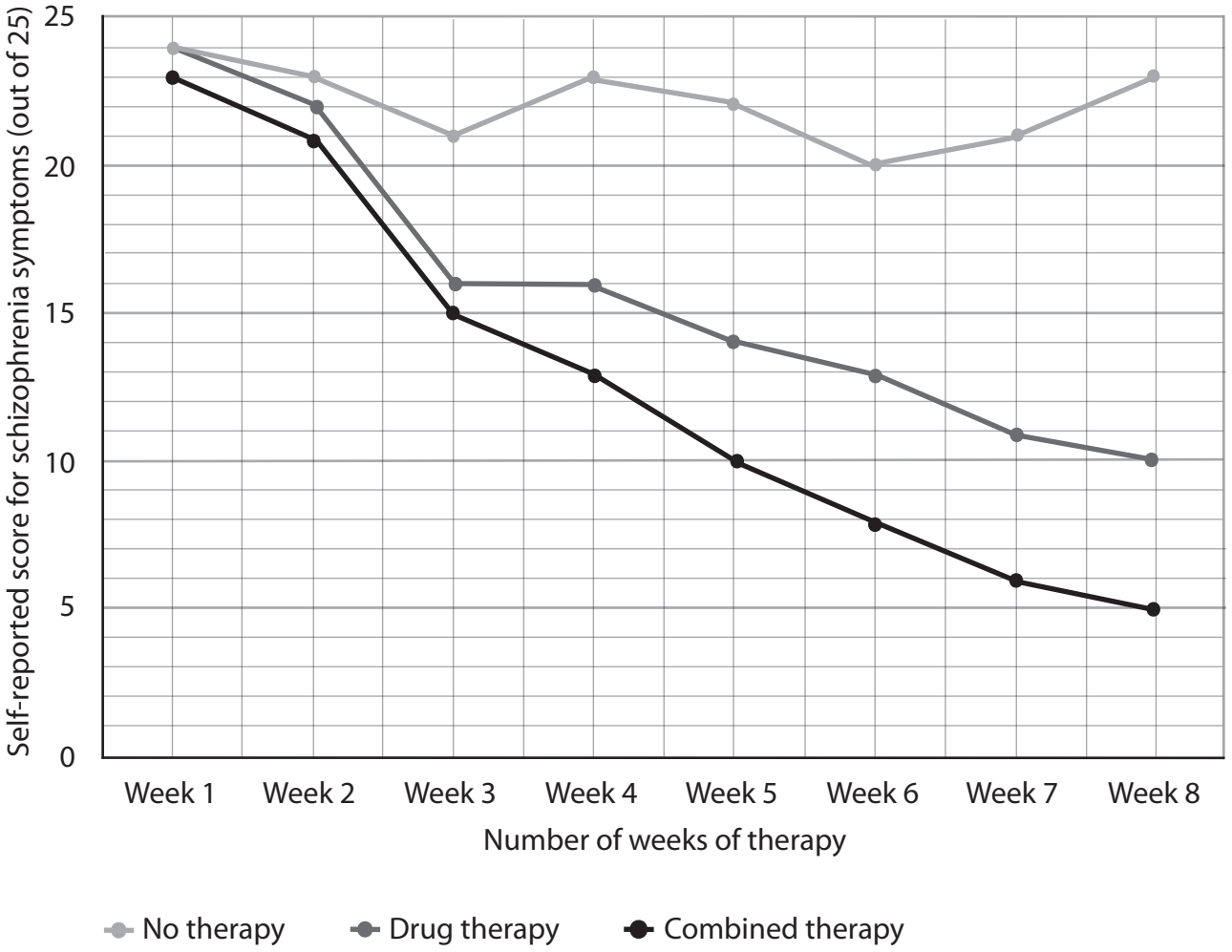


Figure 1

(a) Identify which form of therapy had the highest success rate over the eight-week period.

(1)

Combined therapy (drug therapy and family therapy together)

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Marianne and Harrison initially believed that there was little or no difference between drug therapy alone and combined drug and family therapy.

(b) Describe, with reference to **Figure 1**, why Marianne and Harrison may have had this initial belief.

(2)

For the first three weeks the drug therapy and combined therapy patients made the same level of progress. Their scores fell in parallel by about the same amount each week (drug therapy from 24 to 16, combined from 23 to 15), so it looked as if adding family therapy made little or no difference.

(Total for Question 9 = 3 marks)

TOTAL FOR SECTION A = 32 MARKS

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SECTION B

CLINICAL PSYCHOLOGY

Answer the question. Write your answer in the space provided.

10 Evaluate issues of validity and culture in the diagnosis of mental health disorders.

(16)

Validity in diagnosis is whether a diagnosis is accurate, so it measures the disorder it claims to. Criterion validity is when different classification systems, such as the DSM and ICD, diagnose the same disorder in the same person. Predictive validity is when the diagnosis predicts the course of the disorder and its response to treatment, and construct validity is how well the operationalised criteria represent the disorder as a whole. Culture refers to the shared norms and values of a group, which affect whether behaviour is seen as abnormal.

There is evidence of good validity. Andrews et al. (1999) assessed 1500 people using both the DSM-IV and ICD-10 and found good agreement for diagnoses of depression, substance dependence and anxiety, showing criterion validity. Kim-Cohen et al. (2005) used several data collection methods and found that a DSM-IV diagnosis of conduct disorder was a valid representation of the children's experiences. This suggests that when clear operationalised criteria are used, diagnosis can be accurate.

However, Rosenhan (1973) challenges validity. All eight pseudo-patients were admitted to psychiatric hospitals after reporting only hearing voices, and most were labelled with schizophrenia, even though they then behaved normally. This suggests psychiatrists could not tell the sane from the insane. On the other hand, the pseudo-patients reported a recognised symptom, so the diagnoses could be argued to follow the criteria at the time, and the study used US hospitals in the 1970s, so it may not apply to modern DSM-5 or ICD diagnosis.

Culture is a major issue for validity because what is normal differs between cultures. Some

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religious groups see hearing voices as a sign of speaking to God, and Plains Indians may report hearing dead relatives speak to them, which is normal in their culture but could be seen as a symptom of schizophrenia in North America. If clinicians from a different culture apply the DSM or ICD, normal behaviour may be misdiagnosed as a disorder.

Cooper et al. (1972) supports this: New York psychiatrists were twice as likely to diagnose schizophrenia as London psychiatrists when shown the same video-taped clinical interviews, so diagnosis depended on the culture of the clinician rather than the patient's symptoms. Malgady et al. (1987) found linguistic and cultural differences, with non-Hispanic clinicians rating the symptoms of Hispanic patients differently from Hispanic clinicians. However, Lopez (1989) warns that trying to account for culture can also cause misdiagnosis, as real symptoms may be dismissed as cultural norms, so being culturally sensitive does not guarantee validity.

Culture affects more than how disorders are diagnosed, as cultural ideals can make some disorders more likely. Makino et al. (2004) found bulimia nervosa was more prevalent in Western cultures (up to 7.2% of females) than in non-Western cultures (up to 3.2%), suggesting differences in rates may reflect real cultural influences rather than biased diagnosis. Also, Lee (2006) found that using the DSM to diagnose ADHD in Korea was as valid as using it in the USA, so the classification systems can be valid across cultures for some disorders.

In conclusion, diagnosis using the DSM and ICD shows reasonable criterion validity, especially for disorders such as depression and anxiety with clear criteria. However, validity is weaker for disorders such as schizophrenia, where symptoms are judged against cultural norms and the clinician's own culture can bias diagnosis. Validity is therefore best improved by culturally

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aware clinicians, translated assessments and cross-cultural criteria, while avoiding the opposite error of explaining genuine symptoms away as culture.

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(Total for Question 10 = 16 marks)

TOTAL FOR SECTION B = 16 MARKS

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SECTION C

PSYCHOLOGICAL SKILLS

Answer ALL questions. Write your answers in the spaces provided.

11 Elijah interviewed seven people about their experiences of flying using a semi-structured interview technique.

(a) Describe how Elijah could have designed his interview questions.

(2)

Elijah could prepare some closed questions to ask every interviewee, such as 'How many times have you flown?', and some open-ended questions or prompts to encourage more detail about their experiences, such as 'How do you feel as the plane takes off?', following up on their answers.

(b) Give **one** strength of using qualitative data to investigate people's experiences of flying.

(2)

Qualitative data allow each person to describe their own experiences of flying in depth, such as a bad flight or seeing a plane crash on television. This rich, detailed data reflects the complex reasons behind their feelings, so the data are more valid than simple numerical scores.

After gathering this data, Elijah wanted to find out if there were any similarities in the responses from interviewees who are fearful of flying.

(c) Suggest how Elijah could have analysed his interview responses to generate quantitative data to find any similarities.

(2)

Elijah could use a content analysis: categorise the responses into common flying themes, such as 'being nervous' or 'fear of turbulence', then tally how often each theme occurs in each interview so the fearful interviewees' responses can be compared numerically.

(Total for Question 11 = 6 marks)

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12 Serena observed the number of times that ten students followed the instructions of their teacher during a one-hour lesson.

She recorded the data in **Table 3** below.

Participant	Number of times student followed teacher instructions
A	6
B	5
C	8
D	11
E	5
F	6
G	10
H	11
I	8
J	5

Table 3

Space for calculations

Group the scores into equal class intervals and count the frequencies:

0 – 2 = 0 3 – 5 = 3 (B, E, J) 6 – 8 = 4 (A, F, C, I) 9 – 11 = 3 (D, G, H)

Total = 0 + 3 + 4 + 3 = 10 students

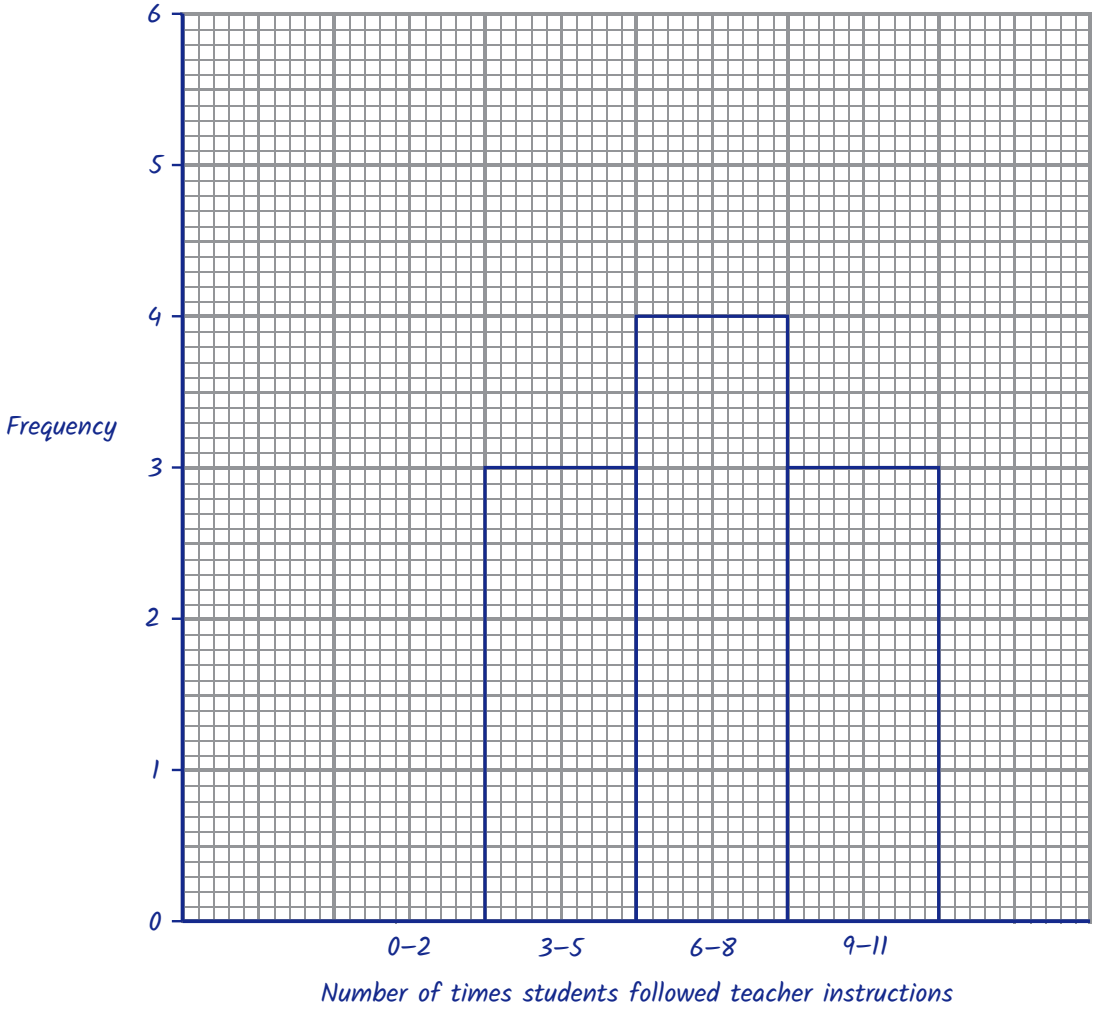
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Draw a histogram to represent the data in **Table 3**.

Title

A histogram to show the frequency of times that students followed the teacher's instructions



(Total for Question 12 = 3 marks)

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13 Compare the use of field experiments with the use of laboratory experiments in psychological research.

(6)

One difference is that field experiments are more reflective of real life than laboratory experiments. Field experiments take place in the participants' natural environment, such as a school or street, whereas laboratory experiments take place in a controlled, artificial setting, so field experiments have higher ecological validity and their findings generalise more easily to everyday behaviour.

A similarity is that both types of experiment can establish cause and effect relationships. In both, the researcher deliberately manipulates the independent variable and measures its effect on the dependent variable, so changes in the DV can be attributed to the IV.

A difference is that laboratory experiments have much stronger control over extraneous variables than field experiments. In a laboratory, variables such as noise and the timing of the task can be standardised, but in a field setting situational variables are hard to control, so cause and effect is less certain and laboratory experiments are easier to replicate, giving more reliable findings.

Another difference is that participants in field experiments are less likely to show demand characteristics. They are usually unaware they are being studied, whereas laboratory participants know they are in a study and may change their behaviour to fit the perceived aims. However, this means field experiments often lack informed consent, so they raise more ethical issues than laboratory experiments.

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(Total for Question 13 = 6 marks)

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14 Sebastian studied short-term memory recall skills in children. He was able to visit his local primary school to conduct the study with children aged nine years old. Sebastian used opportunity sampling and an independent groups design.

He presented two groups of children with a list of 20 words for a duration of one minute.

One group immediately recalled as many words as they could from the list of 20. The other group were shown a 10-second video clip of a cartoon before they were asked to recall the words.

(a) Describe **one** reason why Sebastian may have used an independent groups design in this study.

(2)

Each child only takes part in one condition, which avoids order effects. If the same children did both conditions they would see the list of words twice, so practice would improve their recall in the second condition.

(b) Suggest **one** weakness with the opportunity sampling technique used by Sebastian in this study.

(2)

All the children were nine-year-olds from Sebastian's local primary school, so they come from the same area and culture. The sample is therefore unrepresentative of children in other areas, schools and cultures, so the results cannot be generalised.

(c) State **one** improvement Sebastian could make to the interference task in his study.

(1)

Make the cartoon clip at least 30 seconds long, because the duration of short-term memory is about 15 to 30 seconds, so a 10-second delay may not stop the words being recalled from STM.

(Total for Question 14 = 5 marks)

TOTAL FOR SECTION C = 20 MARKS

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SECTION D

PSYCHOLOGICAL SKILLS

Answer the question. Write your answer in the space provided.

15 One key question for society is the influence of role models on risk-taking behaviour in adolescents.

Distefan et al. (1999) found that adolescents whose favourite movie stars were seen to smoke on and/or off screen, were more likely to smoke themselves than the adolescents whose favourite movie stars were non-smokers. This suggests that role models influence the risk-taking behaviour of smoking in adolescence.

Steinberg (2008) reviewed research that suggested that heightened risk-taking during adolescence is more likely to be 'biologically driven reward sensitivity' which takes place during puberty. Therefore risk-taking behaviour could be a developmental shift with an evolutionary origin.

Discuss the key question of whether role models can influence risk-taking behaviours in adolescents. You should use concepts, theories and/or research studied in your psychology course.

You **must** make reference to the context in your answer.

(8)

Social learning theory (Bandura) suggests behaviour is learned by observing and imitating role models. For imitation to occur the observer must pay attention to the model, retain the behaviour, be able to reproduce it and be motivated to do so, for example through vicarious reinforcement. Role models are more likely to be imitated if they are high status, admired or similar to the observer, and the observer identifies with them.

This explains Distefan et al. (1999). Favourite movie stars are high status to adolescent fans, so they identify with them and want to be like them. Stars are seen smoking repeatedly on and off screen, so adolescents can easily attend to and retain the behaviour, and because the stars appear successful and attractive, smoking is vicariously reinforced, motivating adolescents to copy it. Bandura, Ross and Ross (1961) support this, as children who observed an aggressive adult model were more likely to imitate the aggression, especially with a same-sex model.

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However, Distefan et al. (1999) is correlational, so it cannot show that movie stars caused the smoking. Adolescents who were already inclined to smoke may simply have chosen stars who smoke as their favourites.

Steinberg (2008) offers a biological explanation: heightened risk-taking is driven by reward sensitivity during puberty, as changes in the brain's dopamine reward system make risky, exciting behaviour more rewarding before the prefrontal cortex controlling impulses has fully matured. Smoking stimulates neurotransmitters such as dopamine, which would make it rewarding for adolescents regardless of role models. This would explain why most adolescents 'grow out of' risk-taking as they mature, which social learning theory cannot easily explain. Individual differences such as extraversion, or a predisposition to addictive behaviours, may also explain why only some adolescents copy their role models.

In conclusion, role models can influence risk-taking, but probably as a trigger: biological reward sensitivity in puberty makes adolescents prone to risks, and high status role models such as movie stars shape which risky behaviours, such as smoking, they adopt. Society could therefore reduce smoking in films, but biological development will still make adolescence a period of heightened risk.

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SECTION E

PSYCHOLOGICAL SKILLS

Answer the question. Write your answer in the space provided.

16 Evaluate whether a reductionist approach in psychology can provide a full explanation of the complexities of human behaviour.

(20)

Reductionism is explaining complex human behaviour by breaking it down into smaller, simpler parts, such as genes, neurotransmitters or stimulus-response links. These parts can be measured and tested scientifically. Holism is the opposite: it argues behaviour can only be understood by studying the whole person, including interactions between biology, experience, culture and socialisation, because the whole is more than the sum of its parts.

A strength of reductionism is that it allows scientific, objective research. Neurotransmitters and brain areas can be isolated and measured with techniques such as PET scans. Raine et al. (1997) used PET scans to show that murderers pleading not guilty by reason of insanity had reduced activity in the prefrontal cortex compared with controls, giving a measurable explanation of aggression. Reductionist research has also led to effective treatments: the monoamine hypothesis reduces depression to low serotonin and noradrenaline, and this led to antidepressants such as SSRIs that help many patients, so reductionism has practical value.

However, reductionist explanations ignore interactions between parts and the wider context, so they cannot give a full explanation. The monoamine hypothesis cannot explain why antidepressants take weeks to work when they change neurotransmitter levels within days, or why many patients do not respond, suggesting cognitive and social factors such as negative thinking and life events also matter. Gottesman and Shields (1966) found that concordance for schizophrenia in MZ twins was well below 100% even though they share all their genes, so genes cannot be the only cause and environmental factors must play a part.

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Reductionism can also oversimplify cognitive processes. Atkinson and Shiffrin (1968) reduced memory to an input-output process through separate sensory, short-term and long-term stores, which allowed controlled experiments but ignored the role of experience and meaning. Bartlett (1932) took a more holistic view, showing that memory is reconstructive and shaped by schemas and culture, which better explains real-life errors in recall. Similarly, Pavlov reduced behaviours such as phobias to stimulus-response pairings, ignoring thoughts and emotions, so learning theory cannot explain why only some people develop a phobia after a frightening event.

Reducing behaviour to biology also misses social influences. Explaining aggression only through hormones such as testosterone is insufficient, because Bandura, Ross and Ross (1961) showed children learned aggression by observing a model. Bowlby (1944) argued attachment is an innate process, yet it relies on complex interactions with carers, so it cannot be fully understood at the level of biology alone.

On the other hand, holistic approaches have weaknesses. They are hard to test and falsify, as so many factors interact, so they can be vague and unscientific. Holistic therapies such as psychodynamic and humanistic therapy treat the whole person and can be successful, but their effectiveness is harder to measure. Reductionism is therefore a necessary starting point, allowing hypotheses to be tested under controlled conditions.

In conclusion, a reductionist approach cannot by itself provide a full explanation of the complexity of human behaviour, because it ignores the interactions between biological, psychological and social levels. However, it has produced valuable scientific understanding and effective treatments. The best explanation combines levels, as in the biopsychosocial or

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diathesis-stress approach, using reductionist research to identify the parts while holism explains how they interact in a real person.

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