7.6 How to Write a Hypothesis: Test Pack

AQA 7182 · Calculator allowed · about 75 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer every question in the spaces provided. Write in full sentences where a question asks you to explain, justify or discuss. Where a question asks you to write a hypothesis, write a single complete sentence. The marks available are shown in brackets after each question. This is a full question bank rather than a single sitting: work through it in sections, or use one of the timed cuts.

1 A psychologist is planning an investigation into whether background music affects how quickly people complete a jigsaw puzzle. Which one of the following statements is an AIM rather than a hypothesis? Write the correct letter in your answer.

A To investigate whether background music affects how quickly people complete a jigsaw puzzle.

B Participants who work with background music will complete the jigsaw puzzle in fewer seconds than participants who work in silence.

C There will be a difference in the time taken in seconds to complete the jigsaw puzzle between participants who work with background music and participants who work in silence.

D Participants who work in silence will complete the jigsaw puzzle in fewer seconds than participants who work with background music.

(Total for Question 1 is 1 mark)

2 A researcher is investigating whether revising in a quiet room affects performance on a vocabulary test. Which one of the following is a DIRECTIONAL hypothesis? Write the correct letter in your answer.

A There will be a difference in the number of words recalled correctly out of 20 between participants who revise in a quiet room and participants who revise in a noisy room.

B Participants who revise in a quiet room will recall more words correctly out of 20 than participants who revise in a noisy room.

C To find out whether room noise affects vocabulary test performance.

D There will be no difference in the number of words recalled correctly out of 20 between participants who revise in a quiet room and participants who revise in a noisy room.

(Total for Question 2 is 1 mark)

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3 Before carrying out a statistical test on the results of an experiment into revision technique and test performance, a psychologist writes down both an alternative hypothesis and a null hypothesis. State what is meant by a null hypothesis.

(Total for Question 3 is 2 marks)

4 A student proposes the following prediction for a psychological investigation: 'People who have a healthier unconscious mind will be happier in later life.' Explain why this prediction could not be used as a scientific hypothesis.

(Total for Question 4 is 2 marks)

5 A researcher writes the following dependent variable into her plan for a study of phobia treatment: 'the patient's fear of spiders'. Explain why this is a poorly operationalised dependent variable, and write an improved version.

(Total for Question 5 is 3 marks)

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6 A psychologist investigates whether the colour of a room affects how relaxed people feel. Participants sit for ten minutes in either a room painted pale blue or a room painted bright red, then rate how relaxed they feel on a scale from 1 to 10. The psychologist tests the pale blue group in the morning and the bright red group in the late afternoon.

(a) Identify the independent variable and the dependent variable in this study. **(2)**

(b) Identify one extraneous variable in this study and explain why it should have been controlled. **(2)**

(Total for Question 6 is 4 marks)

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7 An educational psychologist investigates the effect of a token economy on homework completion. Two parallel classes of Year 9 pupils are studied for four weeks. In one class pupils earn a token for each completed homework, exchangeable for a reward at the end of the week; in the other class homework is set and marked as usual with no tokens. The psychologist records the number of homework tasks out of sixteen that each pupil completes over the four weeks. Previous applications of token economies in schools consistently report increased task completion.

Write a directional hypothesis for this study.

(Total for Question 7 is 3 marks)

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8 A psychologist investigates the effect of sleep deprivation on the fight or flight response. Thirty adults are tested twice, once after a normal night of sleep and once after being kept awake for twenty-four hours, with the order counterbalanced. On each occasion the psychologist records the participant's heart rate in beats per minute during a three-minute mental arithmetic test.
Amelia writes: 'Sleep will affect arousal.'
Amelia's hypothesis would earn no marks. Rewrite it so that it would earn all three marks, and state what you have changed.

(Total for Question 8 is 3 marks)

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9 A psychologist investigates whether the colour of a placebo tablet affects reported pain relief. Sixty adults with mild headaches are each given an identical inert tablet, coloured either white or bright red, and rate their pain on a scale from 0 to 10 thirty minutes later.

Leo writes: 'Adults given a bright red inert tablet will report a lower pain rating on the 0 to 10 scale thirty minutes later than adults given a white inert tablet.'

Priya writes: 'Adults given a bright red inert tablet will report less pain thirty minutes later than adults given a white inert tablet.'

The examination question read: 'Write a suitable hypothesis for this study.' No previous research is reported, so either a directional or a non-directional form is acceptable.

(a) State how many of the three available marks Leo would earn, and how many Priya would earn. **(2)**

(b) Explain what separates the two hypotheses. **(2)**

(Total for Question 9 is 4 marks)

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10 A psychologist investigates the sleep of shift workers. Thirty-four nurses who have just moved from a permanent day rota to a rotating rota that includes night shifts complete a sleep diary for two weeks before the change and for two weeks afterwards, recording the total number of hours slept in each twenty-four hour period. The psychologist compares each nurse's mean hours of sleep before and after the change. Existing evidence on rotating rotas is mixed: some nurses sleep less and others sleep more once they stop commuting in rush hour.

(a) Write a non-directional hypothesis for this study. **(3)**

(b) Explain why a non-directional hypothesis rather than a directional hypothesis is appropriate for this study. **(2)**

(Total for Question 10 is 5 marks)

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11 A psychologist wants to find out whether the way a question about a past event is worded affects how confident a witness feels in their answer. She plans a study in which sixty adults watch the same ninety-second film of a bicycle accident and are then asked one question about the colour of the cyclist's jacket. Half are asked 'What colour was the cyclist's jacket?' and half are asked 'The cyclist's jacket was dark, wasn't it?'. Each participant then rates how confident they are in their answer on a scale from 1 to 7. Research on the effect of this kind of question wording on confidence, as opposed to accuracy, has produced inconsistent findings.

(a) Write a suitable aim for this study. **(2)**

(b) Write a non-directional hypothesis for this study. **(3)**

(c) Explain why this study requires a non-directional hypothesis even though research on question wording and eyewitness ACCURACY points clearly in one direction. **(2)**

(Total for Question 11 is 7 marks)

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12 A psychologist investigates whether the amount of time spent on social media each day is associated with self-reported loneliness. Ninety adults record the number of minutes they spend on social media on a typical day and complete a standardised loneliness questionnaire scored out of 30.

Yusuf is asked to write a suitable hypothesis. He writes: 'Adults who spend more than two hours a day on social media will score higher on the loneliness questionnaire out of 30 than adults who spend less than two hours a day.'

(a) Explain why Yusuf's hypothesis does not match the study the psychologist has described. **(2)**

(b) Write a hypothesis that does match the study the psychologist has described. **(3)**

(Total for Question 12 is 5 marks)

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13 A psychologist investigates the effect of a deep brain stimulation device on tremor. Twenty-two patients are assessed twice, once with the device switched on and once with it switched off, with the order counterbalanced. On each occasion a rater who does not know which setting is in use counts the number of visible tremors in a two-minute period. Every previous trial of this device has found fewer tremors when it is switched on. The examination question reads: 'Write a directional hypothesis for this study.'

Niamh writes: 'There will be a difference in the number of visible tremors counted in two minutes between the occasion when the device is switched on and the occasion when it is switched off.'

(a) State how many of the three available marks Niamh would earn, and justify your answer. **(2)**

(b) Rewrite Niamh's hypothesis so that it answers the question that was asked, and state what you have changed. **(3)**

(Total for Question 13 is 5 marks)

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14 A psychologist investigates whether a person's culture affects how they explain another person's behaviour. One hundred adults, half raised in an individualist culture and half raised in a collectivist culture, read the same short account of a driver cutting across a queue of traffic and then write one sentence explaining why the driver behaved that way. Each sentence is coded by two independent raters as either a situational explanation or a dispositional explanation. Earlier work in this area used different stimulus materials and a different coding scheme, and no study has yet compared the two groups on this particular account, so the researcher cannot predict which way this comparison will go.

Three students each answer the question 'Write an appropriate hypothesis for this study'.

Callum writes: 'Adults raised in a collectivist culture will give a situational explanation more often than adults raised in an individualist culture.'

Zainab writes: 'There will be a difference in the proportion of explanations coded as situational between adults raised in an individualist culture and adults raised in a collectivist culture.'

Rhys writes: 'Adults raised in an individualist culture and adults raised in a collectivist culture will explain the driver's behaviour differently.'

(a) State how many of the three available marks Zainab would earn, and justify your answer. **(2)**

(b) State how many of the three available marks Callum would earn, and justify your answer. **(2)**

(c) State how many of the three available marks Rhys would earn, and justify your answer. **(2)**

(Total for Question 14 is 6 marks)

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15 A psychologist has collected the data from an experiment on caffeine and reaction time and is about to carry out a statistical test. She explains to a student that the test is performed on the null hypothesis rather than on her own prediction.

(a) Explain why a statistical test is carried out on the null hypothesis rather than on the alternative hypothesis. **(2)**

(b) Explain why a psychologist should say that she has rejected the null hypothesis rather than that she has proved her own hypothesis. **(2)**

(Total for Question 15 is 4 marks)

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16 A psychologist is deciding what significance level to adopt for a trial of a new therapy for a specific phobia. She is aware that the level she chooses affects the kind of error she is more likely to make.

(a) State what is meant by a Type I error, using the term null hypothesis in your answer. **(2)**

(b) State what is meant by a Type II error, using the term null hypothesis in your answer. **(2)**

(c) The psychologist decides to use a significance level of 0.01 rather than 0.05. Explain the effect this will have on the two kinds of error in her trial of the phobia therapy. **(2)**

(Total for Question 16 is 6 marks)

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Mark scheme · 7.6 How to Write a Hypothesis: Test Pack

Question 1

A. An aim states the general purpose of the investigation and begins 'to investigate', whereas B, C and D are testable predictions about the outcome **B1**

Answer: A

Question 2

B. It predicts which condition will score higher, so it states the direction of the difference **B1**

Answer: B

Question 3

a statement that there is no difference or no relationship between the variables oe **B1**

any difference or relationship found in the sample is attributed to chance oe **B1**

Answer: A null hypothesis states that there is no difference or no relationship between the variables in the population, and that any difference or relationship observed in the sample is due to chance.

Question 4

neither variable is operationalised, as there is no agreed way to measure a 'healthier unconscious mind' or 'happier' oe **B1**

because it cannot be measured it cannot be tested or falsified, so no evidence could ever show it to be wrong oe **B1**

Answer: Neither variable can be measured objectively, so the prediction cannot be tested. A statement that no possible evidence could disprove is not falsifiable and therefore not a scientific hypothesis.

Question 5

'fear of spiders' names the concept but not how it will be measured, so it is not yet measurable oe **B1**

an improved version naming an instrument or count, for example the self-reported anxiety rating on a scale from 0 to 10 when shown a photograph of a spider oe **B1**

the improved version specifies the scale and the moment of measurement so that every participant is measured in the same way oe **B1**

Answer: The original names a concept rather than a measurement. An improved version is the self-reported anxiety rating on a scale from 0 to 10 given while the patient looks at a standard photograph of a spider, which fixes both the scale and the moment at which every participant is measured.

Question 6

(a) IV: the colour the room is painted, pale blue or bright red oe **B1**

(a) DV: the relaxation rating given on the scale from 1 to 10 oe **B1**

(a) Answer: IV: room colour, pale blue or bright red. DV: the relaxation rating on the 1 to 10 scale.

(b) identification of an appropriate extraneous variable, for example the time of day at which each group is tested oe **B1**

(b) explanation naming the effect on the DV, for example people may feel more relaxed in the late afternoon anyway, so a difference in relaxation ratings could be caused by testing time rather than by room colour oe **B1**

(b) Answer: Time of day. The pale blue group is tested in the morning and the bright red group in the late afternoon, so any difference in relaxation ratings could be caused by the time of testing rather than by the room colour.

Question 7

a statement, not an aim or a question, making a directional prediction, stated clearly enough to be understood on a single reading oe **B1**

both conditions of the independent variable are named in operationalised form: whether the class operates a token economy or has homework set and marked as usual with no tokens oe **B1**

the dependent variable is stated in operationalised form: the number of homework tasks out of sixteen completed over the four weeks oe **B1**

Answer: Pupils in the class operating a token economy will complete more of the sixteen homework tasks over the four weeks than pupils in the class where homework is set and marked as usual with no tokens.

Question 8

the rewritten hypothesis names both conditions of the IV: after a normal night of sleep and after twenty-four hours awake oe **B1**

the rewritten hypothesis states the DV in operationalised form: heart rate in beats per minute during the three-minute mental arithmetic test oe **B1**

the changes are identified: both conditions of the IV have been added and the vague term 'arousal' has been replaced with a measured quantity oe **B1**

Answer: There will be a difference in mean heart rate in beats per minute during the three-minute mental arithmetic test between the occasion when participants have had a normal night of sleep and the occasion when they have been kept awake for twenty-four hours. The changes are that both conditions of the independent variable are now named and 'arousal' has been replaced by a measurable quantity.

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Question 9

(a) Leo earns 3 marks **B1**

(a) Priya earns 2 marks **B1**

(a) Answer: Leo earns 3 marks and Priya earns 2 marks.

(b) Leo operationalises the DV by naming the pain rating on the 0 to 10 scale oe **B1**

(b) Priya says only 'less pain', which names the concept but not the measure, so one variable is left unoperationalised and she loses the third mark oe **B1**

(b) Answer: Leo states the dependent variable as the pain rating on the 0 to 10 scale, so it is fully operationalised. Priya writes only 'less pain', which names the concept without the measure, so one of her variables is unoperationalised and she loses the third mark.

Question 10

(a) a statement, not an aim or a question, making a non-directional prediction, stated clearly enough to be understood on a single reading oe **B1**

(a) both conditions of the independent variable are named in operationalised form: the two weeks on a permanent day rota compared with the two weeks on a rotating rota that includes night shifts oe **B1**

(a) the dependent variable is stated in operationalised form: the mean number of hours slept per twenty-four hour period oe **B1**

(a) Answer: There will be a difference in the mean number of hours slept per twenty-four hour period between the two weeks nurses work a permanent day rota and the two weeks they work a rotating rota that includes night shifts.

(b) the existing evidence on rotating rotas points both ways, since some nurses sleep less and others sleep more oe **B1**

(b) with no consistent basis for predicting which way mean sleep hours will move, the researcher can only predict that a difference will be found oe **B1**

(b) Answer: The existing evidence points both ways: some nurses sleep less on a rotating rota and others sleep more once they stop commuting in rush hour. With no consistent basis for predicting the direction, the psychologist can predict only that mean hours of sleep will differ between the two rotas.

Question 11

(a) a statement of purpose rather than a prediction oe **B1**

(a) the aim names both the wording of the question and the witness's confidence oe **B1**

(a) Answer: To investigate whether the wording of a question about a witnessed event affects how confident witnesses feel in the answer they give.

(b) a statement, not an aim or a question, making a non-directional prediction, stated clearly enough to be understood on a single reading oe **B1**

(b) both conditions of the independent variable are named in operationalised form: the open question about jacket colour compared with the leading question suggesting the jacket was dark oe **B1**

(b) the dependent variable is stated in operationalised form: the confidence rating given on the scale from 1 to 7 oe **B1**

(b) Answer: There will be a difference in the mean confidence rating given on the 1 to 7 scale between participants asked what colour the cyclist's jacket was and participants asked whether the cyclist's jacket was dark.

(c) the dependent variable here is confidence, not accuracy, and these are different outcomes oe **B1**

(c) the direction of a hypothesis must be justified by evidence about the variable actually being measured, and the evidence on confidence is inconsistent oe **B1**

(c) Answer: The dependent variable in this study is confidence, not accuracy, and consistent findings about one outcome do not license a prediction about a different outcome. Since the evidence on question wording and confidence is inconsistent, only a non-directional hypothesis can be justified.

Question 12

(a) the study is a correlation, since both social media minutes and loneliness score are measured rather than one being manipulated oe **B1**

(a) Yusuf has written a hypothesis predicting a difference between two groups, which would require the researcher to split the sample into conditions the study does not have oe **B1**

(a) Answer: The study measures both variables rather than manipulating either, so it is a correlation with two co-variables and no independent or dependent variable. Yusuf has predicted a difference between two groups, which would require conditions the study does not contain.

(b) a statement, not an aim or a question, predicting a relationship or correlation between the co-variables rather than a difference between conditions oe **B1**

(b) the first co-variable is stated in operationalised form: the number of minutes spent on social media on a typical day oe **B1**

(b) the second co-variable is stated in operationalised form: the score out of 30 on the standardised loneliness questionnaire oe **B1**

(b) Answer: There will be a positive correlation between the number of minutes adults spend on social media on a typical day and their score out of 30 on the loneliness questionnaire.

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Question 13

(a) 0 marks **B1**

(a) the question demanded a directional hypothesis and Niamh has written a non-directional one, and a hypothesis of the wrong type earns zero however well it is operationalised oe **B1**

(a) Answer: 0 marks. The question asked for a directional hypothesis and she has written a non-directional one. The wrong type of hypothesis earns nothing, even though both conditions and the dependent variable here are operationalised perfectly well.

(b) the rewritten hypothesis states a direction consistent with the evidence in the stem, that fewer tremors occur with the device switched on oe **B1**

(b) both conditions of the IV are retained: the device switched on and the device switched off oe **B1**

(b) the change is identified: what was missing from the original and what has been added oe **B1**

(b) Answer: Patients will have fewer visible tremors counted in a two-minute period when the device is switched on than when it is switched off.

Question 14

(a) 3 marks **B1**

(a) it is a clear non-directional prediction, the type the absence of a prior comparison justifies, naming both conditions of the IV and operationalising the DV as the proportion of explanations coded as situational oe **B1**

(a) Answer: 3 marks. It is a clear non-directional prediction, which is the type justified when no prior study allows the direction to be predicted, it names both cultural conditions, and it operationalises the dependent variable as the proportion of explanations coded as situational.

(b) 0 marks **B1**

(b) he has written a directional hypothesis when the stem gives no basis for predicting a direction, so only a non-directional one is justified, so it is the wrong type for this study oe **B1**

(b) Answer: 0 marks. He has predicted which group will give more situational explanations, but the stem states that no previous study allows the direction to be predicted, so a directional prediction is not justified and the hypothesis is the wrong type.

(c) 2 marks **B1**

(c) it is a clear non-directional statement naming both conditions of the IV in the stem's own terms, adults raised in an individualist culture and adults raised in a collectivist culture, so only the DV is left unoperationalised oe **B1**

(c) Answer: 2 marks. It is a clear non-directional prediction that names both cultural conditions in the stem's own terms, so only one variable is left unoperationalised: it does not say that explanations are coded as situational or dispositional.

Question 15

(a) the null hypothesis specifies an exact expected state of affairs, no difference, against which the observed result can be compared oe **B1**

(a) the test calculates how likely the observed result would be if the null hypothesis were true, which cannot be calculated from the alternative hypothesis because it does not specify a size of effect oe **B1**

(a) Answer: The null hypothesis specifies an exact state of affairs, no difference, so the probability of obtaining the observed result if it were true can be calculated. The alternative hypothesis does not specify how large a difference to expect, so no such probability could be worked out from it.

(b) a significant result shows only that the observed difference is unlikely to have arisen by chance, not that the alternative explanation is certainly correct oe **B1**

(b) there remains a stated probability that the result is a chance one, and a single study cannot establish a theory as proved, so scientific claims stay provisional oe **B1**

(b) Answer: A significant result shows only that the observed difference would be unlikely if the null hypothesis were true; it does not establish that her explanation is correct. There is still a stated probability that the result arose by chance, so the finding remains provisional rather than proved.

Question 16

(a) the null hypothesis is rejected when it is in fact true oe **B1**

(a) the researcher therefore claims a difference or relationship that does not really exist, a false positive oe **B1**

(a) Answer: A Type I error occurs when the null hypothesis is rejected even though it is true, so the researcher claims a difference or relationship that does not really exist.

(b) the null hypothesis is accepted or retained when it is in fact false oe **B1**

(b) the researcher therefore fails to detect a difference or relationship that does really exist, a false negative oe **B1**

(b) Answer: A Type II error occurs when the null hypothesis is retained even though it is false, so the researcher misses a difference or relationship that really does exist.

(c) a stricter level of 0.01 makes a Type I error less likely, so she is less likely to claim the therapy works when it does not oe **B1**

(c) but it makes a Type II error more likely, so she is more likely to miss a genuine benefit of the therapy oe **B1**

(c) Answer: Using 0.01 rather than 0.05 makes a Type I error less likely, so she is less likely to conclude the phobia therapy works when it does not. The trade-off is that a Type II error becomes more likely, so she is more likely to miss a real benefit of the therapy.

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