OCR

SPECIMEN

Advanced Subsidiary GCE/Level 3 Certificate

QUANTITATIVE METHODS (MEI)

G244 Introduction to Quantitative Methods (IQM)

Specimen Question Paper

Candidates answer on the Question Paper.

OCR supplied materials:
- Insert (inserted)

Other materials required:
- Scientific or graphical calculator

Duration: 1 hour 30 minutes

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- The Insert will be found in the centre of this document.
- Write your name, centre number and candidate number in the spaces provided. Please write clearly and in capital letters.
- **Write your answer to each question in the space provided.** Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- You are permitted to use a scientific or graphical calculator in this paper unless the question states otherwise.
- Final answers should be given to a degree of accuracy appropriate to the context.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- You are advised that an answer may receive **no marks** unless you show sufficient detail of the working to indicate that a correct method is being used.
- The Insert contains a copy of the pre-release material for use with one of the questions.
- The total number of marks for this paper is **72**.
- This Question Paper consists of **20** pages. Any blank pages are indicated.

1 The following information is displayed at a bank in England.

Currency	Sell at	Buy at
AUSTRALIAN DOLLAR	1.48	1.64
CANADIAN DOLLAR	1.54	1.76
EURO	1.14	1.31
TURKISH LIRA	2.55	3.08
US DOLLAR	1.52	1.73

(i) How much will 200 Euros cost a customer in pounds? **[3]**

(ii) Dave uses the bank to change pounds to US dollars. In America, he sees a watch priced in US dollars at $58.50. Show how Dave, without using a calculator, could estimate the cost of the watch in pounds. **[3]**

1 (i)

1 (ii)

2 This question is about the speed at which the earth travels round the sun.

The earth travels round the sun once a year. The average distance of the earth from the sun is 1.5×10^{11} m.

Assume that the sun remains still and ignore the rotation of the earth round its axis.

State one further assumption that enables you to model the path of the earth and so estimate the speed that the earth is travelling at. Give your answer in km h^{-1}. **[6]**

2

3 In the pre-release material, the following claim is made. 'In the fictitious example in Figure 1, we can see that those who received the back to work intervention were much more likely to find a job than those who did not.'

(a) Use the information in Figure 1 on the pre-release material to estimate the probability of finding a job for each of the following.

(i) The intervention group

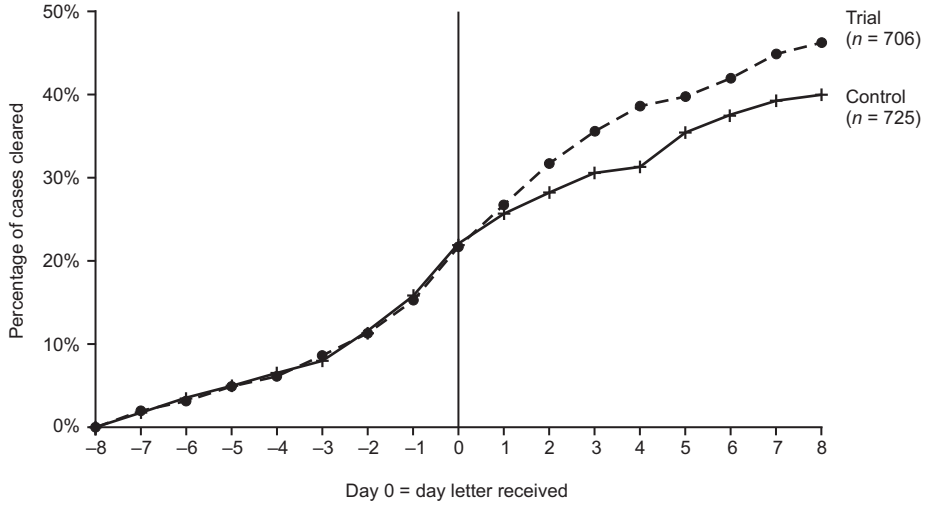
(ii) The control group **[2]**

3 (a) (i)	
3 (a) (ii)	

(b) A randomised controlled trial has been conducted with people who are late paying their tax.

- Those in the control group were sent a standard reminder letter.
- Those in the trial group were sent the standard reminder letter with the additional information that most people in their area pay their tax on time.

The graph below shows the percentage of each group who had paid their tax plotted against time.



From 'Applying behavioural insights to reduce fraud, error and debt'

The conclusion from the trial was that the reminder letter for the trial group was more effective than the letter for the control group. State two features of the graph that support this conclusion. **[2]**

3 (b)	

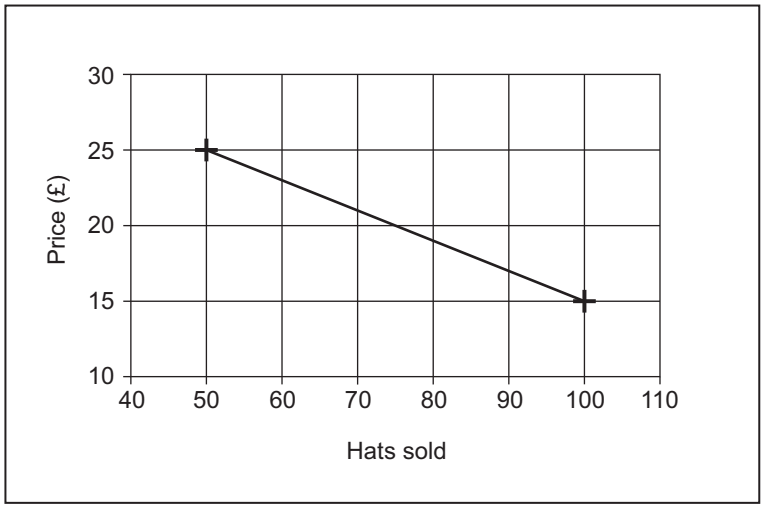
(c) A researcher has a list of all the participants for a randomised controlled trial. She will allocate them randomly to the trial group or the control group. Each participant must have an equal chance of being in either group. Describe a robust randomisation procedure which the researcher could use to make the allocation. **[2]**

3 (c)	

4 Geraldine is setting up a business making hats. She needs to decide how much to sell the hats for.

- Each hat costs her £3 to make.
- She can make up to 100 hats per week.

Geraldine has done market research which suggests that she can sell 100 hats per week if she charges £15 for each hat but only 50 hats per week if she charges £25 for each hat. The graph below shows the demand curve modelled as a straight line.



She uses a spreadsheet to work out how to make the maximum profit.

(i) Fill in the rest of the numbers in column B. **[2]**

(ii) What formula should Geraldine put in cell C2 so that she can copy it down the column to give the cost? **[2]**

(iii) What formula should Geraldine put in cell D2 so that she can copy it down the column to give the profit? **[2]**

(iv) Geraldine wants to sell each hat for a whole number of pounds. What price should she sell the hats for to make the maximum profit? **[4]**

4 (i),(iv)

	A	B	C	D
1	Price (£)	Hats sold	Cost (£)	Profit (£)
2	15	100	300	1200
3	16			
4	17			
5	18			
6	19			
7	20			
8	21			
9	22			
10	23			
11	24			
12	25	50		

4 (ii)

4 (iii)

4 (iv)

5 **(a)** The population of the world in 1960 was 3040 million. In 1975, it was 4090 million. Two models, A and B, for population growth are considered.

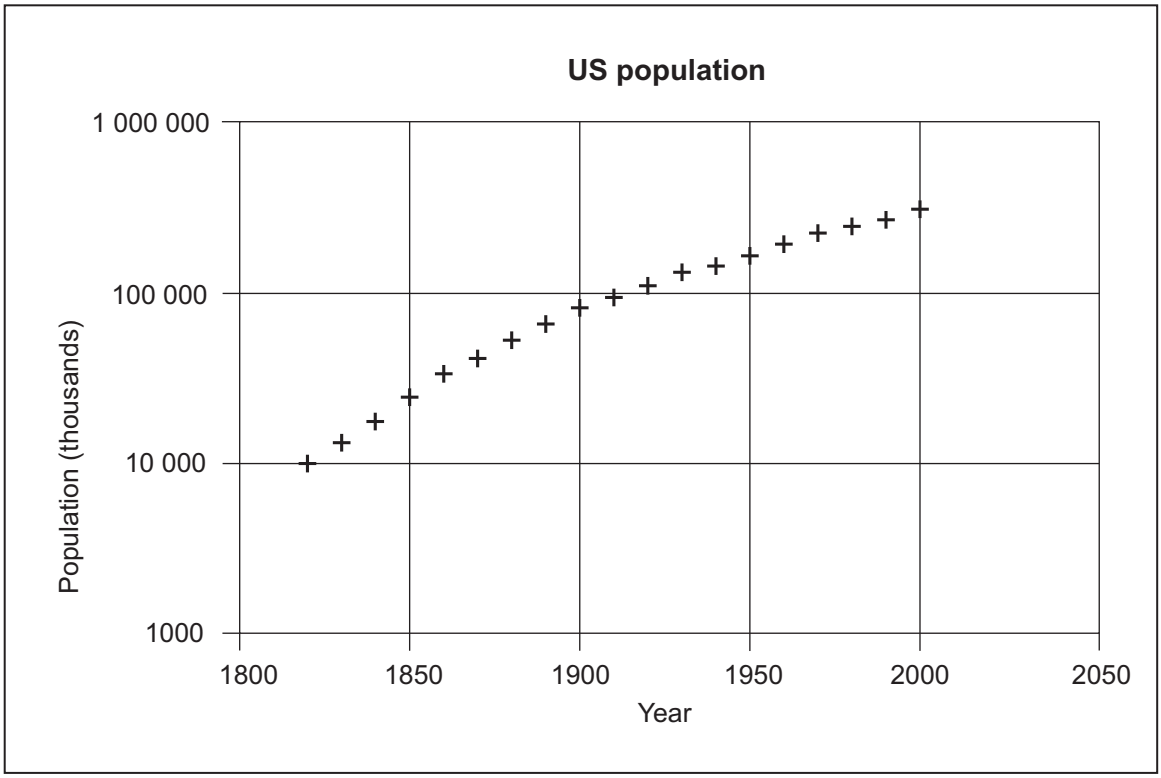
(i) In model A the population grows by a constant number of people each year. Show that the average increase from 1960 to 1975 is 70 million people per year. **[2]**

(ii) In model B the population grows by a constant percentage each year. What is the annual average percentage growth rate for the world population from 1960 to 1975? **[3]**

(iii) The population of the world in 2000 was 6090 million. Showing your working, decide which is the better model: growth by 70 million people per year, as in model A, or constant annual percentage growth, as in model B. **[5]**

5 (a) (i)	
5 (a) (ii)	
5 (a) (iii)	

(b) The spreadsheet chart below shows the population of the United States from 1820 to 2000. The vertical axis has a logarithmic scale.

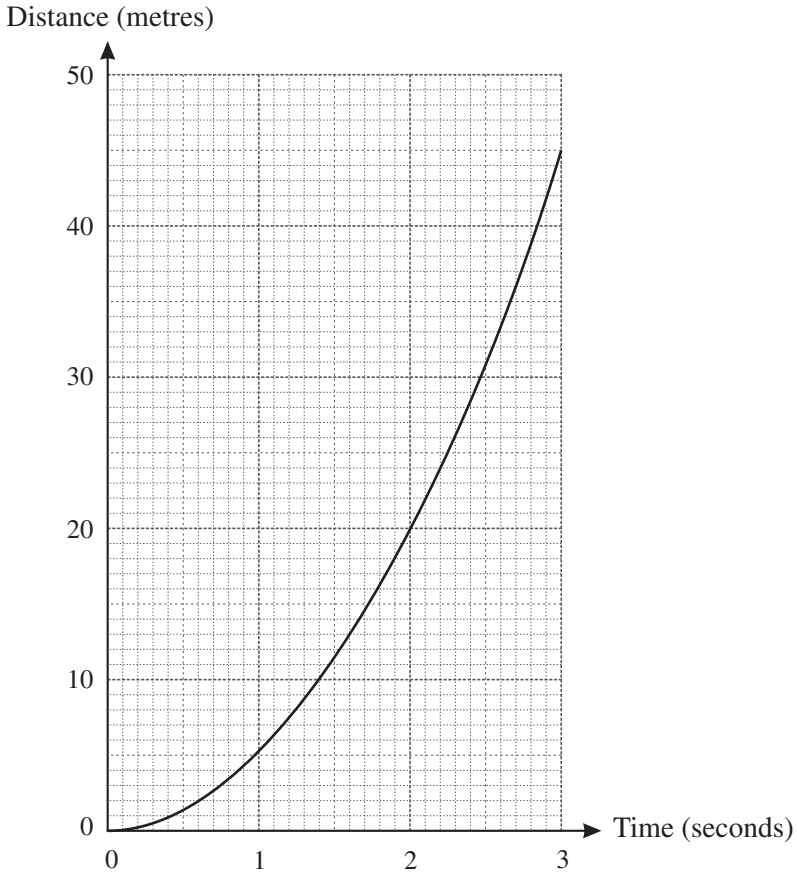


What was the approximate population of the United States in 2000? **[3]**

5 (b)

6 A biology student is researching how fast a cheetah can run.

(a) On one website, he finds the following graph of a cheetah's motion from rest to its maximum speed.



Use the graph to estimate the cheetah's maximum speed. **[4]**

6 (a)

(b) The student looks at two other websites. One website says that a cheetah's maximum speed is 50 metres per second. Another website says that the cheetah's maximum speed is 70 miles per hour. Decide whether or not these two speeds are about the same, showing your working.

[4]

[You may use the fact that 5 miles is about the same as 8 km.]

6 (b)	

7 The table below shows the budget for a village hall for 2012, the projected income and expenditure from the start of 2012 up to the end of September 2012 and the actual figures for the same period. All figures are in pounds.

	Budget 2012	**Jan – Sept 2012 (projected)**	**Jan – Sept 2012 (actual)**
Income			
ticket sales	5000	3750	4320
rents	8000	6000	5200
refreshment sales	500	375	420
TOTAL	**13500**	**10125**	**9940**
Expenditure			
heat and light	9000	6750	6376
repairs	3000	2250	2790
consumables	1000	750	860
TOTAL	**13000**	**9750**	**10026**

(i) Explain how the figures in the column for projected expenditure have been calculated. **[2]**

(ii) It is important that the village hall does not spend more than its annual income. Use the information in the table to write down one question which the budget committee of the village hall needs to consider. **[1]**

(iii) For 2013, gas and electricity prices are due to rise by 8%. Calculate a sensible value for the heat and light budget for 2013. **[2]**

7 (i)

7 (ii)

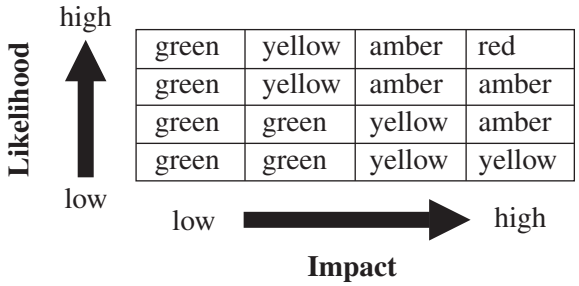
7 (iii)

BLANK PAGE

Question 8 begins on page 14

PLEASE DO NOT WRITE ON THIS PAGE

8 **(a)** The diagram below shows how the Met Office decides what weather warnings to issue. It is based on the likelihood and impact of adverse weather.



Green: no warning
Yellow: be aware
Amber: be prepared
Red: take action

The table below shows a forecast for one town for one day.

Time	Warning	Probability of snow
Morning	Amber warning of snow	60%
Afternoon	Yellow warning of snow	60%

(i) How can the same probability of snow lead to different warnings? **[1]**

(ii) Mrs Rodriguez is planning to fly from London to Chicago. She checks the weather forecast for the day of her flight. The probability of snow for these places is as follows.

London	60%
Chicago	80%

What is the probability that there will be snow in at least one of these two places on that day? You can assume that the weather in London and the weather in Chicago are independent of each other. **[5]**

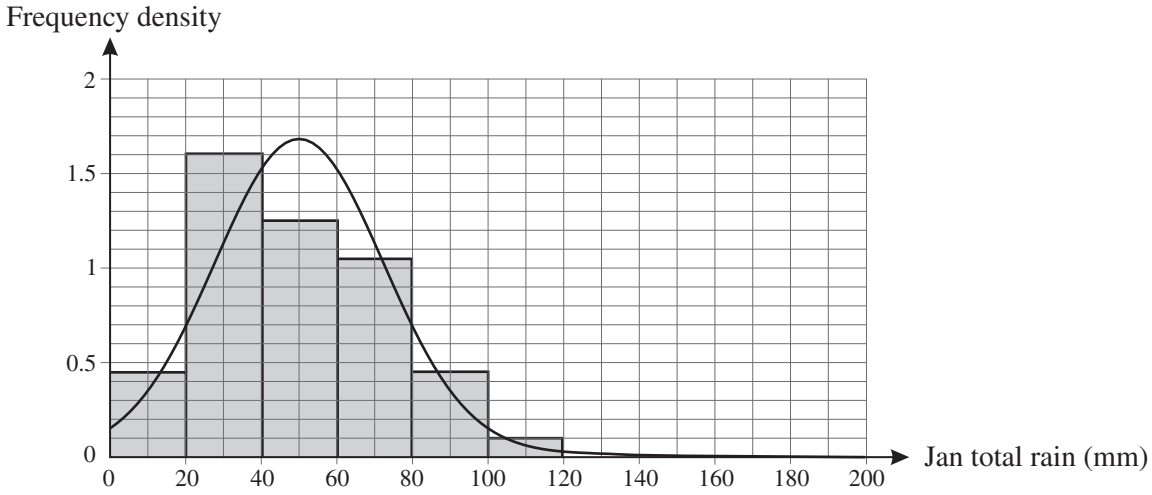
8 (a) (i)

8 (a) (ii)

(answer space continued on next page)

8 (a) (ii)	**(continued)**

(b) The histogram below shows the distribution of January rainfall near Royston for 98 years. A Normal distribution has the same mean and standard deviation as the rainfall data. Part of this Normal curve is shown on the diagram.

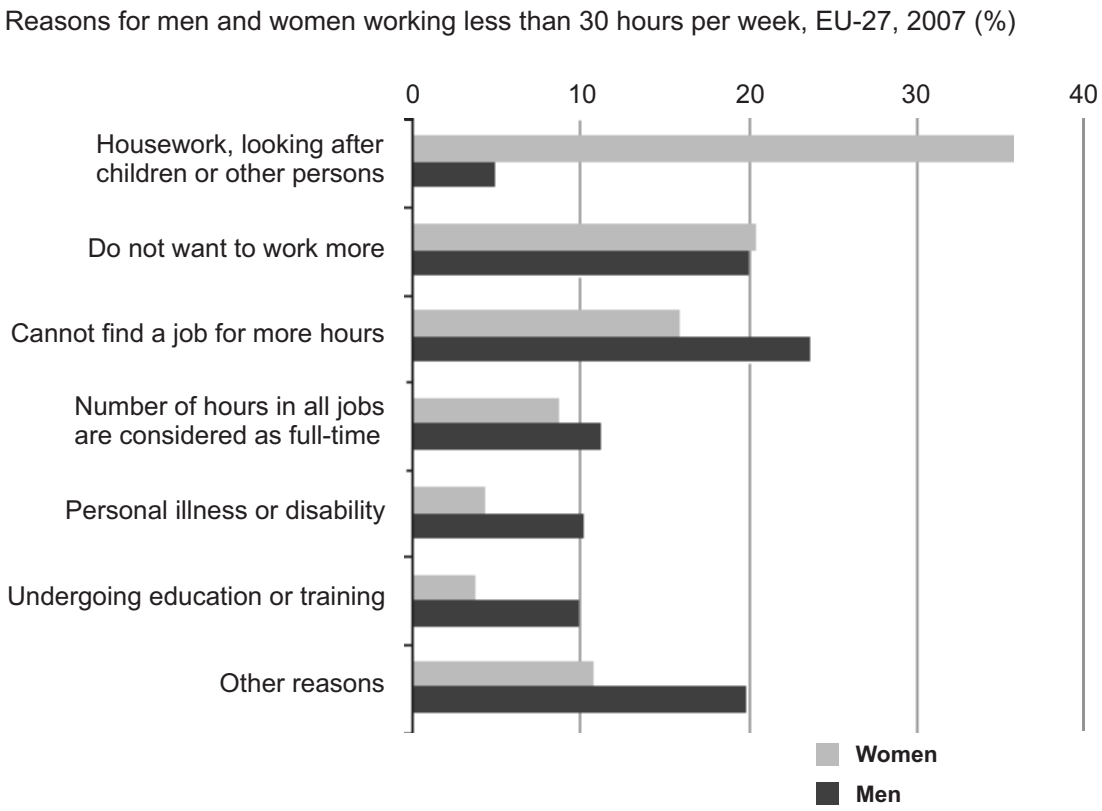


(i) Use the Normal curve to write down an estimate of the mean and standard deviation of the rainfall data. **[2]**

(ii) Give two reasons why the Normal distribution is not a good model for the rainfall data. **[2]**

8 (b) (i)	
8 (b) (ii)	

9 The chart below is from 'Combating poverty and social exclusion: A statistical portrait of the European Union 2010'. The horizontal axis shows percentages.



Source: Eurostat (EU-SILC)

(i) What is the most common reason for men working less than 30 hours a week? **[1]**

(ii) Did people responding to this survey choose one reason or more than one reason? You must justify your answer. **[3]**

(iii) There are four times as many women as men working less than 30 hours a week in the European Union.

(*A*) Show that approximately 5% of those who are working less than 30 hours a week give the reason 'undergoing education or training'. **[2]**

(*B*) Find the corresponding percentage giving the reason 'housework, looking after children or other persons'. **[2]**

9 (i)	

9 (ii)	
9 (iii) (*A*)	
9 (iii) (*B*)	

END OF QUESTION PAPER

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

SPECIMEN

Advanced Subsidiary GCE/Level 3 Certificate
QUANTITATIVE METHODS (MEI)
G244 Introduction to Quantitative Methods (IQM)

Specimen Mark Scheme

The maximum mark for this paper is 72.

This document consists of 16 printed pages

GENERIC MARKING INSTRUCTIONS

1. Mark strictly to the mark scheme.

2. Marks awarded must relate directly to the marking criteria.

3. The schedule of dates is very important. It is essential that you meet the scoris 50% and 100% (traditional 40% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.

4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone or the scoris messaging system, or by email.

5. Work crossed out:

   a. where a candidate crosses out an answer and provides an alternative response, the crossed out response is not marked and gains no marks
   b. if a candidate crosses out an answer to a whole question and makes no second attempt, and if the inclusion of the answer does not cause a rubric infringement, the assessor should attempt to mark the crossed out answer and award marks appropriately.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add a tick to confirm that the work has been seen.

7. There is a NR (No Response) option. Award NR (No Response):

   - if there is nothing written at all in the answer space
   - OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
   - OR if there is a mark (e.g. a dash, a question mark) which is not an attempt at the question.

   Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

8. The scoris **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**
   If you have any questions or comments for your Team Leader, use the phone, the scoris messaging system, or email.

9. Assistant Examiners will send a brief report on the performance of candidates to your Team Leader (Supervisor) by the end of the marking period. The Assistant Examiner's Report Form (AERF) can be found on the RM Cambridge Assessment Support Portal (and for traditional marking it is in the *Instructions for Examiners*). Your report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. **Annotations and abbreviations**

Annotation in scoris	**Meaning**
✓and ✗	
BOD	Benefit of doubt
FT	Follow through
ISW	Ignore subsequent working
M0, M1	Method mark awarded 0, 1
A0, A1	Accuracy mark awarded 0, 1
B0, B1	Independent mark awarded 0, 1
SC	Special case
^	Omission sign
MR	Misread
Highlighting	
Other abbreviations in mark scheme	**Meaning**
E1	Mark for explaining
U1	Mark for correct units
G1	Mark for a correct feature on a graph
M1 dep*	Method mark dependent on a previous mark, indicated by *
cao	Correct answer only
oe	Or equivalent
rot	Rounded or truncated
soi	Seen or implied
www	Without wrong working

SUBJECT SPECIFIC MARKING INSTRUCTIONS

A Annotations should be used whenever appropriate during your marking.

The A, M and B annotations must be used on your standardisation scripts for responses that are not awarded either 0 or full marks. It is vital that you annotate standardisation scripts fully to show how the marks have been awarded.

For subsequent marking you must make it clear how you have arrived at the mark you have awarded.

B An element of professional judgement is required in the marking of any written paper. Remember that the mark scheme is designed to assist in marking incorrect solutions. Correct *solutions* leading to correct answers are awarded full marks but work must not be judged on the answer alone, and answers that are given in the question, especially, must be validly obtained; key steps in the working must always be looked at and anything unfamiliar must be investigated thoroughly.

Correct but unfamiliar or unexpected methods are often signalled by a correct result following an *apparently* incorrect method. Such work must be carefully assessed. When a candidate adopts a method which does not correspond to the mark scheme, award marks according to the spirit of the basic scheme; if you are in any doubt whatsoever (especially if several marks or candidates are involved) you should contact your Team Leader.

C The following types of marks are available.

M
A suitable method has been selected and *applied* in a manner which shows that the method is essentially understood. Method marks are not usually lost for numerical errors, algebraic slips or errors in units. However, it is not usually sufficient for a candidate just to indicate an intention of using some method or just to quote a formula; the formula or idea must be applied to the specific problem in hand, e.g. by substituting the relevant quantities into the formula. In some cases the nature of the errors allowed for the award of an **M** mark may be specified.

A
Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. Accuracy marks cannot be given unless the associated Method mark is earned (or implied). Therefore M0 A1 cannot ever be awarded.

B
Mark for a correct result or statement independent of Method marks.

E

A given result is to be established or a result has to be explained. This usually requires more working or explanation than the establishment of an unknown result.

Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored. Sometimes this is reinforced in the mark scheme by the abbreviation *isw*. However, this would not apply to a case where a candidate passes through the correct answer as part of a wrong argument.

D When a part of a question has two or more 'method' steps, the **M** marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several **B** marks allocated. (The notation 'dep *' is used to indicate that a particular mark is dependent on an earlier, asterisked, mark in the scheme.) Of course, in practice it may happen that when a candidate has once gone wrong in a part of a question, the work from there on is worthless so that no more marks can sensibly be given. On the other hand, when two or more steps are successfully run together by the candidate, the earlier marks are implied and full credit must be given.

E The abbreviation *ft* implies that the **A** or **B** mark indicated is allowed for work correctly following on from previously incorrect results. Otherwise, **A** and **B** marks are given for correct work only – differences in notation are of course permitted. **A** (accuracy) marks are not given for answers obtained from incorrect working. When **A** or **B** marks are awarded for work at an intermediate stage of a solution, there may be various alternatives that are equally acceptable. In such cases, exactly what is acceptable will be detailed in the mark scheme rationale. If this is not the case please consult your Team Leader.

Sometimes the answer to one part of a question is used in a later part of the same question. In this case, **A** marks will often be 'follow through'. In such cases you must ensure that you refer back to the answer of the previous part question even if this is not shown within the image zone. You may find it easier to mark follow-through questions candidate-by-candidate rather than question-by-question.

F Wrong or missing units in an answer should not lead to the loss of a mark unless the scheme specifically indicates otherwise. Candidates are expected to give numerical answers to an appropriate degree of accuracy, with 3 significant figures often being the norm. Small variations in the degree of accuracy to which an answer is given (e.g. 2 or 4 significant figures where 3 is expected) should not normally be penalised, while answers which are grossly over-specified or under-specified should normally result in the loss of a mark. The situation regarding any particular cases where the accuracy of the answer may be a marking issue should be detailed in the mark scheme rationale. If in doubt, contact your Team Leader.

G Rules for replaced work

If a candidate attempts a question more than once, and indicates which attempt he/she wishes to be marked, then examiners should do as the candidate requests.

If there are two or more attempts at a question which have not been crossed out, examiners should mark what appears to be the last (complete) attempt and ignore the others.

NB Follow these maths-specific instructions rather than those in the assessor handbook.

H For a *genuine* misreading (of numbers or symbols) which is such that the object and the difficulty of the question remain unaltered, mark according to the scheme but following through from the candidate's data. A penalty is then applied; 1 mark is generally appropriate, though this may differ for some units. This is achieved by withholding one **A** mark in the question.

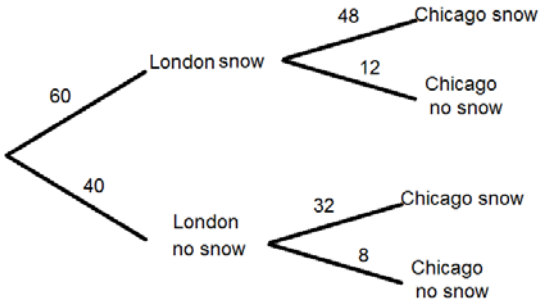
Note that a miscopy of the candidate's own working is not a misread but an accuracy error.

Question			Answer	Marks	Guidance	
1		(i)	Use of 1.14 200 ÷ 1.14 £175.44	M1 M1 A1 **[3]**	 Implied by 175.438……	**B3** for correct answer with no supporting working
1		(ii)	Sensibly rounded exchange rate approximation Sensible rounding of \$58.50 Answer in range £30–£40 supported by working	M1 M1 A1 **[3]**	e.g. £1 is about \$1.50 **or** \$1.75 Something rounded between \$55 and \$60 inclusive	 Or for finding multiples of their exchange rate approx.., working towards \$58.50 E.g. £1≈\$1.50 £4≈\$6 £40≈\$60 so about £40
2			Modelling path as a circle $2\times\pi\times1.5\times10^{11}$ m Dividing by 365 or 365.25 Changing to km h^{-1} Rounding to no more than 3sf 108 000 km h^{-1}	M1 M1 M1 M1 M1 A1 **[6]**	Accept circle drawn instead of statement in words No need to state units Or 110 000 km h^{-1}	Alternative assumption – size of earth and/or sun is negligible/unimportant SC3 for 108 000 km h^{-1} or 110 000 km h^{-1} with no method shown

Question			Answer	Marks	Guidance	
3	**(a)**	**(i)**	½ oe	B1 **[1]**		
3	**(a)**	**(ii)**	¼ oe	B1 **[1]**		
3	**(b)**		Both graphs are (nearly) the same until the letter is received The trial graph goes higher than the control graph	E1 E1 **[2]**	 eg The trial graph gets steeper after the letter is received	
3	**(c)**		Mention of suitable randomising device Clear allocation method which has prob 0.5 for allocation to each group	M1 A1 **[2]**	eg dice, coin, random number generator, cards with either control or trial on them in a hat (equal number of each)	**SC1** cut the list into two equal parts by choosing a random person and taking half the people below (or above) the person to be in one group with the rest in the other group **SC1** Assign alternately to control/trial with first person assigned randomly
4		**(i)**	Sequence decreasing by 5 95, 90, 85, 80, 75, 70, 65, 60, 55	M1 A1 **[2]**		
4		**(ii)**	=3*B2	B2 **[2]**	**SC1** for 3*B2	
4		**(iii)**	B2*A2 =B2*A2 – C2 oe	M1 A1 **[2]**	Or (A2–3) Or =(A2–3)*B2	 Omitting '=' should not be penalised more than once in parts (ii) and (iii)
4		**(iv)**	Costs in table Profits in table Profits: 1235, 1260, 1275, 1280, 1275, 1260, 1235, 1200, 1155, 1100 [£] 19	M1 M1 A1 A1 **[4]**	285, 270, 255, 240, 255, 210, 195, 180, 165, 150 Ft their costs	Implied by at least three correct costs or profits; ignore errors Profits after second 1260 may be missed out

Question			Answer	Marks	Guidance	
5	(a)	(i)	4090 – 3040 Divide by 15 to give 70 (million)	M1 E1 **[2]**	Answer given	**Alternative method** **M1** for 15 x 70 (million) **E1** for adding on to 3040 (million) to give 4090 (million)
5	(a)	(ii)	4090/3040 [= 1.345…] 15^{th} root [=1.01997…] 2%	M1 M1 A1 **[3]**		Only allow 2% with supporting working
5	(a)	(iii)	4090 +70 x 25[=4090 + 1750 = 5840] 1.02^{25} [=1.640…] 4090 X 1.640… [= 6710] Comparison Conclusion	M1 M1 M1 E1 E1 **[5]**	Ft *their* (ii) Appropriate comparison supported by *their* figures Appropriate conclusion supported by *their* figures	 e.g. The actual population was in between the two figures **OR** finding differences [250 million and 620 million] **OR** saying actual population is nearer to 5840 million e.g. 70 million a year is better **OR** Neither model is perfect **OR** It would be better to use more data values before deciding which model is better
5	(b)		$\sqrt{100 \times 1000}$ Use of (thousands) on vertical scale Answer in range 250 million to 330 million	M1 M1 A1 **[3]**	Possibly in thousands or millions Implied by any answer between 100 million and 1000 million	**B3** for correct answer with no working

Question			Answer	Marks	Guidance	
6	(a)		Good tangent at time 3 drawn	M1	**OR** use of section 2 to 3 seconds as approx. linear **OR** identifying time 3(or 2 to 3) as when the fastest speed occurs	**SC2** for answer in range with no supporting working
			Gradient of *their* tangent (or chord) Answer in range 25 to 35 m/s	M1 A1 B1 **[4]**	 including correct units	
6	(b)		$\frac{50\times60\times60}{1000}$	M1		Method 2 **M1 A1** for changing miles to km (112 km/h) **M1 A1** for changing to m/s (31.1 m/s)
			180 km/h $\frac{180}{8}\times5$	A1 M1		Other approaches score full marks if convincing; consult team leader if part-marks should be awarded.
			112.5 mph so not the same	A1 **[4]**	Allow 110 to 115 with supporting working	
7		(i)	They are ¾ of the figures in the budget column because Jan–Sept because Jan – Sept is three quarters of the year	E1 E1 **[2]**		
7		(ii)	Relevant question about income item being too low **or** expenditure item being too high **or** about action to be taken to reduce expenditure or increase income	B1 **[1]**	Examples of relevant questions • Why is the repair expenditure higher than expected? • Why are rents lower than expected? • How can rent income be increased?	
7		(iii)	1.08 x 9000 oe Answer in range 9700 – 10 000	M1 A1 **[2]**	 1 or 2 sf	

Question			Answer	Marks	Guidance	
8	(a)	(i)	The impacts are different	B1 **[1]**		
8	(a)	(ii)	 92% oe	M1 A1 A1 M1 A1 **[5]**	Tree diagram with branches labelled Correct partial frequencies on first set of branches Correct partial frequencies on at least one second set Adding frequencies **or** total – no snow	Probabilities on tree diagram instead of frequencies is OK **Alternative method** **M1** for working with prob of not snowing **A1** for 0.4 **A1** for 0.2 **M1** for 0.4 x 0.2 **A1** for final answer
8	(b)	(i)	Mean = 50 Sd = answer in range 30 to 37	B1 B1 **[2]**		If no B marks scored, **SC1** for method seen (number in range 140 to 160 minus *their* mean)/3 **OR** statement that max value = mean + 3SD
8	(b)	(ii)	The data are skewed/ not symmetrical The Normal would allow negative values	E1 E1 **[2]**		

Question			Answer	Marks	Guidance	
9		(i)	Cannot find a job for more hours	B1 **[1]**		
9		(ii)	Finding percentages for one sex Adding percentages for one sex They each gave one reason because percentages [for men/women] add up to 100	M1 M1 A1 **[3]**	No marks if there is no justification given	
9		(iii)(*A*)	10 and 4 read off graph $\frac{4\times4+10}{5}\approx5$	M1 E1 **[2]**	Answer given so working must be seen	**Alternative method** Out of 100 people working less than 30 hours, 80 are women and 20 men. About 3 women undergoing education and training and 2 men so 5 altogether
9		(iii)(*B*)	$\frac{4\times36+5}{5}$ 30	M1 A1 **[2]**	Allow 37 or 38 instead of 36 and 4 instead of 5 in numerator Answer in range 29–31 (accept 31.4)	Out of 100 people working less than 30 hours, 80 are women and 20 men. About 29 women and 1 man looking after … so 30 altogether

Assessment Objectives (AO) Grid

Question	AO1	AO2	AO3	AO4	AO5	Total
1(i)					3	3
1(ii)					3	3
2		5	1			6
3(a)	2					2
3(b)				2		2
3 (c)	2					2
4(i)	2					2
4(ii)					2	2
4 (iii)					2	2
4 (iv)			4			4
5(a)(i)	2					2
5(a)(ii)	3					3
5(a)(iii)			5			5
5(b)	3					3
6(a)				4		4
6(b)		4				4
7(i)			2			2
7(ii)				1		1
7(iii)	2					2
8(a)(i)				1		1
8(a)(ii)			5			5
8(b)(i)				2		2
8(b)(ii)			2			2
9(i)	1					1
9(ii)		3				3
9(iii)		4				4
Totals	**17**	**16**	**19**	**10**	**10**	**72**

BLANK PAGE

BLANK PAGE

OCR

SPECIMEN

Advanced Subsidiary GCE/Level 3 Certificate

QUANTITATIVE METHODS (MEI)

G244 Introduction to Quantitative Methods (IQM)

Specimen Pre-release Material

NOTES FOR GUIDANCE (CANDIDATES)

- This leaflet contains pre-release material which is needed in preparation for the examination.
- You will need to consider the materials carefully. The examination paper will contain questions related to this material. You will be expected to apply your knowledge and understanding of the work covered in G244 to answer the questions.
- You can seek advice from your teacher about the content of the material and you can discuss it with others in your class. You may also investigate the topic yourself using any resources available to you.
- For the examination, you will be given a clean copy of this pre-release material, together with a question paper. You will **not** be able to bring an annotated copy of this material or other materials, into the examination.
- This document consists of **4** pages. Any blank pages are indicated.

Extract from the Cabinet Office Behavioural Insights Team paper 'Test, Learn, Adapt: Developing Public Policy with Randomised Controlled Trials'

Executive Summary

Randomised controlled trials (RCTs) are the best way of determining whether a policy is working. They are now used extensively in international development, medicine, and business to identify which policy, drug or sales method is most effective. They are also at the heart of the Behavioural Insights Team's methodology.

However, RCTs are not routinely used to test the effectiveness of public policy interventions in the UK. We think that they should be.

What makes RCTs different from other types of evaluation is the introduction of a randomly assigned control group, which enables you to compare the effectiveness of a new intervention against what would have happened if you had changed nothing.

The introduction of a control group eliminates a whole host of biases that normally complicate the evaluation process – for example, if you introduce a new 'back to work' scheme, how will you know whether those receiving the extra support might not have found a job anyway?

In the fictitious example below in Figure 1, we can see that those who received the back to work intervention were much more likely to find a job than those who did not. Because we have a control group, we know that it is the intervention that achieves the effect and not some other factor (such as generally improving economic conditions).

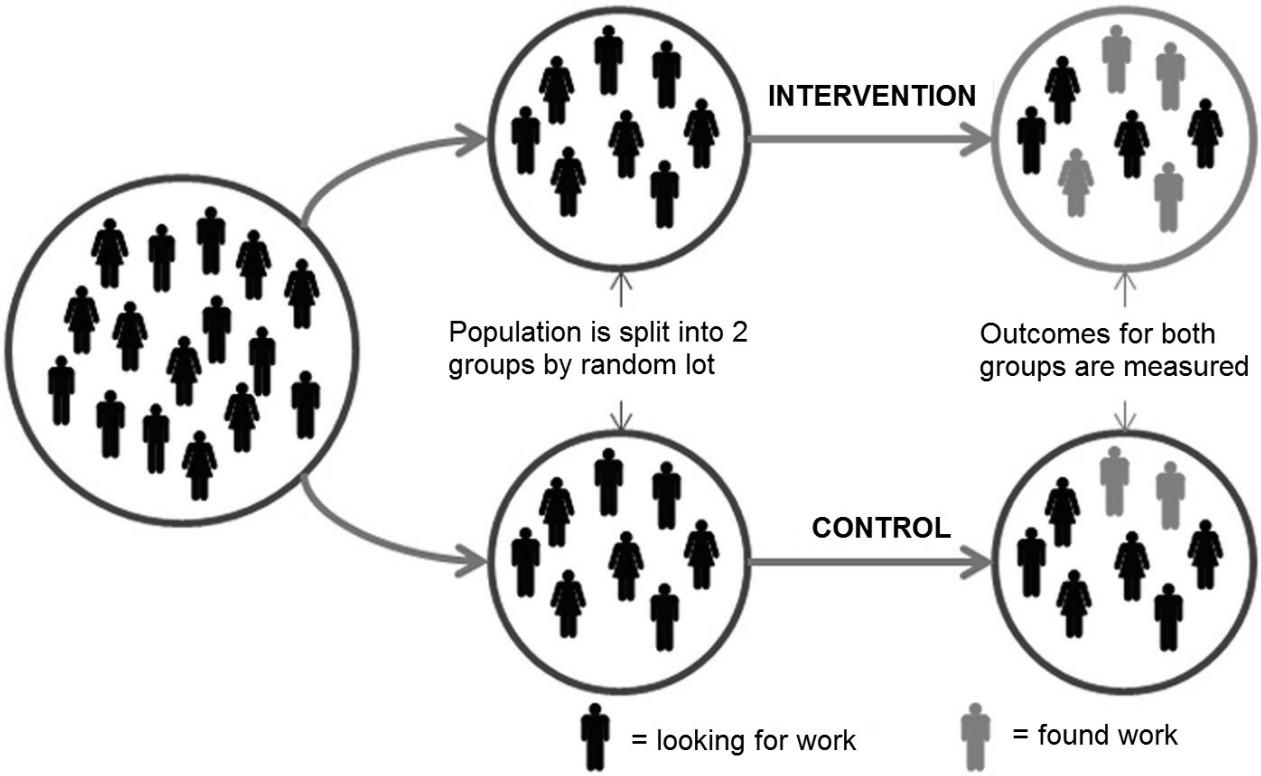


Figure 1. The basic design of a randomised controlled trial (RCT), illustrated with a test of a new 'back to work' programme

With the right academic and policy support, RCTs can be much cheaper and simpler to put in place than is often supposed. By enabling us to demonstrate just how well a policy is working, RCTs can save money in the long term – they are a powerful tool to help policymakers and practitioners decide which of several policies is the most cost effective, and also which interventions are not as effective as might have been supposed. It is especially important in times of shrinking public sector budgets to be confident that public money is spent on policies shown to deliver value for money.

We have identified nine separate steps that are required to set up any RCT. Many of these steps will be familiar to anyone putting in place a well-designed policy evaluation – for example, the need to be clear, from the outset, about what the policy is seeking to achieve. Some – in particular the need to randomly allocate individuals or institutions to different groups which receive different treatment – are what lend RCTs their power. The nine steps are at the heart of the Behavioural Insights Team's 'test, learn, adapt' methodology, which focuses on understanding better what works and continually improving policy interventions to reflect what we have learnt. They are described in the box adjacent.

Test

1. Identify two or more policy interventions to compare (e.g. old *vs* new policy; different variations of a policy).
2. Determine the outcome that the policy is intended to influence and how it will be measured in the trial.
3. Decide on the randomisation unit: whether to randomise to intervention and control groups at the level of individuals, institutions (e.g. schools), or geographical areas (e.g. local authorities).
4. Determine how many units (people, institutions, or areas) are required for robust results.
5. Assign each unit to one of the policy interventions, using a robust randomisation method.
6. Introduce the policy interventions to the assigned groups.

Learn

7. Measure the results and determine the impact of the policy interventions.

Adapt

8. Adapt your policy intervention to reflect your findings.
9. Return to Step 1 to continually improve your understanding of what works.

OCR

SPECIMEN

Advanced Subsidiary GCE/Level 3 Certificate

QUANTITATIVE METHODS (MEI)

G244 Introduction to Quantitative Methods (IQM)

Specimen Insert

Duration: 1 hour 30 minutes

INFORMATION FOR CANDIDATES

- This Insert contains a copy of the pre-release material for use with the Question Paper.
- This document consists of **4** pages. Any blank pages are indicated.

INSTRUCTIONS TO EXAMS OFFICER/INVIGILATOR

- Do not send this Insert for marking; it should be retained in the centre or recycled. Please contact OCR Copyright should you wish to re-use this document.

Extract from the Cabinet Office Behavioural Insights Team paper 'Test, Learn, Adapt: Developing Public Policy with Randomised Controlled Trials'

Executive Summary

Randomised controlled trials (RCTs) are the best way of determining whether a policy is working. They are now used extensively in international development, medicine, and business to identify which policy, drug or sales method is most effective. They are also at the heart of the Behavioural Insights Team's methodology.

However, RCTs are not routinely used to test the effectiveness of public policy interventions in the UK. We think that they should be.

What makes RCTs different from other types of evaluation is the introduction of a randomly assigned control group, which enables you to compare the effectiveness of a new intervention against what would have happened if you had changed nothing.

The introduction of a control group eliminates a whole host of biases that normally complicate the evaluation process – for example, if you introduce a new 'back to work' scheme, how will you know whether those receiving the extra support might not have found a job anyway?

In the fictitious example below in Figure 1, we can see that those who received the back to work intervention were much more likely to find a job than those who did not. Because we have a control group, we know that it is the intervention that achieves the effect and not some other factor (such as generally improving economic conditions).

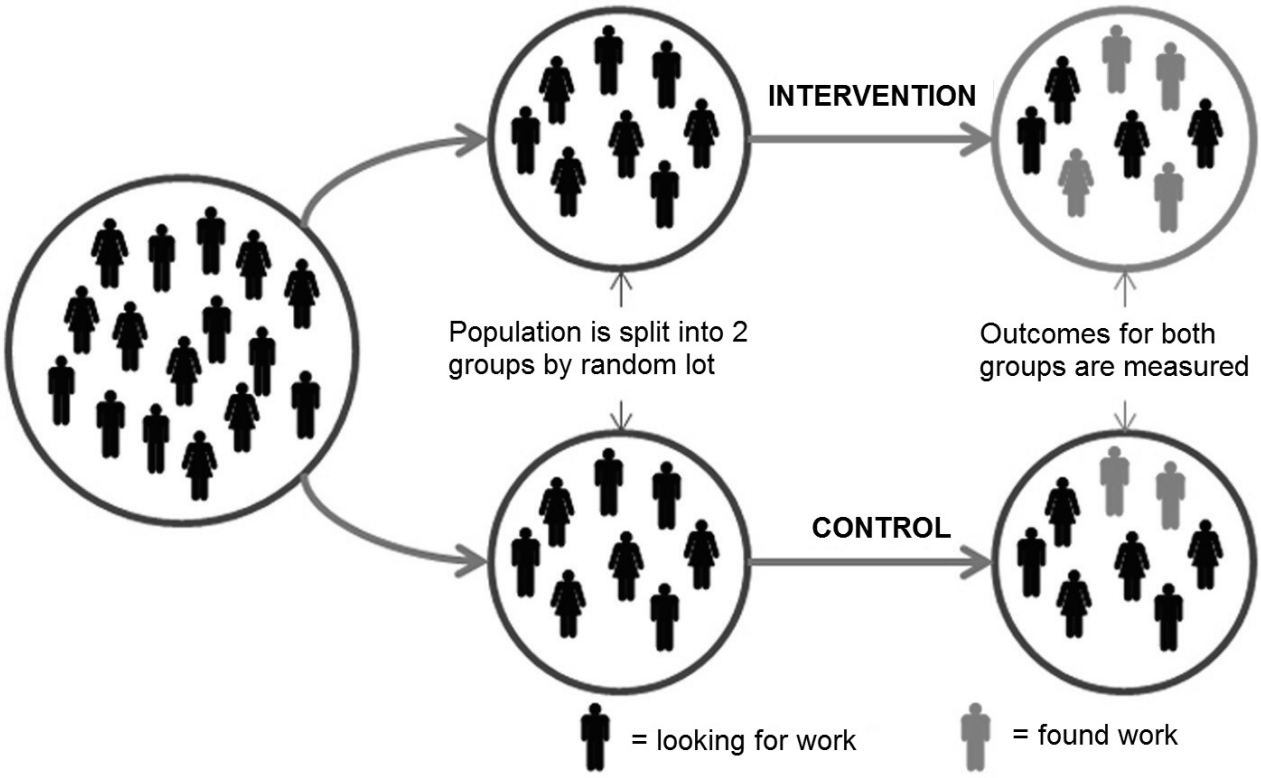


Figure 1. The basic design of a randomised controlled trial (RCT), illustrated with a test of a new 'back to work' programme

With the right academic and policy support, RCTs can be much cheaper and simpler to put in place than is often supposed. By enabling us to demonstrate just how well a policy is working, RCTs can save money in the long term – they are a powerful tool to help policymakers and practitioners decide which of several policies is the most cost effective, and also which interventions are not as effective as might have been supposed. It is especially important in times of shrinking public sector budgets to be confident that public money is spent on policies shown to deliver value for money.

We have identified nine separate steps that are required to set up any RCT. Many of these steps will be familiar to anyone putting in place a well-designed policy evaluation – for example, the need to be clear, from the outset, about what the policy is seeking to achieve. Some – in particular the need to randomly allocate individuals or institutions to different groups which receive different treatment – are what lend RCTs their power. The nine steps are at the heart of the Behavioural Insights Team's 'test, learn, adapt' methodology, which focuses on understanding better what works and continually improving policy interventions to reflect what we have learnt. They are described in the box adjacent.

Test

1. Identify two or more policy interventions to compare (e.g. old *vs* new policy; different variations of a policy).
2. Determine the outcome that the policy is intended to influence and how it will be measured in the trial.
3. Decide on the randomisation unit: whether to randomise to intervention and control groups at the level of individuals, institutions (e.g. schools), or geographical areas (e.g. local authorities).
4. Determine how many units (people, institutions, or areas) are required for robust results.
5. Assign each unit to one of the policy interventions, using a robust randomisation method.
6. Introduce the policy interventions to the assigned groups.

Learn

7. Measure the results and determine the impact of the policy interventions.

Adapt

8. Adapt your policy intervention to reflect your findings.
9. Return to Step 1 to continually improve your understanding of what works.