

# PRACTICE PAPER

Please write clearly in block capitals.									
Centre number	Candidate number								
Surname									
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# Level 3 Certificate MATHEMATICAL STUDIES

Paper 2A Statistical Techniques

Date Morning Time allowed: 1 hour 30 minutes

#### **Materials**

For this paper you must have:

- a clean copy of the Preliminary Material (enclosed)
- a scientific calculator or a graphics calculator
- a copy of the formulae sheet and statistical tables
- a ruler.

#### Instructions

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer all questions.
- You must answer the questions in the space provided. Do not write outside the box around each page or on blank pages.
- Show all necessary working; otherwise, marks for method may be lost.
- Do all rough work in this book. Cross through any work that you do not want to be marked.
- The **final** answer to questions should be given to an appropriate degree of accuracy.
- You may not refer to the copy of the Preliminary Material that was available prior to this examination.
   A clean copy is enclosed for your use.

#### Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You may ask for more answer paper and graph paper, which must be tagged securely to this answer booklet.
- The paper reference for this paper is 1350/2A.

## Answer **all** questions in the spaces provided.

**1** Gerry is a teaching assistant.

The four students he supports each completed a short test consisting of four questions.

Their marks in the short test are shown in the table.

Student	Question 1	Question 1	Question 3	Question 4	Total mark	Percentage (%)
Rachel	3	3	4	5	15	60
Shafi	3	3	4	9	19	76
Ash	2	1	2	5	10	40
Karen	3	2	4	5	14	56
Mode	3	3	4	5		

1 (a) A teacher wants to find out the **maximum total mark** available in the short test.

Circle the maximum total mark.

[1 mark]

19

25

76

100

1	(b)	Identify <b>one</b> formatting error in Gerry's table and suggest <b>three</b> improvements make to the table.	he could
		make to the table.	[4 marks]
		Error	
		Improvement 1	
		Improvement 2	
		Improvement 3	
		Question 1 continues on the next page	

1 (c) Amy gave the same test to the five students she supports.

Their marks are shown in the table.

Student	Question 1	Question 2	Question 3	Question 4	Total mark	Percentage (%)
Ben	3	2	5	6	16	64
Cho	3	1	6	8	18	72
Liz	2	1	2	5	10	40
Nick	3	4	3	7	17	68
Paul	3	3	4	6	16	64

In a meeting, Amy presented her students' marks to her colleagues.

Two of her colleagues made the statements below.

'Most of the students that Amy supports did very well in Question 1.'

(Richard)

'The mean percentage for the five students that Amy supports is 60%.'

(Din)

Critically analyse these two statements.

Show working to justify your comments where necessary.

[4 marks]

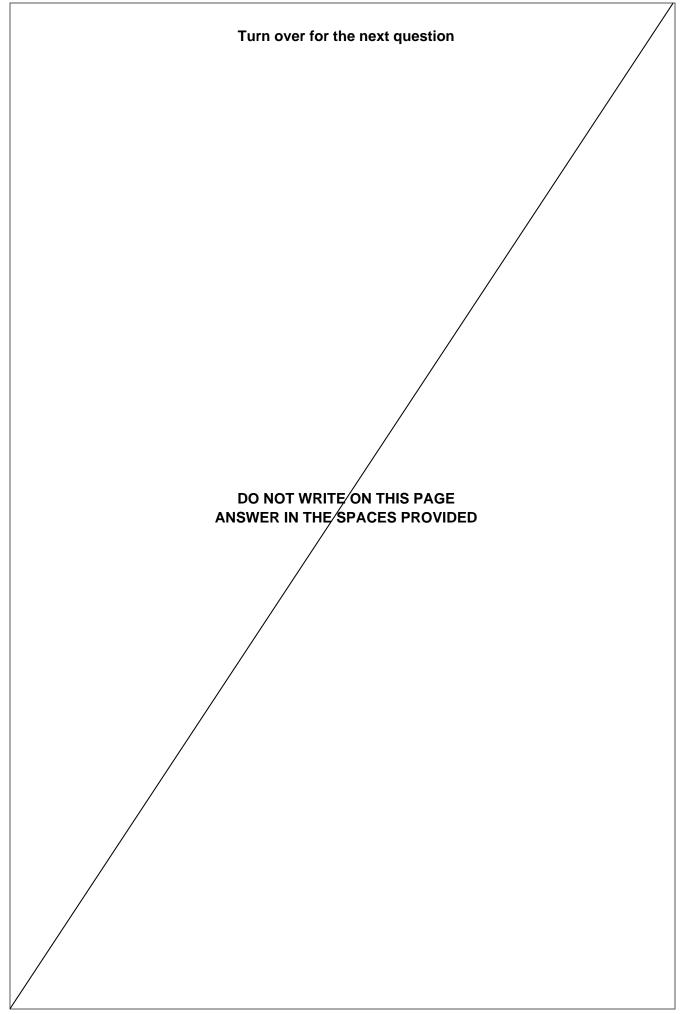
Richard's statement									

Turn over for the next question	

2		Use Communications Market Report in the Preliminary Material.
2	(a)	A journalist suggested that the format and content of the report were not presented well.
		Give <b>three</b> examples to support her suggestion.  [3 marks]
		Example 1
		Example 2
		Example 3

2	(b)	Christopher wants to find out the average time, in hours, spent per day browsin PCs or laptops in 2013 using the data from the CMR.	ng online on
		His calculation is as follows.	
		31.24 × 12 = 374.88 hours	
		374.88 ÷ 355 = 1.056 hours	
		The average time spent per day browsing online is 1.056 hours.	
		Critically analyse Christopher's calculation.	[3 marks]
		Question 2 continues on the next page	

(c)	Three online bloggers made claims about the CMR as follows.	
	'The number of superfast broadband connections had increased by a fac of three fifths in one year.'	ctor (Rasheed)
	'Overall, BT lost over 20000 landline customers in 2013.'	(Francoise)
	'Overall in 2014, the number of national radio stations declined.'	(Eugene)
	Does the data support these claims? Justify your answers.	[5 marks]
	Rasheed	
	Francoise	
	Eugene	



3		Research in 2015 found that the number of sleeping hours in any given day for can be modelled by a normal distribution with mean 6.0 hours and standard devalues.	
3	(a)	Michael claims that the probability of a randomly chosen adult sleeping for more	e than
		7 hours in one day is less than $\frac{1}{3}$	
		Using the model from the 2015 research, show that Michael's claim is justified.	[5 marks]

3	(b)	George is researching the average number of sleeping hours per day among adults in his
		village.

The table shows the data for 15 adults from the village.

3

(c)

Adult	А	В	С	D	Е	F	G	Н	I	J	K	L	М	N	0
Average sleeping hours	6.5	5.5	6.0	5.0	7.0	6.5	6.0	6.5	5.5	8.0	4.0	7.0	5.5	6.0	8.0

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4 Jack works as an analyst for Dopel, a smartphone company.

He chose a random sample of 10 people and recorded how many words from a pre-prepared script each person could type into a text message in one minute.

The results are shown in the table.

Name	Gender	Age, a (years)	Number of words typed, w
Hema	Female	39	13
Nathan	Male	27	15
Asha	Female	16	21
Katie	Female	22	19
Anna	Female	19	25
Iqbal	Male	54	10
Laura	Female	17	18
Joel	Male	43	10
Sanja	Female	35	13
Alison	Female	50	8

l (a)	Draw a sca	tter diagram	of w agains	st $a$ on the gri	id below.		
							[3 marks
umber							
words ped, w							
30 <b>u</b> , 11							
	decimal pla	ces.	of the regre	ge, $a$ (years) ession line of $\mathfrak v$		ling any value	es to two [5 marks
			Question	4 continues	on the next	page	

b) (ii)	Interpret the gradient of your regression line in the context of Jack's data.	[2 marks]
(c)	Suggest <b>two</b> improvements which Jack could make to his process of collecting	data. [2 marks]
	Improvement 1	

Turn over for the next que	estion

Many soft	drink	s conta	ain a s	sweete	ener.							
FizzyFuzz	zy is a	compa	any w	hich p	roduce	es a va	ariety	of soft	drinks	s in 50	00 ml bot	tles.
		_		_								s of
								ed in a	rando	mly s	elected	sample of
81	79	83	79	88	96	70	74	90	78	74	83	
Calculate	a 95°	% confi	idenc	e inter	val for	μ.						[5 marks]
												[o marko]
			ger cl	aims t	hat Fiz	zzyFu	zzy us	es les	s swe	etener	than a	rival
			weete	ener in	500 n	nl bott	les of	Lumus	sat sof	t drink	ks is 82	milligrams.
Commen	t on th	ne prod	luction	n man	ager's	claim						[2 marks]
	FizzyFuzz Assume t FizzyFuzz The weightwelve 50 81 Calculate The prod company The mea	FizzyFuzzy is a Assume that the FizzyFuzzy soft The weight, in retwelve 500 ml be 81 79  Calculate a 959  The production company, Lum The mean weight	FizzyFuzzy is a comparative fizzyFuzzy soft drink in milligrative for twelve 500 ml bottles of 81 79 83  Calculate a 95% configuration management of second soft for the mean weight of second	FizzyFuzzy is a company w Assume that the weight, in a FizzyFuzzy soft drink is nor.  The weight, in milligrams, o twelve 500 ml bottles of Fizz  81 79 83 79  Calculate a 95% confidence  The production manager cl company, Lumusat.  The mean weight of sweeters	FizzyFuzzy is a company which p Assume that the weight, in milligra FizzyFuzzy soft drink is normally of The weight, in milligrams, of the s twelve 500 ml bottles of FizzyFuzz  81 79 83 79 88  Calculate a 95% confidence inter  The production manager claims to company, Lumusat.  The mean weight of sweetener in	Assume that the weight, in milligrams, of FizzyFuzzy soft drink is normally distributed. The weight, in milligrams, of the sweeter twelve 500 ml bottles of FizzyFuzzy soft 81 79 83 79 88 96.  Calculate a 95% confidence interval for the production manager claims that Fizcompany, Lumusat.  The mean weight of sweetener in 500 ml. of the mean weight of sweetener in 500 m	FizzyFuzzy is a company which produces a value of the second of the sec	FizzyFuzzy is a company which produces a variety of Assume that the weight, in milligrams, of the sweeter FizzyFuzzy soft drink is normally distributed with metalely the weight, in milligrams, of the sweetener contained twelve 500 ml bottles of FizzyFuzzy soft drink is  81 79 83 79 88 96 70 74  Calculate a 95% confidence interval for μ.	FizzyFuzzy is a company which produces a variety of soft Assume that the weight, in milligrams, of the sweetener use FizzyFuzzy soft drink is normally distributed with mean μ at twelve 500 ml bottles of FizzyFuzzy soft drink is  81 79 83 79 88 96 70 74 90  Calculate a 95% confidence interval for μ.  The production manager claims that FizzyFuzzy uses less company, Lumusat.  The mean weight of sweetener in 500 ml bottles of Lumus	FizzyFuzzy is a company which produces a variety of soft drinks. Assume that the weight, in milligrams, of the sweetener used in FizzyFuzzy soft drink is normally distributed with mean μ and variety of some milligrams, of the sweetener contained in a randot twelve 500 ml bottles of FizzyFuzzy soft drink is  81 79 83 79 88 96 70 74 90 78  Calculate a 95% confidence interval for μ.  The production manager claims that FizzyFuzzy uses less sweet company, Lumusat.  The mean weight of sweetener in 500 ml bottles of Lumusat soft.	FizzyFuzzy is a company which produces a variety of soft drinks in 50 Assume that the weight, in milligrams, of the sweetener used in 500 m FizzyFuzzy soft drink is normally distributed with mean μ and variance. The weight, in milligrams, of the sweetener contained in a randomly stwelve 500 ml bottles of FizzyFuzzy soft drink is  81 79 83 79 88 96 70 74 90 78 74  Calculate a 95% confidence interval for μ.  The production manager claims that FizzyFuzzy uses less sweetener company, Lumusat.  The mean weight of sweetener in 500 ml bottles of Lumusat soft drink.	FizzyFuzzy is a company which produces a variety of soft drinks in 500 ml bottles Assume that the weight, in milligrams, of the sweetener used in 500 ml bottles FizzyFuzzy soft drink is normally distributed with mean μ and variance 15  The weight, in milligrams, of the sweetener contained in a randomly selected twelve 500 ml bottles of FizzyFuzzy soft drink is  81 79 83 79 88 96 70 74 90 78 74 83  Calculate a 95% confidence interval for μ.

6 Two methods are often used to predict the height a child will reach as an adult.

**Method A** uses the heights of the child's parents.

Method B uses the child's height at age 18 months.

The tables below show, for 10 women, their predicted adult height and their actual adult height, using both Method A and Method B.

#### Method A

Predicted adult height, $P_A$ (cm)	157	159	163	163	168	170	176	176	177	178
Actual adult height, $a$ (cm)	154	161	157	162	164	179	167	169	173	172

### Method B

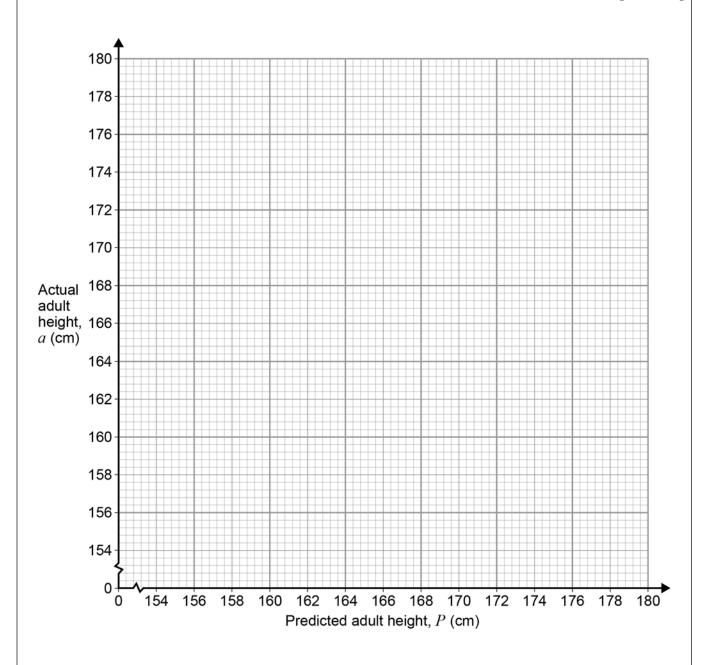
Predicted adult height, $P_B$ (cm)	158	163	160	160	164	170	163	165	167	169
Actual adult height, $a$ (cm)	154	161	157	162	164	179	167	169	173	172

6	(a)	Calculate the product moment correlation coefficient (pmcc) for both methods.	[2 marks]
		pmcc for <b>Method A</b> =	
		pmcc for <b>Method B</b> =	
		Question 6 continues on the next page	

**6 (b)** Using the more accurate method, predict the actual adult height of a person whose predicted adult height is 165 cm.

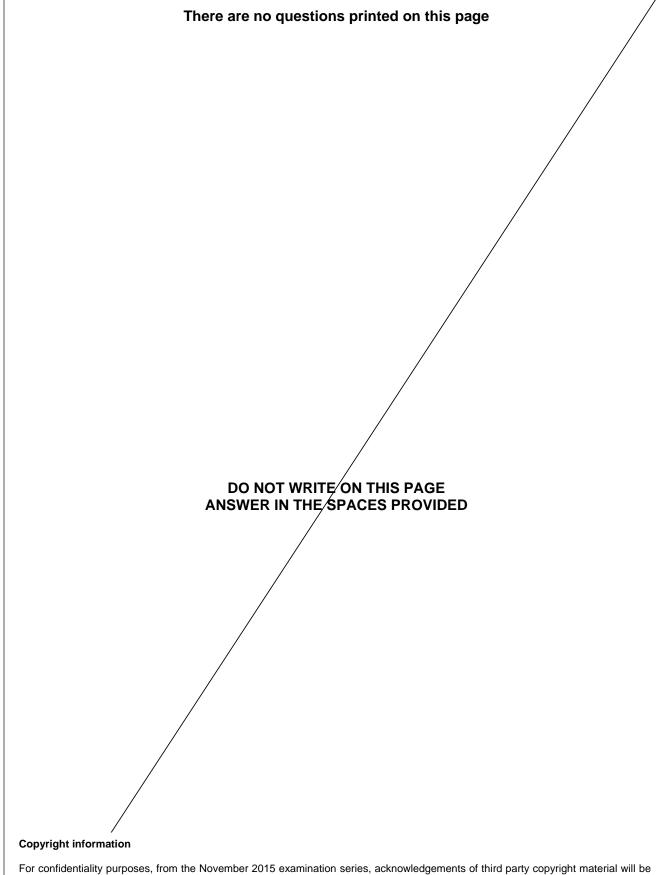
You may use the grid below, but do not have to.

[6 marks]



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END OF QUESTIONS



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