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Level 3 Certificate MATHEMATICAL STUDIES

Paper 2A Statistical techniques

Wednesday 25 May 2016

Morning

Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:

- a clean copy of the Preliminary Material, formulae sheet and statistical tables (enclosed)
- a scientific calculator or a graphics calculator
- 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 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 or 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		Use Facebook Facts on page 2 of the Preliminary Material.					
1	(a)	According to the article, Facebook had 1230 million monthly active users worldwide by the end of 2013					
		Circle 1230 million written in standard form. [1 mark]					
		1230×10^6 1.23×10^7 1.23×10^8 1.23×10^9					
1	(b)	Suggest two improvements that could be made to the presentation of the bar chart in the article.					
		[2 marks]					
		Improvement 1					
		Improvement 2					



1	(c)	Joe has just started working for Survey Hunt, a social media research company.
		Joe calculates the mean increase in the number of active Facebook users per year from the beginning of 2008 to the end of 2013
		His calculation is as follows.
		$\frac{(145 - 58) + (360 - 145) + (680 - 360) + (845 - 608) + (1056 - 845) + (1230 - 1056)}{5}$
		Critically analyse Joe's calculation, stating any corrections or improvements that could be made.
		[3 marks]



1	(d)	Just before Facebook bought Instagram, Facebook had 900 million users.							
		As part of the purchase, each Instagram user was automatically given a Facebook account.							
		On 10 April 2012, Survey Hunt carried out a survey about the public's opinion of social media.							
		A sample of 350 people with Facebook accounts took part in this survey.							
	Of these 350 people, 25 were Instagram users who had just been given a Facebook account.								
	Survey Hunt claimed that its survey fairly represented the Instagram users who had just been given a Facebook account.								
		Does the data support the claim?							
		You must show your working. [4 marks]							



1	(e)	On 4 February 2014, Lena had 50 shares in Facebook.	
		The exchange rate that day was £1 = \$1.60	
		She said,	
		"My shares in Facebook are worth more than £2000"	
		Was she correct? You must show your working.	[2 marks]

Turn over for the next question



2		Use Global Adult Literacy on page 3 of the Preliminary Material.
2	(a)	Some members of UNESCO suggested that the data had not been presented well.
2	(a) (i)	Give one reason why they might suggest this with regard to Figure 1 [1 mark]
2	(a) (ii)	Give one reason why they might suggest this with regard to Table 1 [1 mark]
2	(b)	The two statements below were made on an online forum discussing adult literacy rates.
		'The number of literate adults in the world in 2012 reached nearly 4.2 billion.' (Paul)
		'Central Asia has made the greatest progress in improving adult literacy over the past two decades.' (Rena)
		Critically analyse these two statements. Show working to justify your comments. [6 marks]
		Paul's statement



Rena's statement		 	
Rena's statement			
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3	Debbie i	s the pri	ncipal of	a sports	college.					
	She stat	es,								
			verage th Olympics		its at our	college a	re taller t	han the a	thletes in	the
	The mea	an height	of athlet	tes in the	2012 Oly	mpics wa	as 176.9	cm		
				entimetres nd varian		students a	at the col	ege are r	normally	
	A randor centimet		e of 10 s	tudents fr	rom the s	ports coll	ege had	the follow	ing height	s, in
	173	186	176	185	186	175	179	184	188	173
				nce interva pie's state					[6 ı	marks]





4		For a piece of coursework, Tom and Amy decided to investigate cars passing their school between 3pm and 4pm					
4	(a)	Describe the population in their investigation.	[2 marks]				



4 (b) Tom and Amy each used a speed gun to measure the speeds of a sample of cars.

	Number of cars	Mean speed (mph)
Tom	10	24.1
Amy	20	23.1

Jsing the information in the table, calculate, to one decimal place, the point estimate he population mean.	for
[3 mark	(s]
	—

Answer _____

Turn over for the next question

Turn over ▶

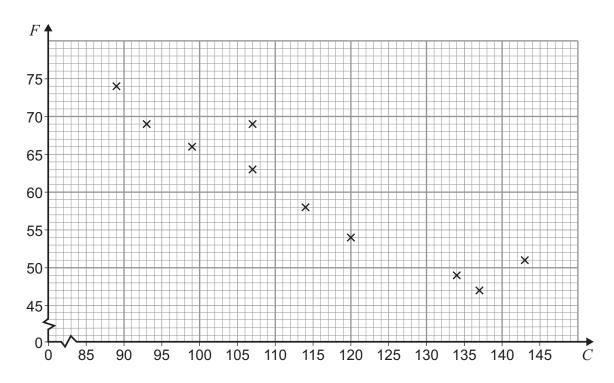
mph



4 (c) Tom also recorded the make and model of each car in his sample.

For each car, he found the figures for the fuel economy in miles per gallon (F) the CO_2 emissions in grams per kilometre (C)

He plotted F against ${\cal C}$ on this scatter diagram.



Calculate the equation of the regression line of F on C.

Draw the regression line on the scatter diagram.

You may use the table below if you wish.

[6 marks]

<i>C</i>							
F							
	<u> </u>		<u> </u>	<u> </u>		<u> </u>	

4 (d) You have to pay vehicle tax if you own a car.

The vehicle tax you pay depends on the ${\rm CO_2}$ emissions of your car, as shown in the table.

Band	Α	В	С	D	E	F
CO ₂ emissions (g per km)	Up to 100	101–110	111–120	121–130	131–140	141–150
Vehicle tax per year	£0	£20	£30	£110	£130	£145

You want to buy a car for which the vehicle tax is not more than £30 per year.

Using your graph or the equation of the regression line of F on C , estimate the minimum fuel economy of a car you might buy.			
minimum ruer economy or a car you might buy.	[3 marks]		
Answer	mpg		

Turn over for the next question



5 Ten students are selected to take a Maths test, an English test and a Science test.

Kenny is absent for the Science test.

Here are the test scores.

	Maths	English	Science
Cathy	14	50	28
Seema	30	42	26
Olena	39	68	30
Joanne	45	45	37
Kenny	95	65	absent
Beth	50	35	45
Shazia	57	85	39
John	67	50	58
Harry	79	44	59
Abdul	63	72	74

A teacher wants to estimate Kenny's score in the Science test.

Using statistical analysis and reasoning, advise the teacher whether she should use scores from the Maths test or the English test to help her.

You must comment on the validity of the score the teacher will award Kenny in the Science test if she follows your advice.

Tou do not need to estimate Kenny's score in the Science test.	[5 marks]





6	Charles travels to work by bus.										
	The time he leaves home depends on which of two buses, A and B, he decides to travel on.										
	Bus A										
	Time he leav	es home				8.30 am					
	The mean tir	me he take	s to get to	work		26 minutes					
	The standard	d deviation	of the time	to get to w	ork	4 minutes					
	Bus B										
	He leaves hor	me at 8.35	am								
	Here are the tusing bus B.	times, in mi	nutes, he t	akes to get	to w	ork on 10 ran	domly sel	ected days			
		23	22	26	20	20					
		23	27	20	23	26					
6 (a)	Compare the	times he ai	rrives at wo	ork using bu	is A a	and bus B.		[6 marks]			





6 (b)	Charles aims to get to work between 8.55 am and 9.00 am								
	Which bus should he travel on to have a better chance of doing this? You must show your working, using a suitable probability distribution.								
	State one assumption you make.								
	[9 marks	s]							
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END OF QUESTIONS



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