

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

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Pearson Edexcel International Advanced Level

Time 1 hour 30 minutes

Paper
reference

WST03/01

Mathematics

International Advanced Subsidiary/Advanced Level Statistics S3

You must have:

Mathematical Formulae and Statistical Tables (Yellow), calculator

Total Marks

Candidates may use any calculator permitted by Pearson regulations. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Values from the statistical tables should be quoted in full. If a calculator is used instead of the tables, the value should be given to an equivalent degree of accuracy.
- Inexact answers should be given to three significant figures unless otherwise stated.

Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 6 questions in this question paper. The total mark for this paper is 75.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.

Turn over ►

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Q:1/1/1/




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3. A medical research team carried out an investigation into the metabolic rate, MR, of men aged between 30 years and 60 years.

A random sample of 10 men was taken from this age group.

The table below shows for each man his MR and his body mass index, BMI. The table also shows the rank for the level of daily physical activity, DPA, which was assessed by the medical research team.

Rank 1 was assigned to the man with the highest level of daily physical activity.

Man	A	B	C	D	E	F	G	H	I	J
MR (x)	6.24	5.94	6.83	6.53	6.31	7.44	7.32	8.70	7.88	7.78
BMI (y)	19.6	19.2	23.6	21.4	20.2	20.8	22.9	25.5	23.3	25.1
DPA rank	10	7	9	8	6	3	1	4	5	2

[You may use $S_{xy} = 15.1608$ $S_{xx} = 6.90181$ $S_{yy} = 45.304$]

- (a) Calculate the value of the product moment correlation coefficient between MR and BMI for these 10 men. (2)
- (b) Use your value of the product moment correlation coefficient to test, at the 5% significance level, whether or not there is evidence of a positive correlation between MR and BMI. State your hypotheses clearly. (3)
- (c) State an assumption that must be made to carry out the test in part (b). (1)
- (d) Calculate the value of Spearman's rank correlation coefficient between MR and DPA for these 10 men. (4)
- (e) Use a two-tailed test and a 5% level of significance to assess whether or not there is evidence of a correlation between MR and DPA. (2)



4. A survey was carried out with students that had studied Maths, Physics and Chemistry at a college between 2016 and 2020. The students were divided into two groups *A* and *B*.

- (a) Explain how a sample could be obtained from this population using quota sampling. (2)

The students were asked which of the three subjects they enjoyed the most. The results of the survey are shown in the table.

	Subject enjoyed the most			
	Maths	Physics	Chemistry	Total
Group <i>A</i>	16	10	13	39
Group <i>B</i>	38	13	10	61
Total	54	23	23	100

- (b) Test, at the 5% level of significance, whether the subject enjoyed the most is independent of group. You should state your hypotheses, expected frequencies, test statistic and the critical value used for this test. (8)

The Headteacher discovered later that the results were actually based on a random sample of 200 students but had been recorded in the table as percentages.

- (c) For the test in part (b), state with reasons the effect, if any, that this information would have on
- the null and alternative hypotheses,
 - the critical value,
 - the value of the test statistic,
 - the conclusion of the test.
- (4)



6. A farmer sells strawberries in baskets. The contents of each of 100 randomly selected baskets were weighed and the results, given to the nearest gram, are shown below.

Weight of strawberries (grams)	Number of baskets
302 – 303	5
304 – 305	13
306 – 307	10
308 – 309	18
310 – 311	25
312 – 313	20
314 – 315	5
316 – 317	4

The farmer proposes that the weight of strawberries per basket, in grams, should be modelled by a normal distribution with a mean of 310 g and standard deviation 4 g.

Using his model, the farmer obtains the following expected frequencies.

Weight of strawberries (s , grams)	Expected frequency
$s \leq 303.5$	a
$303.5 < s \leq 305.5$	7.8
$305.5 < s \leq 307.5$	13.6
$307.5 < s \leq 309.5$	18.4
$309.5 < s \leq 311.5$	19.6
$311.5 < s \leq 313.5$	16.3
$313.5 < s \leq 315.5$	10.6
$s > 315.5$	b

- (a) Find the value of a and the value of b . Give your answers correct to one decimal place.

(5)

Question 6 continues on page 23



