

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Education
Advanced Level Examination
June 2010

Mathematics

MS03

Unit Statistics 3

Tuesday 22 June 2010 1.30 pm to 3.00 pm

For this paper you must have:

- the blue AQA booklet of formulae and statistical tables.
- You may use a graphics calculator.

Time allowed

- 1 hour 30 minutes

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.
- Write the question part reference (eg (a), (b)(i) etc) in the left-hand margin.
- You must answer the questions in the spaces provided. Do not write outside the box around each page.
- 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 requiring the use of tables or calculators should normally be given to three significant figures.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 75.

Advice

- Unless stated otherwise, you may quote formulae, without proof, from the booklet.

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	



J U N 1 0 M S 0 3 0 1

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

1

Ffion, as part of her research project, measured the stem length and the cap diameter of each of a random sample of 24 matsutake mushrooms. Using these measurements, she calculated the value of the product moment correlation coefficient to be 0.336, correct to three significant figures.

Assuming that her measurements came from a bivariate normal distribution, test, at the 5% level of significance, the hypothesis that there is no correlation between the stem length and the cap diameter of matsutake mushrooms. (4 marks)

QUESTION
PART
REFERENCE



QUESTION
PART
REFERENCE

Turn over ►



- 2** Rodney and Derrick, two independent fruit and vegetable market stallholders, sell punnets of locally-grown raspberries from their stalls during June and July.

The following information, based on independent random samples, was collected as part of an investigation by Trading Standards Officers.

		Weight of raspberries in a punnet (grams)		
		Sample size	Sample mean	Sample standard deviation, s
Stallholder	Rodney	50	225	5
	Derrick	75	219	8

- (a) Construct a 99% confidence interval for the difference between the mean weight of raspberries in a punnet sold by Rodney and the mean weight of raspberries in a punnet sold by Derrick. (5 marks)
- (b) What can be concluded from your confidence interval? (2 marks)
- (c) In addition to weight, state one other factor that may influence whether customers buy raspberries from Rodney or from Derrick. (1 mark)

QUESTION
PART
REFERENCE



QUESTION
PART
REFERENCE

Turn over ►



3

The weekly number of hits, S , on Sam's website may be modelled by a Poisson distribution with parameter λ_S . The weekly number of hits, T , on Tina's website may be modelled by a Poisson distribution with parameter λ_T .

During a period of 40 weeks, the number of hits on Sam's website was 940.

During a period of 60 weeks, the number of hits on Tina's website was 1560.

Assuming that S and T are independent random variables, investigate, at the 2% level of significance, Tina's claim that the mean weekly number of hits on her website is greater than that on Sam's website. (7 marks)

QUESTION
PART
REFERENCE



QUESTION
PART
REFERENCE

Turn over ►



- 4 It is proposed to introduce, for all males at age 60, screening tests, A and B, for a certain disease.

Test B is administered only when the result of Test A is inconclusive.

It is known that 10% of 60-year-old men suffer from the disease.

For those 60-year-old men suffering from the disease:

- Test A is known to give a positive result, indicating a presence of the disease, in 90% of cases, a negative result in 2% of cases and a requirement for the administration of Test B in 8% of cases;
- Test B is known to give a positive result in 98% of cases and a negative result in 2% of cases.

For those 60-year-old men not suffering from the disease:

- Test A is known to give a positive result in 1% of cases, a negative result in 80% of cases and a requirement for the administration of Test B in 19% of cases;
- Test B is known to give a positive result in 1% of cases and a negative result in 99% of cases.

- (a) Draw a tree diagram to represent the above information. (4 marks)

- (b) (i) Hence, or otherwise, determine the probability that:

(A) a 60-year-old man, suffering from the disease, tests negative;

(B) a 60-year-old man, not suffering from the disease, tests positive. (2 marks)

- (ii) A random sample of ten thousand 60-year-old men is given the screening tests. Calculate, to the nearest 10, the number who you would expect to be given an **incorrect** diagnosis. (2 marks)

- (c) Determine the probability that:

(i) a 60-year-old man suffers from the disease given that the tests provide a positive result;

(ii) a 60-year-old man does not suffer from the disease given that the tests provide a negative result. (5 marks)



QUESTION
PART
REFERENCE

Turn over ►



[illegible]

[illegible]

P27932/Jun10/MS03



Given that T may be assumed to be normally distributed, determine the probability that the total length of tape needed for the edges of the desk's 4 drawer fronts does not exceed 4.5 metres. (5 marks)

QUESTION	PART	REFERENCE
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[illegible]

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[illegible]

P27932/Jun10/MS03



[illegible]

[illegible]

P27932/Jun10/MS03



Use a distributional approximation to estimate $P(Y \geq d)$. (5 marks)

QUESTION	PART	REFERENCE
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[illegible]

[illegible]

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