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| **SUBJECT** | Advanced Programme Mathematics Paper 2 | **DATE** | 9 July 2015 |
| **GRADE** | 12 | **MARKS** | 100 |
| **EXAMINER** | Mrs MH Povall | **MODERATORS** | Mrs Serafino, Mr Benecke |
| **NAME** |  | **DURATION** | 1 hour |
| **TEACHER** |  |  |  |
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| **QUESTION NO** | **DESCRIPTION** | **MAXIMUM MARK** | **ACTUAL MARK** |
| 1 | Line of regression | 14 |  |
| 2 | Conditional probability | 12 |  |
| 3 | Confidence Intervals | 18 |  |
| 4 | Probability mass and density functions | 19 |  |
| 5 | Probability distribution problems | 20 |  |
| 6 | Normal distribution | 17 |  |
| TOTAL |  | 100 |  |

**INSTRUCTIONS:**

1. Write your name and your Mathematics teacher’s name on this test.

2. Answer all questions in the answer booklet provided.

3. Show all working out , as answers only will not guarantee you full marks.

question 1 14 marks

A Ballito beach vendor kept the records of the number of ice-creams sold and the midday temperatures over a 10 day period. Unfortunately something was spilt over his results and some data was lost.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Temperature (°C), *x* | 25 | 26 | 16 | 24 | 18 | 21 | 18 | 19 | 28 | 23 |
| Ice-cream sales, *y* | 305 | 373 | 77 | 316 | 130 | 186 | 148 | 180 | 406 | 162 |

The following information had been calculated before the data was lost:

; ; ; ; ; ; 

and

* 1. What did the correlation coefficient tell us about the relationship between temperature

 and ice-cream sales. (3)

* 1. Determine the equation of the least squares regression line for this data. You may use the

 fact that this line passes through the point  (4)

* 1. Estimate the ice-cream sales on days with the following midday temperatures. Comment on your answer in each case in terms of the reliability as an estimate.

		1. 20°C (4)
		2. 38°C (3)

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![C:\Users\marjory.SBC\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\5UOVK457\cricket[1].jpg]()

question 2 12 marks

![C:\Users\marjory.SBC\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\N4MC96IE\125604257[1].jpg]()A survey was undertaken at St Benedict’s to determine the proportion of learners who play cricket and rugby. A random sample showed the following:

* The probability that a learner plays rugby is 0,5
* The probability that a learner plays cricket is 0,3
* The probability that a learner plays cricket given that he plays rugby is 0,1.

2.1 Find the probability that a leaner plays both sports. (4)

2.2 Calculate the probability that a learner plays neither of these two sports. (4)

2.3 Are the two events independent? Support your answer using calculations. (4)

question 3 18 marks

 The weights from a certain sample of 100 women have a mean of 61,236kg, with a standard

 deviation of 5,443kg. The weights from a sample of men on the other hand, have a mean of

 81,647kg with a standard deviation of 7,651kg.

3.1 Find a 92% confidence interval for the true mean of the women’s weight from the

 population from which this sample was taken. (8)

3.2 If we can say, with 99% confidence, that the true mean of the men’s weights lies within 1.5kg

 of the observed sample mean, how big was this sample? (8)

3.3 Explain how you could make the interval in question 3.2 smaller. (2)

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question 4 19 marks

**(All your working details must be shown in this question)**

The following function is an example of a probability density function.

4.1 Show that the value of . (6)

4.2 Find (6)

4.3 Determine the mean of the given probability density function if:

 The mean of a probability density function is given by the following formula:

 where is the domain of the probability density function. (7)

question 5 20 marks

![C:\Users\marjory.SBC\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\1RW2FKYR\vanilla-milkshake-vector-illustration-6252980[1].jpg]()

5.1 Basil sell 60 milkshakes’ per day of which 40% are chocolate flavoured.

 Determine the probability that from a random sample of 20 milkshakes on one

 day exactly 5 will be chocolate flavoured .

 (5)

 5.2 A manufacturer of spice jars knows that 8% of the jars produced are defective. He supplies jars in cartons containing 12 jars.

 Calculate the probability that in a crate of cartons that a carton selected a random

 5.2.1 will contain exactly two defective jars. (4)

![C:\Users\marjory.SBC\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\5UOVK457\green-glass-jar[1].jpg]() 5.2.2 will contain at least one defective jar. (5)

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5.3 Suppose that computer chips for a particular integrated circuit are tested, and that the

 probability that they test defective when they are in fact defective is 0,95 (called a “true

negative”). The probability that they are declared in good working order if they are in fact in good working order is 0,97 (called a “true positive”). If 5% of the chips are known to be faulty, what is the probability that a chip will test to be defective if it is actually in good working order (called a “false negative) (6)

Question 6 17 marks

For this question, we shall assume the times for a rider to complete the Argus cycle tour are normally distributed with a mean of 5hrs. The questions are based on a total of 35000 riders starting

![C:\Users\marjory.SBC\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\N4MC96IE\cyclist-black-silhouette-clipart[1].jpg]()the race.

6.1 If only 133 of the riders finish the race in under 3 hours, what is the probability of a random

 rider finishing in under 3 hours. (1)

6.2 Using the probability in 6.1 calculate the standard deviation of all the riders times to the

 nearest minute. (8)

6.3 The medal categories are on a time basis, with riders finishing under 3hrs getting silver (top

 ten of these get gold), and the cut-off time for a bronze medal set so that the organisers

 expect 500 riders to receive a bronze medal. What is the cut-off time for a bronze medal?

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