**SACRED HEART GIRLS’ COLLEGE**

**OAKLEIGH**



**Mathematical Methods CAS 2012**

**Unit 4 SAC 5: Probability TASK**

**PART A**

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

 **Teacher (please circle)**: Ms Gates Mr Smith

**Part A:**

**9 item analysis questions**

 **(notes and calculator permitted)**

**Reading: 5 minutes**

**Writing: 40 minutes**

**Marks: 24**

**Instructions:**

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

In all questions where a numerical answer is required an exact value must be given unless otherwise specified.

In questions where more than one mark is available, appropriate working **must** be shown.

Unless otherwise indicated, the diagrams in this test are **not** drawn to scale.

*The following information is for questions 1, 2 and 3*

A die has been tampered with so that the probability of rolling a six is 0.2. Niranjala rolls the die four times.

Question 1

The probability that she obtains a six and then three numbers which are not sixes is closest to

1. 0.0268
2. 0.1024
3. 0.0965
4. 0.1600
5. 0.0016
6. Find the correct alternative.

2 marks

1. Give a reason to explain why this is not an example of a Markov chain.

1 mark

Question 2

Let X represent the number of sixes that come up. The probability distribution for X is given by

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| A. | X | 0 | 1 | 2 | 3 | 4 |
|  | Pr(X=x) | 0.4096 | 0.4096 | 0.1536 | 0.0256 | 0.0016 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| B. | X | 0 | 1 | 2 | 3 | 4 |
|  | Pr(X=x) | 0.0016 | 0.0256 | 0.1536 | 0.4096 | 0.4096 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| C. | X | 0 | 1 | 2 | 3 | 4 |
|  | Pr(X=x) | 0.4823 | 0.3858 | 0.1157 | 0.0154 | 0.0008 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| D. | X | 0 | 1 | 2 | 3 | 4 |
|  | Pr(X=x) | 0.0596 | 0.4096 | $-$0.1536 | 0.0256 | 0.0016 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| E. | X | 0 | 1 | 2 | 3 | 4 |
|  | Pr(X=x) | 0.0496 | 0.4096 | 0.2536 | 0.2564 | 0.0016 |

1. Find the correct response.

1 mark

1. Give a reason to explain why alternatives D and E are incorrect.

1 mark

Question 3

The probability that she obtains more than two sixes is closest to

1. 0.322
2. 0.1808
3. 0.0272
4. 0.6241
5. 0.0162
6. Find the correct response to this question.

2 marks

1. Give a reason to explain why this is an example of a Binomial probability distribution.

1 mark

Question 4

The discrete random variable X has the following probability distribution.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| x | $$-2$$ | $$-1$$ | 0 | 1 |
| Pr(X=x) | 0.3 | 0.2 | 0.4 | 0.1 |

The mean of the distribution is

1. $-$1.1
2. $-$0.9
3. $-$0.7
4. $-$0.5
5. $-$27.5
6. Find the correct response.

2 marks

1. Find the value of E(X2)

1 mark

1. Hence, find the variance

1 mark

Question 5

At a particular school, ten per cent of Year 12 students have unpaid library fines. If 8 Year 12 students are selected at random, the probability that at least two of them have an unpaid library fine would be closest to

1. 0.1488
2. 0.0381
3. 0.1869
4. 0.7331
5. 0.8722
6. Find the correct response

2 marks

1. What error would lead to alternative A?

1 mark

1. What error would lead to alternative B?

1 mark

Question 6

Eight identical balls numbered 1 to 8 are placed in a box. One ball is randomly selected. The sample space for this activity is {1,2,3,4,5,6,7,8}. Which pair of events listed below is independent of one another?

1. {1,2,3,4} and {5,6,7,8}
2. {1,2,3,4} and {1,4,5,8}
3. {1,2,3} and {2,4,6,8}
4. {1,2,3} and {1,8}
5. {1,2} and {2,8}

Find the correct response.

1 mark

Question 7

Nethmie and Bettina play n games of tennis. The probability that Nethmie wins any game is 0.4; no game can be a draw. If the probability that Bettina wins no games is less than 0.01, then the minimum number of games they played is equal to

1. 5
2. 6
3. 7
4. 9
5. 10
6. Find the correct response

1 mark

1. If they played eight games, write an expression that could be used to evaluate the probability that Nethmie wins three of those eight games. You do not need to evaluate this expression.

1 mark

Question 8

If Pr(A)$=\frac{1}{4}$, Pr(B)$=\frac{1}{3}$ and Pr(A$∩$B)$=\frac{1}{6}$ then Pr(A$'∩$B$'$) is equal to

1. $\frac{1}{13}$
2. $\frac{5}{12}$
3. $\frac{1}{2}$
4. $\frac{7}{12}$
5. $\frac{2}{3}$
6. Find the correct response

1 mark

1. Show that A and B are independent events

1 mark

Question 9

A draw contains four white and five blue socks. Three socks are selected, one at a time, without replacement. The probability that they are all blue socks is

1. $\frac{5}{42}$
2. $\frac{20}{243}$
3. $\frac{1}{2}$
4. $\frac{125}{729}$
5. $\frac{1}{21}$
6. Find the correct response.

2 marks

1. What error would lead to alternative B?

1 mark

END OF PART A