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| YEAR 12 Essentials Mathematics  Semester 1 2017  Test 5 – **Probability** |
| Total Marks: 31 marks  Name: \_\_\_\_Solutions\_\_\_\_\_\_\_\_\_\_ Total Time: 50 minutes |

***Full working out must be shown to get full marks.***

***Attempt all questions***

**Total Time: 50 minutes**

***Resources allowed:***

***1 A4 page, (1 side) of hand written notes, ruler***

***Calculator***

# Marking key for sample assessment Task 8 – Unit 4

1. (a) What is the probability that an Australian resident will have B+ blood type?

|  |  |  |
| --- | --- | --- |
| **Solution** | | |
| 8% of the Australian population have B+ blood type, so the probability is 8% or 0.08 | | |
| **Specific behaviours** | **Marks** | **Rating** |
| Identifies the correct proportion from the table | 1 | simple |
| **Total** | **/1** |  |

(b) Every week, Australia needs over 27,000 blood donations. How many of these blood donations could be from people with A+ blood type?

|  |  |  |
| --- | --- | --- |
| **Solution** | | |
| 31% of the population is A+ blood type  31% x 27 000 = 8370  It is possible approximately 8000 donors could be A+ | | |
| **Specific behaviours** | **Marks** | **Rating** |
| Identifies the percentage | 1 | simple |
| Determines the proportion with A+ blood type | 1 | simple |
| Gives an appropriate approximation | 1 | complex |
| **Total** | **/3** |  |

1. (a) Label the diagram to show the possibilities of boy and girl.

|  |  |  |
| --- | --- | --- |
| **Solution** | | |
| first child second child | | |
| **Specific behaviours** | **Marks** | **Rating** |
| Correctly labels diagram for first child | 1 | simple |
| Correctly labels diagram for second child | 1 | simple |
| **Total** | **/2** |  |

1. What is the chance the family would have two girls?

|  |  |  |
| --- | --- | --- |
| **Solution** | | |
| first child second child  The probability of having two girls is | | |
| **Specific behaviours** | **Marks** | **Rating** |
| Recognises there are four possible outcomes | 1 | simple |
| Determines the probability of two girls | 1 | simple |
| **Total** | **/2** |  |

1. If the family had a third child, what is the chance there would be two girls and a boy?

|  |  |  |
| --- | --- | --- |
| **Solution** | | |
| There are eight possible outcomes with three of these outcomes having two girls and a boy.  The probability would be  or 0.375. | | |
| **Specific behaviours** | **Marks** | **Rating** |
| Extends sample space | 1 | simple |
| Recognises there are eight possible outcomes for three children | 1 | simple |
| Identifies three outcomes with two girls and a boy | 1 | complex |
| Determines the probability | 1 | simple |
| **Total** | **/4** |  |

3. An agricultural research company has completed an investigation into the effect of a new fertiliser on plant growth. The heights of 50 plant seedlings grown under experimental conditions for several weeks were measured and recorded to the nearest centimetre.

107, 162, 151, 145, 133, 125, 116, 108, 111, 113, 125, 126, 158, 142, 139,

165, 168, 152, 141, 147, 147, 131, 137, 137, 111, 119, 121, 125, 125, 156,

117, 133, 138, 157, 124, 124, 159, 132, 131, 139, 141, 137, 129, 131, 148,

127, 136, 136, 121, 148

1. Use the data to complete the table below:

|  |  |  |
| --- | --- | --- |
| **Solution** | | |
| |  |  |  | | --- | --- | --- | | Height (cm) | Frequency | Relative Frequency | |  | 2 | 0.04 | |  | 6 | 0.12 | |  | 11 | 0.22 | |  | 14 | **0.28** | |  | 8 | **0.16** | |  | **6** | **0.12** | |  | **3** | **0.06** | | | |
| **Specific behaviours** | **Marks** | **Rating** |
| Correctly completes frequency column | 1 | simple |
| Correctly fills two rows of relative frequency | 1 | simple |
| Correctly completes relative frequency column | 1 | simple |
| **Total** | **/3** |  |

1. What is the probability of plants growing to a height between 120 cm and 129 cm?

|  |  |  |
| --- | --- | --- |
| **Solution** | | |
| Relative frequency for the height interval of is 0.22. So the probability is 0.22. | | |
| **Specific behaviours** | **Marks** | **Rating** |
| Identifies the relative frequency for the interval | 1 | simple |
| Recognises the relative frequency is an expression of probability | 1 | simple |
| **Total** | **/2** |  |

1. What is the probability of plants growing to a height of at least 130 cm?

|  |  |  |
| --- | --- | --- |
| **Solution** | | |
| 32 plants have heights of at least 130 cm.  Probability is | | |
| **Specific behaviours** | **Marks** | **Rating** |
| Determines number of plants fulfilling criteria | 1 | complex |
| Determines probability | 1 | simple |
| **Total** | **/2** |  |

1. If the experiment is expanded to 1000 plants, how many plants would you expect to grow to a height of at least 130 cm?

|  |  |  |
| --- | --- | --- |
| **Solution** | | |
| Would expect 640 plants to grow to a height of at least 130 cm. | | |
| **Specific behaviours** | **Marks** | **Rating** |
| Applies relative frequency to calculation | 1 | simple |
| Determines the number of plants expected to meet criteria | 1 | simple |
| **Total** | **/2** |  |

1. The fertiliser is considered effective if 75% of seedlings have a height of 130 cm or more. Comment on the effectiveness of the fertiliser on plant growth based on the results from the experiment.

|  |  |  |
| --- | --- | --- |
| **Solution** | | |
| Relative frequency of 0.64 is the same as 64%  Of the 50 seedlings, only 64% reached a height of at least 130 cm , which suggests the fertiliser may not be effective. | | |
| **Specific behaviours** | **Marks** | **Rating** |
| Refers to relative frequency | 1 | complex |
| Connects relative frequency to percentage | 1 | complex |
| Draws a conclusion based on results | 1 | complex |
| **Total** | **/3** |  |

1. (a) Why are 200 numbers assigned to the letter E and only 100 numbers to the other letters?

|  |  |  |
| --- | --- | --- |
| **Solution** | | |
| There are twice as many E’s as any other letter in the word CEREAL | | |
| **Specific behaviours** | **Marks** | **Rating** |
| States the relationship of the number of E’s to the number of other letters | 1 | simple |
| **Total** | **/1** |  |

The first 20 random numbers that Nguyen gets from his calculator are shown below, with his first number being 242, the second, 413, and so on.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 242 | 413 | 176 | 075 | 500 | 832 | 416 | 974 | 587 | 004 |
| 723 | 124 | 543 | 219 | 853 | 361 | 643 | 054 | 387 | 634 |

(b) Use Nguyen’s random numbers to assign letters until you have spelt the word CEREAL.

|  |  |  |
| --- | --- | --- |
| **Solution** | | |
| |  |  | | --- | --- | | Random number used | Letter | | 242 | E | | 413 | **L** | | 176 | **C** | | **075** | **A** | | **500** | **R** | | **416** | **L** | | **587** | **R** | | **004** | **A** | | **124** | **C** | | **543** | **R** | | **219** | **E** | | | |
| **Specific behaviours** | **Marks** | **Rating** |
| Correctly completes the next entry in the table | 1 | simple |
| Correctly adds six entries to the table | 1 | simple |
| Correctly completes the table | 1 | simple |
| **Total** | **/3** |  |

(c) How many packets of Wheat Flakes would Nguyen need to buy to win a prize in this competition, on the basis of the results in part (b)?

|  |  |  |
| --- | --- | --- |
| **Solution** | | |
| 11 | | |
| **Specific behaviours** | **Marks** | **Rating** |
| Correctly states the number of packs required | 1 | complex |
| **Total** | **/1** |  |

1. If you ran this simulation with your calculator, what would be the minimum number of times you would need to generate a random number to spell CEREAL?

|  |  |  |
| --- | --- | --- |
| **Solution** | | |
| 6 | | |
| **Specific behaviours** | **Marks** | **Rating** |
| Correctly states the minimum number of trials. | 1 | complex |
| **Total** | **/1** |  |

1. Nguyen’s friend Georgina buys 30 packets of Wheat Flakes. Will she definitely win a prize? Explain.

|  |  |  |
| --- | --- | --- |
| **Solution** | | |
| No, it is possible but not certain | | |
| **Specific behaviours** | **Marks** | **Rating** |
| Correctly states no with a supporting reason | 1 | complex |
| **Total** | **/1** |  |