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| Year | *Two and Three Stage Events* | Calculator  Allowed | |
| **Skills and Knowledge Assessed:**   * Describe the results of two­ and three­step chance experiments, both with and without replacements, assign probabilities to outcomes and determine probabilities of events. Investigate the concept of independence (ACMSP246) * Use the language of ‘if ....then, ‘given’, ‘of’, ‘knowing that’ to investigate conditional statements and identify common mistakes in interpreting such language (ACMSP247) | | Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | |
| Longer Answer Test | | | |
| Answers should be supported by relevant mathematical reasoning and/or calculations.  Write all working and answers in the spaces provided on this test paper. | | | |

|  | | **Marks** |
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|  | Dustin places the top four cards shown below in one pile and the bottom four in another. He shuffles both piles and draws a card from each pile. |  |
|  | (a) Complete the table below to show the possible outcomes from drawing the two cards.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | K | Q | J | 10 | | 9 | K 9 |  |  |  | | 8 |  |  |  |  | | 7 |  |  |  |  | | 6 |  |  |  |  | | **2** |
|  | (b) What is the probability that he draws two diamonds?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
|  | (c) What is the probability that he draws a Queen and a number less than 8?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
|  | (d) What is the probability that he draws a 10 or a 9 or both?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
|  | (e) If he draws a Jack or a 10 from the first pile, what is the probability that both of the cards he draws are numbered cards?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
|  | (a) The two way table illustrates two features of the mammal in a zoo.     |  |  |  |  | | --- | --- | --- | --- | |  | Herbivore | Non Herbivore | Totals | | Placental |  | 16 | 47 | | Marsupial | 19 | 4 |  | | Totals |  |  |  |   Complete the missing values in the table. | **2** |
|  | (b) If an animal is chosen at random from this zoo, what is the probability that it is a marsupial?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
|  | (c) If an animal is chosen at random from this zoo, what is the probability that it is a placental herbivore?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
|  | (d) If an animal is chosen at random from this zoo, what is the probability that it is a not a marsupial herbivore?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
| 3. | A tree diagram has been drawn to show the results of drawing two cards (without replacement) from a pack of four cards which have the letters A, B, C and D on them. |  |
|  | (a) What is the probability that the two cards are A and D in any order?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
|  | (b) What is the probability that the two cards show the same letter?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
|  | (c) What is the probability that one card is D with either A or B in any order?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
|  | (d) Given that the first card is not C, what is the probability that the two cards are A and B in any order?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
| 4. | (a) Four swimmers; Jackie, Katie, Leanne and Margaret; competed in two races in which they were the only competitors.  Draw a tree diagram to show the possible winners of the two races. | **2** |
|  | (b) What is the probability that Margaret wins the first race and Leanne wins the second race?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
|  | (c) What is the probability that Jackie and Katie both win a race?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
|  | (d) Given that Jackie wins at least one of the races, what is the probability that Margaret wins the other?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
| 5. | (a) An election is to be held among four committee members for the positions of President and Vice-president. The committee has two male members William and Yosef and two female members Xanthe and Zoe.  Draw a tree diagram to show the possible ways that the two positions can be filled. | **2** |
|  | (b) What is the probability that William and Xanthe fill the two positions?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
|  | (c) What is the probability that the president and vice president are both the same gender?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
|  | (d) Given that William is not elected as president, what is the probability that the president and vice president are both the same gender?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
| 6. | The Venn diagram shows the number of songs in different musical styles played by a band called The Lonesome. |  |
|  | (a) If one song is chosen at random, what is the probability that it is Bluegrass style?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
|  | (b) If two songs are chosen at random, what is the probability that they are both Bluegrass style?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
|  | (c) If two songs are chosen at random, what is the probability that they are not both Bluegrass style?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
|  | (d) If two Soul songs are chosen at random, what is the probability that they are also Bluegrass style?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
| 7. | (a) Rick, Steve and Terry run a company and must fill the positions of Manager, Secretary and Treasurer.  Two different people must hold the positions of Manager and Secretary, but any one of them can be the Treasurer.  Complete the tree diagram to show the possible combinations of positions held. | **2** |
|  | (b) What is the probability that Rick and Steve hold all of the positions between them?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
|  | (c) What is the probability that only two people holds all three positions?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
|  | d) What is the probability that the three positions are held by three different people?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |
|  | e) Given that Steve does not hold the Managers position, what is the probability that only two people hold all three positions?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |

Two and Three Stage Events

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| Answers | |  |
|  | Working and Answers | Marks |
| 1. | a)     |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | K | Q | J | 10 | | 9 | K 9 | Q 9 | J 9 | 10 9 | | 8 | K 8 | Q 8 | J 8 | 10 8 | | 7 | K 7 | Q 7 | J 7 | 10 7 | | 6 | K 6 | Q 6 | J 6 | 10 6 | | 2 |
|  | b) Since all cards are diamonds, | 1 |
|  | c) Q 6 and Q 7 meet the criteria | 1 |
|  | d) | 1 |
|  | e) If he draws a J or 10 first, there are 8 possible combinations.  Those with 2 numbered card are those with 10 first, so 4. | 1 |
| 2. | a)     |  |  |  |  | | --- | --- | --- | --- | |  | Herbivore | Non Herbivore | Totals | | Placental | 31 | 16 | 47 | | Marsupial | 19 | 4 | 23 | | Totals | 50 | 20 | 70 | | 2 |
|  | b) | 1 |
|  | c) | 1 |
|  | d) | 1 |
| 3. | a) | 1 |
|  | b) P( Same letter ) = 0  ( since there is only one of each card and they are not replaced.) | 1 |
|  | c) Possibilities are DA DB AD AB. | 1 |
|  | d) If first is not C, there are 9 possible outcomes.  Required result is AB or BA, so 2 outcomes. | 1 |
| 4. | a) | 2 |
|  | b) | 1 |
|  | c) | 1 |
|  | d) 7 outcomes where J is a winner of at least 1.  Of these 2 have Margaret as the other winner. | 1 |
| 5. | a) | 2 |
|  | b) | 1 |
|  | c) Two males is WY and YW, two females is XZ or ZX. | 1 |
|  | d) If William is not president, there are only 9 outcomes altogether.  Now there are only 3 combinations with same gender (two males YW or two females XZ or ZX). | 1 |
| 6. | a) | 1 |
|  | b) | 1 |
|  | c) | 1 |
|  | d) | 1 |
| 7. | a) | 2 |
|  | b) Total possible outcomes = 18  Outcomes which meet the criteria are RSR RSS SRR SRS. | 1 |
|  | c) Outcomes which meet the criteria are RSR RSS SRR SRS.  TST TSS STT STS.  RTR RTT TRR TRT. | 1 |
|  | d) Outcomes which meet the criteria are RST RTS SRT STR TRS TSR | 1 |
|  | e) If Steve is not the manager, the middle section of the tree diagram is taken out leaving a total of 12 outcomes.  Outcomes which meet the criteria are RSR RSS TST TSS  RTR RTT TRR TRT. | 1 |