School Name
Mathematics Test 2017

Year 10

Two and Three Stage Events

Calculator Allowed
Longer Answer Test

Skills and Knowledge Assessed:

- List all outcomes for two - step chance experiments, with and without replacement, using tree diagrams or arrays; assign probabilities to outcomes and determine probabilities for events. (ACMSP225)
- Describe the results of two- and three-step 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_____

Show all necessary working in the spaces provided, for all questions.
Marks may not be awarded for careless or untidy working or diagrams.

Marks

1. Ella has two bags which each contain balls numbered from 1 to 4
She draws one ball from each bag.

(a) Complete the table to show the possible pairs of numbers. **2**

Bag 1 / Bag 2	1	2	3	4
1	1, 1	1, 2	1, 3	1, 4
2	2, 1	2, 2		
3				
4				

(b) What is the probability that both balls have the same number? **1**

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Marks

(c) What is the probability that both numbers are even? **1**

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(d) What is the probability that the sum of the two numbers is 6? **1**

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(e) What is the probability that at least one of the balls is numbered 1? **1**

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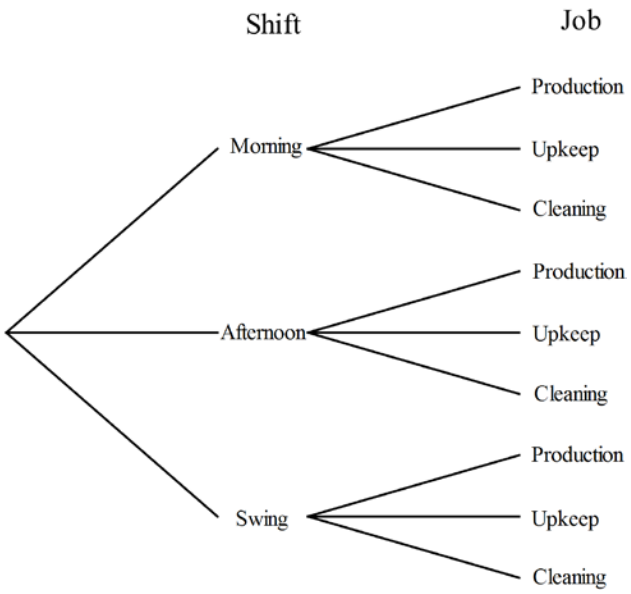
2. A factory runs three shifts during the day, morning, afternoon and swing shifts.
On each shift, unskilled staff can be rostered on production, upkeep or cleaning.
A tree diagram has been drawn to show the different options for work at the factory.



An unskilled worker is randomly allocated to a shift and job by his supervisor.

(a) What is the probability that he is rostered on cleaning? **1**

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(b) What is the probability that he is rostered on the morning or afternoon shifts, doing upkeep? **1**

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(c) What is the probability that it is not rostered on swing shift doing cleaning? **1**

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(d) What is the probability that he is rostered on swing shift or on upkeep but not both? **1**

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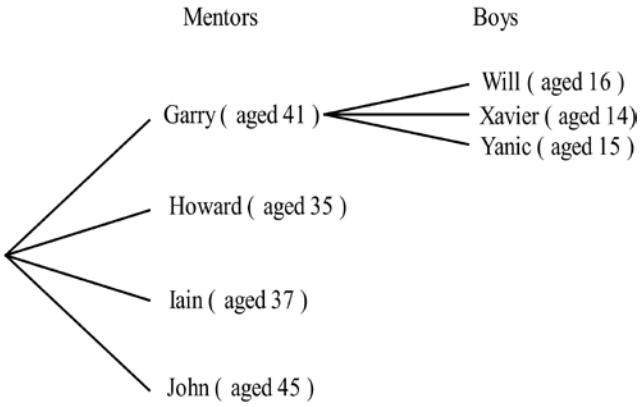
3. Wooparinga has a program where men work as mentors with teenage boys on community projects.

On a particular day, four men and three boys are available for a project and one man and one boy are chosen at random by computer.

(a) Complete the tree diagram to show the possible pairs of men and boys. **2**



(b) What is the probability that the pair consists of Will and a mentor younger than 40? **1**

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(c) What is the probability that the pair includes either Howard or Xavier or both? **1**

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(d) What is the probability that the combined age of the pair is less than 50? **1**

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(e) What is the probability that neither Garry nor Will are a part of the pair? **1**

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4. The four members of the Westbrook tennis team are Emma, Fiona, Gina and Hermione. They write down their names on slips of paper and draw out two names to be the captain and vice-captain respectively.

(a) Draw a tree diagram to show the possible order that the two names could be drawn. **2**

(b) What is the probability that Fiona is the vice-captain? **1**

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(c) What is the probability that Emma and Gina fill the two positions? **1**

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(d) What is the probability that Hermione fills one of the positions? **1**

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(e) If we know that Emma is not the captain, what is the probability that she is the vice-captain. **1**

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5. The two-way table shows the results of a survey of viewers who watched the pilot episode for a new TV series.

	Male	Female	Totals
Like	32	48	80
Dislike	42	28	70
Totals	74	76	150

(a) If one of the viewers is chosen at random, what is the probability that they liked the pilot episode? **1**

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(b) If one of the viewers is chosen at random, what is the probability that they are a male who disliked the pilot? **1**

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(c) If one of the viewers is chosen at random, what is the probability that they are male or they like the pilot (or both)? **1**

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(d) If one of the male viewers is chosen at random, what is the probability that he liked the pilot? **1**

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6. Four kittens, Quirky, Rusty, Snooky and Tabby are entered in the "Cutest kitten" section of cat show.
A tired judge draws three names from his hat to decide 1st, 2nd and 3rd prizes.

(a) Draw a tree diagram to show the possible order in which the prizes could be awarded. **2**

(b) What is the probability that Quirky and Rusty win 1st and 2nd prizes? **1**

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(c) What is the probability that Tabby wins a prize? **1**

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(d) What is the probability that Snooky does not win any prize? **1**

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(e) What is the probability that the three names drawn are in consecutive alphabetical order? **1**

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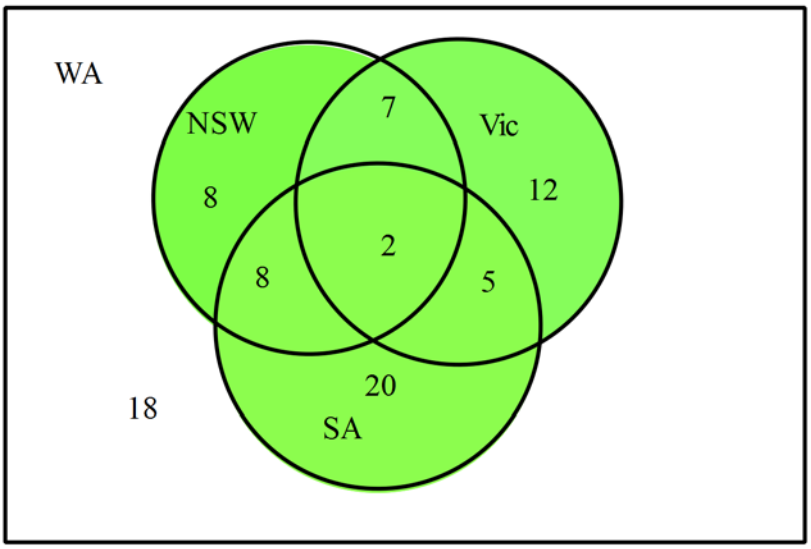
7. Many of the workers who are living in WA to work in a mine, also live or have lived in other states at various times.
The Venn diagram below shows where the workers have lived.



(a) If one of the workers is selected at random, what is the probability that they have lived in NSW at some stage? **1**

……

……

(b) If one of the workers is selected at random, what is the probability that they have only ever lived in WA? **1**

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(c) If one of the workers is selected at random, what is the probability that they have lived in SA and Vic, but not NSW? **1**

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(d) If one of the workers who has lived in Vic is selected at random, what is the probability that they have also lived in NSW? **1**

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8. Russell plays two games at a party.

In the first game, called *Venture*, a card is selected from a deck, it's value is recorded and it is returned to the pack which is then shuffled and a second card is drawn and recorded.

In the second game, called *Enterprise*, two cards are selected together from a deck of cards, and their values are both recorded.

(a) In which of the games are the drawing of the two cards dependent events? **2**

As a part of your answer, explain what the is meant by the term and relate it to the game.

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(b) Which game has the larger sample space? Explain why and give an example of an outcome which occurs in the sample space for your chosen game but not for the other game. **2**

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……..

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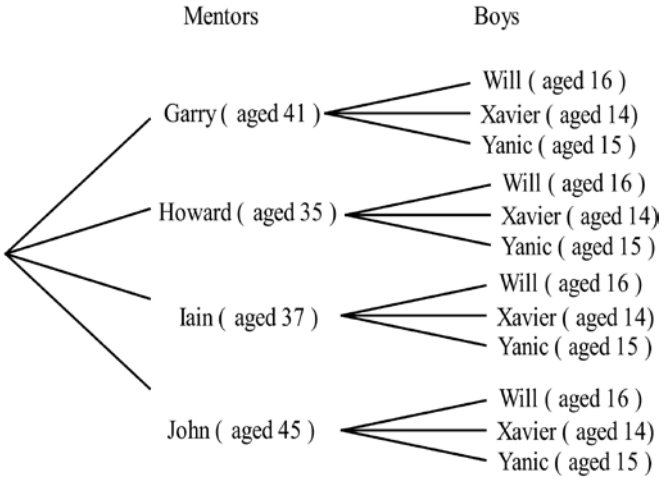
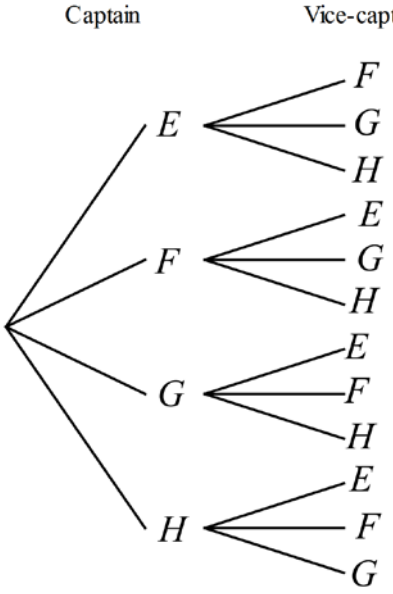
ANSWERS

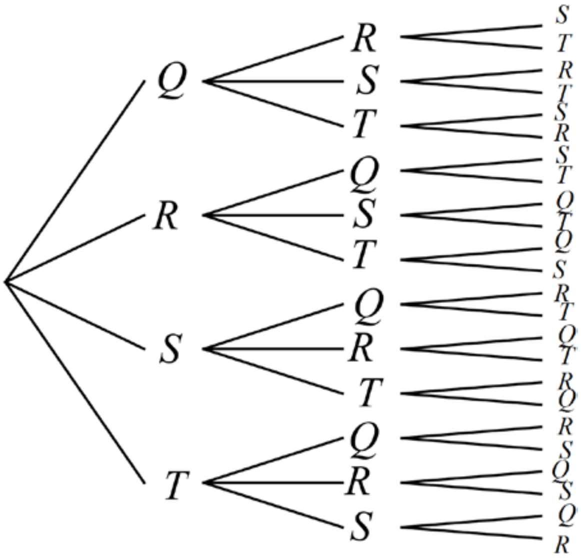
		Working and Answer	Marks
1	(a)		2 marks for correct and complete table. 1 mark for table which is almost complete or mostly correct with minor errors

Bag 1 / Bag 2	1	2	3	4
1	1, 1	1, 2	1, 3	1, 4
2	2, 1	2, 2	2, 3	2, 4
3	3, 1	3, 2	3, 3	3, 4
4	4, 1	4, 2	4, 3	4, 4

	(b)	$P(\text{Same Number}) = \frac{4}{16} = \frac{1}{4}$	1 mark for correct answer
	(c)	$P(\text{Both Even}) = \frac{4}{16} = \frac{1}{4}$	1 mark for correct answer
	(d)	$P(\text{Sum} = 6) = \frac{3}{16}$	1 mark for correct answer
	(e)	$P(\text{At least one 1}) = \frac{7}{16}$	1 mark for correct answer
2	(a)	$P(\text{Cleaning}) = \frac{3}{9} = \frac{1}{3}$	1 mark for correct answer

	Working and Answer	Marks
	(b) $P(\text{ Morning or afternoon upkeep }) = \frac{2}{9}$	1 mark for correct answer
	(c) $P(\text{ Swing Cleaning }) = \frac{1}{9}$ $P(\text{ Not Swing Cleaning }) = 1 - \frac{1}{9} = \frac{8}{9}$	1 mark for correct answer
	(d) $P(\text{ Swing or Upkeep not Both }) = \frac{4}{9}$	1 mark for correct answer
3	(a) 	2 marks for correct and complete tree diagram. 1 mark for tree diagram which is almost complete or mostly correct with minor errors.
	(b) Two are less than 40 to pair with Will. $P(W \text{ and Under } 40) = \frac{2}{12} = \frac{1}{6}$	1 mark for correct answer
	(c) $P(H \text{ or } X \text{ or both }) = \frac{6}{12} = \frac{1}{2}$	1 mark for correct answer
	(d) Only Howard paired with Xavier is below 50. (49) $P(\text{ Under 50 total age }) = \frac{1}{12}$	1 mark for correct answer
	(e) $P(G \text{ or } W \text{ not included }) = \frac{6}{12} = \frac{1}{2}$	1 mark for correct answer

		Working and Answer	Marks
4.	(a)		2 marks for correct and complete tree diagram. 1 mark for tree diagram which is almost complete or mostly correct with minor errors.
	(b)	$P(\text{ Fiona is } VC) = \frac{3}{12} = \frac{1}{4}$	1 mark for correct answer
	(c)	$P(EG \text{ or } GE) = \frac{2}{12} = \frac{1}{6}$	1 mark for correct answer
	(d)	$P(H \text{ in one position}) = \frac{6}{12} = \frac{1}{2}$	1 mark for correct answer
	(e)	$P(E \text{ is } VC \text{ given not } C) = \frac{3}{9} = \frac{1}{3}$	1 mark for correct answer
5.	(a)	$P(\text{ liked the pilot }) = \frac{80}{150} = \frac{8}{15}$	1 mark for correct answer
	(b)	$P(\text{ male and disliked the pilot }) = \frac{42}{150} = \frac{7}{25}$	1 mark for correct answer
	(c)	$P(\text{ male and liked}) = \frac{42 + 32 + \ + 48}{150} = \frac{122}{150} = \frac{61}{75}$	1 mark for correct answer

	Working and Answer	Marks
	(d) $P(\text{ liked given male }) = \frac{32}{74} = \frac{16}{37}$	1 mark for correct answer
6.	(a) 	2 marks for correct and complete tree diagram. 1 mark for tree diagram which is almost complete or mostly correct with minor errors.
	(b) $P(QR \text{ or } RQ) = \frac{4}{24} = \frac{1}{6}$ Four choices are QRS, QRT, RQS and RQT	1 mark for correct answer
	(c) $P(T \text{ included in prizes }) = \frac{18}{24} = \frac{3}{4}$	1 mark for correct answer
	(d) $P(S \text{ not included in prizes }) = \frac{6}{24} = \frac{1}{4}$	1 mark for correct answer
	(e) In alphabetical order is either QRS or RST $P(\text{ Alphabetical order }) = \frac{2}{24} = \frac{1}{12}$	1 mark for correct answer
7.	(a) $P(NSW) = \frac{8+7+8+2}{80} = \frac{25}{80} = \frac{5}{16}$	1 mark for correct answer.
	(b) $P(\text{ only } WA) = \frac{18}{80} = \frac{9}{40}$ (Only lived in WA is outside all circles)	1 mark for correct answer.
	(c) $P(SA \text{ and Vic, not } NSW) = \frac{5}{80} = \frac{1}{16}$	1 mark for correct answer.

	Working and Answer	Marks
	(d) $P(NSW \text{ given Vic}) = \frac{7+2}{26} = \frac{9}{26}$	1 mark for correct answer.
8.	(a) The drawing of two cards in the game of Enterprise are dependent events which are those where one event has an effect on the result of the other. As the cards are selected together, the second card cannot be the same as the first.	2 marks for choosing the correct game and giving a correct and coherent explanation. 1 mark if not named the correct game, or if explanation is not clear or correct.
	(b) In the game of Venture, as the 1st card is replaced before the second is selected, the first and second cards can be the same, which is not possible in Enterprise, so Venture has the larger sample space. An example of an outcome which occurs only in the game of Venture is drawing the Ace of Spades twice.	2 marks for explaining the why Venture has more in its sample space and for giving an example of an outcome. 1 mark if explanation is not clear or correct or if an example is not given or is incorrect.