High School
Mathematics Test 2013

Year 9

Counting Techniques

Non Calculator

Skills and Knowledge Assessed:

- List all outcomes for two-step chance experiments, both with and without replacement using tree diagrams or arrays. Assign probabilities to outcomes and determine probabilities for events (ACMSP225)
- Calculate relative frequencies from given or collected data to estimate probabilities of events involving 'and' or 'or' (ACMSP226)
- Investigate reports of surveys in digital media and elsewhere for information on how data were obtained to estimate population means and medians (ACMSP227)

Name_____

Section 1 Short Answer Section

Write all working and answers in the spaces provided on this test paper.

Questions 1 – 3 refer to the following. A coin is tossed and a normal six sided die is rolled. Adam starts to draw up a table to show the possible outcomes.

	1	2	3	4	5	6
H	1,H	2,H	3, H			
T	1,T					

1. Complete the table.

2. What is the probability of tossing a head and rolling a five?

……

……

3. What is the probability of tossing a tail and rolling a multiple of 3?

……

……

4. Melissa places two red cards numbered 1 and 2 and three blue cards numbered 1 – 3, face down on a table. She mixes them up and picks up one red and one blue card. What is the probability that the cards have the same number?

Blue Card \ Red Card	1	2	3
1	1, 1		
2			

……

……

Questions 5 – 7 refer to the frequency table below, which shows the types of books on Carl's bookshelf.

Book Genre	Frequency	Relative Frequency
Crime	14	0.28
Thriller	16	
Comedy	5	
Biography	7	
Self Help	8	0.16

5. Complete the relative frequency column.

6. Carl picks a book at random from the bookshelf. What is the probability that it is a comedy book?

……

7. What is the probability that a book chosen at random is not a biography?

……

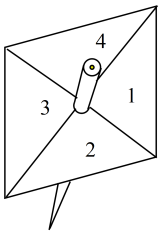
……

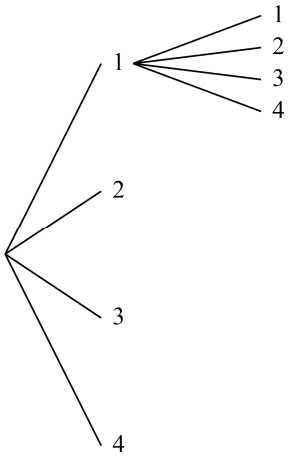
8. What is the probability that a book chosen at random is either a crime book or a thriller?

……

……

Questions 9 – 12 refer to the following. A spinner has four sectors numbered 1 – 4. A tree diagram has been started to show the possible outcomes when the spinner is spun twice.





9. How many possible outcomes are there from the two spins?

……

……

10. What is the probability that both spins result in a 4?

……

……

11. What is the probability that the same number occurs on both spins?

……

……

12. What is the probability that one spin gives a 1 and the other gives an even number?

……

……

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Counting Techniques

Year 9

Calculator Allowed

Name_____

Section 2 Multiple Choice Section

Mark all your answers on the accompanying multiple choice answer sheet, not on this test paper. You may do any working out on this test paper. Calculators are allowed for this section.

1. In a gym there are ten different exercise machines. Louis arrives at the gym and decides to do exercises on four different machines. Which calculation gives the number of different ways that he could choose to do his exercises?

   A. $1 + 2 + 3 + 4$ B. $1 \times 2 \times 3 \times 4$
   C. $10 + 9 + 8 + 7$ D. $10 \times 9 \times 8 \times 7$

Questions 2 – 3 refer to the following:

A survey of athletes asked if they used protein supplements and asked their mass. The results are shown in the table.

	Used supplement	Doesn't use supplement	Total
Above average mass	30	16	46
Not above average mass	12	22	34
Total	42	38	80

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2. A person is chosen at random from those who took part in the survey. What is the probability that they did not use the supplement?

   A. $\frac{1}{5}$ B. $\frac{8}{23}$ C. $\frac{19}{40}$ D. $\frac{11}{17}$

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3. If a person used the supplement, what is the probability that they were not above average mass?

   A. $\frac{2}{7}$ B. $\frac{6}{17}$ C. $\frac{15}{23}$ D. $\frac{5}{7}$

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4. An experiment is held where a pair of coins is tossed 50 times and the results are recorded in the table below.

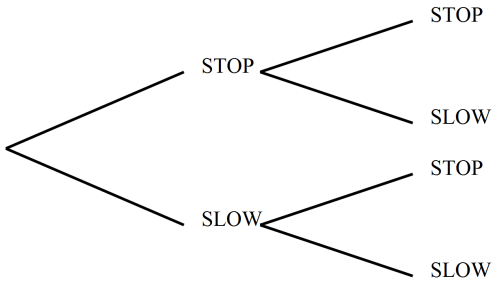
Result	Two Heads	A Head and a Tail	Two Tails	Total
Frequency	10	26	14	50

Based on this result, what is the probability that, when two coins are rolled, there is at least one Tail?

A. $\frac{7}{25}$ B. $\frac{13}{25}$ C. $\frac{18}{25}$ D. $\frac{4}{5}$

Questions 5 – 6 refer to the following.

Mr Harris passes through two sections of roadwork when driving to school. Each has STOP and SLOW signs showing for equal amounts of time. He draws the tree diagram below to show the possible outcomes at the roadwork.



5. What is the probability that he will have to stop at both lots of roadwork on his way to school?

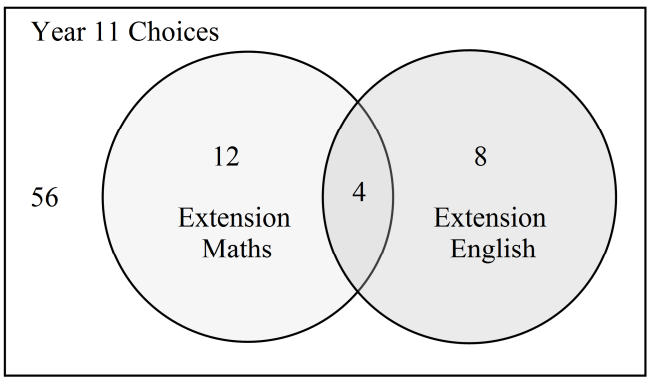
A. $\frac{1}{6}$ B. $\frac{1}{4}$ C. $\frac{1}{2}$ D. $\frac{3}{4}$

6. What is the probability that he will have to stop at least once for roadwork on his way to school?

A. $\frac{1}{6}$ B. $\frac{1}{4}$ C. $\frac{3}{4}$ D. $\frac{4}{5}$

Questions 7 and 8 refer to the following.

The Venn diagram at right shows how many Year 10 students chose Extension subjects in their Year 11 choices



7. A student is chosen at random. What is the probability that they chose Extension Maths?

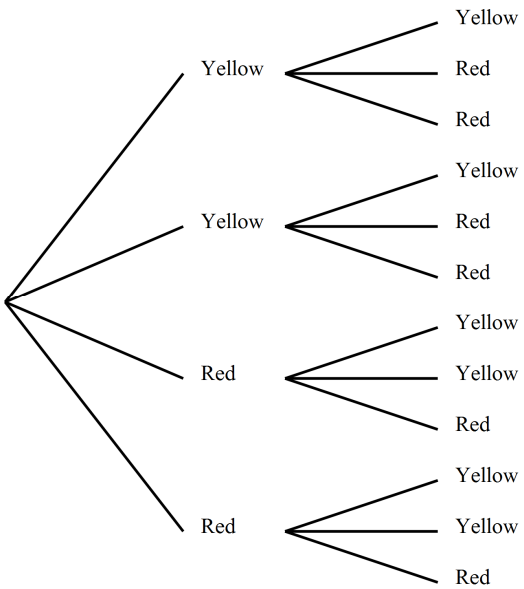
A. $\frac{1}{20}$ B. $\frac{1}{5}$ C. $\frac{1}{4}$ D. $\frac{2}{3}$

8. A student is chosen at random. What is the probability that they chose exactly one Extension subject?

A. $\frac{1}{20}$ B. $\frac{3}{20}$ C. $\frac{1}{5}$ D. $\frac{1}{4}$

Questions 9 – 10 refer to the following.

A barrel contains two yellow marbles and two red marbles. Two marbles are drawn out without replacement. The tree diagram gives the possible outcomes.



9. What is the probability that the two marbles are both yellow?

A. $\frac{1}{6}$ B. $\frac{1}{3}$ C. $\frac{1}{2}$ D. $\frac{2}{3}$

10. What is the probability that the two marbles are the same colour?

A. $\frac{1}{3}$ B. $\frac{1}{2}$ C. $\frac{2}{3}$ D. $\frac{3}{4}$

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Year 9

Counting Techniques

Calculator Allowed Section

Name_____

Section 3 Longer Answer Section

Write all working and answers in the spaces provided on this test paper.

Marks

1. A bag contains two blue counters, one green counter and one white counter. Two are drawn out without replacement.

   a) Draw a tree diagram to show the outcomes which are possible. **2**

   b) What is the probability that the two counters are blue and green? **1**

   ……

   ……

   c) What is the probability that the two counters are different colours? **1**

   ……

   ……

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Multiple Choice Answer Sheet

Name _____

Completely fill the response oval representing the most correct answer.

1.	A ⬭	B ⬭	C ⬭	D ⬭
2.	A ⬭	B ⬭	C ⬭	D ⬭
3.	A ⬭	B ⬭	C ⬭	D ⬭
4.	A ⬭	B ⬭	C ⬭	D ⬭
5.	A ⬭	B ⬭	C ⬭	D ⬭
6.	A ⬭	B ⬭	C ⬭	D ⬭
7.	A ⬭	B ⬭	C ⬭	D ⬭
8.	A ⬭	B ⬭	C ⬭	D ⬭
9.	A ⬭	B ⬭	C ⬭	D ⬭
10.	A ⬭	B ⬭	C ⬭	D ⬭

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Counting Techniques

ANSWERS

Section 1

1.

	1	2	3	4	5	6
H	1, H	2, H	3, H	4, H	5, H	6, H
T	1, T	2, T	3, T	4, T	5, T	6, T

2. $P(H\,5) = \frac{1}{12}$

3. $P(T \text{ and Mult of } 3) = \frac{2}{12} = \frac{1}{6}$

4. P(Same number) = $\frac{2}{6} = \frac{1}{3}$

5.

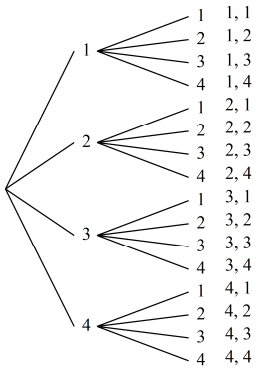
Book Genre	Frequency	Relative Frequency
Crime	14	0.28
Thriller	16	**0.32**
Comedy	5	**0.1**
Biography	7	**0.14**
Self Help	8	0.16

6. P(Comedy) = 0.1

7. P(Not Biography) = 1 – 0.14 = 0.86

8. P(Crime or Thriller) = 0.28 + 0.32 = 0.6

9.



There are 16 outcomes.

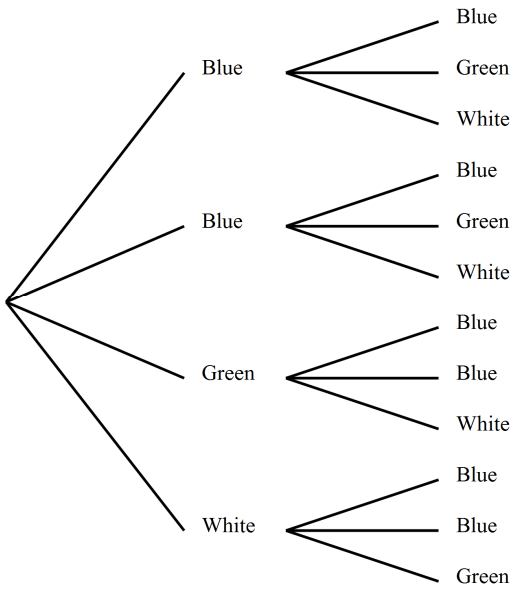
10. P(4,4) = $\frac{1}{16}$

11. P(Same number) = $\frac{4}{16} = \frac{1}{4}$

12. Favourable outcomes are 1, 2 1, 4 2, 1 4, 1

P(1 and even number) = $\frac{4}{16} = \frac{1}{4}$

Section 2	
1.	D
2.	C
3.	A
4.	D
5.	B
6.	C
7.	B
8.	D
9.	A
10.	A

Section 3		
1.	a) 	2 marks
	b) $P(\text{Blue and Green}) = \frac{4}{12} = \frac{1}{3}$	1 mark
	c) $P(\text{Different}) = 1 - P(\text{Same}) = 1 - \frac{1}{6} = \frac{5}{6}$	1 mark

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Multiple Choice Answer Sheet

Name Marking Sheet

Completely fill the response oval representing the most correct answer.

1.	A ○	B ○	C ○	D ●
2.	A ○	B ○	C ●	D ○
3.	A ●	B ○	C ○	D ○
4.	A ○	B ○	C ○	D ●
5.	A ○	B ●	C ○	D ○
6.	A ○	B ○	C ●	D ○
7.	A ○	B ●	C ○	D ○
8.	A ○	B ○	C ○	D ●
9.	A ●	B ○	C ○	D ○
10.	A ●	B ○	C ○	D ○