School Name
Mathematics 2017

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)

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:
Mac has two pairs of pants, (Jeans and Chinos) and three tops (T Shirt, Singlet and Polo) in his overnight bag. He chooses one top and a pair of pants at random to wear.

	Jeans	Chinos
T Shirt	J T	C T
Singlet	J S	C S
Polo	J P	C P

The table shows his possible combinations.

1. What is the probability that he wears Jeans with a T shirt?

   …….

2. What is the probability that he wears either Jeans or a T Shirt or both?

   ……....

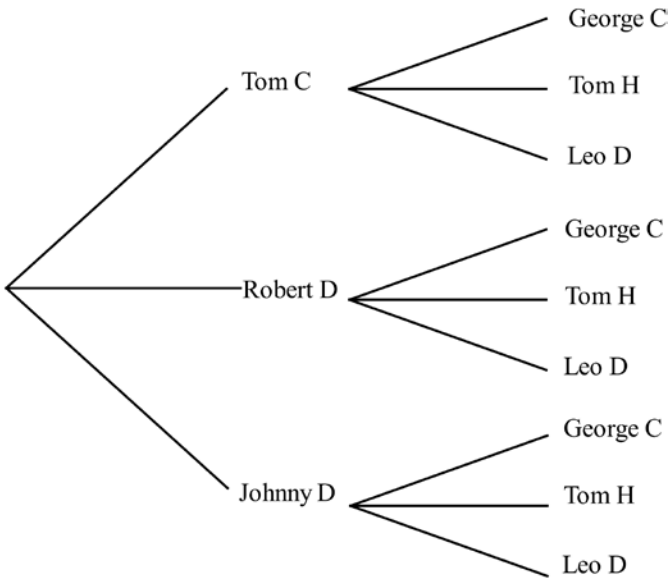
   …….

3. What is the probability that he doesn't wear Chinos and a Singlet together?

   ……....

   …….

Questions 4 – 6 refer to the following:
A film producer has two male roles to fill in a movie. He has a shortlist of three actors for each role. He writes the names for each part in a hat and draws out two names at random.



The tree diagram shows the possible pairings.

4. What is the probability that Johnny D and Tom H fill the two roles?

……....

……

5. What is the probability that both roles are filled by an actor whose second initial is D?

……....

……

6. What is the probability that at least one of the roles are filled by an actor named Tom?

……....

……

Questions 7 – 9 refer to the following:

Driver	Movie	Beach
Anna	A M	A B
Laura	L M	L B
Trish	T M	T B
Shay	S M	S B

Four friends draw straws to see who drives on their day out.
They also flip a coin to decide whether to go to the movies or the beach.
The table shows the possible combinations.

7. What is the probability that Anna drives them to the beach?

……....

…….

8. What is the probability that Laura or Trish Drive?

……....

…….

9. What is the probability that Shay drives or they go to the movies, but not both?

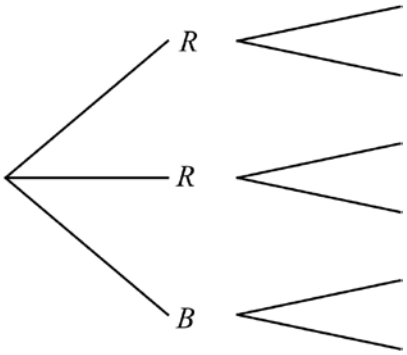
……....

…….

Questions 10 – 12 refer to the following:

Shawna puts two red marbles and one blue marble into a bag and draws two marbles back out without looking.

10. Complete the tree diagram to show the possible combinations of two marbles.



11. What is the probability that both marbles are red?

……....

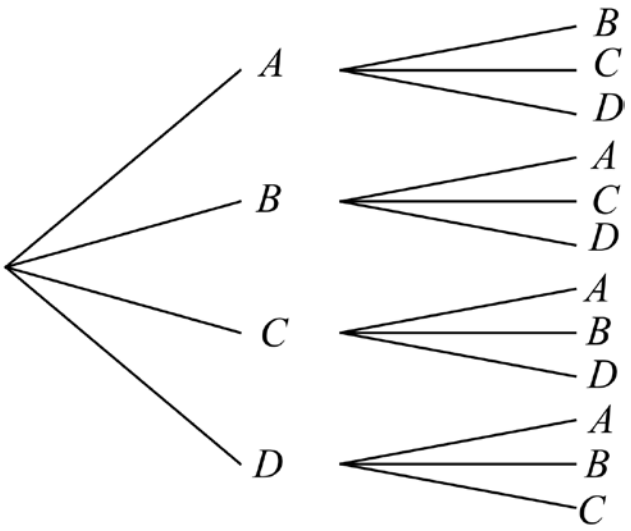
……

12. What is the probability that one marble is blue and the other is red?

……....

……

Questions 13 – 15 refer to the following:
Steve has four dogs named Adam, Basil, Charlie and Dion.
One day he chooses the first pair to take for a walk by drawing two names out of a hat.



The tree diagram shows the possible pairs.

13. What is the probability that Adam and Basil are the first pair?

…….

14. What is the probability that Charlie is one of the names drawn?

……....

…….

15. What is the probability that Dion is drawn, but Adam isn't?

……....

…….

Questions 16 – 18 refer to the following:
A survey was done on the left or right-handedness for people who were born in the 1950s, compared to those who were born in the 2000s.

	1950s	2000s	Total
Left Handed	14	36	50
Right Handed	66	84	150
Total	80	120	

The two-way table shows the results
One of the people included in the survey is chosen at random.

16. What is the probability that the person is left-handed and was born in the 1950s?

……....

…….

17. If the person was born in the 1950s, what is the probability that they are left-handed?

……....

…….

18. What is the probability that the person is right handed or born in the 2000s but not both?

……....

…….

School Name
Mathematics 2017

Calculator Allowed

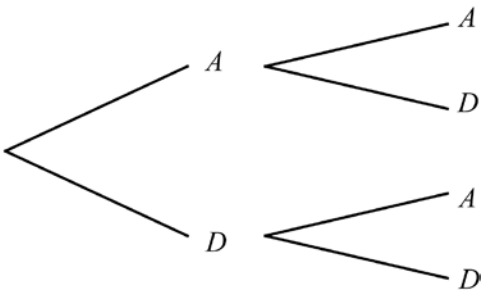
Year 9 **Counting Techniques**

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.

Questions 1 and 2 refer to the following:
William completes a form which has two statements with which he can Agree or Disagree.
He randomly chooses his answers.
The possible combinations of his answers are shown in the tree diagram.



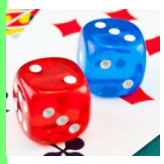
1. What is the probability that he agrees with both statements?

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

2. What is the probability that he gives different answers to the two statements?

   A. 0 B. $\frac{1}{4}$ C. $\frac{1}{2}$ D. $\frac{3}{4}$

Questions 3 – 6 refer to the following:
A pair of dice are rolled and the numbers on the dice are multiplied together.
The possible outcomes are shown in the table below.



Dice	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	4	6	8	10	12
3	3	6	9	12	15	18
4	4	8	12	16	20	24
5	5	10	15	20	25	30
6	6	12	18	24	30	36

3. What is the probability of rolling a product of 4?

A. $\frac{1}{36}$ B. $\frac{1}{12}$ C. $\frac{1}{18}$ D. $\frac{1}{6}$

4. What is the probability that the product is greater than 17?

A. $\frac{1}{9}$ B. $\frac{5}{18}$ C. $\frac{1}{3}$ D. $\frac{7}{36}$

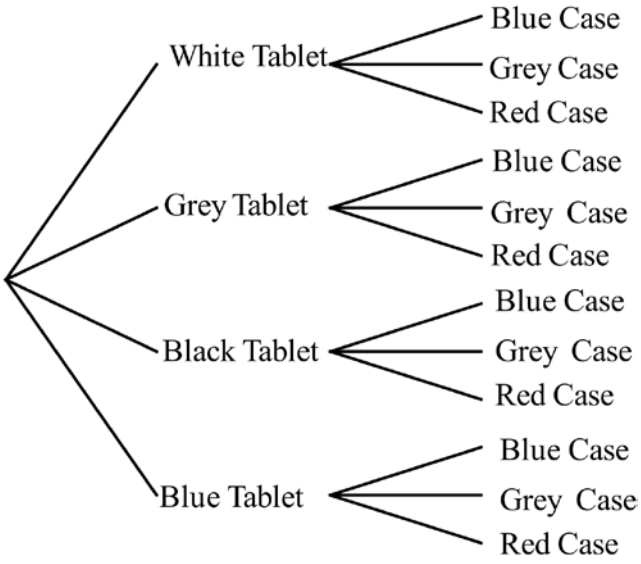
5. What is the probability that the product contains the digit 3?

A. $\frac{5}{36}$ B. $\frac{5}{18}$ C. $\frac{5}{12}$ D. $\frac{5}{9}$

6. What is the probability that the product is 12 or 18?

A. $\frac{1}{12}$ B. $\frac{1}{9}$ C. $\frac{5}{36}$ D. $\frac{1}{6}$

Questions 7 – 9 refer to the following:
Lois wants to buy a new tablet and case.
To achieve a discount, she will be randomly allocated one of four colours for the tablet and three colours for the case.
The choices are shown on the tree diagram.



7. What is the probability that she gets a black tablet with a grey case?

A. $\frac{1}{12}$ B. $\frac{1}{6}$ C. $\frac{1}{4}$ D. $\frac{1}{3}$

8. What is the probability that she gets a grey tablet or a grey case, but not both?

A. $\frac{1}{6}$ B. $\frac{1}{4}$ C. $\frac{1}{3}$ D. $\frac{5}{12}$

9. What is the probability that she gets a tablet and case which are the same colour?

A. 0 B. $\frac{1}{12}$ C. $\frac{1}{6}$ D. $\frac{5}{12}$

Questions 10 – 12 refer to the following:
Will and Jess have a new baby boy and plan to choose two given names for him.

They place the five possible first names and four possible second names into two containers and draw one from each.

The table shows the possible choices.

First → / Second ↓	Alan	Charles	Jayson	Stevie	William
Aiden	Alan Aiden	Charles Aiden	Jayson Aiden	Stevie Aiden	William Aiden
Evan	Alan Evan	Charles Evan	Jayson Evan	Stevie Evan	William Evan
Shaun	Alan Shaun	Charles Shaun	Jayson Shaun	Stevie Shaun	William Shaun
Timothy	Alan Timothy	Charles Timothy	Jayson Timothy	Stevie Timothy	William Timothy

10. What is the probability that they use the name William Aiden?

A. $\frac{1}{20}$ B. $\frac{1}{10}$ C. $\frac{1}{5}$ D. $\frac{1}{4}$

11. What is the probability that the names Evan or Jayson (or both) are used?

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

12. What is the probability that both names start with the same letter?

A. $\frac{1}{20}$ B. $\frac{1}{10}$ C. $\frac{1}{5}$ D. $\frac{1}{4}$

Questions 13 - 15 refer to the following:
A market research company collects information on the number of screens that movies are showing on.

The results for a particular day are shown in the table below.

A relative frequency column has been started.

Movie	Number of Screens (*f*)	Relative Frequency
The Girl on the Train	50	0.2
Deepwater Horizon	25	0.1
The Magnificent Seven	30	0.12
The Secret Life of Pets	45	0.18
Storks	35	
Sully	25	0.1
Nerve	40	

13. What numbers go in the relative frequency column for the movies Storks and Nerve?

A. 0.07 and 0.08 B. 0.07 and 0.16 C. 0.08 and 0.14 D. 0.14 and 0.16

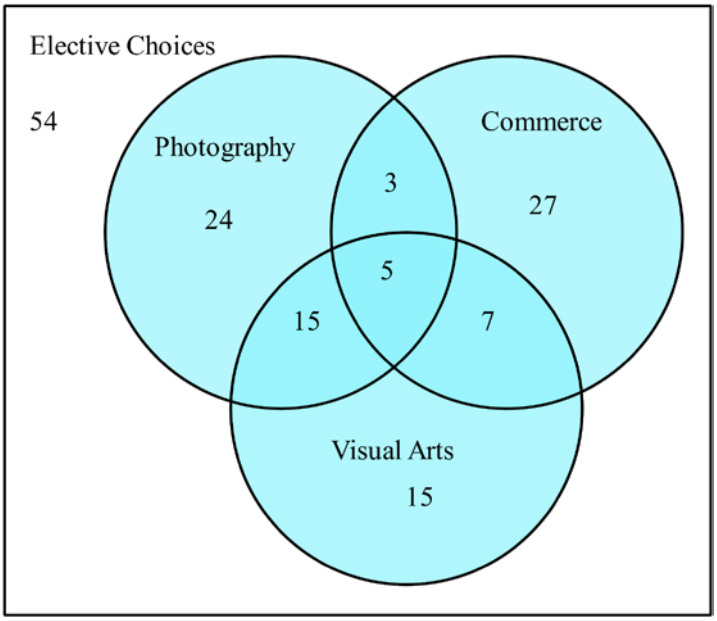
14. If one of the surveyed screens is chosen at random what is the probability that it is showing a movie whose title starts with the word "The"?

A. 0.32 B. 0.47 C. 0.5 D. 0.53

15. If one of the surveyed screens is chosen at random what is the probability that it is showing a movie with a single word title?

A. 0.3 B. 0.34 C. 0.36 D. 0.4

Questions 16 – 18 refer to the following:
The Venn diagram shows the elective choices for Year 9 students at Whyhope High School.



One of the students is chosen at random.

16. What is the probability that the student chooses Commerce and Visual Arts?

A. 0.08 B. 0.075 C. 0.1 D. 0.125

17. What is the probability that the student chooses Visuals Arts or Commerce or both?

A. 0.46 B. 0.48 C. 0.51 D. 0.72

18. If we know that the student doesn't choose Visual Arts, what is the probability that they choose Photography?

A. 0.125 B. 0.25 C. 0.375 D. 0.55

School Name
Mathematics 2017

Year 9 **Counting Techniques**

Calculator Allowed

Name_____

Section 3 Longer Answer Section

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

Marks

1. Five cards are laid face down on a table. Two of the cards are Hearts, two are Spades and one is Diamonds.
Two cards are picked up together from the table.

(a) Draw a tree diagram to show the possible combinations of suits for the two cards. **2**

(b) What is the probability that both cards are Hearts? **1**

……..

(c) What is the probability that neither of the cards is Diamonds? **1**

……..

……..

(d) If the first card is a Heart, what is the probability that the second card is a Spade? **1**

……..

……..

School Name

Mathematics 2017

Multiple Choice Answer Sheet

Counting Techniques

Name _____

Completely fill the response oval representing the most correct answer.

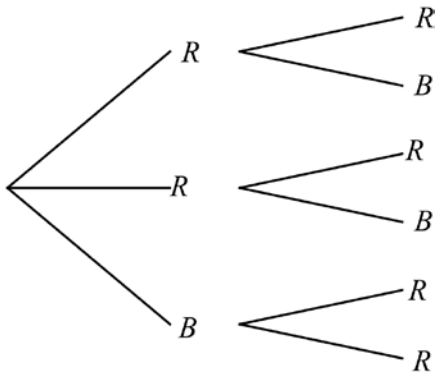
1. A ⬭ B ⬭ C ⬭ D ⬭
2. A ⬭ B ⬭ C ⬭ D ⬭
3. A ⬭ B ⬭ C ⬭ D ⬭
4. A ⬭ B ⬭ C ⬭ D ⬭
5. A ⬭ B ⬭ C ⬭ D ⬭
6. A ⬭ B ⬭ C ⬭ D ⬭
7. A ⬭ B ⬭ C ⬭ D ⬭
8. A ⬭ B ⬭ C ⬭ D ⬭
9. A ⬭ B ⬭ C ⬭ D ⬭
10. A ⬭ B ⬭ C ⬭ D ⬭
11. A ⬭ B ⬭ C ⬭ D ⬭
12. A ⬭ B ⬭ C ⬭ D ⬭
13. A ⬭ B ⬭ C ⬭ D ⬭
14. A ⬭ B ⬭ C ⬭ D ⬭
15. A ⬭ B ⬭ C ⬭ D ⬭
16. A ⬭ B ⬭ C ⬭ D ⬭
17. A ⬭ B ⬭ C ⬭ D ⬭
18. A ⬭ B ⬭ C ⬭ D ⬭

School Name
Mathematics Test 2017

Year 9 *Counting Techniques* Non Calculator Section

ANSWERS

Question	Working and Answer
1.	$P(J\ T) = \mathbf{\frac{1}{6}}$
2.	$P(J \text{ or } T \text{ or both}) = \frac{4}{6} = \mathbf{\frac{2}{3}}$
3.	$P(C\ S) = \mathbf{\frac{1}{6}}$ $P(\text{Not } C\ S) = 1 - \frac{1}{6} = \mathbf{\frac{5}{6}}$
4.	$P(\text{ JD and TH}) = \mathbf{\frac{1}{9}}$
5.	$P(JD\ LD \text{ or } RD\ LD) = \mathbf{\frac{2}{9}}$
6.	Choices which include Tom are (TC GC) (TC TH) (TC LD) (RD TH) (JD TH) $P(\text{ a Tom is included}) = \mathbf{\frac{5}{9}}$
7.	$P(\text{AB}) = \mathbf{\frac{1}{8}}$
8.	$P(\text{L or T}) = \frac{4}{8} = \mathbf{\frac{1}{2}}$
9.	$P(\text{AM LM TM SB}) = \frac{4}{8} = \mathbf{\frac{1}{2}}$

Question	Working and Answer
10.	
11.	$P(RR) = \frac{2}{6} = \mathbf{\frac{1}{3}}$
12.	$P(BR \text{ or } RB) = \frac{4}{6} = \mathbf{\frac{2}{3}}$
13.	$P(AB \text{ or } BA) = \frac{2}{12} = \mathbf{\frac{1}{6}}$
14.	Choices which include Charlie are AC BC CA CB CD DC $P(\text{C included}) = \frac{6}{12} = \mathbf{\frac{1}{2}}$
15.	Choices which include Dion but not Adam are BD CD DB DC $P(\text{D included A not}) = \frac{4}{12} = \mathbf{\frac{1}{3}}$
16.	$P(\text{L and 50s}) = \frac{14}{200} = \mathbf{\frac{7}{100}}$
17.	$P(\text{L given 50s}) = \frac{14}{80} = \mathbf{\frac{7}{40}}$
18.	$P(\text{R or 200s not both}) = \frac{66+36}{200} = \frac{102}{200} = \mathbf{\frac{51}{100}}$

School Name
Mathematics Test 2017

Year 9

Counting Techniques

Calculator Allowed
Multiple Choice
Section

ANSWERS

Question	Working	Answer
1.	$P(AA) = \frac{1}{4}$	**A**
2.	$P(DA \text{ or } AD) = \frac{2}{4} = \frac{1}{2}$	**C**
3.	$P(\text{product } 4) = \frac{3}{36} = \frac{1}{12}$	**B**
4.	$P(\text{product} > 17) = \frac{10}{36} = \frac{5}{18}$	**B**
5.	$P(\text{digit } 3) = \frac{5}{36}$	**A**
6.	$P(\text{product is 12 or 18}) = \frac{6}{36} = \frac{1}{6}$	**D**
7.	$P(\text{BlackT Grey C}) = \frac{1}{12}$	**A**
8.	$P(\text{Grey T or Grey C not Both}) = \frac{5}{12}$	**D**
9.	$P(\text{Same Colour}) = P(GG \text{ or } BB) = \frac{2}{12} = \frac{1}{6}$	**C**
10.	$P(\text{William Aiden}) = \frac{1}{20}$	**A**
11.	$P(\text{Evan or Jayson or Both}) = \frac{8}{20} = \frac{2}{5}$	**C**
12.	$P(AA \text{ or } SS) = \frac{2}{20} = \frac{1}{10}$	**B**

13.	Total Screens = 250 $\text{Storks} = \frac{35}{250} = 0.14$ $\text{Nerve} = \frac{40}{250} = 0.16$	**D**
14.	P(Starts with THE) $= \mathbf{0.2 + 0.12 + 0.18 = 0.5}$	**C**
15.	P(Single word title) $= \mathbf{0.14 + 0.1 + 0.16 = 0.4}$	**D**
16.	Total Students = 150 P(Commerce and VA) $= \frac{7+5}{150} = \frac{\mathbf{12}}{\mathbf{150}} = \mathbf{0.08}$	**A**
17.	P(Commerce or VA or both) $= \frac{7+5+3+27+15+15}{150} = \frac{\mathbf{72}}{\mathbf{150}} = \mathbf{0.48}$	**B**
18.	Students who don't do VA = 108 P(Photo given not VA) $= \frac{24+3}{108} = \frac{\mathbf{27}}{\mathbf{108}} = \mathbf{0.25}$	**B**

School Name

Mathematics 2017

Multiple Choice Answer Sheet

Counting Techniques

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 ○
11.	A ○	B ○	C ●	D ○
12.	A ○	B ●	C ○	D ○
13.	A ○	B ○	C ○	D ●
14.	A ○	B ○	C ●	D ○
15.	A ○	B ○	C ○	D ●
16.	A ●	B ○	C ○	D ○
17.	A ○	B ●	C ○	D ○
18.	A ○	B ●	C ○	D ○

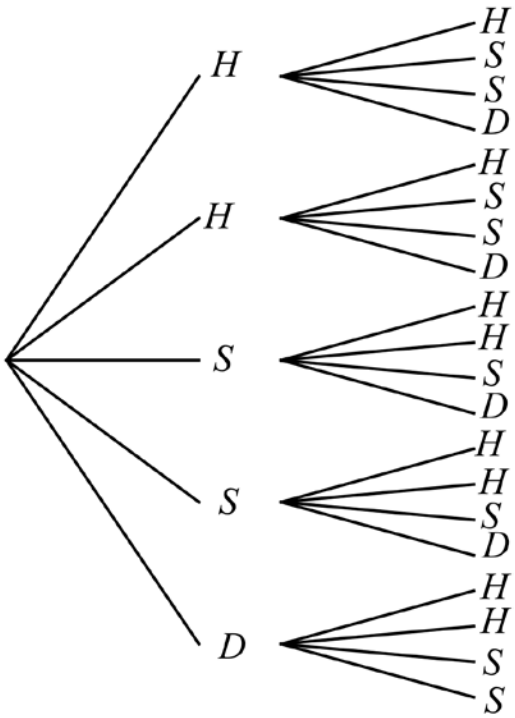
School Name
Mathematics Test 2017

Year 9

Counting Techniques

Calculator Allowed
Longer Answer Section

ANSWERS

Question	Working and Answer	Marks
1.	(a) 	2 marks for correct and complete tree diagram 1 mark if basically correct layout but with a minor error
	(b) $P(HH) = \frac{2}{20} = \frac{1}{10}$	1 mark for correct answer
	(c) $P(\text{one diamond}) = \frac{8}{20} = \frac{2}{5}$ $P(\text{no diamond}) = 1 - \frac{2}{5} = \frac{3}{5}$	1 mark for correct answer
	(d) There are 8 ways the first card is a H. Of these, 4 have the second as a S. $P(S \text{ second given } H \text{ first}) = \frac{4}{8} = \frac{1}{2}$	1 mark for correct answer