



**Applecross Senior High School**  
**SPECIALIST MATHEMATICS UNIT 1 & 2**  
**TEST 1, 2021**

Section A:

**16**

**SECTION A:** *Standard Formula Sheet allowed. No other notes or Calculators allowed.*

Name: \_\_\_\_\_

Time Allowed: 18 minutes.

1. [1, 1, 2 = 4 marks]

Alan, Barry, Christine and Dianne are to be arranged in a line for a photograph.

**Give all answers as numbers.**

a) How many arrangements are possible?

b) In how many of these arrangements are Alan and Christine side by side?

c) Alan is married to Christine and Barry is married to Dianne. The photographer doesn't know this and randomly places them all in a line. What is the **probability** that he arranges them with both of the couples next to their own partner?

2. [ 2, 3 = 5 marks]

(a) Rewrite using factorial notation:  $39 \times 38 \times 37 \times 36 \times 35$

(b) Solve  $\frac{n!}{(n-2)!} = 2$

3. [1, 2 = 3 marks]

- (a) How many ways can the 9 letters of the word BOORAGOON be arranged in a row?  
*Leave your answer in factorial notation.*

- (b) How many of these words start with the letter G?  
*Leave your answer in factorial notation.*

4. [2, 2 = 4 marks]

I have the numbers 1 to 20 written on individual cards which are placed inside a bag and randomly drawn out, one at a time.

- a) How many do I have to draw out to guarantee that I can put 2 of them together for a total of 21? Explain how you got the answer.

- b) How many cards would be needed to guarantee a pair that would total 24?  
Explain your answer.



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Section B:

**34**

**SECTION B:** *Standard Formula Sheet, calculator and an A4 sheet of notes allowed.*

Name: \_\_\_\_\_

Time Allowed: 37 minutes.

**\*\* GIVE ALL NON EXACT VALUE ANSWERS CORRECT TO 1 DECIMAL PLACE**

5. [1, 1, 1, 2, 2 = 7 marks]

Four digit numbers are to be formed from the digits 0, 2, 4, 6, and 8 without repetition.

We are allowing the number to start with 0, i.e. **0468 is a valid answer.**

How many of these 4-digit numbers:

a) may be formed?

b) begin with 8?

c) end in a 2 or 4?

d) are **less than** 0486?

e) A 2 digit code is to be chosen from the digits {0, 2, 4, 6, 8} OR from the digits {6, 7, 8, 9}.  
How many of these 2 digit codes are possible?

6. [4 marks]

From a group of 7 cyclists, 8 gymnasts and 6 athletes, two representatives from each sport are to be chosen and then arranged in a line for a publicity photo. How many possible arrangements are there if the representatives of each sport must stand together? **Clearly justify your answer.**

7. [1, 1, 3 = 5 marks]

Three teachers and four students are to be arranged in line for a photo-shoot. Leaving your answer in non-simplified form, in how many ways can this be done if,

(a) a teacher must stand at either end of the row.

(b) a teacher must stand at either end of the row and at the centre.

(c) The teachers must not be next to another teacher.



8. [1, 1, 3, 2 = 7 marks]

A committee of **four** is to be chosen from five teachers (two of whom are Mr Black and Mrs Collins) and the eight student council members. In how many ways can the committee be selected with:

a) no restriction

b) at least one student?

c) Mr Black and Mrs Collins cannot both be on the committee, which must have equal numbers of teachers and students.

d) Once the committee from part C is formed, they then elect a Chairperson and Secretary. How many **different** committees are now possible? Explain!

9. [3 marks]

Explain why if I randomly chose 6 positive integers at least 2 of them would differ by a multiple of

5.

Hint:  $36 = 7 \times 5 + 1$

10.[4 marks]

How many **different** 4 letter words can be formed from the word “NEEDLED”?

11.[2, 2 = 4 marks]

Five friends have gone to a restaurant by the ocean. Their table has been set with 3 chairs facing the ocean and 2 facing into the restaurant. How many ways can they be seated if:

a) John and Alison who are a couple insist on facing the ocean sitting side by side?

b) John and Alison realise they are selfish to insist on ocean views but still wish to sit side by side?