

**Mathematics Specialist Year 11**

Student name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Teacher name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date: Friday 14 May 2021

**Task type: Response**

**Time allowed: 40 minutes**

**Number of questions: 8**

**Materials required:** Calculator with CAS capability (to be provided by the student)

Standard items: Pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: Drawing instruments, templates, notes on two unfolded sheet of   
A4 paper, and up to three calculators approved for use in the WACE examinations



**Marks available: 40 marks**

**Task weighting: 10%**

**Formula sheet provided: Yes**

**Note: All part questions worth more than 2 marks require working to obtain full marks.**

**Question 1 {1.3.4, 1.3.5} (3 marks)**

Let and be positive integers. Prove by contradiction that

**Question 2 {1.3.4, 1.3.5} (3 marks)**

A high school student council has 7 boys and 6 girls. A yearbook committee of 7 people is to be appointed from the student council.

1. In how many different ways can the committee be selected if all the members are available?

(1 mark)

1. In how many different ways can the committee be selected if it is to have more girls than boys?



(2 marks)

**Question 3 {1.3.4, 1.3.5} (6 marks)**

Anna, Belinda and Charles belong to a team of 8 students.

1. How many selections of 4 students would include both Anna and Belinda but not Charles?

(2 marks)

A team photo is about to be taken with all eight students standing next to each other.

1. Determine the number of arrangements in which;
   1. Anna is standing at one end and Belinda and Charles are standing next to each other

(3 marks)

* 1. Anna and Belinda are standing next to each other and Charles is standing next to them

(3 marks)

**Question 4 {1.3.4, 1.3.5} (7 marks)**

1. Seven teams play 23 volleyball games. Prove that there is some pair of teams that play each other more than once. (2 marks)



1. How many of the integers from 1 to 220 inclusive are divisible by 2, 5 or 11? (5 marks)

**Question 5 {1.3.4, 1.3.5} (11 marks)**

Let **,** and

1. Find a unit vector in the same direction as (1 mark)
2. A vector in the same direction as but equal in magnitude to (2 marks)
3. Solve for if and are perpendicular (2 marks)

Solve for if and are parallel (3 marks)

1. Solve for if the angle between and is . Make sure you clearly show the use of the scalar product (3 marks)

**Question 6 {1.3.4, 1.3.5} (4 marks)**

Let and be the points defined by the position vectors and respectively. Find;

1. The component of that is parallel to (2 marks)



1. The component of that is perpendicular to (2 marks)



**Question 7 {1.3.4, 1.3.5} (4 marks)**

A helicopter can maintain a speed of 200 km/h in still air. What bearing should the pilot set if they wish to fly 380 km in a direction of ? The instrument readout shows that the wind is blowing at 60 km/h from .

(Additional working space)