

**Mathematics Specialist Year 11**

Student name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Teacher name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date: Friday 23rd July 2021

**Task type: Response**

**Time allowed: 45 minutes**

**Number of questions: 6**

**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 sheets 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.**

1. [7 marks]

Use mathematical induction to prove that

for all positive integers .

1. [2 marks]

A question in a Specialist exam paper asked students to prove the following statement:

‘ is odd if and only if is odd (where is an integer)’.

One student wrote the answer below. Explain clearly why they should **not** receive full marks for this answer.

*Proof:*

*We prove the contrapositive. Assume that is an even integer. Then for some integer . Now*

*which is even since is an integer. Hence if is even then is even, which implies that is odd if and only if is odd.*

1. [9 = 3+3+3 marks]

Write whether each of the following statements is true or false, and prove or disprove it accordingly.

1. For all positive real numbers
2. There exist distinct prime numbers and such that .
3. There exist distinct prime numbers and such that .
4. [6 marks]

Find the values of and in each of the following:

1. Diagram

   Description automatically generated and all lie on the circle with centre :
2. Diagram

   Description automatically generated is tangent to the circle with centre .
3. [5 marks]

is a quadrilateral such that each of the four sides is tangent to the same circle, at the points and , as illustrated below. If , and , find the length .

Diagram

Description automatically generated

1. [11 = 3+4+4 marks]

Solve each of the following trigonometric equations for in the stated domain.

**Show all working to support your answers.**

1. for
2. for
3. for