PERTH MODERN SCHOOL
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Independent Public School

Mathematics Specialist Year 11

Student name: _____ Teacher name: _____

Date: Friday 21st February 2020

Task type:	**Response**
Time allowed:	**45 mins**
Number of questions:	**7**
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 one unfolded sheet of A4 paper, and up to three calculators approved for use in the WACE examinations
Marks available:	**45 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 (2.3.2) (3 marks)

(a) Give a decimal representation of $\frac{2}{7}$ (1 mark)

(b) Write $0.3\dot{2}5\dot{4}$ in the form $\frac{m}{n}$ where *m* and *n* are integers and n≠0. An answer without working will not be awarded any marks (2 marks)

Question 2 (2.3.1) (3 marks)

Answer with True or False;

(a) The product of two rational numbers can be irrational (1 marks)

(b) The sum of two irrational numbers is always irrational (1 marks)

(c) The quotient of two irrational numbers is also irrrational (if defined) (1 marks)

Question 3 (2.3.1) (8 marks)

(a) Assume that a is even and b is odd. Prove that ab^2 is even. (3 marks)

(b) Show that $u^2 + t^2 \geq -2ut$ given that u and t are real numbers. (3 marks)

(c) Prove that $\frac{w}{w+3} > \frac{w-3}{w}$ given that w$\in$ {1, 2, 3 …} (4 marks)

Question 4 (1.3.1) (3 marks)

(a) Negate the statement "The sum of each pair of prime numbers is even" (1 mark)

(b) Negate the statement "12 is divisible by 2 or 5". (1 mark)

(c) Write down the contrapositive of "If $2^x \geq 2^y$, then $x \geq y$" (1 mark)

Question 5 (1.3.1, 2.3.1) (6 marks)

Write down the contrapositive and prove the following statements

(a) If $n^2 - 10n + 9$ is even, then n is odd. (3 marks)

(b) If $2x + 3y \geq 12$, then $x \geq 3$ or $y \geq 2$ (3 marks)

Question 6 (3.1.1, 3.1.4, 3.1.9) (9 marks)

Use proof by contradiction for the following questions;

(a) Suppose that $5^x = 8$. Prove that x is irrational. (4 marks)

(b) Suppose that $m^2 - n^2 - 4 = 0$. Prove that m and n cannot both be natural numbers (5 marks)

Question 7 (3.1.1, 3.1.4, 3.1.9) (10 marks)

(a) Write the contrapositive of "if m^3 is divisible by 3 then m is divisible by 3" (1 mark)

(b) Prove the contrapositive above (hint: you will need to consider cases) (4 marks)

(c) Hence, prove by contradiction that $\sqrt[3]{3}$ is irrational. (6 marks)