



PERTH MODERN SCHOOL
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Independent Public School

Course: Mathematics Specialist Year 11
Test 1 2021

Student name: _____ Teacher name: _____

Date: 19th February 2021

Task type: Response

Time allowed for this task: 40 mins

Number of questions: Eight

Materials required:

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

Special items: Drawing instruments, templates

Marks available: 34 marks

Task weighting: 10%

Formula sheet provided: No

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

Question 1 {2.3.2}**(4 marks)**

Show that $3.4\overline{67}$ is a rational number.

Question 2 {1.3.1}**(3 marks)**

Consider the statement: "If the river floods, then school will be cancelled."

Assuming this to be a true statement:

- (a) Write down the contrapositive of the statement. (1)

- (b) Is the contrapositive valid? Explain. (2)

Question 3 {1.3.1}**(3 marks)**

The statement 'if a natural number is a multiple of 4 and a multiple of 5 then the natural number is a multiple of 20' is true. Write the contrapositive of the statement and explain whether or not the contrapositive is also true.

Question 4 {1.3.1}**(3 marks)**

You are travelling to a town and come to a point where the road splits into two (ie a fork in the road). There are two people (Person A and Person B) standing at the fork and as you do not know which way to go you need to ask for help. It is known that one of the people will always lie and the other will always tell the truth. You can only ask one question to only one of the people. The question you ask of Person A is "Which road would the other person tell me to take?"

Explain why this question would always give you the correct road to take.

Question 5 {1.3.1, 2.3.1}**(4 marks)**

Prove that the reciprocal of any irrational number is irrational by proving the contrapositive.

Question 6 {2.3.1}**(7 marks)**

- a) An arithmetic sequence is a set of numbers which has a first term and a common difference. For the sequence $\{5, 9, 13, 17, \dots\}$ the first term is 5 and the common difference is 4.
- (i) Write down the next three terms of this sequence. (1 mark)
- (ii) Choose any three consecutive terms and show that the sum of these terms is a multiple of 3. (2 marks)
- b) Prove that the sum of any three consecutive terms of an arithmetic sequence with first term a and common difference d is always a multiple of three, for $a, d \in \mathbb{N}$. (4 marks)

Question 7 {2.3.1}**(5 marks)**

Prove that, for every positive real number x , $\frac{x}{x+1} < \frac{x+1}{x+2}$.

Question 8 {1.3.1, 2.3.1}**(5 marks)**

A proposition states that for any integer n , if $n^2 - 4n - 3$ is even, then n is odd.

(a) Write the contrapositive of this proposition.

(1 mark)

(b) Use the contrapositive statement to prove the proposition is true.

(4 marks)

END OF TEST