PERTH MODERN SCHOOL
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Independent Public School

Course Specialist Year 11 Test 1 2022

Student name: ________________ Teacher name: ________________

Task type: **Response**

Time allowed for this task: 40 mins

Number of questions: **5**

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: **32 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 **(6 marks)**

Write down the contrapositive statement and state whether each one is true or false.

(a) If $x \geq -3$, then $x^2 \geq 9$. (2 marks)

(b) If a quadrilateral has four right angles, then it is a square. (2 marks)

(c) If two rectangles are not congruent then they do not have same area. (2 marks)

Question 2 **(7 marks)**

(a) Use proof by contraposition to prove that if n^2 is even, then n is even, where $n \in \mathbb{Z}$. (4)

(b) Hence or otherwise prove that, if x and y are integers and if $x^2 + y^2$ is even, then $x + y$ is even. (3)

Question 3 **(3 marks)**

A set of real numbers is given by $\{\pi,\ \sqrt{5},\ 0.\overline{36},\ \sqrt[3]{10}\}$. Identify the rational number and clearly show that it satisfies the definition of a rational number.

Question 4 **(8 marks)**

(a) Prove algebraically that if you add the squares of three consecutive numbers and then subtract 2, you always get a multiple of three. (4)

(b) Prove that one more than $(n+1)^2 - (n-1)^2$ is always odd, where n is a positive integer. (4)

Question 5 **(8 marks)**

(a) Prove that if $\boldsymbol{n^2}$ is divisible by 3, then $\boldsymbol{n}$ is divisible by 3. (4)
(Hint: Prove the contrapositive by considering two cases, when $\boldsymbol{n = 3k + 1}$ and $\boldsymbol{n = 3k + 2}$.)

(b) Hence, prove that $\sqrt{\boldsymbol{3}}$ is irrational. (4)

End of questions

Extra Working Space

Question___________