Mathematics Methods Unit 3

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Investigation Marking Rubric: Volume of Swimming Pools**

Mark \_\_\_\_\_\_/ 50

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| Grade | Interpret the task and choose the mathematics | Apply mathematical knowledge to obtain a solution | Interpret and communicates results and conclusions |
| A | * All tasks in Part A have correct notation including defining the piecewise function and all definite integrals * Chooses a perimeter for the pool design in Part B based on a mixture of functions and areas between curves would be required * Chooses a varying depth based on a mixture of functions * Pool design indicates thought to minimise sharp edges by considering gradients between functions at their junctions   **(13 – 15 marks)** | * Has all calculation in Part A correct including all units and function domains * Has plotted their pool design accurately for both the perimeter and depth while also representing the design as a 3D drawing with some accuracy. * All definite integrals are correctly calculated * Volume and capacity correctly calculated with units   **(17 – 20 marks)** | * All functions chosen to define the perimeter of their pool are clearly defined with domains * All functions chosen to define the depth of their pool are clearly defined with domains * Lists at least two quality limitations to the designing based on the limitations of the method of calculating the volume using definite integrals, for example:   + Circles are not able to be used   + Difficulty of avoiding ‘sharp’ corners at function junctions   + Cross-section of the pool at any point perpendicular to the x-axis and parallel to the y-axis must be rectangular   **(13 – 15 marks)** |
| B | * Is able to define the piecewise function for the depth of the pool in Part A * Has written all definite integrals correct in Part A * Chooses a perimeter for the pool design in Part B based on at least two curves * Chooses a varying depth for pool based on linear and at least one curve * Pool design indicates thought to minimise sharp edges at function junctions   **(10 – 12 marks)** | * Has calculated the definite integrals correct for both pools in Part A * Has plotted their pool design accurately for both the perimeter and depth * Most definite integrals are correctly calculated * Volume and capacity correctly calculated   **(13 – 16 marks)** | * All functions chosen to define the perimeter of their pool are defined with most domains correct * All functions chosen to define the depth of their pool are defined with most domains correct * Lists at least one quality limitation to the designing based on the limitations of the method of calculating the volume using definite integrals, (*see above in A grade for examples*)   **(10 – 12 marks)** |
| C | * Identifies and writes the correct bounds for all definite integrals in Part A * Chooses a perimeter for the pool design in Part B based on linear functions forming multi-angled sides * Chooses a varying depth for pool based on linear functions   **(9 – 11 marks)** | * Has calculated the definite integral correct for the uniform depth pool in Part A * Has plotted their pool design accurately for both the perimeter and depth * Most definite integrals are correctly calculated * Volume correctly calculated   **(9 – 12 marks)** | * All functions chosen to define the perimeter of their pool are defined * All functions chosen to define the depth of their pool are defined * Lists at least one limitation to the designing of their pool based on the limitations of the method of calculating the volume using definite integrals   **(9 – 11 marks)** |
| D | * Is able to identify the dimensions of the two pools in Part A required for volume calculation * Uses correct volume formulas for prisms in Part A * Chooses a perimeter for the pool design in Part B based on one or two linear functions and the x-axis * Chooses a uniform depth for pool   **(max 8 marks)** | * Is able to determine the volume of the two pools in part A using volume of prism formulas * Has plotted their pool design accurately for the perimeter * Some definite integrals are correctly calculated * Volume correctly calculated   **(max 8 marks)** | * Some functions chosen to define the perimeter of their pool are defined * Lists at least one limitation to the designing of their pool, however, is not clearly linked to the method of calculating the volume using definite integrals   **(max 8 marks)** |