Name: _____

Class: _____

Due Date: _____

Orange High School

Year 11 Standard Mathematics

Task 2 Assignment

2020

Outcomes Assessed MS11-3: solves problems involving quantity measurement, including accuracy and the choice of relevant units MS11-4: performs calculations in relation to two-dimensional and three dimensional figures MS11-10: justifies a response to a given problem using appropriate mathematical terminology and/or calculations		
Weighting	**30%**	**Due:** This assignment is due to your classroom teacher 2 weeks from the date received (Term 2 Week 9).
Penalties as per assessment booklet Failure to submit the assignment within the negotiated timeframe may result in an N-award in Standard Mathematics.		

Year 11 Standard Mathematics Assignment

Nature of the task

This assignment requires you to apply what you have learnt in class to a real-world context. In Section 1, you will need to apply your knowledge of area and measurement to redesign the car park for a new Aquatic Centre in Orange. In Section 2, you will be required to help solve problems relating to the construction of multiple facilities inside the new Aquatic Centre. In Section 3, you will be required to make judgements and decisions which are informed by Mathematics.

Submission

Please complete all questions and working in the booklet provided.

Marking criteria

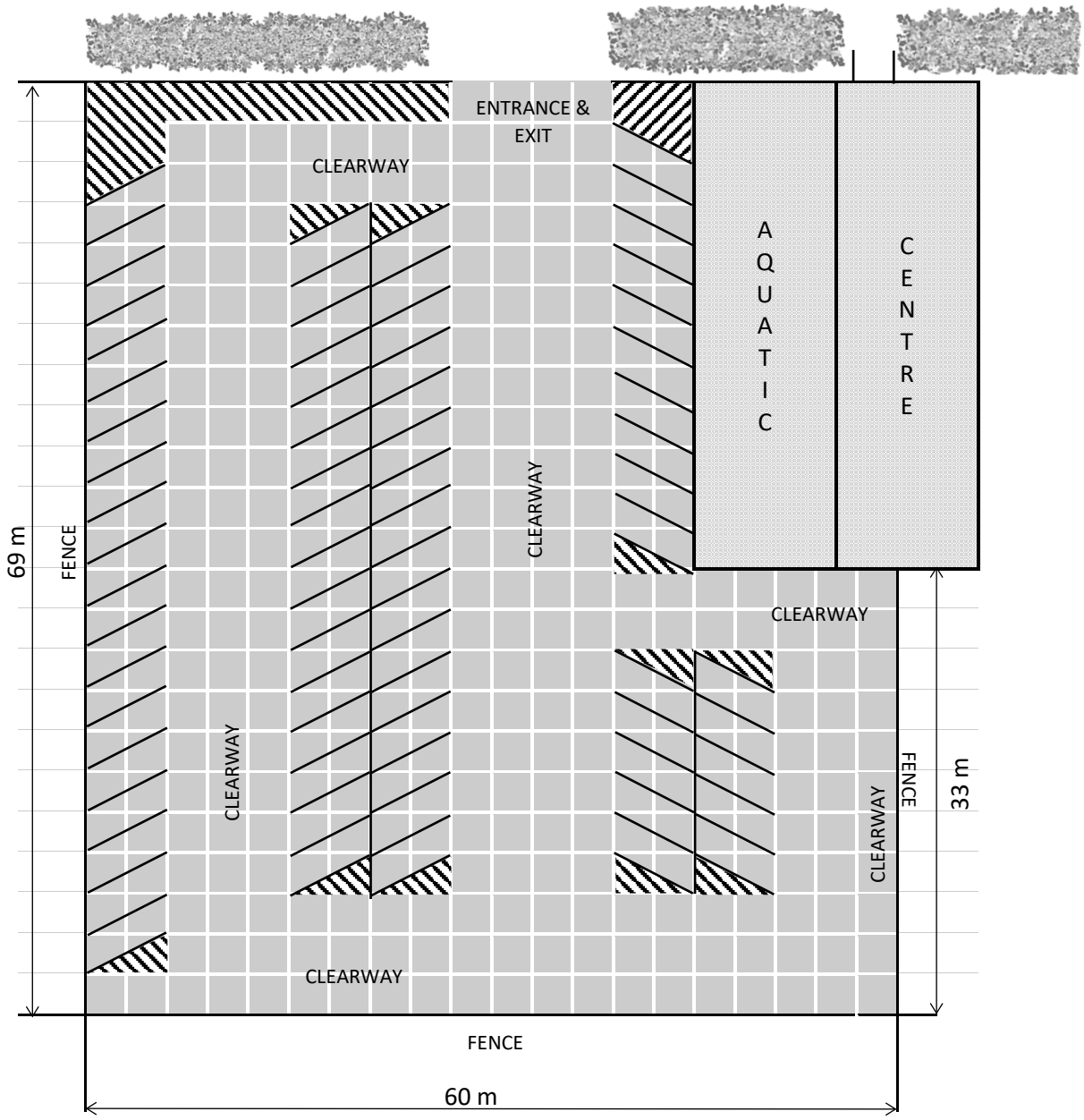
A marking rubric is provided at the back of this booklet.

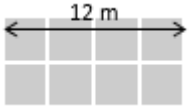
You will be assessed on how well you:

- Accurately solve a variety of problems based on the scenarios.
- Select and use the appropriate mathematical processes, technologies and language to investigate questions from the measurement units.
- Provide reasoning and justification related to the problems.

Section 1 – Parking for Fun (15 marks)

The Aquatic Centre requires a new car park. A draft plan for the car park design has been included below.



Scale = 

Please turn over for questions.

1. Using the draft plan on the previous page, answer the following questions.

   a. In the draft plan, what is the maximum number of cars that can be accommodated? **½**

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   b. If each car is allowed 2 squares on the plan, how many square metres does this allow for each car? **1**

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   c. What is the area in square metres of:

      i. The total car parking spaces? **1**

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      ii. The total clearways? **1**

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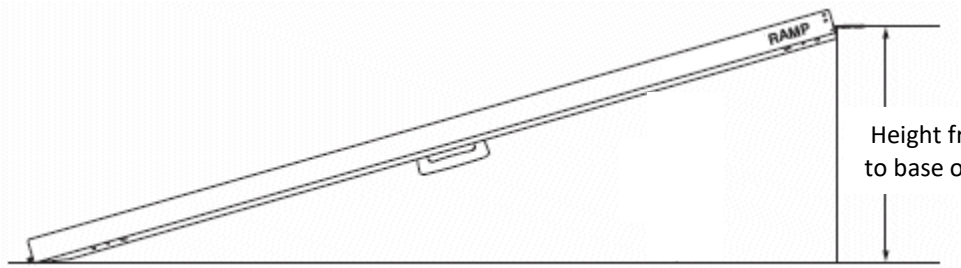
2. The new car park requires a minimum of 3 spaces to be reserved for disabled parking spaces. There are many different types of vehicles that cater for disabled people. Some different vehicle options are portrayed below.

Some vehicles have a rear ramp and others have a side ramp.



Maximum Ramp Height and Incline Angle

For the following questions, assume that the average height from the ground to the floor of the vehicle is 30 cm and the average disabled ramp is 110 cm long.

a. Draw a diagram displaying this information (hint: refer to the triangle pictured above). **1**

b. Use your image from part a to calculate the distance between the base of the ramp and the vehicles' tyres, rounded to the nearest centimetre. **2**

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c. The average disabled van (pictured on previous page) has a length of 4.5 m and width of 1.7 m. Disabled parks must allow enough room for disabled vans with both rear and side ramps to be used effectively. How many whole squares on the new carpark plan should be allocated to disabled parking spaces? **2**

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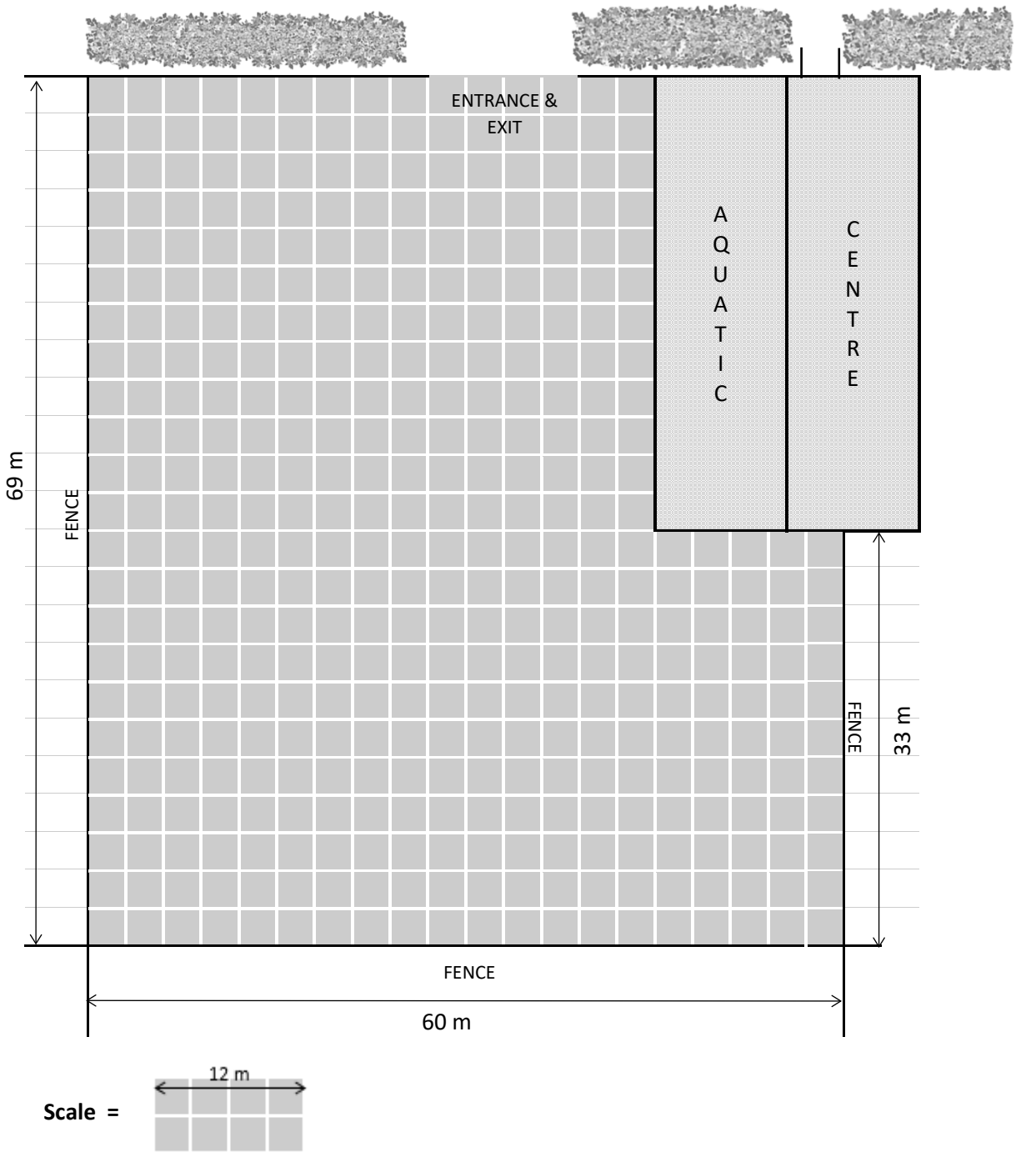
3. Because of increased patronage to the new Aquatic Centre, it is necessary to increase the number of parking spaces.

a. You are required to redesign the carpark provided below to include a **minimum of 80** car spaces according to the following guidelines:

- The minimum clearway width is 6 m.
- The minimum car park length is 6 m and the minimum car park width is 3 m.
- There are to be 3 spaces for disabled persons. These should be sized according to your solution in question 2.
- The Entrance/Exit clearway is to remain in the current position and have a width of 12 m. All other clearways to a minimum of 6 m.
- No Dead-End Clearways are allowed. This means that no car should have to reverse or U-turn to exit.
- The parking bays need to be numbered from 1 to 80 and the disabled bays specially labelled.



3

Scale =

b. Write down the number of car park spaces (including disabled parking spaces) your redesigned car park now holds. **½**

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c. Calculate for your new carpark:

i. The total area of all your carparking spaces (in square metres). **1**

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ii. The area of the clearways (in square metres). **1**

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d. Find the new carparking area as a percentage of the draft carparking area (HINT: use your solution in question 1 part c). **1**

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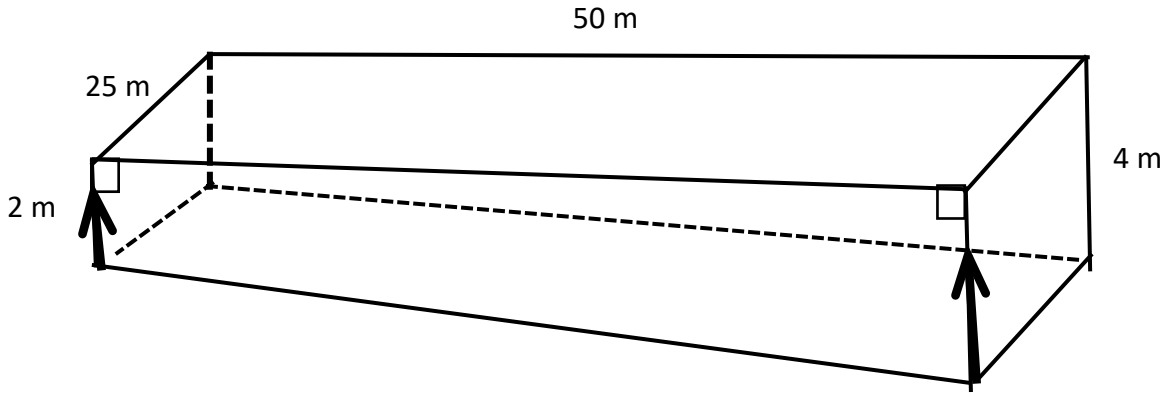
Section 2 – Inside the Aquatic Centre (20 marks)

The new Aquatic Centre will host an Olympic-size swimming pool and children's pool.

1. An Olympic-size swimming pool must meet FINA specifications to host events. Generally, the pool is 50 metres in length, 25 metres in width and can vary in depth. For this exercise, we will assume the pool is a trapezoidal prism with the shallow end being 2 metres deep and the deep end being 4 metres deep.



a. If the pool length is measured to the nearest metre, what is the absolute error that could occur during measurement? **1**

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b. Calculate the volume (in m^3) of the pool using the dimensions in the image above. **2**

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c. How many kilolitres of water would be required to completely fill the pool? **1**

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d. An error in measurement can severely alter the total capacity of water required to fill the pool.

1

i. Calculate the upper bound for the length, width and depths of the pool pictured above (HINT: add your answer in part a. to each of the dimensions pictured above).

Length Upper Bound: ……

Width Upper Bound: ……

'Shallow End' Depth Upper Bound: ……

'Deep End' Depth Upper Bound: ……

ii. Calculate the largest possible volume (rounded to 2 decimal places) of the pool using your measurements from part i. **1**

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iii. How many extra kilolitres (rounded to 2 decimal places) of water would be needed to completely fill the pool compared to that in part c? **1**

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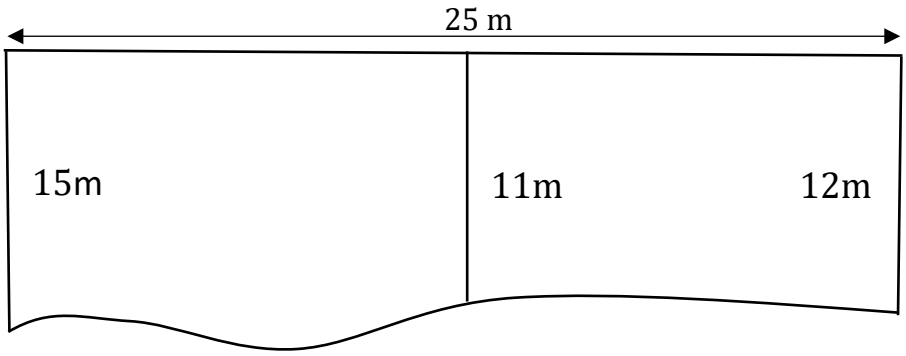
2. A cross section of the children's pool is pictured below.



a. Apply the trapezoidal rule twice to estimate the area of the cross-section. Answer correctly to the nearest square metre. **2**

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b. In the centre of the children's pool there will be a play area with a water fountain. This fountain will require 3 pumps. Each pump produces 5 m^3 of water per minute. How much water (in litres) will all 3 pumps produce if they are used for 6 hours a day for 7 days a week. Express your answer in scientific notation. **3**

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c. If it costs 328 cents per hour to run each pump, calculate how much it will cost (in dollars) to power all three pumps if the water fountain is powered for fifteen minutes every half an hour for 6 hours. **2**

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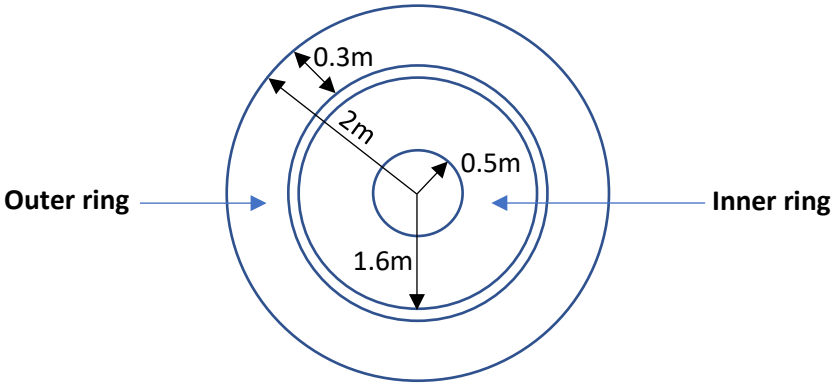
3. The swim teachers at the Aquatic Centre have asked for a target to be tiled into the bottom of the children's pool to encourage young swimmers to dive under the water. A diagram of this target is pictured below.



The target above has been designed using four overlapping circles forming one full circle surrounded by three rings. The outer ring will be tiled blue and the inner ring will be tiled red.

a. Find the area of:

i. The inner ring which will be tiled red. **1**

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ii. The outer ring which will be tiled blue. **2**

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b. The red tiles supplied are 50mm high and 50mm wide. Calculate how many whole tiles will be needed to tile the inner ring. **3**

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Section 3 – Compare the Pair (5 marks)

We need to light the new Aquatic Centre. You are required to compare the two industrial lights pictured below.

Option 1 – LED High Light

- Cost per light = $160
- Electricity rating = 750W
- Total number of lights required = 12

Option 2 - LED Stadium Lighting

- Cost per light = $210
- Electricity rating = 800W
- Total number of lights required = 10

1. For each light option pictured above, calculate:

a. the cost for the total number of lights required to light the Aquatic Centre. **1**

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b. the energy used (in kilowatts) for the required number of lights. **1**

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2. The average rate of electricity is 22.81 cents per kWh. What is the yearly cost (in dollars) to power each set of lights for both options 1 and 2 if they are left on for an average of 10 hours a day? **2**

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3. Which light would you recommend to be used in the new Aquatic Centre? Justify your response. **1**

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Marking Rubric – Section 1

Question	Marks	Description
1 a	0 ½	• No answer provided. • Maximum number of cars correctly stated.
1 b	0 1	• No answer provided. • Correct answer provided.
1 c i.	0 1	• No answer provided. • Correct answer provided with working out.
1 c ii.	0 1	• No answer provided. • Correct answer provided with working out.
2 a	0 1	• No diagram provided. • Diagram provided with all information correctly labelled.
2 b	0 1 2	• No answer provided. • Some working out provided with minor errors. • Correct answer provided with working out.
2 c	0 1 2	• No answer provided. • Correct calculation of van size and/or correct calculation of van and ramp(s) size but fail to determine number of whole squares on grid required. • Correct calculation of van size including ramp(s) and correct calculation of whole squares required on grid.
3 a	0 1 2 3	• No diagram provided. • Parking bays have not been labeled from 1 to 80 (or maximum number on design) • Diagram is missing clearway specifications and/or minimum of 80 parks has not been reached and/or disabled bays have not been included. • Diagram is neat and easy to read and all specifications have been followed.
3 b	0 ½	• No answer provided. • Maximum number of cars correctly stated.
3 c i.	0 1	• No answer provided. • Correct answer provided with working out.
3 c ii.	0 1	• No answer provided. • Correct answer provided with working out.
3 d	0 1	• No answer provided. • Correct answer provided with working out.
		Total for Section 1: **out of 15**

Marking Rubric – Section 2

Question	Marks	Description
1 a	0 1	• Incorrect calculation of the absolute error. • Correct calculation of the absolute error.
1 b	0 1 2	• No working correct and an incorrect response • Correct response with missing working, or correct working used with an incorrect response • Correct response with adequate working out.
1 c	0 1	• Incorrect conversion of volume into capacity • Correct calculation of kilolitres required with adequate working
1 d i.	0 ½ 1	• Incorrect response with no correct working • At least 2 upper bounds provided and correct. • All upper bounds provided and correct.
1 d ii.	0 1	• Incorrect response with no correct working. • Correct working out and solution.
1. d. iii.	0 1	• Incorrect response with no correct working. • Correct working out and solution.
2 a	0 1 2	• No answer provided. • Trapezoidal rule applied with some mistakes. • Correct answer and working provided.
2 b	0 1 2 3	• Incorrect response. • One of the following: correct volume with working, correct conversion to litres or correctly expressed in scientific notation. • Two of the following: correct volume with working, correct conversion to litres or correctly expressed in scientific notation. • Correct calculation of volume with working, has correctly converting to litres and has expressed their answer in scientific notation.
2 c	0 1 2	• Incorrect response. • Some correct working included but incorrect solution provided. • Correct answer (in dollars) and working provided.
3 a i.	0 1	• Incorrect response. • Correct answer and working provided.
3 a ii.	0 1 2	• Incorrect response. • Incorrect radius used for circles and correct answer with working out. • Correct radius used for both circles and correct answer with working out.
3 b	0 1 2 3	• Incorrect response. • Incorrect unit conversion and correct answer with working out. • Correct unit conversion and correct decimal answer with working out. • Correct unit conversion and correct whole number of tiles with working out.
		Total for Section 2: **out of 20**

Marking Rubric – Section 3

Question	Marks	Description
1 a	0 ½ 1	• No correct solutions provided. • Cost for one light option calculated correctly. • Cost for both light options calculated correctly.
1 b	0 ½ 1	• No correct solutions provided. • Energy for one light option calculated correctly or energy for both light options calculated correctly but answer only provided in watts. • Energy for both light options calculated correctly and answered in kilowatts.
2	0 1 2	• No working correct and an incorrect response. • Correct response with missing working and/or correct working used with an incorrect response and/or correct working and answer for only one light option provided. • Correct response with adequate working out.
3	0 1	• No solution provided or incorrect light selected. • Correct light selected and decision is supported by mathematics.

Total for Section 3: **out of 5**

Total: **out of 40**

Teacher's comment: