Name: _____

Year 12 2018 Standard 2 Mathematics Assessment Task 1

Rates and Ratios Assignment

Task number: 1	**Weighting:** 20%	**Due Date:** Week 7

Outcomes assessed:

- Use rates to solve and describe practical problems (ACMEM071, ACMEM072, ACMEM073, ACMEM074, ACMEM075)
- Solve practical problems involving ratio, including but not limited to: map scales, mixtures for building materials, cost per item (ACMEM065, ACMEM066, ACMEM067, ACMEM068, ACMEM069, ACMEM070)
- Obtain measurements from scale drawings, including but not limited to maps (including cultural mappings or models) or building plans, to solve problems (ACMGM023, ACMGM024, ACMGM025)

Nature and description of the task:

As a result of completing this Assignment, students should be familiar with the calculations involving rates and ratios. They should be able to solve and describe practical problems, make informed comparisons and calculate perimeter, area and volume using a scale.

The Investigative Assignment will consist of two parts:

- Part 1 Preparation Activity (value >> 50% of the overall Assignment) – completed at home. The suggested time for the Preparation Activity is one week, although you will have 2 weeks to complete it. All answers will need to be completed on your own paper and attached to this booklet. The marks allocated to each question is shown next to the question. All necessary working will need to be shown and answers /responses should be correct / detailed to obtain full marks.
- Part 2 Validation Task (value >> 50% of the overall Assignment) – to be conducted in class for a period of 50 minutes. The Preparation Activity can be used during the Validation Task and will be handed in together with the Validation Task at the conclusion of the task. Calculators should also be used and all marks for each question will be clearly shown next to each question on the task.

Non-Completion of Task:

If you know you are going to be away on the day of the Validation Task and are unable to hand in / complete both parts of the Investigative Assignment on the due day, then you must have supportive documentation. *Zero marks will apply if the Assessment Task is submitted/completed late, unless an Illness/ Misadventure or Application for Extension form has been submitted.*

Part 1 Preparation Activity (35 marks)

Extended investigation – Answer on your own paper and show all working

Question 1 (11 marks)

(a) Fully simplify each of the following ratios. **5**

i. \$20 : \$4

ii. 560 km : 240 km

iii. 1.25 L : 300 mL

iv. $\frac{1}{3} : \frac{1}{4}$

v. $65\% : 1\frac{1}{2}$

(b) A concrete mixture of gravel to sand to cement of 4 : 3 : 1 is needed for strong foundations. How much of each is needed to make 40 cubic metres of concrete? **2**

(c) Convert each speed into kilometres per hour. Round your answers to two decimal places. **2**

i. An African cheetah was measured running at 27 m/s.

ii. A Tanzanian snake can travel at a speed of 3.3 m/s.

(d) A fuel tank holds 90L of fuel. The vehicle averages 8.6L/100km. **2**

i. How far could the vehicle travel on a full tank?

ii. How many litres of fuel would it require for a 420km trip?

End of Question 1

Question 2 (11 marks)

(a) The sides of two cubes are in the ratio 1 : 4. What is the ratio of their surface area? (Hint – you may wish to draw a diagram). **2**

(b) A surveyor measures the following lengths: AB = 65 m; BC = 28 m; CD = 83 m; DA = 15 m. How long will each of these lines be on a scale drawing is the scale is 1 cm : 10 m? **2**

(c) Answer the following to compare Indonesia and Australia. **3**

i. Indonesia has a population of 249 million and an area of 1 919 440 km^2. Calculate its population density in persons/km^2 correct to one decimal place.

ii. Australia has a much smaller population of 23 million but a much larger area of 7 692 000 km^2. Calculate its population density correct to one decimal place.

iii. If Australia was as densely populated as Indonesia, what would its population be? Answer to the nearest hundred.

(d) An electric kettle is rated at 2400 W and takes $2\frac{1}{2}$ minutes to boil water when full. **2**

Charlotte boils a full kettle of water on average 5 times a day.

The cost of electricity is 34.5062 cents/kWh.

What is the cost of using the kettle for a year (to the nearest cent)?

(e) A swimming pool has a volume of 150 m^3. Given that 1 m^3 = 1000L of water, calculate the length of time that it will take to fill a pool using a hose with a flow rate of 40 L/min. **2**

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End of Question 2.

Question 3 (13 marks)

(a) Each year in New South Wales 320 000 tonnes of glass are used in the production of glass containers. Of this amount 61 000 tonnes of glass containers are returned for recycling. **3**

i. Express the amount of glass returned as a percentage of the amount of glass used.

ii. Calculate the ratio of the amount of glass returned to the amount of glass not returned.

(b) In 1989 a Qantas jet travelled non-stop from London to Sydney, a distance of 17 850 kilometres, in 20 hours and 9 minutes. The plane started with 184 tonnes of fuel, and on landing had enough fuel in reserve to fly for another 55 minutes. **3**

i. What was the plane's average speed in kilometres per hour?

ii. How much fuel was used, to the nearest tonne?

(c) The ratio of Michael's height to Neville's height is 4 : 5 and the ratio of Neville's height to Raymond's height is 4 : 5. Find the ratio of Michael's height to Raymond's height. **2**

Question 3 continues on next page.

Question 3 continued.

(d) A farm irrigation system requires 100 mega litres of water per year to water a 24 hectare farm. The water supply for the farm can provide 400 000 L of water per day. **3**

i. Express the water requirement as a rate in litres per hectare per day. Answer correct to three significant figures.

ii. The farmer hopes to expand his farm but can access no further water. Calculate the maximum area of the farm that can be irrigated using the existing system. Give your answer to the nearest hectare.

(e) Despite greater awareness and concern for the natural environment, unsustainable logging of tropical rainforests continues worldwide. **2**

When thinning a forest, trees designated for removal are marked with paint.

Suppose the ratio of trees to be felled to those to be left in a particular forest is 2 : 3 and this forest contains 32 000 trees.

After felling, however, it was noted that 5% of the trees to remain had fallen accidentally.

How many trees were actually felled?

End of Question 3.

End of Preparation Activity