**MATHEMATICS APPLICATIONS 3**

**Test 1 2020**

**Sequences**

**Time Allowed: 35 minutes Marks: /33**

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

**Non-calculator ALL** working must be shown for full marks.

1. **[2, 2, 2, 4 = 10 marks]**

The first three terms of a sequence are

* 1. Show that the sequence is geometric.
  2. Write a recursive rule for this sequence.
  3. Find the 4th and 5th terms of this sequence.
  4. What is the 50th term of this sequence?

1. **[2, 1, 2, 2, 2, 4 = 12 marks]**

Consider the sequence A defined as Sequence A: 2, 4.5, 7, …

* 1. Is Sequence A an arithmetic or geometric sequence? Justify your response.
  2. Define Sequence A using a non-recursive rule which will give the nth term of this sequence.
  3. Using the rule found in b), or otherwise, determine whether 50 is a term of Sequence A. Show our working.
  4. Define Sequence A using a recursive rule.

Sequence B is defined as Sequence B:

* 1. Is Sequence B an arithmetic or geometric sequence? Justify your response.
  2. Using algebraic techniques show how to determine the value(s) of n for which

Sequence A = Sequence B.

1. **[2, 3, 3 = 8 marks]**

Three consecutive positive terms of a geometric progression have a product of 125. The third term is 9 times the first term.

* 1. Determine the constant ratio.
  2. Determine the first term.
  3. Determine Terms 1, 2, and 3.

1. **[3 marks]**

Identify which of the following sequences has a long-term steady-state solution and determine the steady state solution.

**MATHEMATICS APPLICATIONS 3**

**Test 6 2019**

**Sequences**

**Calculator Allowed Marks:**

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

**ALL** working must be shown for full marks.

Calculators Allowed

1. **[2, 2, 2, 2 = 8 marks]**

A long ribbon 0.05mm thick is folded in half. After one fold the thickness is 0.1mm. It is then folded in half repeatedly.

* 1. Write a recursive formula that will enable you to calculate the thickness of the ribbon for n folds.
  2. Calculate the thickness after 7 folds.
  3. Write a non-recursive rule for calculating the thickness of the folded ribbon after n folds.
  4. If the thickness after folds is 2.56 cm, find f.

1. **[4, 2 = 6 marks]**

A sequence is defined by the recursive formula: The tenth term of this sequence is 126.

* 1. Give the first four terms of this sequence.
  2. Determine whether the number 666.2 belongs to this sequence. Justify your answer.

1. **[2, 2 = 4 marks]**

This year, 600 people are expected to enter the workforce as electricians. This number is expected to increase by 4% next year, and the same percentage every year after that. Calculate:

* 1. The number of electricians expected to enter the workforce between eight and nine years from now.
  2. The number of electricians expected to enter the workforce over the next eight years.

1. **[1, 1, 2, 2, 2 = 8 marks]**

Deborah is purchasing mealworms for her pet lizard, Lizzy, to eat. Deborah starts by buying 50 mealworms. She then buys an additional 15 at the start of each subsequent week. She feeds 12 mealworms to Lizzy each week, and each week a certain percentage of the mealworms dies. Deborah has found that the approximate number of mealworms at the start of the *n*th week can be modelled by , where = 0.9 (– 12) + 15, = 50.

1. What percentage of the mealworms dies each week?
2. Determine the approximate number of mealworms Deborah has at the start of the fifth week.
3. Deborah claims that she will never run out of mealworms using this model. Justify her claim.

After 10 weeks, hot weather results in a larger percentage of the mealworms dying, so Deborah alters the model to: = 0.8 (– 12) + 15, = *c*

1. (i) Determine the value of *c*.

(ii) Determine the approximate number of mealworms Deborah has at the start of the thirtieth week.

Deborah’s vet recommends feeding Lizzy 10 mealworms a week. She would also like to maintain a constant number of 30 mealworms at the start of each week, so she changes the above model to:

= 0.8 (– 10) + *k*

(e) Determine the value of *k*, the number of mealworms she must buy each week, to ensure this occurs.