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**MATHEMATICS  
Methods Units 1 & 2**

**Test 6 – Exponentials and Sequences**

**Semester 1 2019**

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**Section Two - Calculator Assumed**

Time allowed for this section

Working time for this section: 32 minutes

Marks available: 32 marks

## Material required/recommended for this section

##### To be provided by the supervisor

This Question/Answer booklet

Formula sheet

##### To be provided by the students

Standard items: pens, pencils, pencil sharpener, eraser, correction fluid, ruler, highlighters

Special items: drawing instruments, templates, notes on one unfolded sheet of A4 paper, and up to three calculators satisfying the conditions set by the Curriculum Council for this course.

## Important note to students

No other items may be used in this section of the assessment. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the assessment room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

1. (6 marks: 3, 1, 2)

An arithmetic sequence has first term –20 and common difference 3.

1. Find the 20th term of the sequence and the sum of the first 20 terms.
2. Find the first positive term in the sequence.
3. Find *n* so that the sum of the first *n* terms is positive for the first time.
4. (6 marks: 3, 3)

The fourth term and the ninth term of a geometric sequence are respectively 2662 and 428 717 762.

1. Find the common ratio of this sequence.
2. Find the sum of the first six terms of this sequence.
3. (10 marks: 2, 2, 3, 3)

A rubber ball is dropped from a height of 200cm. Each time it hits the ground it will bounce vertically upwards to a height that is 80% of the height it reached in the previous bounce. It bounced to a height of 150cm after it hit the ground the first time.

1. Find the height reached by the ball after it hits the ground for the 3rd time.
2. After how many times would the ball have to hit the ground before it first rebounds to a height less than 50cm.
3. Find the total distance travelled by the ball just before it hits the ground for the 5th time.
4. Find the total distance travelled by the ball before it comes to rest on the ground.
5. (10 marks: 2, 1, 2, 5)

At the commencement of the use of a desalination plant, the number of dolphins at a cove near the desalination plant was estimated to be 2000. The number of dolphins, *N*, was monitored for several years and is displayed in the table below.



|  |  |
| --- | --- |
| Years after, *t* | Number of dolphins, *N* |
| 0 | 2000 |
| 1 | 1750 |
| 5 | 1050 |
| 10 | 550 |

The accompanying graph plots the points from the given table onto a set of axes.

The relationship between *N* and *t* is of the form .

1. Use an appropriate method to find the values of *a* and *k*. Give the value of *a* to the nearest 100 and the value of *k* to 2 decimal places.
2. Predict the population after 20 years.
3. How many years will it take for the dolphin population to reach 100?
4. The population of another marine animal in the area was also studied over the same time period and its population, *Q*, is given as . Draw the graph of *Q* onto the diagram given and use the graphs drawn to determine when the two populations are equal?

**End of Test**