BALDIVIS SECONDARY COLLEGE

APPLICATIONS - Unit 3 & 4

2018 Test 2- Sequences

Baldivis Secondary College

Student Name Solutions. Teacher Name _____

Time allowed for this task: 55 minutes, in-class, test conditions.

Section 1: 15 minutes + 2 minutes reading time
Section 2: 35 minutes + 3 minutes reading time

Materials required:

Section 1 Calculator free section (17 marks)
Standard writing equipment
SCSA Formula Sheet

Section2 Calculator assumed section (30 marks)
Calculator (to be supplied by the student)
SCSA formula Sheet
One page A4 (double sided) hand written notes

Other materials allowed: Drawing templates

Marks available: **47 marks**

Task Weighting: **6%**

Question 1 (11 marks: 4, 4, 3)

a) A geometric sequence has $T_3 = 4$ and $T_6 = 32$

I. Determine the recursive rule.

$T_{n+1} = 2T_n$ ✓ $\quad T_1 = 1$ ✓

II. By determining the **explicit** rule, calculate the 5th term

$T_n = 2^{(n-1)}$ ✓ $\quad T_5 = 2^4 = 16$ ✓

b) An arithmetic sequence has $T_3 = -5$ and $T_6 = 4$

I. Determine the recursive rule.

$T_{n+1} = T_n + 3$ ✓ $\quad T_1 = -11$ ✓

II. By determining the **explicit** rule, calculate the 5th term

$T_n = -11 + 3n - 3 = -14 + 3n$ ✓ $\quad T_5 = -14 + 3(5) = 1$ ✓

c) For the following sequence determine the recursive rule and T_7

T_1	T_2	T_3	T_4	T_5
4	-8	16	-32	64

× -2 ✓ × -2 ✓

$T_{n+1} = -2T_n$ ✓

$T_7 = 256$ ✓

Question 2 (6 marks: 2, 2, 2)

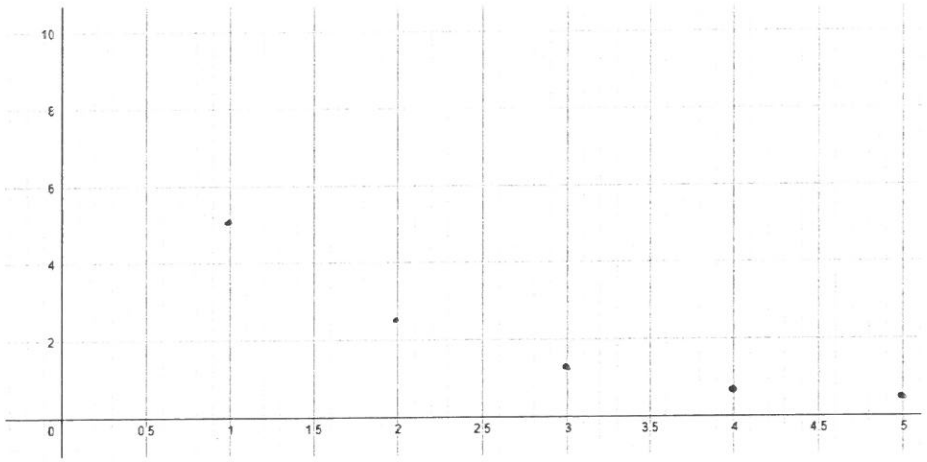
a) An arithmetic sequence has $T_3 = 9$ and a common difference of 2. Determine the twelfth term.

$T_1 = 5$

$T_{12} = 5 + 2(11)$ ✓

$= 27$ ✓

b) The following graph depicts a geometric sequence.

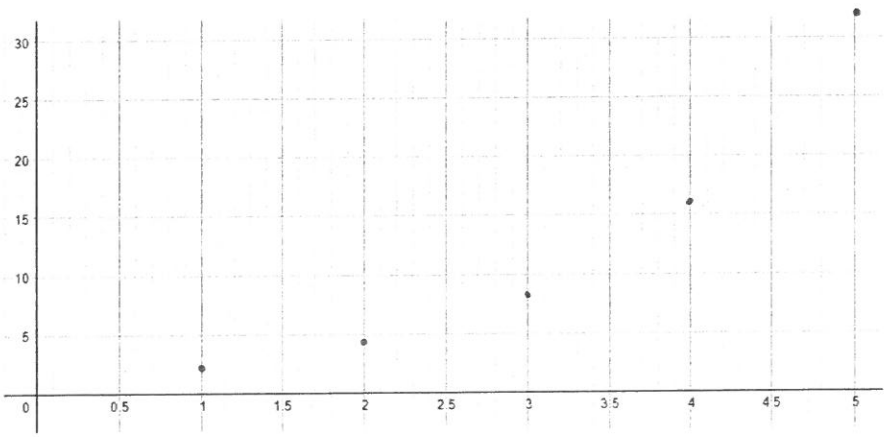


$T_{n+1} = 0.5T_n$ ✓

Determine the rule to find the nth term

$T_n = 5 \times 0.5^{(n-1)}$ ✓

c) The following graph depicts a geometric sequence



$T_{n+1} = 2T_n$ ✓

$T_n = 2 \times 2^{(n-1)}$

Determine the 8th term

$T_8 = 2 \times 2^7$

$= 256$ ✓

End of non-calculator Section

Solutions.

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Section 2 - Calculator Allowed

Total marks – 30 **Working time 35 minutes**

Question 3 (10 marks: 6, 2, 2)

Consider a sequence which is generated as follows:

$T_{n+2} = T_{n+1} + 2x - 3$, $T_2 = 3x - 1$

$T_{n+1} = T_n + 2x - 3$ ✓ $T_1 = x - 4$ ✓

a) Write simplified expressions for the first four terms of the sequence

$T_1 = x - 4$ ✓

$T_2 = 3x - 1$ ✓

$T_3 = 3x - 1 + 2x - 3$
$= 5x - 4$ ✓

$T_4 = 5x - 4 + 2x - 3$
$= 7x - 7$ ✓

b) Is this a geometric, arithmetic or linear sequence? Justify your answer

Arithmetic. ✓

Common difference of $2x - 3$ ✓

c) If $2T_1 = T_2 + 2$ calculate the value of x

$2(x - 4) = 3x - 1 + 2$ ✓

$2x - 8 = 3x + 1$

$x = 7$. ✓

Question 4 (3 marks)

A geometric sequence is such that $T_{10} = -1536$ and $T_{15} = -49152$. Find the first term and the common ratio

$T_{15} - T_{10} = 5$. $-49152 \div -1536 = 32$ $\sqrt[5]{32} = 2$ ✓

Common ratio = 2 ✓ $T_{n+1} = 2T_n$

$T_1 = -3$ ✓ $T_n = -3 \times 2^{(n-1)}$

Question 5 (4 marks: 2, 2)

For the following sequences

i) State whether the relationship is arithmetic or geometric
ii) Find the 40th term

a) $T_n = 8 \times (1.1)^n$

Geometric ✓

$T_{40} = 8 \times (1.1)^{40}$

$= 362.07$ (2dp)

✓

b) $T_n = 80 - 3n$

Arithmetic ✓

$T_{40} = 80 - 3(40)$

$= 80 - 120$

$= -40$ ✓

Question 6 (5 marks: 1, 1, 2, 1)

A house is valued each year over the course of 5 years

Year	1	2	3	4	5	6
	$450000	$477000	$505620	$535957.20	$568114.63	$602201.51

a) Show that the house follows a geometric sequence

$477000 \div 450000 = 1.06$

$505620 \div 477000 = 1.06$.

Common ratio $= 1.06$ ✓

b) Find the annual rate of increase as a percentage

6%. ✓

c) Write a general rule for the terms in the sequence

$T_n = ar^{(n-1)}$

$T_n = 450000 \times 1.06^{(n-1)}$ ✓ $T_1 = \$450\,000$ ✓

d) Find the value of the house in year 30

$T_{30} = \$2,438,274.55$ ✓

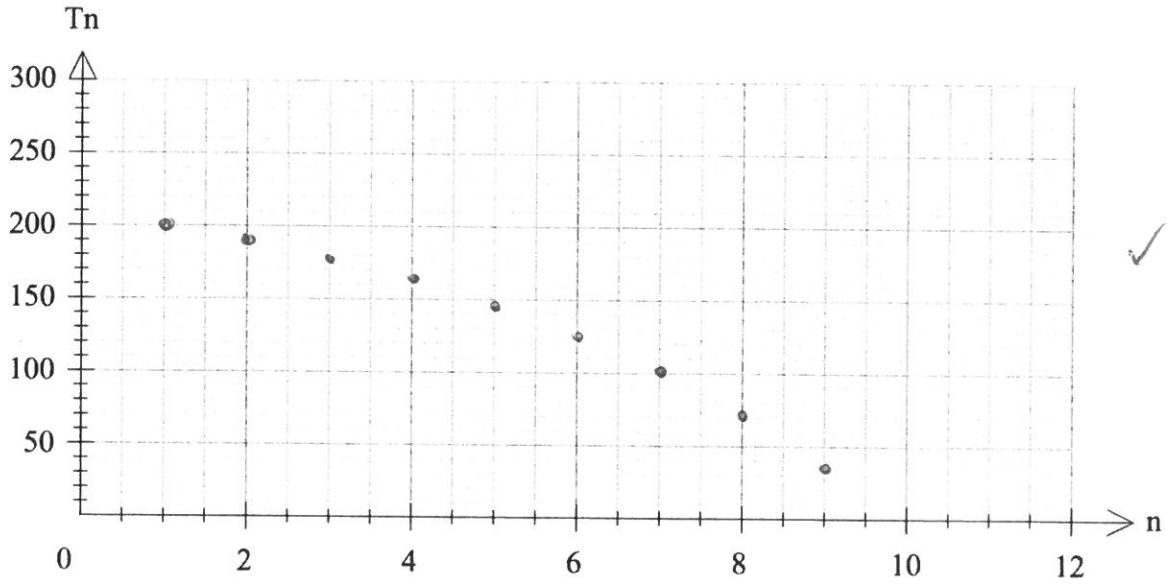
Question 7 (8 marks: 3, 2, 2, 1)

On a private property in Rosa Brook, the owner releases a population of 200 marron into her dam. She expects that the marron population will grow at a rate of 20% per year and she plans to capture 50 to eat each year.

a) Write a first order linear recurrence relation to model this situation

$T_{n+1} = 1.2T_n - 50$ ✓ ✓ $\quad T_1 = 200$ ✓

b) Plot the terms of the sequence on the axes below



✓✓

✓1 for at least 3 correct

✓ all correct

c) Describe what is expected to happen to the population of marron over time

All of the marron will be caught. ✓

There will be none left by year 10. ✓

d) How many marron should the owner harvest each year to achieve a 'steady state' situation?

20% of 200

= 40 ✓

End of test