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Email: [hello@contoureducation.com.au](mailto:hello@contoureducation.com.au)

VCE Specialist Mathematics ½  
Sequences & Series [1.3]  
**Test Solutions**

Results:

Test	_____ / 19.5
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## Section A: Test Questions (19.5 Marks)

INSTRUCTION: 19.5 Marks. 20 Minutes Writing.



### Question 1 (3.5 marks)

Tick whether the following statements are **true** or **false**.

	True	False
a. Recurrence relation is defining a term in terms of the previous term.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b. The arithmetic mean of $a$ and $b$ is given by $\frac{a+b}{2}$ .	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c. The sum of first 200 arithmetic terms is always given by $200a + 19900d$ .	<input checked="" type="checkbox"/>	<input type="checkbox"/>
d. A geometric sequence always has a positive common ratio.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e. A geometric mean of $a$ and $b$ is given by $ab$ .	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f. Infinite geometric sum always equals to $\frac{a}{1-r}$ , regardless of the value of $r$ .	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Space for Personal Notes

**Question 2** (2 marks)

Find  $x$ , if  $3x - 2$  is the arithmetic mean of  $5x + 1$  and  $11$ .

$$x = 16$$

**Question 3** (4 marks)

For the arithmetic sequence with  $t_2 = -12$  and  $S_{12} = 18$ , find  $a, d, t_6$  and  $S_6$ .

$$\begin{aligned} a &= -15 \\ d &= 3 \\ t_6 &= 0 \\ S_6 &= -45 \end{aligned}$$

Space for Personal Notes

**Question 4** (3 marks)

It is known that two terms in a geometric sequence are  $t_4 = 3$  and  $t_7 = \frac{3}{64}$ .

a. Find the value of  $r$ . (2 marks)

$$r^3 = \left( \frac{\left( \frac{3}{64} \right)}{3} \right)$$

$$r^3 = \frac{1}{64}$$

$$r = \frac{1}{4}$$

b. Hence, find  $t_n$  in terms of  $n$ . (1 mark)

$$t_n = 192 * \left( \frac{1}{4} \right)^{n-1}$$

**Question 5** (2 marks)

For  $t_n = 10 \cdot r^{n-1}$  it is known that the geometric mean of  $t_1$  and  $t_5$  is given by 90.

Find the value of  $r$ .

$$r = \pm 3$$

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**Question 6** (5 marks)

Consider the following recurrence relation.

$$t_n = \frac{1}{3} t_{n-1} \text{ where } t_1 = 2$$

- a. Define  $t_n$  in terms of  $n$ . (2 marks)

$$t_n = 2 \cdot \left(\frac{1}{3}\right)^{n-1}$$

- b. Find  $S_2$ . (2 marks)

$$S_2 = \frac{2\left(\left(\frac{1}{3}\right)^2 - 1\right)}{\frac{1}{3} - 1}$$

$$S_2 = 2 * \frac{\left(\frac{1}{9} - 1\right)}{\frac{1}{3} - 1}$$

$$S_2 = \frac{8}{3}$$

- c. Find the value of  $S_\infty$ . (1 mark)

$$S_\infty = \frac{2}{1 - \frac{1}{3}}$$

$$S_\infty = 3$$

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## VCE Specialist Mathematics ½

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