KEY

$t_n = t_1 + (n-1)d$ $\quad S_n = \frac{n}{2}[2t_1 + (n-1)d]$ $\quad S_n = \frac{n}{2}(t_1 + t_n)$

$r = \frac{t_n}{t_{n-1}}$ $\quad t_n = t_1 r^{n-1}$ $\quad S_n = \frac{t_1(r^n-1)}{r-1}, r \neq 0$ $\quad S_n = \frac{rt_n - t_1}{r-1}, r \neq 0$ $\quad S_\infty = \frac{t_1}{1-r}, -1 < r < 1$

L70 – LQ – 1.5 Infinite Geometric Series

Use the following information to answer Q1:

> A Geometric Series is shown below:
>
> 18 + 12 + 8 + ...
>
> $r = \frac{t_2}{t_1} = \frac{12}{18} = \frac{2}{3}$
>
> $t_1 = 18$

Q1: Complete the Table below. ***(2 marks)***

S_6	S_8	S_{10}	S_{12}
$S_n = \frac{t_1(r^n-1)}{r-1}$ $S_6 = \frac{18[(2/3)^6-1]}{(2/3)-1}$ $S_6 = \frac{-16.41975...}{-0.\bar{3}}$ $S_6 = 49.259259...$	$S_n = \frac{t_1(r^n-1)}{r-1}$ $S_8 = \frac{18[(2/3)^8-1]}{(2/3)-1}$ $S_8 = \frac{-17.29766...}{-0.\bar{3}}$ $S_8 = 51.8930...$	$S_n = \frac{t_1(r^n-1)}{r-1}$ $S_{10} = \frac{18[(2/3)^{10}-1]}{(2/3)-1}$ $S_{10} = \frac{-17.68785...}{-0.\bar{3}}$ $S_{10} = 53.06355...$	$S_n = \frac{t_1(r^n-1)}{r-1}$ $S_{12} = \frac{18[(2/3)^{12}-1]}{(2/3)-1}$ $S_{12} = \frac{-17.861267...}{-0.\bar{3}}$ $S_{12} = 53.5838...$

Q2: Is this a ***Converging*** or ***Diverging*** series? Explain. ***(1 mark)***

Converging $r = 0.\bar{6}$, so $\boxed{-1 < r < 1}$

Q3: Determine the sum of the series. ***(1 mark)***

$S_\infty = \frac{t_1}{1-r} = \frac{18}{1-(2/3)} = \frac{18}{0.\bar{3}} = \boxed{54}$

MARKING:

Beginning	0.0 – 3.0
Progressing	3.5 – 5.0
Competent	5.5 – 6.5
Exemplary	7.0