Arithmetic Sequences

1. (i) $a = 14$

$a + 19d = 25.4$

$\Rightarrow 19d = 11.4$

$d = 0.6$

(ii) $S = \frac{n}{2}(2a + (n-1)d)$

$= 250(28 + 499 \times 0.6)$

$= 81850$

2. $5200 = 25(2a + 49d)$

$\Rightarrow 208 = 2a + 49d$ ①

$234 = a + 19(3d)$

$\Rightarrow 234 = a + 57d$ ②

②×2: $468 = 2a + 114d$ ③

③ − ①: $260 = 65d$

$\Rightarrow d = 4$ $\quad a = 234 - 57 \times 4 = 6$

3. $S = 40(2 \times 1.71 + 79(0.02))$

$= 200$

$S_\infty = \frac{a}{1-r} \Rightarrow 200 = \frac{250}{1-r}$

$\Rightarrow 200 - 200r = 250$

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

4. (i) $a = 8 \quad d = 2 \quad n = 100$

$S = 50(16 + 99 \times 2)$

$= 10700$

(ii) $a = 8 \quad r = 1.25$

$S = \frac{a(1-r^n)}{(1-r)} = \frac{8(1-1.25^n)}{1-1.25} = -32(1-1.25^n)$

$\therefore \frac{10^{15}}{-32} - 1 = -1.25^n$

$\Rightarrow -\left(\frac{10^{15}}{-32} - 1\right) = 1.25^n$

$\Rightarrow \log\left(\frac{10^{15}}{32} + 1\right) = n \log 1.25$

$\Rightarrow n = \frac{\log\left(\frac{10^{15}}{32} + 1\right)}{\log 1.25} = 139.25$, $\therefore k = 140$

5. $S_n = \frac{n}{2}\{16 + (n-1)1.2\}$ $\quad G = \frac{8(1-1.2^{35})}{1-1.2}$

$= 8(2948.34....)$

So $\frac{n}{2}\{16 + 1.2n - 1.2\} > 8(2948.34....)$

$\Rightarrow \frac{n}{2}\{14.8 + 1.2n\} > 8(2948.34....)$

$\Rightarrow 7.4n + 0.6n^2 > 8(2948.34....)$

$\Rightarrow 0.6n^2 + 7.4n - 8(2948.34....) > 0$

Use graphical calc. equation solver to solve quadratic

~~$n = 64.2$ or $-7\cancel{6}.53$~~

~~So $n = 65$~~

$n = 192.19$ or $n = -\cancel{2}04.5$

$n = 193$