$19603 = 3^{n-1}$

(logs)

$n-1 = 9$

$n = 10$ 10 terms

$S_{10} = \frac{\frac{1}{27}(3^{10}-1)}{3-1}$

$S_{10} = \frac{29524}{27}$

* Class 1 do 1-10 pg 53-54
Class 2 do 11-22 pg 54-57

Geometric Series

1 a) geometric, $r = 6$

b) geometric, $r = -\frac{1}{2}$

c) ~~geometric~~ not, $t_2/t_1 = 3$ $t_3/t_2 = 2$

d) geometric, $r = 1.1$

2 a) $S_{10} = \frac{6(1.5^{10}-1)}{1.5-1} = 679.98$ $\frac{174075}{256}$

b) $S_{12} = \frac{18((-\frac{1}{2})^{12}-1)}{-\frac{1}{2}-1} = 11.997$ $\frac{12285}{1024}$

c) $S_9 = \frac{2.1(2^9-1)}{2-1} = 1073.1$ $\frac{10731}{10}$

d) $S_{12} = \frac{0.3(.01^{12}-1)}{.01-1} = 0.\overline{30}$ $\frac{10}{33}$

3. a) $S_{10} = \frac{12(2^{10}-1)}{2-1} = 12276$

b) $S_8 = \frac{27(\frac{1}{3}^8-1)}{\frac{1}{3}-1} = +40.494$ $\frac{3280}{81}$

c) $S_{10} = \frac{\frac{1}{256}(-4^{10}-1)}{-4-1} = -819.2$ $-\frac{209715}{256}$

d) $S_{12} = \frac{72(\frac{1}{2}^{12}-1)}{\frac{1}{2}-1} = 143.96$ $\frac{36855}{256}$

4a) $t_n = 27\left(\frac{1}{3}\right)^{n-1}$ $\quad \frac{1}{243} = 27\left(\frac{1}{3}\right)^{n-1}$

$.000152 = \frac{1}{3}^{n-1}$

(logs) $\quad n-1 = 8 \quad n = 9$

$S_9 = \frac{27\left(\frac{1}{3}^9 - 1\right)}{\frac{1}{3} - 1} = 40.5 \quad \frac{9841}{243}$

b) $t_n = \frac{1}{3}\left(\frac{2}{3}\right)^{n-1}$ $\quad \frac{128}{6561} = \frac{1}{3}\left(\frac{2}{3}\right)^{n-1}$

$\frac{128}{2187} = \frac{2}{3}^{n-1}$

(logs) $\quad n-1 = 7 \quad n = 8$

$S_8 = \frac{\frac{1}{3}\left(\frac{2}{3}^8 - 1\right)}{\frac{2}{3} - 1} = 0.961 \quad \frac{6305}{6561}$

c) $81920 = 5(4)^{n-1}$

$16384 = 4^{n-1}$

$7 = n-1$

(logs) $\quad n = 8$

$S_8 = \frac{5(4^8 - 1)}{4-1} = 109225$

d) $46875 = 3(-5)^{n-1}$

$15625 = (-5)^{n-1}$

(logs) * can't use -5

$6 = n-1$

$n = 7$

$S_7 = \frac{3(-5^7 - 1)}{-5-1} = 39063$

5. * variation of formula $S_n = \frac{rt_n - t_1}{r-1}$

a) $33 = \frac{-2(48) - t_1}{-2-1}$

$-99 = -96 - t_1$

$-3 = -t_1$

$t_1 = 3$

b) $443 = \frac{t_1\left(\frac{1}{3}^6 - 1\right)}{\frac{1}{3} - 1}$

$-295.\overline{3} = t_1\left(\frac{1}{3}^6 - 1\right)$

$t_1 = 295.7$

6. $4372 = \frac{4(3^n - 1)}{3-1}$

$8744 = 4(3^n - 1)$

$2186 = 3^n - 1$

$2187 = 3^n$

$n = \frac{\log 2187}{\log 3}$

$n = 7$ 7 terms

7a) $121 = \frac{t_1\left(\left(\frac{1}{3}\right)^5 - 1\right)}{\frac{1}{3} - 1}$

$-80\frac{2}{3} = t_1\left(\frac{1}{243} - 1\right)$

$t_1 = 81$

b) 81, 27, 9, 3, 1 $\quad 81 + 27 + 9 + 3 + 1$

8. $t_3 = 9/4 \quad t_6 = -16/81 \quad r^3 = \frac{-16/81}{9/4} \quad r^3 = \frac{64}{729} \quad r = \frac{4}{9}$

$t_1 \cdot 4/9^2 = 9/4 \quad t_1 \cdot 16/81 = 9/4 \quad t_1 = 729/64 \quad t_2 = 729/64 \cdot -4/9 = -81/16$

$S_6 = \frac{729}{64}\left(\frac{(-4/9)^6 - 1}{-4/9 - 1}\right)$ $\quad \frac{40565}{5184}$ $\quad (7.8)$

9a) $1 + 4 + 16 + 64 \ldots$

b) $S_{10} = \frac{1(4^{10} - 1)}{4-1}$ $\quad 349525$ (including person in charge as level 1)

10. 20, 8, 3.2... (downs) $\quad$ ups 8, 3.2...

(downs) $\quad S_6 = \frac{20(.4^6 - 1)}{.4 - 1}$ $\quad 33.1968$

(ups) $\quad S_5 = \frac{8(.4^5 - 1)}{.4 - 1}$ $\quad 13.1968$ $\quad$ total 46.39m

11 $S_{15} = \frac{25(1.1^{15} - 1)}{1.1 - 1}$ $\quad 794.3$ Km

13 increase by 40% $\therefore$ 140%, $r = 1.4$ $\quad \frac{1400[(1.4)^{10} - 1]}{1.4 - 1}$ $\quad 97739$

1000, 1400, 1960 ...

t_1 (10 downs)

14 $t_1 = 24$ $r = 3/4$ $n = 10$ $S_{10} = \dfrac{24\left(\left(\frac{3}{4}\right)^{10} - 1\right)}{\frac{3}{4} - 1}$ 90.59 (91mm)

15 $S_3 = \dfrac{200\left(.12^3 - 1\right)}{.12 - 1} = 226.88$

$S_6 = \dfrac{200\left(.12^6 - 1\right)}{.12 - 1} = 227.27$

16. $9840 = \dfrac{3(3^n - 1)}{3 - 1}$ $19680 = 3(3^n - 1)$ $6560 = 3^n - 1$ $6561 = 3^n$

$n = \dfrac{\log 6561}{\log 3}$

$n = 8$

17. $t_3 = 24$ $t_4 = 36$ $r = 1.5$

$t_3 = t_1 r^2$

$24 = 2.25 t_1$

$\frac{32}{3} = t_1$

$S_{10} = \dfrac{\frac{32}{3}\left(1.5^{10} - 1\right)}{1.5 - 1}$ $\frac{58025}{48}$

18. $a + ar + ar^2 = 35$ $a \; b \; c$

$a(ar)(ar^2) = 1000$

$a^3 r^3 = 1000$ ↓ cube root.

$ar = 10$

$a = \frac{10}{r}$

$a(1 + r + r^2) = 35$

$\frac{10}{r}(1 + r + r^2) = 35$

$10(1 + r + r^2) = 35r$

$10 + 10r + 10r^2 = 35r$

$10r^2 - 25r + 10 = 0$

$2r^2 - 5r + 2 = 0$

$(2r - 1)(r - 2) = 0$

$r = 1/2 \quad r = 2$

for $r = 1/2$ $a = 20$ $b = 10$ $c = 5$

for $r = 2$ $a = 5$ $b = 10$ $c = 20$

19 $S_7 = 89$

$S_8 = 104$ $\therefore t_8 = 15$

#20 r 8, 4, 2, 1, 1/2
A $64\pi, 16\pi, 4\pi, \pi, \frac{1}{4}\pi$ total area $85\frac{1}{4}\pi$

#22a) Tom's work is OK but he is assuming all 400 eggs successfully hatch, all parents survive, and no butterflies ever die.
b) he is finding S_5, not t_5
c) no. It is extremely high
d) research hatch rates/survival rates...