Pre Calculus Math 11

P. 53 # 2ab, 3ab, 4bc, 6, 9, 10

2. a) $6 + 9 + 13.5 + \ldots$ S_{10} $\qquad S_n = \frac{t_1(r^n - 1)}{r - 1}$

$t_1 = 6$

$r = \frac{9}{6} = \frac{3}{2}$ (or 1.5)

$$S_{10} = \frac{6\left[\left(\frac{3}{2}\right)^{10} - 1\right]}{\frac{3}{2} - 1}$$

remember: $\left(\frac{3}{2}\right)^{10} = \frac{3^{10}}{2^{10}}$

$$S_{10} = \frac{6\left(\frac{59049}{1024} - \frac{1024}{1024}\right)}{\frac{3}{2} - \frac{2}{2}}$$

remember: $1 = \frac{1024}{1024}$

$$S_{10} = \frac{6\left(\frac{58025}{1024}\right)}{\frac{1}{2}}$$

$$S_{10} = \frac{348150}{1024} \cdot \frac{2}{1}$$

remember: dividing is the same as multiplying by the reciprocal

$$S_{10} = \frac{696300}{1024}$$

$$S_{10} = \frac{174075}{256}$$

change S_{10} to a decimal

$S_{10} = \frac{174075}{256} = 679.98$

or do the question with a decimal from the beginning

$$S_{10} = \frac{6(1.5^{10} - 1)}{1.5 - 1}$$

use lots of decimals

$$S_{10} = \frac{6(57.665039 - 1)}{0.5}$$

$$S_{10} = \frac{6(56.665039)}{0.5}$$

$$S_{10} = \frac{339.990234}{0.5}$$

$$S_{10} = 679.98$$

p. 53 cont.

2. b) $18 - 9 + 4.5 - \ldots \quad S_{12}$

$t_1 = 18$

$r = \frac{-9}{18} = -\frac{1}{2}$ (or -0.5)

$$S_{12} = \frac{18\left[\left(-\frac{1}{2}\right)^{12} - 1\right]}{-\frac{1}{2} - 1}$$

$$S_{12} = \frac{18\left(\frac{1}{4096} - \frac{4096}{4096}\right)}{-\frac{3}{2}}$$

$$S_{12} = \frac{\cancel{18}^{9}\left(\frac{-4095}{\cancel{4096}}\right)^{2048}}{-\frac{3}{2}}$$

$$S_{12} = -\frac{12285}{1024} \cdot \frac{\cancel{-2}^{1}}{\cancel{3}_{1}}$$

$$S_{12} = \frac{12285}{1024}$$

$$S_{12} = \frac{18\left[(-0.5)^{12} - 1\right]}{-0.5 - 1}$$

$$S_{12} = \frac{18\left[(0.000244141) - 1\right]}{-1.5}$$

$$S_{12} = \frac{18(-0.9997559)}{-1.5}$$

$$S_{12} = \frac{-17.9956055}{-1.5}$$

$S_{12} = 11.997$

$S_{12} = 12.00$ (to the nearest hundredth)

3. a) $t_1 = 12, \; r = 2, \; n = 10$

$$S_{10} = \frac{12(2^{10} - 1)}{2 - 1}$$

$$S_{10} = \frac{12(1024 - 1)}{1}$$

$S_{10} = 12(1023)$

$S_{10} = 12276$

b) $t_1 = 27, \; r = \frac{1}{3}, \; n = 8$

$$S_8 = \frac{27\left[\left(\frac{1}{3}\right)^{8} - 1\right]}{\frac{1}{3} - 1}$$

$$S_8 = \frac{27\left(\frac{1}{6561} - \frac{6561}{6561}\right)}{-\frac{2}{3}}$$

$$S_8 = \frac{\cancel{27}^{1}\left(\frac{-6560}{\cancel{6561}}\right)^{243}}{-\frac{2}{3}}$$

$$S_8 = -\frac{\cancel{6560}^{3280}}{\cancel{81}_{1}} \cdot \frac{\cancel{-3}^{1}}{\cancel{2}_{1}}$$

$$S_8 = \frac{3280}{81}$$

p. 53 cont.

4. b) $\frac{1}{3}+\frac{2}{9}+\frac{4}{27}+\ldots+\frac{128}{6561}$

$r=\frac{2}{9}\div\frac{1}{3}=\frac{2}{9_3}\cdot\frac{3}{1}=\frac{2}{3}$

$S_n=\frac{rt_n-t_1}{r-1}$ for this page

$S_n=\dfrac{\frac{2}{3}\cdot\frac{128}{6561}-\frac{1}{3}}{\frac{2}{3}-1}$

$S_n=\dfrac{\frac{256}{19683}-\frac{6561}{19683}}{\frac{2}{3}-\frac{3}{3}}$

$S_n=\dfrac{-\frac{6305}{19683}}{-\frac{1}{3}}$

$S_n=-\frac{6305}{\cancel{19683}_{6561}}\cdot\frac{-\cancel{3}^{1}}{1}$

$S_n=\frac{6305}{6561}$

$S_n=0.96$

c) $t_1=5,\ t_n=81920,\ r=4$

$S_n=\frac{4(81920)-5}{4-1}$

$S_n=\frac{327680-5}{3}$

$S_n=\frac{327675}{3}$

$S_n=109225$

6. $4+12+36+108+\ldots+t_n$

$S_n=4372$

$4372=\frac{3t_n-4}{3-1}$

$4372=\frac{3t_n-4}{2}$

$8744=3t_n-4$

$8748=3t_n$

$2916=t_n$

p. 53 cont.

9. fan out → each person contacts 4 people

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

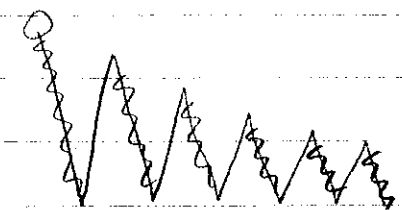
b) $t_1 = 1$, $r = 4$ $\quad S_{10} = \dfrac{1(4^{10}-1)}{4-1}$

$$S_{10} = \frac{1048576-1}{3}$$

$$S_{10} = \frac{1048575}{3}$$

$$S_{10} = 349525$$

10. 20 m drop, 40% bounce find total vertical distance at the floor for 6th bounce



this has 6 "drops"

$t_1 = 20$, $r = 0.4$

$$S_6 = \frac{20(0.4^6-1)}{0.4-1}$$

$$S_6 = \frac{20(0.004096-1)}{-0.6}$$

$$S_6 = \frac{20(-0.995904)}{-0.6}$$

$$S_6 = \frac{-19.91808}{-0.6}$$

$S_6 = 33.1968$

double this to include an "up" for each down

$2(33.1968) = 66.3936$

but... there is no "up" for the 20 m "drop" so subtract that back out

$66.3936 - 20 = 46.3936$

46.4 m