$S_n = \frac{1}{2} \cdot n \cdot (a_1 + a_n)$

$S_n = \frac{a_1(1-r^n)}{1-r}$

Math 4
1-8 Practice

Name Key

Date

1. A new graduate accepts a job as a data processing clerk at a starting salary of $18,500 per year, with an annual increase of $750. Suppose he stays in the job for ten years. How much will he earn in total after 10 years?

$a_1 = 18,500$
$a_n =$
$n = 10$
$d = 750$

$a_{10} = 18,500 + 750(9)$

$a_{10} = 25,250$

$S_{10} = \frac{1}{2}(10)(18,500 + 25,250)$

$= \$219,750$

2. Find $\sum_{n=1}^{14}(-5n+3)$ using one of the arithmetic series formulas.

$a_1 = -2$
$a_n = a_{14} = -67$
$n = 14$
$d = -5$

$S_{14} = \frac{1}{2}(14)(-2 + -67)$

$S_{14} = -483$

3. Evaluate the following sums:

a. $\sum_{n=1}^{7}(2n+7)$

$a_1 = 9$
$a_7 = 21$
$n = 7$
$d = 2$

$S_7 = \frac{1}{2}(7)(9+21)$

$S_7 = 105$

b. $\sum_{i=1}^{5}(3i-6)$

$a_1 = -3$
$a_5 = 9$
$n = 5$
$d = 3$

$S_5 = \frac{1}{2}(5)(-3+9)$

$S_5 = 15$

4. You borrowed $6000 and agreed to pay it back over 5 years. Your **monthly** payments were

$145, $144.25, $143.50, $142.75,….,$100.75

$100.75 = 145 - .75(n-1)$

$n = 60$

a. How much did you pay over the life of the loan?

$a_1 = 145$
$a_n = 100.75$
$n = 60$
$d = -.75$

$S_{60} = \frac{1}{2}(60)(145 + 100.75)$

$S_{60} = \$7372.50$

b. How much money in interest did she pay on this loan? That is, how much over $6000 did she have to pay back?

$1372.50

5. Find the sum of the following series: $\sum_{i=2}^{6} 2(3)^{i-1}$

$a_1 = 6$ $\quad r = 3$ $\quad S_5 = \frac{6(1-3^5)}{1-3}$

$S_5 = 726$

$S_n = \frac{a_1(1-r^n)}{1-r}$

6. Find the partial sum of the following series: $\{1.01 + 2.02 + 4.04 + 8.08 + \ldots + 4236247.04\}$

$a_1 = 1.01$ $\quad r = 2$ $\quad 4,236,247.04 = 1.01(2)^{n-1}$

$\log_2 \frac{4,236,247.04}{1.01} = n-1$

$n = 23$

$S_{23} = \frac{1.01(1-2^{23})}{1-2}$

$S_{23} = 8,472,493.07$

7. Because of air resistance, the length of each swing of a certain pendulum is 85% of the length of the previous swing. If the first swing has a length of 40 cm, find the total length the pendulum will swing before coming to rest.

$|r| < 1$ $\quad S_\infty = \frac{40}{1-.85}$

$S_\infty = 266\frac{2}{3}$ cm

Find the sum of the following series (if it exists. . .)

8. $\frac{1}{6} + \frac{1}{3} + \frac{2}{3} + \ldots$ $\quad |r| > 1$ diverges

$r = 2$

9. $15 + 10 + \frac{20}{3} + \frac{40}{9} + \ldots$ $\quad S_\infty = \frac{15}{1-\frac{2}{3}}$

$r = \frac{2}{3}$ $\quad S_\infty = 45$

10. $3 - \frac{9}{2} + \frac{27}{4} - \frac{81}{8} + \ldots$ $\quad |r| > 1$ diverges

$r = -\frac{3}{2}$

11. $\sum_{n=1}^{\infty} -6\left(\frac{2}{3}\right)^{n-1}$ $\quad S_\infty = \frac{-6}{1-\frac{2}{3}}$

$r = \frac{2}{3}$ $\quad S_\infty = -18$