Finding Missing Information

Arithmetic Series:

$$S_n = \left(\frac{n}{2}\right)(a_1 + a_n) \qquad S_n = \left(\frac{n}{2}\right)[2a_1 + (n-1)d]$$

1. If $S_n = 51.7$, $n = 22$, $a_n = -11.3$, find a_1.

$51.7 = \frac{22}{2}(a_1 + (-11.3))$

$\frac{51.7}{11} = \frac{11(a_1 - 11.3)}{11}$

$4.7 = a_1 - 11.3$

$\boxed{16 = a_1}$

2. Find a_1 if $S_n = 1287$, $n = 22$, and $d = 5$.

$1287 = \frac{22}{2}[2a_1 + (22-1)5]$

$\frac{1287}{11} = \frac{11[2a_1 + 105]}{11}$

$117 = 2a_1 + 105$

$12 = 2a_1$

$\boxed{6 = a_1}$

Geometric Finite Series:

$$S_n = a_1\left(\frac{1-r^n}{1-r}\right) \qquad S_n = \frac{a_1 - a_n r}{1-r}$$

3. If $S_6 = 196.875$, $a_1 = 100$, $r = 0.5$, find a_6.

$196.875 = \frac{100 - a_6(0.5)}{1-0.5}$

$0.5(196.875) = \left(\frac{100 - 0.5a_6}{0.5}\right)0.5$

$98.4375 = 100 - 0.5a_6$

$-1.5625 = -0.5a_6$

$\boxed{3.125 = a_6}$

4. Find n for $4.1 + 8.2 + 16.4 + \ldots$ if $S_n = 61.5$ $\quad a_1 = 4.1$, $r = 2$

$61.5 = 4.1\left(\frac{1-(2)^n}{1-2}\right)$

$\frac{61.5}{4.1} = \frac{4.1\left(\frac{1-(2)^n}{1-2}\right)}{4.1}$

$15 = \frac{1-(2)^n}{1-2}$

$-1(15) = \left(\frac{1-(2)^n}{-1}\right)-1$

$-15 = 1-(2)^n$

$\frac{-16}{-1} = \frac{-1(2)^n}{-1}$

$16 = 2^n$

$2^4 = 2^n$

$\boxed{4 = n}$

Geometric Infinite Series:

$$S = \frac{a_1}{1-r}$$

5. Write the first three terms of the infinite geometric series with the given characteristics.

$S = -126.25$, $a_1 = -50.5$

$$(1-r)(-126.25) = \left(\frac{-50.5}{1-r}\right)(1-r)$$

$$-126.25 + 126.25r = -50.5$$

$$126.25r = 75.75$$

$$r = 0.6$$

$$-50.5, -30.3, -18.18$$

6. Write the first three terms of the infinite geometric series with the given characteristics.

$S = \frac{891}{20}, r = -\frac{1}{9}$

$$\frac{891}{20} = \frac{a_1}{1-\left(-\frac{1}{9}\right)}$$

$$\frac{891}{20} \times \frac{a_1}{\frac{10}{9}}$$

$$990 = 20a_1$$

$$49.5 = a_1$$

$$49.5, -5.5, \frac{11}{18}$$

p. 595: 37-43 odd, p. 606: 51-61 odd, 69

p. 616: 65-71 odd, 81-87 odd