Arithmetic and Geometric Series

1. In an amphitheatre, seats are arranged in 50 semicircular rows. The first row contains 23 seats, and each row contains 4 more seats than the previous row. How many seats are in the theatre?

$a = 23$
$d = 4$
$n = 50$

$$S_n = \frac{50(2(23)+(50-1)4)}{2}$$
$$S_n = 6,050$$

2. Determine the sum of -31 - 35 - 39 - ... - 403

$t_1 = -31$ (a)
$d = -4$
$n = ??$
$t_n = -403$

*find n $t_n = a + (n-1)d$

$$S_n = \frac{94(-31-403)}{2}$$

$$S_n = \frac{47(-434)}{2}$$

$$S_n = -20,398$$

$-403 = -31 + (n-1)(-4)$
$+31 \qquad +31$
$-372 = -4n + 4$
$\frac{-4}{} \qquad \frac{-4}{}$
$\frac{4n}{4} = \frac{376}{4}$

$n = 94$

3. At a fish hatchery the number of fish that hatched on each of the first four days after fertilization was 2, 10, 50 and 250. How many fish will hatch in the first 10 days?

$a = 2$
$r = 5$
$n = 10$

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

$$= \frac{2(5^{10}-1)}{4}$$

$$S_n = \frac{2(9765624)}{4}$$

$$S_n = 4,882,812 \text{ fish}$$

4. Calculate the sum of the geometric series
7,971,615 + 5,314,410 + 3,542,940 + ... + 92,160

$a = 7,971,615$

$$r = \frac{5314410}{7971615} = \frac{2}{3}$$

$t_n = 92,160$

$t_{n+1} = rt_n$
$= 61,440$

$$S_n = \frac{61,440 - 7,971,615}{\frac{2}{3} - 1}$$

$$S_n = \frac{-7910175}{-\frac{1}{3}}$$

$$S_n = 23,730,525$$