Basic Arithmetic (Addition) Sequences

$t_n = a + (n - 1)\,d$ $\qquad$ $S_n = \frac{n}{2}[2a + (n - 1)d]$

1. For the sequence starting with 10 and increasing by 4 each time:

   a) What value is the 15th term in the sequence?

   b) If we add the first 15 terms, what do they add up to?

2. For the sequence 12, 15, 18, 21, …

   a) How large is the 40th number in the pattern?

   b) What is the total sum of the first 40 numbers in the pattern?

3. For the sequence 110, 102, 94, 86, …

   a) What value is the 20th term in the sequence?

   b) What do all the terms up to the 20th add up to?

4. Peter runs 6 km in the first week, 8 km in the next week, 10 the week after, etc.

   a) How far would he run in the 15th week if he kept that pattern going?

   b) How far would he have run in total after 12 weeks?

5. A town council spends $400,000 each year on its parks. It agrees to increase that spending by another $25,000 each year.

   a) How much would the town be spending by the eighth year?

   b) How much would the total spending on parks be after 12 years?

6. Merit: For the sequence 40, 44, 48, 52, …

   a) Which term is the first to be more than 200?

   b) If we add them up as we go, when does the total get to 1000?

Answers: Basic Arithmetic (Addition) Sequences

1. a = 10, d = 4, n = 15

   a) $t_{15} = 10 + (15 - 1) \times 4 = 66$

   b) $S_{15} = \frac{15}{2}(2 \times 10 + (15 - 1) \times 4) = 570$

2. a = 12, d = 3, n = 40

   a) $t_{40} = 12 + (40 - 1) \times 3 = 129$

   b) $S_{40} = \frac{12}{2}(2 \times 12 + (40 - 1) \times 3) = 846$

3. a = 110, d = –8, n = 20

   a) $t_{20} = 110 + (20 - 1) \times -8 = -42$

   b) $S_{20} = \frac{20}{2}(2 \times 110 + (20 - 1) \times -8) = 680$

4. a = 6, d = 2, n = 15 and 12

   a) $t_{20} = 6 + (15 - 1) \times 2 = 34$

   b) $S_{12} = \frac{12}{2}(2 \times 6 + (12 - 1) \times 2) = 204$

5. a =400,000, d = 25,000, n = 8 and 12

   a) $t_8 = 400000 + (8 - 1) \times 25000 = \$575{,}000$

   b) $S_{12} = \frac{12}{2}(2 \times 400\,000 + (12 - 1) \times 25\,000) = \$6\,450\,000$

6. a = 40, d = 4, n is unknown

   a) $t_n = 200 = 40 + (n - 1) \times 4$ Solving n = 40

   So the 41st is the first **over** 200

   b) $S_{12} = 1000 = \frac{n}{2}(2 \times 40 + (n - 1) \times 4)$ Solving n = 14.79

   So the 15th term