Arithmetic Series

5, 7, 9, 11, 13,.....

common difference = 2

97, 92, 87, 82, 77,.....

common difference = −5

Find the n^{th} term: $a_n = a_1 + d(n-1)$

Sum of n terms: $S_n = \frac{n}{2}(a_1 + a_n)$

a_1 : 1st term

d : common difference

n : term

1. Write the first 5 terms of each arithmetic sequence.

a) $a_n = 3 + 4(n-2)$

$a_1 = 3 + 4(1-2) = 3 + 4(-1) = -1$

$a_2 = 3 + 4(2-2) = 3 + 4(0) = 3$

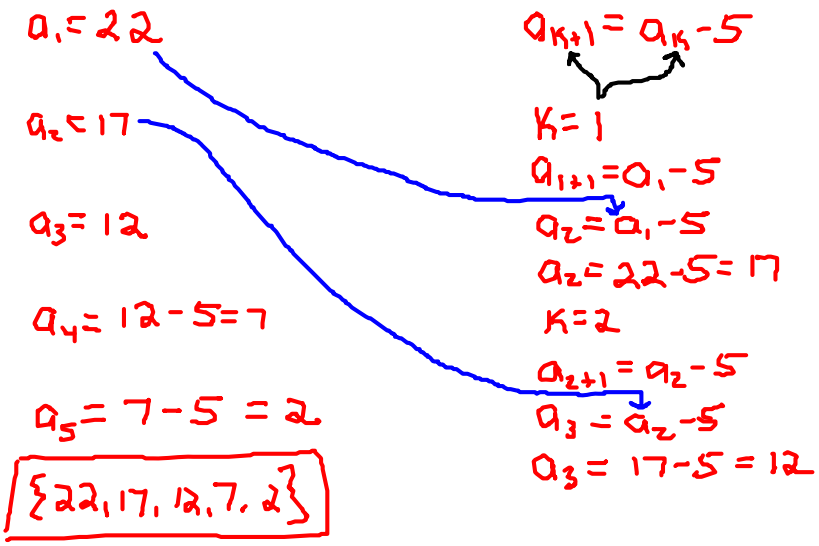
$a_3 = 3 + 4(3-2) = 3 + 4(1) = 7$

$a_4 = 3 + 4(4-2) = 3 + 4(2) = 11$

$a_5 = 3 + 4(5-2) = 3 + 4(3) = 15$

$\{-1, 3, 7, 11, 15\}$

b) $a_1 = 22$
$a_{k+1} = a_k - 5$



2. Find the 25th term of each arithmetic sequence.

a) 4, 7, 10, 13, 16,.....

3 3 3 3

common difference = 3

$n = 25 \quad a_1 = 4 \quad d = 3$

$a_n = a_1 + d(n-1)$

$a_{25} = 4 + 3(25-1)$
$= 4 + 3(24)$
$= 4 + 72$
$= \boxed{76}$

b) 3, $\frac{5}{2}$, 2, $\frac{3}{2}$, 1,.....

$-\frac{1}{2} \quad -\frac{1}{2} \quad -\frac{1}{2} \quad -\frac{1}{2}$

$n = 25$
$a_1 = 3$
$d = -\frac{1}{2}$

$a_n = a_1 + d(n-1)$

$a_{25} = 3 + -\frac{1}{2}(25-1)$

$= 3 + -\frac{1}{2}(24)$

$= 3 + -12$
$= \boxed{-9}$

3. Find a formula for a_n for the arithmetic sequence.

a) $a_1 = 10$, $d = -3$

$a_N = a_1 + d(N-1)$

$a_N = 10 + -3(N-1)$

$a_N = 10 - 3N + 3$

$\boxed{a_N = 13 - 3N}$

b) $a_3 = 1$, $a_{10} = \frac{10}{3}$

$a_N = a_1 + d(N-1)$

$a_N = \frac{1}{3} + \frac{1}{3}(N-1)$

$a_N = \frac{1}{3} + \frac{1}{3}N - \frac{1}{3}$

$\boxed{a_N = \frac{1}{3}N}$

$d = \frac{1}{3}$

$a_1 = \frac{1}{3}$

$a_3 \quad a_{10}$

$d \quad d \quad d \quad d \quad d \quad d \quad d$

$a_3 + 7d = a_{10}$

$1 + 7d = \frac{10}{3} - \frac{1 \cdot 3}{1 \cdot 3} = \frac{7}{3}$

$7d = \frac{7}{3} \cdot \frac{1}{7}$

$d = \frac{1}{3}$

$a_N = a_1 + d(N-1)$

$d = \frac{1}{3}$

$a_N = a_3 = 1$

$N = 3$

$1 = a_1 + \frac{1}{3}(3-1)$

$1 = a_1 + \frac{1}{3}(2)$

$1 = a_1 + \frac{2}{3}$

$a_1 = \frac{1}{3}$

4. Find the n^{th} partial sum of the arithmetic sequence.

a) $2, 10, 18, 26, 34, \ldots$ (+8)

$n = 20$

$a_N = a_1 + d(N-1)$

$a_{20} = 2 + 8(20-1)$

$a_{20} = 2 + 8(19)$

$a_{20} = 2 + 152$

$a_{20} = 154$

$S_N = \frac{N}{2}(a_1 + a_N)$

$N = 20$

$a_1 = 2$

$a_{20} = 154$

$S_{20} = \frac{20}{2}(2 + 154)$

$= 10(156)$

$= \boxed{1560}$

$= \boxed{1560}$

b) $\sum_{n=1}^{20}(2n+1)$

$S_N = \frac{N}{2}(a_1 + a_N)$

$N = 20 - 1 + 1 = 20$

$a_1 = 2(1) + 1 = 3$

$a_{20} = 2(20) + 1 = 41$

$S_{20} = \frac{20}{2}(3 + 41)$

$= 10(44)$

$= \boxed{440}$

c) $\sum_{n=10}^{100} 4n$

$S_N = \frac{N}{2}(a_1 + a_N)$

$a_{10} = 4(10) = 40$

$a_{100} = 4(100) = 400$

$N = \text{top} - \text{bottom} + 1 = 100 - 10 + 1 = 91$

$S_{91} = \frac{91}{2}(40 + 400)$

$= 45.5(440)$

$= \boxed{20,020}$