6.2 - Arithmetic Sequences

A sequence where there is a common difference, d, between consecutive terms. The same value is added or subtracted to a term to generate the next term.

+2

eg. 3, 5, 7, 9, 11, ... d = 2

5, 1, -3, -7, ... d = -4

0, 5, 10, 15, 20,.. d = 5

Notice the pattern: +3

1, 4, 7, 10, 13

1, 1 + 1(3), 1 + 2(3), 1 + 3(3), 1+4(3)

a, a + 1d, a + 2d, a + 3d, a + 4d

always 1 less than term #

first term

a = 1 d = 3

difference

Arithmetic Sequence Formula

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

where a is the first term and d is the common difference

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Ex. 1 Determine t_n for each.

This means find the general formula which works to find any term in the sequence. Must be simplified.

a) 7, 3, -1, -5, ...

$a = 7$, $d = -4$

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

$= 7 + (n-1)(-4)$

$= 7 - 4n + 4$

$\boxed{t_n = 11 - 4n}$

b) -5, -3, -1, 1, ...

$a = -5$, $d = 2$

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

$= -5 + (n-1)(2)$

$= -5 + 2n - 2$

$\boxed{t_n = 2n - 7}$

Ex. 2 Determine the # of terms in each sequence.

① a) 2, 5, 8, ..., 155

$a = 2$, $d = 3$

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

$= 2 + (n-1)(3)$

$= 2 + 3n - 3$

$\boxed{t_n = 3n - 1}$

② Use 155 to solve for n

$155 = 3n - 1$

$\frac{156}{3} = n$

$n = 52$

$\therefore$ 52 terms

b) 1, -1, -3, ..., -199

$a = 1$, $d = -2$

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

$= 1 + (n-1)(-2)$

$= 1 - 2n + 2$

$\boxed{t_n = 3 - 2n}$

$-199 = 3 - 2n$

$-202 = -2n$

$n = 101$

$\therefore$ 101 terms

Ex. 3 Insert two numbers between 17 and 59, so that the four numbers form an arithmetic sequence.

17 ___ 31 ___ 45 ___ 59

+d +d +d

$59 = 17 + 3d$

$42 = 3d$

$14 = d$

$t_2 = 17 + 14$

$= 31$

$t_3 = 31 + 14$

$= 45$

4. Determine, a, d, and t_n for each arithmetic sequence.

a) $t_4 = 13$, $t_{17} = 39$

13 differences (17 - 4)

$t_4 + 13d = t_{17}$

$13 + 13d = 39$

$13d = 26$

$d = 2$

Need a

Use one term to solve for it

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

$t_4 = a + (4-1)d$

$13 = a + (3)(2)$

$7 = a$

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

$= 7 + (n-1)(2)$

$= 7 + 2n - 2$

$t_n = 2n + 5$

b) $t_{10} = -67$, $t_{43} = -298$

33d

$t_{10} + 33d = t_{43}$

$-67 + 33d = -298$

$d = -7$

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

$t_{10} = a + (10-1)(-7)$

$-67 = a + (9)(-7)$

$a = -4$

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

$= -4 + (n-1)(-7)$

$= -4 - 7n + 7$

$t_n = 3 - 7n$

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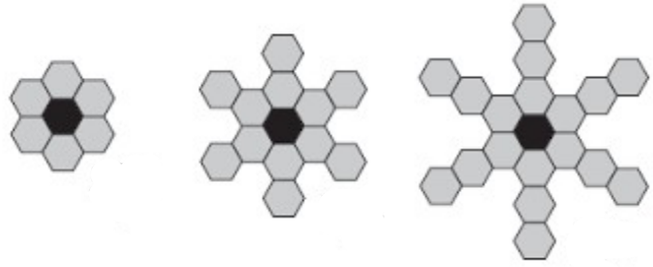
p. 424 #1, 3, 6, 8, 10, 11, 13, 15



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