Chapter 7.5 Arithmetic Series Classwork **Name:** Solutions by Hagen

1. Calculate the sum of the first 10 terms of each arithmetic series. Use $S_n = \frac{n[2a+(n-1)d]}{2}$

a) 59 + 64 + 69 + …

$a = 59$, $d = 5$, $n = 10$

$S_{10} = \frac{10[2(59)+(10-1)(5)]}{2}$

$S_{10} = 5(118+45)$

$S_{10} = 815$

b) -103 – 110 – 117 - …

$a = -103$, $d = -7$, $n = 10$

$S_{10} = \frac{10[2(-103)+(10-1)(-7)]}{2}$

$S_{10} = 5(-206-63)$

$S_{10} = -1345$

2. Calculate the sum of the first 20 terms of an arithmetic sequence with first term 18 and common difference 11.

$n = 20$, $a = 18$, $d = 11$

$S_{20} = \frac{20[2(18)+(20-1)(11)]}{2}$

$S_{20} = 10[36+209]$

$S_{20} = 2450$

3. For each series, calculate t_{12} then S_{12}.

$t_n = a+(n-1)d$ Then use $S_n = \frac{n(t_1+t_n)}{2}$

a) -18 – 12 – 6 + 0 + …

$a = -18$, $d = 6$, $n = 12$

$t_{12} = -18+(12-1)(6)$

$t_{12} = -18+66$

$t_{12} = 48$

$S_{12} = \frac{12(-18+48)}{2}$

$S_{12} = 6(30)$

$S_{12} = 180$

b) 3.19 + 4.31 + 5.43 + 6.55 + …

$a = 3.19$, $d = 1.12$ ($4.31 - 3.19 = 1.12$), $n = 12$

$t_{12} = 3.19+(12-1)(1.12)$

$t_{12} = 3.19+12.32$

$t_{12} = 15.51$

$S_{12} = \frac{12(3.19+15.51)}{2}$

$S_{12} = 6(18.7)$

$S_{12} = 112.2$

4. Determine the sum of the first 20 terms of an arithmetic series in which the 15th term is 107 and terms decrease by 3.

$n = 20$, $t_{15} = 107$, $d = -3$, $a = ?$

$107 = a+(15-1)(-3)$

$107 = a-42$

$149 = a$

$S_{20} = \frac{20[2(149)+(20-1)(-3)]}{2}$

$S_{20} = 10(298-57)$

$S_{20} = 2410$

We need to know "n", so first use $t_n = a + (n-1)d$

5. Calculate the sums of these finite arithmetic series (example 2 in notes)

a) $1 + 6 + 11 + \ldots + 96$ (a, t_n)

$a = 1$, $d = 5$, $t_n = 96$, $n = ?$

$96 = 1 + (n-1)(5)$

$95 = (n-1)(5)$

$19 = n-1$

$20 = n$

Now: $S_{20} = \frac{20(1+96)}{2}$

$S_{20} = 10(97)$

$S_{20} = 970$

b) $-31 - 38 - 45 - \ldots - 136$

$a = -31$, $d = -7$, $t_n = -136$, $n = ?$

$-136 = -31 + (n-1)(-7)$

$-105 = (n-1)(-7)$

$15 = n-1$

$16 = n$

$S_{16} = \frac{16(-31-136)}{2}$

$S_{16} = 8(-167)$

$S_{16} = 1336$

6. Bricks are stacked in 20 (n) rows such that each row has a fixed number of bricks more than the row above it. The top row has 5 bricks (t_1) and the bottom row has 62 bricks (t_{20}). How many bricks are in the stack?

$S_{20} = \frac{20(5+62)}{2}$

$S_{20} = 10(67)$

$S_{20} = 670$

7. Jamal got a job working on an assembly line in a toy factory. On the 20th (n) day of work, he assembled 137 ($t_{20} = 137$) toys. He noticed that since he started, every day he assembled 3 more toys than the day before. How many toys did Jamal assemble altogether during his first 20 days?

$a = ?$, $d = 3$

$137 = a + (20-1)(3)$

$137 = a + 57$

$80 = a$

$S_{20} = \frac{20[2(80) + (20-1)(3)]}{2}$

$S_{20} = 10[(160 + 57)$

$S_{20} = 2170$ toys

8. Given the arithmetic sequence below, determine the sum of the 20th term to the 39th term.

$5 + 12 + 19 + \ldots$

20 terms.

Let's find t_{20} and t_{39} using $t_n = a + (n-1)d$

$a = 5$, $d = 7$

$t_{20} = 5 + (20-1)(7)$

$t_{20} = 5 + 133$

$t_{20} = 138$

$t_{39} = 5 + (39-1)(7)$

$t_{39} = 5 + 266$

$t_{39} = 271$

Now, shift the "a" to t_{20}

Do either $S_{20} = \frac{20[2(138) + (20-1)(7)]}{2}$

OR:

$S_{20} = \frac{20(t_{20} + t_{39})}{2}$

$S_{20} = 10(138 + 271)$

$S_{20} = 4090$