Mathematics 11U

7.5 – Arithmetic Series

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Series:

- the sum of the terms of a sequence

- Add up this sequence WITHOUT using a calculator

$$3 + 7 + 11 + 15 + 19 + 23 + 27$$

$$27 + 23 + 19 + 15 + 11 + 7 + 3$$

$$30 + 30 + 30 + 30 + 30 + 30 + 30$$

$$\rightarrow 7(30) = 210$$

$$\rightarrow \frac{210}{2} = \boxed{105}$$

$$\boxed{\frac{n(t_1 + t_n)}{2}}$$

Two Arithmetic Series Formulas:

$$S_n = \frac{n(t_1 + t_n)}{2}$$

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

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

You do not need to know "d" If you have t_1 and t_n AND n.

Example 1

Find S_{22} of the sequence 32, 25, 18, ….

-7 -7

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

$$S_{22} = \frac{22[2(32) + (21)(-7)]}{2}$$

$$S_{22} = 11[64 - 147]$$

$$S_{22} = -913$$

Example 2

Find the sum of the arithmetic series:

$t_1 = a$ Last term $= t_n$

$8 + 11 + 14 + \ldots + 2129$

$3 = d$

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

$2129 = 8 + (n-1)(3)$

$2121 = (n-1)(3)$

$707 = n-1$

$708 = n$

$S_n = \frac{n(t_1 + t_n)}{2}$

$S_{708} = \frac{708(8 + 2129)}{2}$

$S_{708} = 756,498$