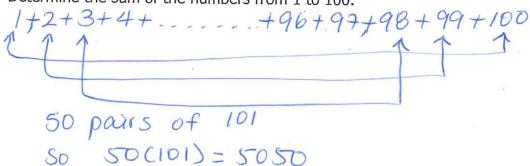
Foundations and Pre-Calculus 10

key

The Sum of an Arithmetic Series

Determine the sum of the numbers from 1 to 100.



What difference do you see between the problem above and the sequences we worked with previously?

we are adding the terms

series: the sum of a sequence

<u>arithmetic series</u>: a series whose terms are separated by a common difference eg. 2 + 6 + 10 + ...

The sum of the first n terms of an arithmetic series is given by the following formula:

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

Ex. 1) Determine the sum of the first 30 terms of the series 3 + 5 + 7 + 9 + ...

$$n=30$$
 $d=2$
 $a=3$
 $t_{30}=?$
 $t_{30}=3+(30-1)2$
 $=61$
 $S_{30}=\frac{30}{2}(3+61)$
 $=960$

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Ex. 2) Determine the sum of the first 50 terms of the series $1 + 6 + 11 + \dots$

$$a=1$$
 $d=5$
 $n=50$
 $t_{50}=1+(50-1)5$
 $=264$

$$S_6 = \frac{50}{2}(1 + 264)$$
= 6625

Ex. 3) Determine the sum of the series $5 + 9 + 13 + 17 + \dots + 65$.

$$a=5$$
 $d=4$
 $t_{n}=65$
 $n=?$
 $65=5+(n-1)4$
 $60=4(n-1)$
 $15=n-1$
 $n=16$

$$S_{16} = \frac{16}{2} (5 + 65)$$
= 560

Ex. 4) Determine the sum of the series $17 + 9 + 1 + \dots + (-95)$.

$$a = 17$$

 $d = (-8)$
 $t_{n} = -95$
 $n = ?$
 $-95 = 17 + (n-1)(-8)$
 $-112 = -8(n-1)$
 $14 = n-1$
 $n = 15$

$$S_{15} = \frac{15}{2} (17 - 95)$$

= -585