Pg 20
#24

50, 70, 90 ...

$t_n = 50 + 20(n-1)$

$t_n = 20n + 30$

$t_{12} = 20(12) + 30$

$t_{12} = 270$

270 m from pipe

$C = 2\pi r$

$C = 2\pi(270)$

$C = 540\pi$ (1696.5 m)

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4 sides → $t_1 + t_2 + t_3 + t_4 = 60$ $\quad t_4 = 24$

$t_1 + t_2 + t_3 = 36$

$t_1 + t_1 + d + t_1 + 2d = 36$

$\boxed{3t_1 + 3d = 36}$

$t_1 + 3d = 24$

$2t_1 = 12$

$t_1 = 6$

$\boxed{t_1 + 3d = 24}$

$6 + 3d = 24$

$3d = 18$

$d = 6$

6, 12, 18, 24

1.2 Arithmetic Series (adding terms of an arithmetic sequence)

Sum: $1+2+3+\ldots+98+99+100$

Sum: $100+99+98+\ldots+3+2+1$

$2\text{Sum}\ \boxed{101}+101+101\ \ldots\ 101+101+101$

$t_n = t_1+(n-1)d$

$2\text{Sum} = 100(101)$

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

$2\text{Sum} = 10100$

$\text{Sum} = 5050$

Determine the Sum of an Arithmetic Series

Male fireflies flash in various patterns to signal location or to ward off predators. Different species of fireflies have different flash characteristics, such as the intensity of the flash, the rate of the flash, and the shape of the flash. Suppose that under certain circumstances, a particular firefly flashes twice in the first minute, four times in the second minute, and six times in the third minute.

a) If this pattern continues, what is the number of flashes in the 30th minute?

b) What is the total number of flashes in 30 min?

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2, 4, 6 ...

a) t_{30}

b) S_{30}

a) $t_n = 2 + 2(n-1)$ OR $t_n = 2n$

$t_{30} = 2(30)$

$t_{30} = 60$

b) $S_{30} = \frac{30}{2}(t_1 + t_{30})$

$= 15(2 + 60)$

$= 930$

Example 2

Determine the Terms of an Arithmetic Series

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The sum of the first two terms of an arithmetic series is 13 and the sum of the first four terms is 46. Determine the first six terms of the series and the sum to six terms.

$t_1 + t_2 = 13$

$t_1 + t_1 + d = 13$

$2t_1 + d = 13$

$t_1 + t_2 + t_3 + t_4 = 46$

$t_1 + t_1 + d + t_1 + 2d + t_1 + 3d = 46$

$4t_1 + 6d = 46$

$\times 2$

$4t_1 + 2d = 26$

$4d = 20$

$d = 5$

$2t_1 + 5 = 13$

$2t_1 = 8$

$t_1 = 4$

ANS: 4, 9, 14, 19, 24, 29

* $t_3 + t_4 = 33$

$S_6 = \frac{6}{2}(4 + 29)$

$S_6 = 99$

Practise

1. Determine the sum of each arithmetic series.

   a) $5 + 8 + 11 + \cdots + 53$

   b) $7 + 14 + 21 + \cdots + 98$

a) $t_n = 3n + 2$

$53 = 3n + 2$

$51 = 3n$

$n = 17$

$t_n = 5 + 3(n-1)$

$S_{17} = \frac{17}{2}(5 + 53)$

$S_{17} = 493$

b) $t_n = 7n$

$98 = 7n$

$n = 14$

$S_{14} = \frac{14}{2}(7 + 98)$

$= 735$

2. For each of the following arithmetic series, determine the values of t_1 and d, and the value of S_n to the indicated sum.

a) $1 + 3 + 5 + \cdots (S_8)$ $t_1 = 1$ $d = 2$ $S_8 = \frac{8}{2}(1 + t_8)$

b) $40 + 35 + 30 + \cdots (S_{11})$

$t_8 = t_1 + 7d$

$t_8 = 1 + 14$

$S_8 = 4(1 + 15)$

$S_8 = 64$

$t_1 = 40$ $d = -5$

$S_{11} = \frac{11}{2}(40 + t_{11})$

$t_{11} = t_1 + 10d$

$= 40 + 10(-5)$

$= -10$

$S_{11} = \frac{11}{2}(40 - 10)$

$= 165$

3. Determine the sum, S_n, for each arithmetic sequence described.

a) $t_1 = 7, t_n = 79, n = 8$

b) $t_1 = 58, t_n = -7, n = 26$

$t_1 = 7 \quad t_8 = 79 \quad S_8 ?$

$S_8 = \frac{8}{2}(7 + 79)$

$S_8 = 344$

$t_1 = 58 \quad t_{26} = -7 \quad S_{26} ?$

$S_{26} = \frac{26}{2}(58 - 7)$

$S_{26} = 663$

4. Determine the value of the first term, t_1, for each arithmetic series described.

a) $d = 6, S_n = 574, n = 14$

b) $d = -6, S_n = 32, n = 13$

a) $S_{14} = 574$

$574 = \frac{14}{2}(t_1 + t_{14})$

$574 = 7(t_1 + t_1 + 13d)$

$574 = 7(2t_1 + 78)$

$82 = 2t_1 + 78$

$4 = 2t_1$

$t_1 = 2$

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

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

* $S_n = \frac{n}{2}(2t_1 + (n-1)d)$

5. For the arithmetic series, determine the value of n.

a) $t_1 = 8,\ t_n = 68,\ S_n = 608$

$S_n = 608$

$608 = \frac{n}{2}(8 + 68)$

$608 = \frac{n}{2}(76)$

$8 = \frac{n}{2}$

$n = 16$

6. For each series find t_{10} and S_{10}.

a) $5 + 10 + 15 + \cdots$

$t_n = 5n$

$t_{10} = 50$

$S_{10} = \frac{10}{2}(5 + 50)$

$S_{10} = 275$

Apply

7. a) Determine the sum of all the multiples of 4 between 1 and 999.

$\frac{999}{4} = 249.75$

$t_{249} = 996$

$4 + 8 + 12 + \ldots 996$

$S_{249} = \frac{249}{2}(4 + 996)$

$= 124500$

Complete 1-10 pgs.27-28