first 6 terms: $4, 9, 14, 19, 24, 29 \ldots$

sum $\frac{6}{2}(4+29)$ $\quad S_6 = 99$

class ① complete 1-10 pgs 27-28 (Arithmetic Series 1.2)

② go over 1-10, do 11-23 pgs 28-31

1 a) $t_n = 5+3(n-1)$ $\quad t_n = 3n+2$ $\quad 53 = 3n+2$ $\quad 51 = 3n$ $\quad n = 17$

$S_{17} = \frac{17}{2}(5+53)$ $\quad S_{17} = 493$

b) $t_n = 7n$ $\quad 98 = 7n$ $\quad n = 14$

$S_{14} = \frac{14}{2}(7+98)$ $\quad S_{14} = 735$

c) $t_n = 8-5(n-1)$ $\quad t_n = -5n+13$ $\quad -102 = -5n+13$ $\quad -115 = -5n$ $\quad n = 23$

$S_{23} = \frac{23}{2}(8-102)$ $\quad S_{23} = -1081$

d) $t_n = \frac{2}{3}+\frac{3}{3}(n-1)$ $\quad t_n = n-\frac{1}{3}$ $\quad \frac{41}{3} = n-\frac{1}{3}$ $\quad \frac{42}{3} = n$ $\quad n = 14$

$S_{14} = \frac{14}{2}\left(\frac{2}{3}+\frac{41}{3}\right)$ $\quad S_{14} = 100\,1/3$

2. a) $t_n = 2n-1$ $\quad t_8 = 15$ $\quad S_8 = \frac{8}{2}(1+15)$ $\quad S_8 = 64$ $\quad (t_1 = 1 \ d = 2)$

b) $t_1 = 40$ $d = -5$ $\quad t_n = -5n+45$ $\quad t_{11} = -10$ $\quad S_{11} = \frac{11}{2}(40-10)$ $\quad S_{11} = 165$

c) $t_1 = \frac{1}{2}$ $d = 1$ $\quad t_n = n-\frac{1}{2}$ $\quad t_7 = \frac{13}{2}$ $\quad S_7 = \frac{7}{2}\left(\frac{1}{2}+\frac{13}{2}\right)$ $\quad S_7 = \frac{49}{2}$

d) $t_1 = -3.5$ $d = 2.25$ $\quad t_n = 2.25n - 5.75$ $\quad t_6 = 7.75$ $\quad S_6 = \frac{6}{2}(-3.5+7.75)$

$S_6 = 12.75$

3a) $S_8 = \frac{8}{2}(7+79) = 344$ $\qquad$ b) $S_{26} = \frac{26}{2}(58-7) = 663$

c) $S_{10} = \frac{10}{2}(-12+51) = 195$ $\qquad$ d) $S_9 = \frac{9}{2}(2(12)+8(8)) = 396$

e) $S_{14} = \frac{14}{2}(2(42)+13(-5)) = 133$

4 a) S_{14} $574 = \frac{14}{2}(2t_1 + 13(6))$

$574 = 7(2t_1 + 78)$

$82 = 2t_1 + 78$

$4 = 2t_1$ $t_1 = 2$

b) S_{13} $32 = \frac{13}{2}(2t_1 + 12(-6))$

$\frac{64}{13} = 2t_1 - 72$

$\frac{64}{13} + 72 = 2t_1$ $t_1 = 500/13$ or $38\ 6/13$

c) S_{23} $218.5 = \frac{23}{2}(2t_1 + 22(.5))$

$19 = 2t_1 + 11$

$8 = 2t_1$ $t_1 = 4$

d) S_{18} $279 = \frac{18}{2}(2t_1 + 17(-3))$

$31 = 2t_1 - 51$

$82 = 2t_1$ $t_1 = 41$

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

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

$8 = \frac{n}{2}$ $n = 16$

b) $75 = \frac{n}{2}(-6 + 21)$

$75 = \frac{n}{2}(15)$

$5 = \frac{n}{2}$ $n = 10$

6 a) $t_n = 5n$ $t_{10} = 50$ $S_{10} = \frac{10}{2}(5 + 50)$ $S_{10} = 275$

b) $t_n = -3n + 13$ $t_{10} = -17$ $S_{10} = \frac{10}{2}(10 - 17)$ $S_{10} = -35$

c) $t_n = -4n - 6$ $t_{10} = -46$ $S_{10} = \frac{10}{2}(-10 - 46)$ $S_{10} = -280$

d) $t_n = 0.5n + 2$ $t_{10} = 7$ $S_{10} = \frac{10}{2}(2.5 + 7)$ $S_{10} = 47.5$

7 a) $4, 8, \ldots 996$ $t_n = 4n$ $S_{249} = \frac{249}{2}(4 + 996)$ $S_{249} = 124500$

$996 = 4n$

$n = 249$

7b * depends if 6 is included

$6, 12, 18 \ldots 996$ $\quad t_n = 6n$ $\quad S_{166} = \frac{166}{2}(6+996)$

$996 = 6n$ $\quad = 83(1002)$

$n = 166$ $\quad 83166$

textbook answer incorrect.

8. $(1+2+\ldots 12) + (1+2+\ldots 12)$

$S_{12} = \frac{12}{2}(1+12)$

$= 78 + 78$ $\quad$ 156 times

9. $t_5 = 14$ $\quad t_1 + 4d = 14$ $\quad d = 3$

a) $t_1 = 2$

b) $2+5+8+11+14 = 40$

c) $\frac{n}{2}(2(2) + 3(n-1))$

$\frac{n}{2}(3n+1)$

10. $t_2 = 40$ $\quad t_5 = 121$ $\quad 3d = 81$

$d = 27$ $\quad t_1 = 13$

$t_{25} = 13 + 24(27)$ $\quad t_{25} = 661$

$S_{25} = \frac{25}{2}(13+661)$ $\quad S_{25} = 8425$

11. $S_5 = 85$ $\quad S_6 = 123$ $\quad \therefore t_6 = 38 \rightarrow t_1 + 5d = 38$

$t_1 + 2d = 17$

$3d = 21$

$d = 7$

$t_1 + t_2 + t_3 + t_4 + t_5 = 85$

$t_1 + t_1 + d + t_1 + 2d + t_1 + 3d + t_1 + 4d = 85$

$5t_1 + 10d = 85$

$t_1 + 2d = 17$

$t_1 + 14 = 17$ $\quad t_1 = 3$

$3, 10, 17, 24, \ldots$

12. $5, 15, 25, 35, \ldots$ $\quad t_n = 10n-5$

a) $S_n = \frac{n}{2}(5 + 10n-5)$ $\quad S_n = \frac{n}{2}(10n)$ $\quad S_n = 5n^2$

b) for $n = 100$ $\quad t_{100} = 995$ $\quad S_{100} = \frac{100}{2}(5+995) = 50000$

formula $5n^2 \rightarrow 5(100)^2 = 50000$

13. $1, 2, 3, \ldots 18$ $\quad S_{18} = \frac{18}{2}(1+18)$ $\quad S_{18} = 171$

14. 2 people → 1 handshake (1)
3 people → 3 handshakes (1+2)
4 people → 6 handshakes (1+2+3)
5 people → 10 handshakes (1+2+3+4)

a) 1+2+3+4+5 represents handshakes needed for 6 people

b) 10 people → 1+2+3+4+5+6+7+8+9

c) 30 people → $1+2+\ldots 29$ $\quad S_{29} = \frac{29}{2}(1+29)$ $\quad$ 435 handshakes.

d) round-robin sporting events: each team plays every other team.

15. $x, 2x-5, 8.6$ $\quad d = t_2 - t_1 \quad x-5$
$d = t_3 - t_2 \quad -2x+13.6$ $\qquad x-5 = -2x+13.6$
$3x = 18.6$
$x = 6.2$

a) $t_1 = 6.2$ $\quad d = 1.2$

b) $t_{20} = 6.2 + 19(1.2)$ $\quad t_{20} = 29$

c) $S_{20} = \frac{20}{2}(6.2+29)$ $\quad S_{20} = 352$

16.

first ring = 3
2^{nd} ring = 4 (adds 2)
3^{rd} ring = 5 (adds 3)
⋮
18^{th} ring = 20 (adds 18)

Sum $= 3 + S_{17}$
$3 + (2+3+4+\ldots 18)$
$3 + \frac{17}{2}(2+18)$
$3 + 170$
173 cm

17. a) True $2t_1 + 2t_2 + \dots 2t_n = 2(t_1 + t_2 + \dots t_n)$

b) False $1+3+5 = 9$

$1+3+5+7+9+11 = 36$] sum is not doubled.

c) True $ct_1 + ct_2 + \dots ct_n = c(t_1 + t_2 + \dots t_n)$

18 a) $S_1 = 2(1)^2 + 5(1) = 7$ $(t_1 = 7)$

$S_2 = 2(2)^2 + 5(2) = 18$ $(t_2 = 11)$

$S_3 = 2(3)^2 + 5(3) = 33$ $(t_3 = 15)$

b) $S_{10} = \frac{10}{2}(2(7) + 9(4))$

$= 5(50)$ $S_{10} = 250$

c) $S_{10} = 2(10)^2 + 5(10)$ $S_{10} = 250$

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

$S_n = \frac{n}{2}(2(7) + 4(n-1))$

$S_n = \frac{n}{2}(4n + 10)$

$S_n = \frac{4n^2}{2} + \frac{10n}{2}$

$S_n = 2n^2 + 5n$

19 a) $240 + 250 + 260 + 270 + 280 + 290 + 300$

b) $S_n = \frac{n}{2}(2(240) + 10(n-1))$

$S_n = \frac{n}{2}(10n + 470)$

$S_n = 5n^2 + 235n$

c) add values from (a) or use $5(7)^2 + 235(7)$ 1890 bushels

d) he continues to increase production by 10 bushels per hour.

20. $t_{15} = 43$

$S_{15} = 120$

$\rightarrow \frac{15}{2}(t_1 + 43) = 120$

$t_1 + 43 = 16$

$t_1 = -27$

$t_{15} = -27 + 14d$

$43 = -27 + 14d$

$70 = 14d$

$d = 5$

first 3 terms: $-27, -22, -17$

21. Both are using the same formula

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

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

Pierre $\quad$ Jeanette

22. 1, 3, 5 ... $\quad t_n = 2n-1$

a) $S_{10} = \frac{10}{2}(2(1) + 2(10-1))$
$= 5(20)$ $\quad S_{10} = 100$

b) green: $S_{10} = \frac{10}{2}(1+10)$ $\quad$ blue: $S_{10} = \frac{10}{2}(0+9)$
$S_{10} = 55$ $\quad S_{10} = 45$

$\therefore S_{10} = 100$

23. 1, 3, 6, 10 $\quad \overset{t_1}{1}, \overset{t_2}{1+2}, \overset{t_3}{1+2+3}, \ldots$ $\quad t_{10} = 1+2+\ldots 10$ (a)
$t_{10} = \frac{10}{2}(1+10)$
$t_{10} = 55$

(b) $S_n = \frac{n}{2}(1+n)$

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