Key

Name: _____ Date: _____

Arithmetic Sequences/Series & Geometric Sequences & Interest Unit Review

1) What are the following in terms of arithmetic sequences / series:

n= number of terms t_n = last term

t_1 = first term d= common difference (arithmetic)

S_n = sum of arithmetic series r = common ratio (geometric)

2) For the following arithmetic sequence, find the 58th term: *120, 114, 108, ...*

$t_1 = 120$, $d = -6$, $n = 58$

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

$t_{58} = 120 + (58-1)(-6)$

$t_{58} = 120 + (-342)$

$t_{58} = -222$

3) Find the first term of an arithmetic sequence with $t_{11} = 100$ and $d = 8$.

$n = 11$, $d = 8$, $t_{11} = 100$

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

$100 = t_1 + (11-1)(8)$

$100 = t_1 + 80$

$t_1 = 20$

4) If the first term of an arithmetic sequence is -25, and the last term is 20, with a common difference of 3, find the number of terms.

$t_1 = -25$, $t_n = 20$, $d = 3$

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

$20 = -25 + (n-1)(3)$

$45 = 3(n-1)$

$15 = n-1$

$n = 16$

5) Molly starts with 21 cards and adds 18 baseball cards each month to her collection. How many cards will she have in 3 years? **Think carefully about what your 'n' value will be.*

21, 39, 57, 75, ...

↑ after 1 month

$n = 36 + 1 = 37$

$t_1 = 21$

$d = 18$

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

$t_{37} = 21 + (37-1)(18)$

$t_{37} = 21 + 648$

$t_{37} = 669$

6) Jon is 14 and has a birthday party. Every 3 years after that, up to and including his 50th birthday, he has another party. How many parties has Jon had in total?

$14, 17, 20, \ldots, 50$

$t_1 = 14$
$d = 30$
$t_n = 50$

$t_n = t_1 + (n-1)d$
$50 = 14 + (n-1)(3)$
$36 = 3(n-1)$
$12 = n-1$
$n = 13$

13 parties

7) Find the sum of the arithmetic series: $-10 + -1 + 8 + \ldots + 80$

$t_1 = -10$
$d = 9$
$t_n = 80$
need n

$t_n = t_1 + (n-1)d$
$80 = -10 + (n-1)(9)$
$90 = 9(n-1)$
$10 = n-1$
$n = 11$

$S_n = \frac{n}{2}(t_1 + t_n)$
$S_{11} = \frac{11}{2}(-10 + 80)$
$S_{11} = 5.5(70)$
$S_{11} = 385$

8) Find the sum of an arithmetic series that starts at 37, has a common difference of -6, and has 27 terms.

$t_1 = 37$
$d = -6$
$n = 27$

$S_n = \frac{n}{2}[2t_1 + (n-1)d]$
$S_{27} = \frac{27}{2}[2(37) + (27-1)(-6)]$
$S_{27} = 13.5(74 + (-156))$
$S_{27} = -1107$

9) If an arithmetic series has $S_7 = 175$, and $t_7 = 40$, find t_1.

$n = 7$
$S_7 = 175$
$t_7 = 40$

$S_n = \frac{n}{2}(t_1 + t_n)$
$175 = \frac{7}{2}(t_1 + 40)$
$175 = 3.5(t_1 + 40)$
$50 = t_1 + 40$
$t_1 = 10$

10) If an arithmetic series has a first term of 3, and $S_{14} = 406$, find d.

$t_1 = 3$
$n = 14$
$S_{14} = 406$

$S_n = \frac{n}{2}[2t_1 + (n-1)d]$
$406 = \frac{14}{2}[2(3) + (14-1)d]$
$406 = 7[6 + 13d]$
$58 = 6 + 13d$
$52 = 13d$
$d = 4$

11) Find $\sum_{n=2}^{5} 4n - 5$

$[4(2)-5] + [4(3)-5] + [4(4)-5] + [4(5)-5]$

$3 + 7 + 11 + 15$

36

12) If you started with \$17 and then were given \$19 after the first minute, then \$21 after the next minute, and this pattern continued, how much would you have after 30 minutes?

$17+19+21+\ldots$

$t_1 = 17$

$n = 31$

$d = 2$

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

$S_{31} = \frac{31}{2}[2(17) + (31-1)(2)]$

$S_{31} = 15.5[34+60]$

$S_{31} = \$1457$

13) Calculate the simple interest when \$8500 is invested at 4.6% for 7 years.

$I = Prt$

$I = (8500)(0.046)(7)$

$I = \$2737$

\$2737

14) Calculate the number of years that \$2500 is invested at 6% in order to make \$750 in simple interest.

$I = Prt$

$750 = (2500)(0.06)t$

$750 = 150t$

$t = \frac{750}{150} = 5$

5 years

15) \$5000 is invested at 3.5% for 4 years simple interest. After 4 years, all of that money is taken and invested at 5% for 6 years simple interest. How much in total will you have after this?

$I = Prt$

$I = (5000)(0.035)(4) = 700$

$Total = 5000 + 700 = 5700$

$I = Prt = (5700)(0.05)(6) = 1710$

$Total = 5700 + 1710 = 7410$

\$7410

16) \$3000 is invested for 4 years at compound interest of 7%. How much total money will you have after 4 years?

$A = P(1+r)^t$

$A = 3000(1+0.07)^4$

$A = 3000(1.07)^4$

$A = 3932.39$

\$3932.39

17) Micah ends up with $21 522.79 after 7 years of compound interest at 3%. How much did he originally invest?

$A = P(1+r)^t$

$21\,522.79 = P(1.03)^7$

$21\,522.79 = P(1.229873865)$

$P = 17\,500$

$17 500

18a) Joanie wins $2 000 000 in a lottery. She decides to invest it at 5.5% compound interest for 5 years. How much will she have in total at that point?

$A = P(1+r)^t$

$A = 2\,000\,000(1.055)^5$

$2 613 920.01

b) How much more interest will she make with compound interest compared to if she invested with the same terms at simple interest?

$I = Prt$

$I = (2\,000\,000)(0.055)(5)$

$I = 550\,000$

Total $= 2\,000\,000 + 550\,000 = 2\,550\,000$

difference: $2\,613\,920.01 - 2\,550\,000.00 = 63\,920.01$

$63 920.01

19) Find the 30th term: -3, 6, -12, 24, ...

$t_1 = -3$, $r = -2$, $n = 30$

$t_n = t_1 r^{n-1}$

$t_{30} = (-3)(-2)^{30-1}$

1 610 612 736

20) Find the 10th term: 1152, 576, 288, ...

$\frac{576}{1152} = \frac{1}{2}$ $t_1 = 1152$ $r = \frac{1}{2}$

$t_{10} = 1152\left(\frac{1}{2}\right)^{10-1}$

2.25 or $\frac{9}{4}$

21) Find r if the 2nd term is 15 and the 7th term is 3645

15, –, –, –, –, 3645

$15r^5 = 3645$

$r^5 = 243$

$\sqrt[5]{243} = r = 3$

3

22) A bacterial colony quadruples every hour. The colony starts with 9 organisms. How many organisms will there be after 12 hours?

t_{13}

9, 36, –, – etc

$n = 13$, $t_1 = 9$, $r = 4$

$t_{13} = 9(4)^{13-1}$

150 994 944