Worksheet Applications of Sequence and Series **Name:** Key

Find the specified term of each arithmetic sequence described

1. A stacked pile of firewood has one more log in each row than in the row above it. If there are three logs in the seventh or top row, how many logs are in the bottom row?

$a_1 =$ ooo oooo $d=1$ $a_7 = 3+(7-1)1$

$= \boxed{9 \text{ logs}}$

a_7

2. If Aunt Millie sent you \$100 on your first birthday, then increased each successive birthday present by \$10, how much will you receive on your 21st birthday?

$100+(21-1)10$

$100 + \underbrace{20(10)}_{200} = \boxed{\$300}$

3. The Apple Festival attracted 40,000 people in 1980. It has grown steadily each year by 2,500 people. How many people will attend in 1990?

$d=2500$

$n=11$

$40000+(11-1)2500$ In 1990 65,000 people

4. A lecture hall has 6 seats in the first row, 8 in the second, 10 in the third, and so on, through row 12. Rows 12 through 20 (the last row) all have the same number of seats. Find the number of seats in the lecture hall.

$S_{12} = \frac{12}{2}(6+28) = 204$ $S_{13-20} = 8(28) = 224$

$a_{12} = 6+(12-1)2$ 428 seats

5. If the starting salary for a job is \$20,000 and you get a \$2,000 raise at the beginning of each subsequent year, what will your salary be during the tenth year? How much will you earn during the first ten years?

20,000 $S_{10} = \frac{10}{2}(20{,}000 + 38{,}000)$

$20{,}000 + 9(2000)$ $= 5(58{,}000)$

$20{,}000 + 18000 = \boxed{\$38000}$ $\boxed{\$290{,}000}$

Find the specified term of each geometric sequence described.

6. Assuming a constant 9% annual increase for inflation, what will be the price in 6 years for a pen that costs \$.25 today?

$a_6 = .25(1.09)^6$

$\boxed{= \$.42}$

7. The number of different electronic games in the arcade seems to have doubled each month since the first one introduced a year ago. If the description is accurate, how many different games should be in the arcade today? $n=13$ include full year

$a_1=1$

$a_2=2$

$a_3=4$

$1(2)^{12} = \boxed{4096 \text{ games}}$

8. Starting with your parents, how many ancestors (grandparents, great grandparents, etc.) do you have for the past ten generations? $r=2$

$a_1=2$

$a_2=4$

$a_3=8$

$S_{10} = \frac{2(1-2^{10})}{1-2}$

$\boxed{2046 \text{ ancestors}}$

9. If you are paid a salary of $.01 on the first day of March, $.03 on the second day, and your salary continues to triple each day, how much will you earn in the month of March?

$a_1=.01$ $r=3$

$a_2=.03$

$S_{31} = \frac{.01(1-3^{31})}{1-3}$

$\boxed{\$3088,366,981,000}$

10. A car that sold for $8,000 depreciates in value 25% each year. What is it worth after 5 years?

$r = 1-.25 = .75$ $a_1 = 8000$

$a_6 = 8000(.75)^5$ $\boxed{\$1898.44}$

Select the appropriate formula and solve for the indicated value.

11. In a grocery store display, there are 9 boxes of tissue in the top level and 10 more boxes in each successive level down to the floor. If there are 10 levels, how many boxes are in the display?

$a_1 = 9$

$S_{10} = \frac{10}{2}(9+99)$ $\boxed{540 \text{ boxes}}$

$a_{10} = 9+(10-1)10$

$a_{10} = \boxed{99}$

12. During the first week in January, Sue took $10 from her home cash box for hobby expenses. She increased each monthly withdrawal by $5 over the preceding month. If she started with $500 on the first of January, how much did she have on the last day of December? $n=12$

$a_1 = 10$ $d=5$ $S_{12} = \frac{12}{2}(10+65) = 450$

$a_{12} = 10+(12-1)5$

$500 - 450$

$\boxed{\text{has } \$50 \text{ left}}$

13. To join the Friendship Club, Mark must introduce himself to 5 more people on each day than on the previous day. Starting with 5 on the first day, how many new people will Mark have met by the 30th of the month? $d=5$ $a_1=5$ $a_{30}=5+(30-1)5=150$

$S_{30}=\frac{30}{2}(5+150)$ $\boxed{2325 \text{ new people}}$

14. On the first day of production, the inspectors rejected 384 faulty radios. Each day after that, the number of rejects was half the previous day's rejects. After 7 days of production, how many faulty radios had been rejected in all?

$a_1=384$ $r=\frac{1}{2}$ $S_8=\frac{384(1-\frac{1}{2}^8)}{1-\frac{1}{2}}=\boxed{765 \text{ faulty radios}}$

15. In January, Alli could do only one sit-up. With continued practice, she has tripled the number of sit-ups she can do every month. How many sit-ups did Alli do for the entire year?

$a_1=1$ $r=3$

$S_{12}=\frac{1(1-3^{12})}{1-3}$ $\boxed{265{,}720 \text{ situps}}$

16. During a vacation, Sandy and Danny noticed that they spent less time on the beach each day than the previous day. If they spent 120 minutes the first day and 90 percent of each day's time on succeeding days, how much time did they spend on the beach at the end of 7 days?

$a_1=120$ $r=.90$ $S_7=\frac{120(1-.90^7)}{1-.90}$ $\boxed{626.04 \text{ minutes}}$

17. Find the sum of the even integers from 2 to 100, inclusive.

$2+4+...+100$ $S_{50}=\frac{50}{2}(2+100)$

$100=2+(n-1)2$ $\boxed{2550}$

$=\cancel{2}+2n-\cancel{2}$ $n=50$

18. A city spends \$10,000 in 1990 for pollution control. Assume that these costs increase by 7% per year. What would the city spend for pollution control in 1995? What would be its total expenditure in this category from 1990 through 1995? What would the city spend in 2003? What would be its total expenditure in pollution from 1990-2003?

$n=6$ 2003 $n=14$

$a_6=10000(1.07)^5$ $a_{14}=10000(1.07)^{13}=\boxed{\$24098.45}$

in 1995 $=\$14025.52$ $S_{14}=\frac{10000(1-1.07^{14})}{1-1.07}=\boxed{\$225504.88}$

$S_6=\frac{10000(1-1.07^6)}{1-1.07}=\$71532.91$

19. A projectile fired vertically upward rises 15,840 feet the first second, 15,808 feet the following second, and 15,776 feet in the third second. How many feet does it rise the 45th second?

$a_1 = 15840$

$a_2 = 15808$

$a_3 = 15776$ -32

$a_{45} = 15840 + (45-1)(-32)$

$\boxed{14432 \text{ feet}}$

20. The Jones family has rented a house for the past six years. During the first year of renting, they paid $600 per month. If their rent was increased by 5% for each year after that, what is the total amount of money they have paid in rent over the past six years?

600 x12
year

$$S_6 = \frac{7200(1-1.05^6)}{1-1.05}$$

$\boxed{\$48,973.77}$