Name_____

Sequences and Series Applications

1. Miss Rice drops a ball from a height of 30 feet. Each time it strikes the ground, it bounces up to .8 of the previous height. What will the ball bounce up to after it strikes the ground for the third time? What is its height after it strikes the ground for the nth time (find the formula)? How many times does the ball need to strike the ground before its height is less than 6 inches?

$a_0 = 30$
$a_1 = 24$

(a) $a_n = 24(.8)^{n-1}$

(c) $.5 = 24(.8)^{n-1}$
$n = 18.35$
19 times

(b) $a_3 = 24(.8)^2$
$a_3 = 15.36$ ft

2. Suppose Miss Ledford hired you to grade her papers at an annual salary of $18,000 and you expect to receive annual increases of 5%. What will your salary be when you begin your fifth year?

~~$a_n = 18000(1.05)^n$~~ ≈
or
$a_n = 18000(1.05)^{n-1} = 21,879.11$

3. If Mr. Hoyes has a bottle filled with 1000 fruit flies and 10% die each day, how many flies will there be in the bottle at the end of the 15th day?

$a_0 = 1000$
$r = .9$
$a_n = 900(.9^{n-1})$
$a_n = 900(.9)^{14}$
≈ 206 flies
$a_{15} = 1000(.9)^{15} \approx 206$ flies

4. The Middle Creek marching band has 14 marchers in the front row, 16 in the second, 18 in the third, and so on for 15 rows. How many marchers are in the last row? How many marchers are there altogether?

$a_n = 14 + 2(n-1)$
$a_n = 12 + 2n$
$a_{15} = 42$

$S_{15} = \frac{15}{2}(14 + 42) = 420$

5. How many poles will be in a pile of telephone poles if there are 50 in the first layer, 49 in the second, and so on, until there are 6 poles in the last layer?

$a_n = 50 - 1(n-1)$
$= 51 - n$
$6 = 51 - n$
$n = 45$

$S_n = \frac{45}{2}(50 + 6) = 1260$ poles

6. If Miss Rice saves ten cents October 1st, another 20 cents on October 2nd, another 30 cents on October 3rd, and so on, how much is saved during October? (There are 31 days in October)

$a_n = .10 + .10(n-1)$
$a_n = .10n$
$a_{31} = 3.1$

$S_{31} = \frac{31}{2}(.10 + 3.1)$
$= \$49.60$

7. Miss Ledford spend $30 on August 1st, $50 on August 2nd, $70 on August 3rd, and so on. How much did she spend during the 31 days of August?

$a_n = 30 + 20(n-1)$
$= 20n + 10$
$a_{31} = 630$

$S_{31} = \frac{31}{2}(30 + 630)$
$= \$10,230$

20

8. A ping-pong ball is dropped out of Mr. Hoyes' hand from a height of 20 feet and always rebounds one-fourth of the distance fallen. How high does it rebound the 6th time? Approximate the total of the rebound heights of the ball.

$a_0 = 20$ $a_1 = 5$ $a_n = 20(1/4)^n$ $a_n = 5(1/4)^{n-1}$ $a_6 = 5(1/4)^5 \approx 0.0049$ ft $S = \frac{5}{1-1/4} \sim 6.67$ ft

9. A population of 5000 flies is dying off at a rate of 4% per minute. How many flies will be alive after 15 minutes?

$r = .96$ $a_n = 5000(.96)^{96\%\, n} = 2710.43$ $a_n = 4800(.96)^{n-1}$ 2710.43 flies

10. As Miss Rice bales a field of hay, each trip around the field gets shorter. On the first trip around the field there were 230 bales of hay. On the second trip there were 219. The number of bales on each succeeding trip decreases arithmetically. The total number of trips is 10. How many bales of hay does Miss Rice get from the field?

$a_1 = 230$ $a_2 = 219$ $d = -11$ $a_n = 230 + -11(n-1)$ $230 - 99 = 131$ $S_n = \frac{10}{2}(230 + 131) = 1805$ bales

11. A clock chimes once at 1:00, twice at 2:00, three times at 3:00 and so on. The clock also chimes once at 15 minute intervals that are not on the hour. How many times does Miss Ledford hear the clock chime in a 12 hour period?

1 hr - 4
2 hr - 5
3 hr - 6
4 hr - 7

$a_n = 4 + 1(n-1)$ $= n + 3$ $a_{12} = 15$ $S_{12} = \frac{12}{2}(4 + 15) = 114$ times

12. A certain bacteria culture initially contains 8000 bacteria and increases by 15% every hour. Write a rule for the number of bacteria present at the beginning of the nth hour. How many bacteria are present at the 12th hour?

$a_0 = 8000$ $a_1 = 9200$ $a_n = 9200(1.15)^{n-1}$ $a_{12} = 42,802$ bacteria

13. A well-drilling company charges $15 for drilling the first foot of a well, $15.25 for the next foot, $15.50 for the third foot, and so on. How much would Mr. Hoyes calculate the cost of a 100 foot well to be?

1 ft = 15
2 ft = 15.25
3 ft = 15.50

$d = .25$ $a_n = 15 + .25(n-1)$ $14.75 + .25n$ $a_{100} = 39.75$ $S_n = \frac{100}{2}(15 + 39.75) = \$2737.50$

14. Your rick uncle says he will pay $.01 for your first day of work, $.02 for the second day, $.04 for the third day, and so on. Each day your wage doubles. How much will you have in all after 10 days? 20 days? 30 days?

.01
.02
.04
⋮

$r = 2$ $a_n = .01(2)^{n-1}$

10 day: $S_{10} = \frac{.01(1-2^{10})}{1-2} = \$10.23$

20 day: $S_{20} = \frac{.01(1-2^{20})}{1-2} = \$10,485.75$

$S_{30} = 10,737,418.23$