Name ____________ Date _____________
Mr. Schlansky Algebra II

# *Recursive Sequences Regents Practice*

1. The formula below can be used to model which scenario?

$$a_1 = 3000$$

$$a_n = 0.80a_{n-1}$$

1) The first row of a stadium has 3000 seats, and each row thereafter has 80 more seats than the row in front of it.
2) The last row of a stadium has 3000 seats, and each row before it has 80 fewer seats than the row behind it.
3) A bank account starts with a deposit of $3000, and each year it grows by 80%.
4) The initial value of a specialty toy is $3000, and its value each of the following years is 20% less.

2. The formula below can be used to model which scenario?

$a_0 = 92.2$

$a_n = 1.015a_{n-1}$

1) The initial population of a county is 92.2 thousand and it is increasing by 15% each year.
2) The initial population of a county is 92.2 thousand and it is increasing by 1.5% each year.
3) The population after one year is 92.2 thousand and it is increasing by 15% each year.
4) The population after one year is 92.2 thousand and it is increasing by 1.5% each year.

3. The sequence defined by $r_1 = 15$ and $r_n = 0.75r_{n-1}$ best models which scenario?

1) Gerry's $15 allowance is increased by $0.75 each week.
2) A store that has not sold a $15 item reduces the price by $0.25 each week until someone purchases it.
3) A 15-gram sample of a chemical compound decays at a rate of 75% per hour.
4) A picture with an area of 15 square inches is reduced by 25% over and over again to make a proportionally smaller picture.

4. The sequence defined by $a_1 = 20$ and $a_n = 1.05a_{n-1}$ best models which scenario?

1) Jamal scored 20 baskets the first week and scores 5 more baskets each week.
2) Julie made $20 her first month working and earns 5% more each month.
3) Samantha creates 20 paintings the first year and makes 50% more paintings each year.
4) Jennifer's flower is 20 inches tall on day 1 and increases by .05 inches each day.

5. Which situation *cannot* be modeled by the formula $a_n = a_{n-1} + 20$ with $a_1 = 10$?

1) Nancy put \$10 in her piggy bank on the first day and then added \$20 daily to her piggy bank.
2) Jay has a box of ten crayons and his teacher gives him twenty new crayons each month for good behavior.
3) Buzz has ten apples and that number increases by 20% per week.
4) Teresa has a block of metal that is 10°F and she heats it up at a rate of 20°F per minute.

6. Which situation *can* be modeled by the formula $a_n = 1.025a_{n-1}$ with $a_0 = 100$?

1) Devin has \$100 saved and he will increase that amount by \$2.50 each week.
2) Catherine has 100 Pokemon cards and gets 25% more each week.
3) Lucas has 100 points and each week increases by 2.5%.
4) Olivia's plant is 100 cm tall and it grows .025 cm each week.

7. Which situation *cannot* be modeled by the formula $a_n = a_{n-1} - 6$ with $a_0 = 1000$?

1) A bank account with an initial balance of \$1000 increases by 6% each year.
2) Taylor is assigned 1000 SAT problems and completes 6 each day.
3) The starting population of fish in a pond is 1000 and the population decreases by 6% each day.
4) Jessica has \$1000 saved and saves an additional \$6 each week.

8. The height of Jenny's sunflower when she planted it was 6 inches. The sunflower grows by 0.25 inches per day. Which formula can be used to determine the height, in inches, of Jenny's sunflower on day *n*?

(1) $\begin{aligned} h_0 &= 6 \\ h_n &= 0.25a_{n-1} \end{aligned}$

(3) $\begin{aligned} h_0 &= 6 \\ h_n &= h_{n-1} + 0.25 \end{aligned}$

(2) $\begin{aligned} h_0 &= 6 \\ h_n &= 6 + 0.25h_{n-1} \end{aligned}$

(4) $\begin{aligned} h_0 &= 6 \\ h_n &= 6h_{n-1} + 0.25 \end{aligned}$

9. A population of bacteria triples every day. If on the first day there are 300 bacteria in a Petri dish, which recursive sequence can be used to determine the population on day *n*?

1) $\begin{aligned} b_1 &= 300 \\ b_n &= 3b_{n-1} \end{aligned}$

3) $\begin{aligned} b_1 &= 300 \\ b_n &= 300(3b_{n-1}) \end{aligned}$

2) $\begin{aligned} b_1 &= 300 \\ b_n &= b_{n-1} + 3 \end{aligned}$

4) $\begin{aligned} b_1 &= 300 \\ b_n &= \frac{1}{3}b_{n-1} \end{aligned}$

10. A lumber yard has 1500 2” by 4” pieces of wood that need to be transported to a construction site. A truck can take 100 pieces of wood per trip. Which sequence can be used to determine the number of pieces of wood left at the lumberyard after *n* trips?

(1) $a_0 = 1500$, $a_n = a_{n-1} - 100$

(3) $a_0 = 1500$, $a_n = 1500 - 100a_{n-1}$

(2) $a_0 = 1500$, $a_n = 100 - a_{n-1}$

(4) $a_0 = 1500$, $a_n = 100 - 1500a_{n-1}$

11. Daniela invested $2000 in a stock that increases by 1.6% each week. Which of the following recursive sequences represents the value of her stock after n weeks?

1) $a_0 = 2000$, $a_n = a_{n-1} + 1.6$

3) $a_0 = 2000$, $a_n = 1.6a_{n-1}$

2) $a_0 = 2000$, $a_n = a_{n-1} + 1.016$

4) $a_0 = 2000$, $a_n = 1.016a_{n-1}$

12. At her job, Pat earns $25,000 the first year and receives a raise of $1000 each year. The explicit formula for the *n*th term of this sequence is $a_n = 25,000 + (n-1)1000$. Which rule best represents the equivalent recursive formula?

1) $a_n = 24,000 + 1000n$

3) $a_1 = 25,000,\ a_n = a_{n-1} + 1000$

2) $a_n = 25,000 + 1000n$

4) $a_1 = 25,000,\ a_n = a_{n+1} + 1000$

13. The average depreciation rate of a new boat is approximately 8% per year. If a new boat is purchased at a price of $75,000, which model is a recursive formula representing the value of the boat *n* years after it was purchased?

1) $a_n = 75,000(0.08)^n$

3) $a_n = 75,000(1.08)^n$

2) $a_0 = 75,000$, $a_n = (0.92)^n$

4) $a_0 = 75,000$, $a_n = 0.92(a_{n-1})$

14. An initial investment of $5000 in an account earns 3.5% annual interest. Which function correctly represents a recursive model of the investment after *n* years?

1) $A = 5000(0.035)^n$

3) $A = 5000(1.035)^n$

2) $a_0 = 5000$, $a_n = a_{n-1}(0.035)$

4) $a_0 = 5000$, $a_n = a_{n-1}(1.035)$

15. MathSchlansky posts a video to his YouTube channel and it receives 4 views on the first day. Each day after that, the number of views increases by 7%. Which sequence can be used to determine the number of views his video receives after *n* days?

1) $\begin{aligned} a_1 &= 4 \\ a_n &= a_{n-1} + 7 \end{aligned}$

2) $\begin{aligned} a_1 &= 4 \\ a_n &= a_{n-1} + 1.07 \end{aligned}$

3) $\begin{aligned} a_1 &= 4 \\ a_n &= .07a_{n-1} \end{aligned}$

4) $\begin{aligned} a_1 &= 4 \\ a_n &= 1.07a_{n-1} \end{aligned}$

16. A tree farm initially has 150 trees. Each year, 20% of the trees are cut down and 80 seedlings are planted. Which recursive formula models the number of trees, $a_n$, after *n* years?

1) $a_1 = 150$
$a_n = a_{n-1}(0.2) + 80$

2) $a_1 = 150$
$a_n = a_{n-1}(0.8) + 80$

3) $a_n = 150(0.2)^n + 80$

4) $a_n = 150(0.8)^n + 80$

17. A recursive formula for the sequence $18, 9, 4.5, \ldots$ is

1) $g_1 = 18$
$g_n = \frac{1}{2}g_{n-1}$

2) $g_n = 18\left(\frac{1}{2}\right)^{n-1}$

3) $g_1 = 18$
$g_n = 2g_{n-1}$

4) $g_n = 18(2)^{n-1}$

18. A recursive formula for the sequence $40, 30, 22.5, \ldots$ is

1) $g_n = 40\left(\frac{3}{4}\right)^n$

2) $g_1 = 40$
$g_n = g_{n-1} - 10$

3) $g_n = 40\left(\frac{3}{4}\right)^{n-1}$

4) $g_1 = 40$
$g_n = \frac{3}{4}g_{n-1}$

19. A recursive formula for the sequence $64, 48, 36, \ldots$ is

1) $a_n = 64(0.75)^{n-1}$

2) $a_1 = 64$
$a_n = a_{n-1} - 16$

3) $a_n = 64 + (n-1)(-16)$

4) $a_1 = 64$
$a_n = 0.75a_{n-1}$

20. After Roger's surgery, his doctor administered pain medication in the following amounts in milligrams over four days.

| **Day** (n) | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| **Dosage** (m) | 2000 | 1680 | 1411.2 | 1185.4 |

How can this sequence best be modeled recursively?

1) $m_1 = 2000$
   $m_n = m_{n-1} - 320$

2) $m_n = 2000(0.84)^{n-1}$

3) $m_1 = 2000$
   $m_n = (0.84)m_{n-1}$

4) $m_n = 2000(0.84)^{n+1}$

21. The population of Jamesburg for the years 2010-2013, respectively, was reported as follows:
250,000   250,937   251,878   252,822
How can this sequence be recursively modeled?

1) $j_n = 250,000(1.00375)^{n-1}$

2) $j_1 = 250,000$
   $j_n = 1.00375 j_{n-1}$

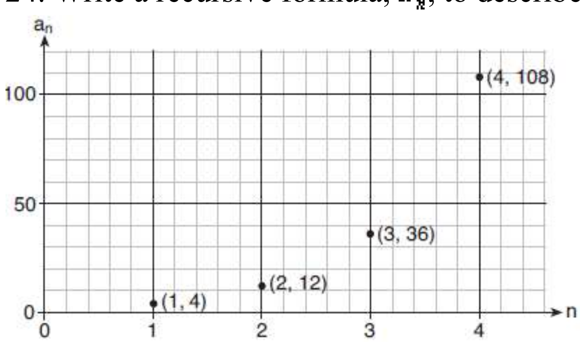
3) $j_n = 250,000 + 937^{(n-1)}$

4) $j_1 = 250,000$
   $j_n = j_{n-1} + 937$

22. Write a recursive formula for the sequence $6, 9, 13.5, 20.25, \ldots$

23. Write a recursive formula for the sequence $189, 63, 21, 7, \ldots.$

24. Write a recursive formula, $a_n$, to describe the sequence graphed below.




25. The explicit formula $a_n = 6 + 6n$ represents the number of seats in each row in a movie theater, where *n* represents the row number. Rewrite this formula in recursive form.