percents
If less than 1: decreasing
If more than 1: increasing

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Algebra II

Recursive Sequences Regents Practice

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

$$a_1 = 3000$$

$$a_n = 0.80a_{n-1}$$ → decreasing by 20%

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?

$a_0 = 92.2$

$a_n = 1.015a_{n-1}$ → increasing by 1.5%

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.

→ decreasing by 25%

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.

→ increasing by 5%

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.

add 20

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. $1.2a_{n-1}$
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 $a_0 = 100$?

increase by 2.5%

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.

decrease by 6

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?

$a_{n-1} + .25$

(1) $h_0 = 6$, $h_n = 0.25a_{n-1}$

(2) $h_0 = 6$, $h_n = 6 + 0.25h_{n-1}$

(3) $h_0 = 6$, $h_n = h_{n-1} + 0.25$

(4) $h_0 = 6$, $h_n = 6h_{n-1} + 0.25$

$3a_{n-1}$

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) $b_1 = 300$, $b_n = 3b_{n-1}$

2) $b_1 = 300$, $b_n = b_{n-1} + 3$

3) $b_1 = 300$, $b_n = 300(3b_{n-1})$

4) $b_1 = 300$, $b_n = \frac{1}{3}b_{n-1}$

$a_{n-1} - 100$

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

$1 + .016$ $1.016a_{n-1}$

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

$a_{n-1} + 1000$

12. At her job, Pat earns \$25,000 the first year and receives a raise of \$1000 each year. The explicit formula for the nth 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) $a_1 = 25,000,\ a_n = a_{n+1} + 1000$

$1 - .08$

$.92a_{n-1}$

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

$1 + .035$

$1.035a_{n-1}$

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? $\rightarrow 1.07a_{n-1}$

1) $a_1 = 4$, $a_n = a_{n-1} + 7$

3) $a_1 = 4$, $a_n = .07a_{n-1}$

2) $a_1 = 4$, $a_n = a_{n-1} + 1.07$

4) $a_1 = 4$, $a_n = 1.07a_{n-1}$

$1 - .20$

$.8a_{n-1} + 80$

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

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

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

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

$r = \frac{a_2}{a_1} = \frac{9}{18} = \frac{1}{2}$

$r = \frac{4.5}{9} = \frac{1}{2}$

$\frac{1}{2}a_{n-1}$

$r = \frac{30}{40} = \frac{3}{4}$

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

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

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

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

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

$r = \frac{22.5}{30} = \frac{3}{4}$

$\frac{3}{4}a_{n-1}$

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

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

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

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

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

$r = \frac{48}{64} = \frac{3}{4}$

$r = \frac{36}{48} = \frac{3}{4}$

$\frac{3}{4}a_{n-1}$

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

$r = \frac{1680}{2000}$ $r = \frac{1411.2}{1680}$

$.84a_{n-1}$ $r = .84$ $r = .84$

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) $j_1 = 250,000$

$j_n = j_{n-1} + 937$

$r = \frac{250937}{250000} \approx 1.00375$

$r = \frac{251878}{250937} \approx 1.00375$

$1.00375a_{n-1}$

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

$r = \frac{9}{6} = 1.5$

$r = \frac{13.5}{9} = 1.5$

$a_1 = 6$

$a_n = 1.5a_{n-1}$

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

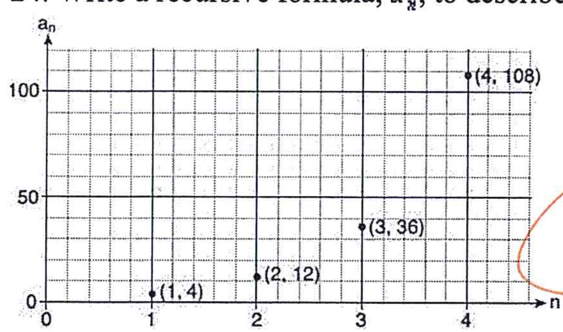
$r = \frac{63}{189} = \frac{1}{3}$

$r = \frac{21}{63} = \frac{1}{3}$

$a_1 = \cancel{6}\ 189$

$a_n = \frac{1}{3}a_{n-1}$

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



4, 12, 36, 108

$r = \frac{12}{4} = 3$

$r = \frac{36}{12} = 3$

$a_1 = 4$

$a_n = 3a_{n-1}$

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.

$a_1 = 6 + 6(1) = 12$

$a_2 = 6 + 6(2) = 18$

$a_3 = 6 + 6(3) = 24$

$d = 18 - 12 = 6$

$d = 24 - 18 = 6$

$a_1 = 12$

$a_n = a_{n-1} + 6$