Student Name: _____

Teacher: _____ Date: _____

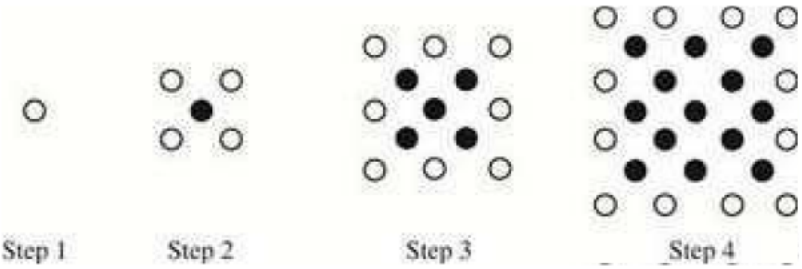
District: Miami-Dade County Public Schools

Assessment: 9_12 Mathematics Algebra II Exam 4

Description: Algebra 2 Topic 9 Sequences and Series

Form: 201

1. Beginning with Step 2, the border of white dots in each step in the pattern below is one dot wider and one dot longer than the border in the previous step.



How many white dots are in the border of Step **n**?

MAFS.912.F-BF.1.2
Webb: 1

A. n^2
B. $2n + (n - 2)$
C. $4n$
D. $4n - 4$

2. Brad hiked a 9-mile trail in 3 hours. He hiked m miles during the first hour and then $\frac{2}{3}$ of the remaining distance during the second hour. Which expression shows the number of miles Brad hiked during the third hour?

MAFS.912.F-BF.1.1.a
Webb: 1

A. $\frac{2}{3}(9 - m)$
B. $9 - 1\frac{2}{3}m$
C. $3 - m$
D. $3 - \frac{1}{3}m$

3. In a sequence, a term a_n can be determined by adding 5 to the mean of the previous two terms. Which equation can be used to determine a_n for this sequence?

MAFS.912.F-BF.1.1.a
Webb: 2

A. $a_n = a_{n-1} + a_{n-2} + 5$

B. $a_n = \frac{a_{n-1} + a_{n-2}}{2 + 5}$

C. $a_n = \frac{a_{n-1} + a_{n-2} + 5}{2}$

D. $a_n = \frac{a_{n-1} + a_{n-2}}{2} + 5$

4. Bianca derived a formula to determine the value of $\sum_{n=1}^{5} 80(0.7)^n$. Bianca's teacher asked her to derive the formula again after increasing the common ratio by 1. Which expression represents the formula Bianca should have written after increasing the common ratio by 1?

MAFS.912.A-SSE.2.4
Webb: 2

A. $\frac{56(1 - 1.7^5)}{1 - 1.7}$

B. $\frac{57(1 - 1.7^5)}{1 - 1.7}$

C. $\frac{81(1 - 0.7^5)}{1 - 0.7}$

D. $\frac{136(1 - 1.7^5)}{1 - 1.7}$

5. For the sequence $0, 1\frac{1}{2}, 2\frac{2}{3}, 3\frac{3}{4}, 4\frac{4}{5}, \ldots$, which expression represents the **n**th term of the sequence?

MAFS.912.F-BF.1.2
Webb: 1

A. $n - \frac{1}{n}$

B. $-\frac{1}{2}n$

C. $n + 1\frac{1}{2}$

D. $2\frac{1}{2}n$

6. A ball is dropped from a height of 100 feet. Each time it hits the ground, it bounces back up and reaches a maximum height that is 80% of its previous height. Which formula gives the total distance, in feet, it would have traveled when hitting the ground for the 10th time?

MAFS.912.A-SSE.2.4

Webb: 3

A. $2\left(\frac{100(1-0.8^{10})}{1-0.8}\right)-100$

B. $\left(\frac{100(1-0.8^{10})}{1-0.8}\right)-100$

C. $2\left(\frac{100(1-0.8^{10})}{1-0.8}\right)$

D. $\left(\frac{100(1-0.8^{10})}{1-0.8}\right)$

7. The geometric series 1 + 0.2 + 0.04 is summarized using the following formula, where n, x, and y represent real numbers greater than 0.

$$\sum_{n=1}^{3} x(y)^n$$

Which statement describes the effect on the variables if the series is changed to 2.5 + 1.25 + 0.625?

MAFS.912.A-SSE.2.4

Webb: 2

A. The value of x increases from 1 to 2.5.

B. The value of y increases from 1 to 2.5.

C. The value of x increases from 0.2 to 0.5.

D. The value of y increases from 0.2 to 0.5.

8. Which equation represents the formula for the general term, g_n, of the geometric sequence $3,\ 1,\ \frac{1}{3},\ \frac{1}{9},\ldots$?

MAFS.912.F-BF.1.2

Webb: 1

A. $g_n=\left(\frac{1}{3}\right)^{n-2}$

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

C. $g_n=(3)^{n-2}$

D. $g_n=(3)^{1-n}$

9. A pendulum's first swing has an arc of 36 inches. As the pendulum swings back and forth, the arc length for each successive swing is 95% of the previous swing. If this pattern continues, at which swing of the pendulum will the length of the arc be less than 27 inches?

MAFS.912.F-BF.1.2
Webb: 2

A. 5th
B. 6th
C. 7th
D. 9th

10. William derived a formula to determine the value of the following expression with 6 as the coefficient of each term.

$$6(1.5)^1 + 6(1.5)^2 + \ldots + 6(1.5)^{13}$$

William recalculated the formula after increasing each coefficient from 6 to 8. Which expression represents the formula William should have written after increasing each coefficient?

MAFS.912.A-SSE.2.4
Webb: 2

A. $\frac{7.5(1 - 1.5^{13})}{1 - 1.5}$
B. $\frac{9(1 - 1.5^{13})}{1 - 1.5}$
C. $\frac{9.5(1 - 1.5^{13})}{1 - 1.5}$
D. $\frac{12(1 - 1.5^{13})}{1 - 1.5}$

11. A geometric sequence is defined by:

$$a_1 = 10$$
$$a_n = 2a_{n-1}$$

What are the first four terms of the sequence?

MAFS.912.F-BF.1.2
Webb: 1

A. 10, 12, 14, 16
B. 10, 20, 30, 40
C. 10, 20, 40, 80
D. 10, 12, 24, 48

12. A geometric sequence has r as the common ratio and a as its first term. Which expression represents the sum of the series from term $(n+1)$ to term $2n$?

MAFS.912.A-SSE.2.4
Webb: 3

A. $\frac{a(r^n - r^{2n})}{1-r}$

B. $\frac{ar^n - r^{2n}}{1-r}$

C. $\frac{a(r^{2n} - r^n)}{1-r}$

D. $\frac{ar^{2n} - r^n}{1-r}$

13. A company is increasing production by 50% each year for an 8-year period. The initial production was 850 units. Which set of equations shows a correct derivation and sum of the total number of units produced, T, over this 8-year period?

MAFS.912.A-SSE.2.4

Webb: 2

A.

$$T = 850 + 850(0.5) + 850(0.5)^2 + \ldots + 850(0.5)^7$$

$$0.5T = 850(0.5) + 850(0.5)^2 + 850(0.5)^3 + \ldots + 850(0.5)^8$$

$$0.5T = 850 - 850(0.5)^8$$

$$T = \frac{850(1 - 0.5^8)}{0.5} = 1{,}693$$

B.

$$T = 850 + 850(0.5) + 850(0.5)^2 + \ldots + 850(0.5)^7$$

$$0.5T = 850(0.5) + 850(0.5)^2 + 850(0.5)^3 + \ldots + 850(0.5)^8$$

$$0.5T = 850 - 850(0.5)^8$$

$$T = \frac{850(1 - 0.5^8)}{0.5} = 41{,}869$$

C.

$$T = 850 + 850(1.5) + 850(1.5)^2 + \ldots + 850(1.5)^7$$

$$1.5T = 850(1.5) + 850(1.5)^2 + 850(1.5)^3 + \ldots + 850(1.5)^8$$

$$-0.5T = 850 - 850(1.5)^8$$

$$T = \frac{850(1 - 1.5^8)}{-0.5} = 1{,}693$$

D.

$$T = 850 + 850(1.5) + 850(1.5)^2 + \ldots + 850(1.5)^7$$

$$1.5T = 850(1.5) + 850(1.5)^2 + 850(1.5)^3 + \ldots + 850(1.5)^8$$

$$-0.5T = 850 - 850(1.5)^8$$

$$T = \frac{850(1 - 1.5^8)}{-0.5} = 41{,}869$$

14. West Wheel is a small business that makes skateboards. It has fixed costs of $65,270 and a cost of $57.50 to produce each skateboard. It sells the skateboards for $98.00. Which set of functions below is the correct model for the company's costs and revenue?

MAFS.912.F-BF.1.1.a

Webb: 2

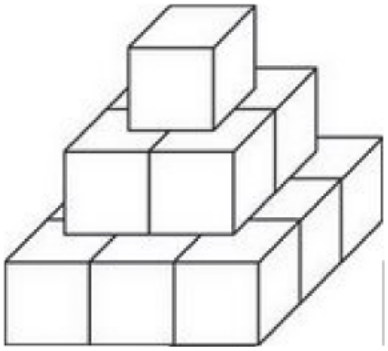
A. $C(x) = 62{,}750 + 57.5x;\ R(x) = 98x$

B. $C(x) = 62{,}750 + 98x;\ R(x) = 57.5x$

C. $C(x) = 98x;\ R(x) = 62{,}750 + 57.5x$

D. $C(x) = 57.5x;\ R(x) = 62{,}750 + 98x$

15. A pyramid is being built with cubes, as shown.

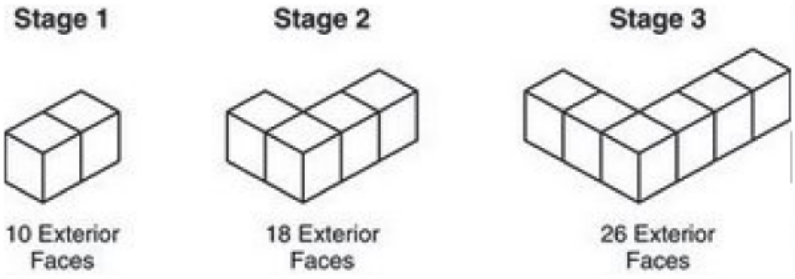


On the top layer is one cube. Under that is a layer of 4 cubes arranged in a square. The third layer has 9 cubes arranged in a square. If this pattern continues indefinitely, which expression gives the number of cubes in the nth layer?

MAFS.912.F-BF.1.2
Webb: 1

A. n^2
B. n^3
C. $2n$
D. $n(n-2)$

16. A pattern begins with two cubes and continues by adding a cube to each side as shown below.



Which function could be used to determine the number of exterior faces in stage n?

MAFS.912.F-BF.1.2
Webb: 2

A. $f_n = f_{n-1} + 8$, where $f_1 = 10$
B. $f_n = f_{n-1} + 10$, where $f_1 = 8$
C. $f_n = 8 \cdot f_{n-1} + 2$, where $f_1 = 10$
D. $f_n = 10 \cdot f_{n-1} + 2$, where $f_1 = 8$

17. In an arithmetic series, what is the sum of the first 22 terms if the first term is 12 and the common difference is 3?

MAFS.912.A-SSE.2.4
Webb: 2

A. 627
B. 792
C. 957
D. 990

18. The pattern shown is based on the sum of the cubes of consecutive positive integers.

$$1^3 = 1$$
$$1^3 + 2^3 = 9$$
$$1^3 + 2^3 + 3^3 = 36$$
$$1^3 + 2^3 + 3^3 + 4^3 = 100$$
$$1^3 + 2^3 + 3^3 + 4^3 + 5^3 = 225$$

Which conjecture generalizes this pattern for all positive integers, **k**?

MAFS.912.F-BF.1.2
Webb: 1

A. $\frac{k(k+1)}{2}$
B. $\frac{(k+1)^3}{3}$
C. $\frac{k^2(k+1)^2}{4}$
D. $\frac{k(k+1)^3}{5}$

19. John burns 300 calories dancing 1 hour per day for 1 day per week. In the equation $y = 300w$, y represents the total number of calories he will burn dancing in w weeks. If John starts dancing 1 hour per day, 3 times per week, which expression represents the

MAFS.912.F-BF.1.1.a
Webb: 2

A. $300w$
B. $900w$
C. $w + 900$
D. $3w + 300$

20. In a geometric sequence, $g_3 = 1$ and $g_8 = 32$ Which recursive formula produces this geometric sequence?

MAFS.912.F-BF.1.2
Webb: 1

A. $g_n = 2g_{n-1}$, where $g_1 = 0.25$
B. $g_n = 2g_{n-1}$, where $g_1 = 0.125$
C. $g_n = g_{n-1} + 6.2$, where $g_1 = -11.4$
D. $g_n = g_{n-1} + 6.2$, where $g_1 = -17.6$

21. Simplify $\sum_{k=1}^{\infty} -4\left(\frac{3}{4}\right)^{k-1}$

MAFS.912.A-SSE.2.4
Webb: 1

A. -16
B. -12
C. -10
D. -7

22. Mr. Swanson's company took out a loan to buy a photocopier. The first year, the company must pay 4.5% of the loan in interest, in addition to making monthly payments.

Let c represent the original cost of the photocopier and m represent the monthly payment amount.

Part A: Using the variables given above, write an expression for the total amount of money the company will have to pay on the loan the first year.

Expression: _____

Part B: If the loan is for $7,000 and monthly payments are $345, what is the total amount of money that will be paid on the loan the first year? Show your work.

The total that would be paid the first year is _____.

MAFS.912.F-BF.1.1.a
Webb: 2

View rubric details in the rubric section at the end of the answer key

23. Travis made a sequence using a rule where n is the number of the term in the sequence. Terms 1 through 5 of Travis' sequence are shown below.

$\frac{3}{4}, 1\frac{3}{8}, 2, 2\frac{5}{8}, 3\frac{1}{4}$

Which expression is the rule Travis used to create the sequence?

MAFS.912.F-BF.1.2
Webb: 2

A. $\frac{n+5}{8}$
B. $\frac{1}{8}$
C. $\frac{5n+1}{8}$
D. $\frac{3n+3}{8}$

24. Coach Henderson ordered **x** certificates for the players of three sports teams at a high school.

- $\frac{1}{4}$ of the certificates ordered went to the basketball players
- 66 of the certificates ordered went to the volleyball players
- The remaining certificates ordered went to the football players

Which method could be used to determine the number of certificates Coach Henderson ordered for the football players?

MAFS.912.F-BF.1.1.a
Webb: 2

A. $\frac{1}{4}x - 66$
B. $\frac{3}{4}x + 66$
C. $x - \frac{1}{4}x + 66$
D. $x - \frac{1}{4}x - 66$

25. Terry attempted to determine the value, V, of $\sum_{n=3}^{11} 4.2(1.58)^n$, but made an error. The steps to her work are shown below. Which step contains Terry's first error?

Step 1: $V = 4.2(1.58)^3 + 4.2(1.58)^4 + 4.2(1.58)^5 + \ldots + 4.2(1.58)^{11}$

Step 2: $1.58V = 4.2(1.58)^4 + 4.2(1.58)^5 + 4.2(1.58)^6 + \ldots + 4.2(1.58)^{12}$

Step 3: $-0.58V = 4.2(1.58)^3 - 4.2(1.58)^{11}$

Step 4: $V = \frac{4.2(1.58)^3(1 - 1.58)^8}{-0.58}$

MAFS.912.A-SSE.2.4
Webb: 2

A. Step 1
B. Step 2
C. Step 3
D. Step 4

Rubric Section

22. Mr. Swanson's company took out a loan to buy a photocopier. The first year, the company must pay 4.5% of the loan in interest, in addition to making monthly payments.

Let c represent the original cost of the photocopier and m represent the monthly payment amount.

Part A: Using the variables given above, write an expression for the total amount of money the company will have to pay on the loan the first year.

Expression: _____

Part B: If the loan is for $7,000 and monthly payments are $345, what is the total amount of money that will be paid on the loan the first year? Show your work.

The total that would be paid the first year is _____.

MAFS.912.F-BF.1.1.a
Webb: 2

0	1	2	3	4
See Rubric Directions for Point Criteria	See Rubric Directions for Point Criteria	See Rubric Directions for Point Criteria	See Rubric Directions for Point Criteria	See Rubric Directions for Point Criteria