Principles of Mathematics 12

Geometric Series Practice Exam

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Principles of Math 12 - Geometric Series Practice Exam

	Use this sheet to record your answers		

1.	10.	18.	26.
NR 1)	11.	19.	27.
2.	12.	20.	28.
3.	13.	NR 4)	29.
4.	14.	21.	
5.	NR 2)	22.	
6.	15.	23.	
7.	NR 3)	24.	
8.	16.	NR 5)	
9.	17.	25.	

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Geometric Series Diploma Style Practice Exam

1. A geometric series with a common ratio of $\sqrt{2}$ is

   A. $\sum\limits_{n=1}^{k}\left(\sqrt{2}\right)^{n}$

   B. $\sum\limits_{n=1}^{k}\left(2+\sqrt{2}\right)^{n}$

   C. $\sum\limits_{n=1}^{k}\sqrt{2}n$

   D. $\sum\limits_{n=1}^{k}\left(2+\sqrt{2}\right)n$

Numerical Response

1. The expression $\sum\limits_{k=1}^{9}6\left(2\right)^{k}$ has a sum of _____.

2. The series $\log_{3}3+\log_{3}9+\log_{3}27+\log_{3}81$ can be expressed in sigma notation as

   A. $\sum\limits_{n=1}^{4}3^{n}$

   B. $\sum\limits_{n=1}^{4}n$

   C. $\sum\limits_{n=1}^{4}n^{3}$

   D. $\sum\limits_{n=1}^{4}3n$

3. The sum of the series $\dfrac{1}{3}+\dfrac{4}{3}+\dfrac{16}{3}+.....\dfrac{4096}{3}$ is

   A. 1600
   B. 1788.56
   C. 1820.33
   D. 1984.77

4. The number of terms in the expression $\displaystyle\sum_{k=21}^{41} 3(4)^{k-2}$ is

   A. 19
   B. 20
   C. 21
   D. 41

5. If the sum of the first six terms of a geometric series is 5.25, and the common ratio is $-\dfrac{1}{2}$, then the first term is

   A. -2
   B. $\dfrac{1}{2}$
   C. 4
   D. 8

6. If the fourth term in a geometric series is $\dfrac{4}{3}$ and the seventh term is $\dfrac{32}{81}$, then the value of the common ratio is

   A. $\dfrac{2}{3}$
   B. $\dfrac{3}{2}$
   C. 2
   D. $\dfrac{4}{3}$

An amusement park ride consists of a pendulum-like basket that goes back and forth. A swing is completed when the basket changes direction. Riders board at the top of the swing, and the first swing has an arc length of 40 m. Due to friction, each swing is $\dfrac{15}{16}$ as long as the previous swing. The ride ends as soon as the length of an arc is less than 21 m.
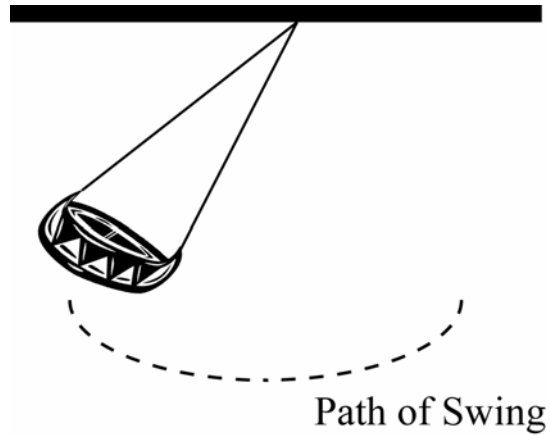
Path of Swing

7. The number of swings that are completed in a full ride is

A. 6
B. 8
C. 9
D. 11

8. The total distance traveled by the basket when it comes to rest is

A. 198 m
B. 215 m
C. 498 m
D. 640 m

9. A square picture, with a side length of 12 cm, is reduced in size using successive photocopies. If the area of each photocopy is shrunk to 80% of the previous area, then the area of the 13th photocopy is, to the nearest hundredth,

A. 4.26 cm^2
B. 5.56 cm^2
C. 7.92 cm^2
D. 8.88 cm^2

10. A filter can remove 72% of impurities each time a sample of water is passed through it. If a cup of water from a lake has 10 g of impurities, the mass of impurities still in the water after passing through seven filters is

A. 0.0005 g
B. 0.0010 g
C. 0.0014 g
D. 0.0017 g

11. A geometric series has $t_4 = 48$ and $t_6 = 192$. The sum of the first 9 terms in this series is

A. 1444
B. 2198
C. 3066
D. 4092

12. The value of $\sum_{k=3}^{6} \log_k k^3$ is

A. 6
B. 12
C. 27
D. 81

13. An example of a geometric sequence is

A. $\sqrt{3}, \ -3, \ -3\sqrt{3}, \ 9$
B. $0, \ -\sqrt{3}, \ -3, \ -3\sqrt{3}$
C. $\sqrt{3}, \ 3, \ 3\sqrt{3}, \ 9$
D. $0, \ \sqrt{3}, \ 3, \ 3\sqrt{3}$

14. If $t_n = 5(3^n)$, $n \geq 1$, then the sum of the first 10 terms of the series is

A. 202 025
B. 365 995
C. 442 860
D. 655 011

Numerical Response

2. On July 1, $100 is deposited into a savings account. On the first day of every month after that, the deposit is 12% more than the previous month. The total amount of money saved after 20 deposits is _____.

15. The value of $\sum_{k=1}^{4} \log k$ is

A. $\log(k^4)$
B. $\log(4^k)$
C. $\log(1 \times 2 \times 3 \times 4)$
D. $\log(1 + 2 + 3 + 4)$

Numerical Response

3. In the first stage of a chain e-mail, four people send a message to four of their friends. In the second stage, each person who received the message forwards it to four of their friends. The number of stages required for one million people to have received the e-mail is, to the nearest whole number, _____.

16. The sum of the first 11 terms of the geometric sequence $-6, 9, -\dfrac{27}{2}...$ is

A. -591
B. -210
C. 0
D. $\dfrac{1}{2}$

17. A store is clearing merchandise by reducing the price of all items by 8% at the start of each week. If a MP3 player is $207 before any of the discounts are applied, the cost after 8 weeks is

    A. $115.47
    B. $120.89
    C. $123.64
    D. $150.00

18. The value of $\sum_{k=3}^{13}\left(2^{k-1}\right)$ is

    A. 1024
    B. 4092
    C. 6486
    D. 8188

Use the following information to answer the next three questions.

A square is drawn with a side length of 16 cm. A second square is drawn using the midpoints of the first square, and has a side length of $8\sqrt{2}$ cm. This process is continued indefinitely.
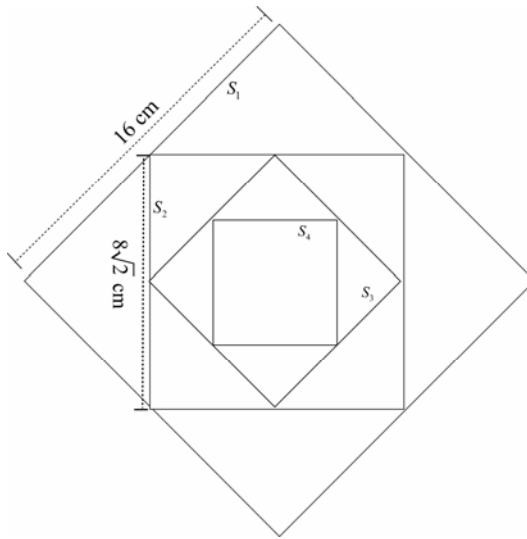

19. If the side lengths form a geometric sequence, then the length of S_4 is

    A. $\sqrt{2}$
    B. $4\sqrt{2}$
    C. 6
    D. $6\sqrt{2}$

20. The perimeter of the squares also forms a geometric sequence. The perimeter of S_6 is, to the nearest tenth,

    A. $2\sqrt{2}$
    B. $4\sqrt{2}$
    C. 6
    D. $8\sqrt{2}$

Numerical Response

4. The areas of consecutive squares form a geometric sequence with a common ratio of _____.

Use the following information to answer the next two questions.

A person decides to save their money using the following strategy: On day one, put a loonie on the first square. On day two, put two loonies on the second square. On day three, put four loonies on the third square. There are 64 squares.
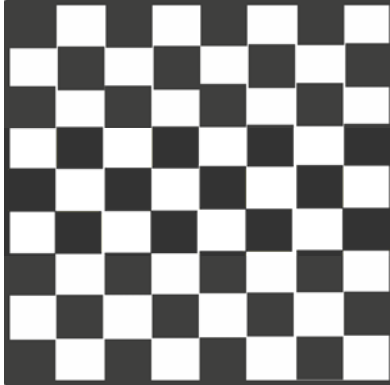
21.   The amount of money the person would have on the 64th square is

A. $128.00
B. 64^2
C. 2^{63}
D. $2^{64} - 1$

22.   If there 700 million loonies in circulation, the last square to have the full amount of loonies is

A.   28
B.   29
C.   30
D.   31

23. The sum of the series $-2+\dfrac{4}{3}-\dfrac{8}{9}+...$, to the nearest hundredth, is

   A. -53.4
   B. 53.4
   C. -1.2
   D. 1.2

24. A hammer drives a nail into a piece of wood. If the nail is pushed 2 cm into wood on the first swing of the hammer, and each successive swing will drive it in 70% of the previous swing, the depth of the nail in the wood on the 5th swing is

   A. 4.58
   B. 5.00
   C. 5.26
   D. 5.55

25. The series $20+40+80+...+163840$ can be written in sigma notation as

   A. $\displaystyle\sum_{n=1}^{14} 20(2)^{n}$

   B. $\displaystyle\sum_{n=1}^{14} 20(2)^{n-1}$

   C. $\displaystyle\sum_{n=1}^{13} 20(2)^{n}$

   D. $\displaystyle\sum_{n=1}^{13} 20(2)^{n-1}$

Numerical Response

5. A ball is dropped from a height of 15 m and bounces to 60% of the previous height. The total distance the ball travels when it hits the ground for the ninth time is, to the nearest tenth, _____.

26. The sequence which is **not** geometric is

   A. $x^{3a}, x^{9a^2}, x^{27a^3} ...$
   B. $\dfrac{1}{x}, x, x^3 ...$
   C. x-3, 9-3x, 9x-27 …
   D. $3, 3\sqrt{3}, 9...$

27. If $3a$, $2a$ - 1, and $7a$ + 8 form a geometric sequence, the value of the first term is

   A. -5.05
   B. 0.16
   C. 2.00
   D. 5.64

28. If $-1, \dfrac{2}{3}, -\dfrac{4}{9} ...$ forms a geometric sequence, the value of the tenth term is

   A. 0.011
   B. 0.026
   C. 0.500
   D. 0.689

29. The expansion of $\displaystyle\sum_{k=3}^{5} a + k$ gives

   A. 15ak
   B. 3a+12k
   C. 20
   D. 3a+12

Use the following information to answer the next question.

A student is saving up to go to Australia. The student puts $800 into a savings account at the start of each year, and the interest earned is 5% compounded annually. The table below is used to keep track of each investment.

	Purchase Year					
	2006	**2005**	**2004**	**2003**	**2002**	**2001**
Current value as of Jan 1, 2006	$800	$840	$882			

Written Response – 10%

1.

- Complete the table by filling in the remaining years.

- Using the geometric sum formula, verify the amount the student saved over six years is equal to the sum of all values from the table.

- If $9500 is required for the trip, determine **algebraically** the year in which the student will have the funds to go on the trip.

- The above question can also be solved graphically. Write the equation(s) required to solve this question, indicate appropriate window settings, and describe how the graphs can be used to find the answer.

2.

- Find the sum of the series $-1+\dfrac{1}{2}-\dfrac{1}{4}+...$

- Find the sum of the series $\displaystyle\sum_{k=1}^{\infty}100(0.3)^{k-1}$ to the nearest hundredth.

- The sum of an infinite geometric series is $\dfrac{13}{5}$ and the common ratio is $-\dfrac{1}{4}$. Determine the first term.

Use the following information to answer the next part of the question.

A ball is dropped from a height of 15 m and bounces to 60% of the previous height.

- How far has the ball traveled when it hits the ground for the fourth time?

- How far has the ball traveled vertically when it comes to rest?

You have now completed the examination. Please check over your answers carefully before self-marking. Good luck on your real exam!