Lesson 2: Sum of a Finite Geometric Series

Question #1

Reference Q.10799

Given the following geometric series, write the formula for the first n terms, then use it to determine S_{13}.

$3 + 6 + 12 + 24...$

Question #2

Reference Q.10800

Given the following geometric series write the formula for the first n terms, then use it to determine S_8.

$-6 + 3 - 1.5...$

Question #3

Reference Q.10801

Given the following geometric series, write the formula for the first n terms, then use it to determine S_{20}.

$-1344 + 4032 - 12096 + 36288...$

Question #4

Reference Q.10802

Find the sum of the first 6 terms of the geometric series:

$10 + 2.5 + 0.625...$

Question #5

Reference Q.10804

Find the sum of the first 11 terms of the following geometric series:

$-15 + 12 - 9.6 + 7.68...$

Question #6

Reference Q.10803

Find the sum of the following geometric series with the following information for the first 9 terms.

$a_1 = 8$

$r = -3$

Question #7

Reference Q.10805

Find the sum of the first 16 terms of the geometric series with the following information.

$a = 2022$

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

Question #8

Reference Q.10808

Once a month Mrs Chocolate bakes cookies. The first week she makes the recipe she uses 3 full cups of chocolate chips. Each week after that she reduces the amount of chocolate chips by $\frac{1}{3}$. How many cups of chocolate chips does she use in the 5th week and how many chocolate chips will she use over 8 weeks?

Question #9

Reference Q.10809

While on vacation with your parents, you stop for a visit at the grand canyon. You are at a lookout when you drop your water bottle over the edge. The distance the water bottle falls is 16 feet the first second, 32 feet the next second, 64 feet the third second, and so on. What is the total distance the water bottle falls in 7 seconds?

Question #10

Reference Q.10810

Jenn's parents started a college fund for her on her 1st birthday. The first year they deposit $100. On her second birthday they deposit $110. On her third birthday they deposit $121. If this continues how much will Jenn have on her 18th birthday?

Question #11

Reference Q.10811

A teacher teaches 7 students to fold origami models. Each of these students then teaches 7 students of their own to fold the same model. If the teaching process goes on for 8 generations, how many people total will know how to fold the origami model?

Question #12

Reference Q.10812

A ball is dropped from a table that is 24 inches high. The ball always rebounds $\frac{3}{4}$ of the distance fallen. Approximately how far will the ball have travelled when the ball hits the ground for the 6th time?

Question #13

Reference Q.10813

A child jumps on a trampoline. He jumps once, starting from the trampoline, and each bounce after that is at a height of 60% of the previous bounce. If the first bounce is 1.2m high, how much distance is travelled after 4 complete bounces?

Question #14

Reference Q.12022

John receives weekly allowance for the summer while he is home from school. The value of the allowance triples every two weeks. In weeks 1 and 2, John is paid $1, then $3 in weeks 3 and 4 and so on. If his allowance continues to triple for the duration of the 14 week summer holiday, what is the amount of his allowance at week 14? How much does he earn in total over the summer?

Question #15

Reference Q.12024

Lucas was hired to pick cherries in the summer of 2002. He was paid a salary of $6,500. Each year he picked cherries after that, he received a salary increase of 8% of the previous year's salary. How much did Lucas earn if he worked the summers of 2002 to 2013 inclusive?

Question #16

Reference Q.12025

Margie is offered two different jobs. The first is as a cashier at a grocery store where she'd work for 22 weeks and earn $350.00 per week. The second is as a dog walker where she'd work for 8 months and would earn $1375.00 per month with monthly raises of 5% of the previous months salary. How much more does Margie earn if she takes the dog walking job?

Question #17

Reference Q.12990

Find the sum of the indicated number of terms in each geometric series.
Answer as an exact value unless otherwise indicated.

a. $4 + 16 + 64 + \ldots (S_8)$

b. $24 + 12 + 6 + \ldots (S_7)$

c. $64 - 32 + 16 - \ldots (S_9)$

d. $\frac{1}{8} + \frac{1}{4} + \frac{1}{2} + \ldots \text{ to 10 terms}$

e. $-\frac{1}{3} + \frac{4}{9} - \frac{16}{27} + \ldots \text{ to 11 terms}$ (to the nearest tenth)

Question #18

Reference Q.12991

Find the sum of the terms in each series.
Answer as an exact value unless otherwise indicated.

a. $1 + 3 + 9 + \ldots + 729$

b. $512 + (-256) + 128 + \ldots + (-1)$

c. $-8 - 2 - \frac{1}{2} - \ldots - \frac{1}{128}$

d. $\frac{1}{384} - \frac{1}{192} + \frac{1}{96} - \ldots - \frac{16}{3}$ (to the nearest tenth)

Question #19

Reference Q.12992

Consider the geometric series with general term $t_n = -3(-2)^{1-n}$.

a. Determine the first three terms of the corresponding sequence.

b. Find the *exact* sum of the first eight terms of the geometric series.

Question #20

Reference Q.12993

For the geometric series $125 + (-25) + 5 + \ldots$, find

a. the sixth term

b. the sum of six terms

Question #21

Reference Q.12994

In a geometric sequence the third term is 1024 and the common ratio is 0.5.
Determine the sum of the first nine terms of the sequence.

Question #22

Reference Q.12998

Consider the series $5 + 3 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \cdots + \frac{1}{512}$.

a. Explain why you cannot use the formula $S_n = \frac{rt_n - a}{r - 1}$ with $a = 5$ to determine the sum of the series.

b. Determine the sum of the series.

Question #23

Reference Q.12995

A line is divided into 5 parts whose lengths form a geometric sequence. If the shortest length is 2 cm, and the longest 162 cm, find the length of the whole line.

Question #24

Reference Q.12997

Legend has it that long ago a king was so pleased with the game of chess that he decided to reward the inventor of the game, Sessa, with whatever he wanted. Sessa, taking the request seriously, asked for a resource instead of money. Specifically, he asked for one grain of wheat for the first square of a chessboard, two grains of wheat for the second square, four grains for the third square, and so on until the entire chess board was full. (There are 64 squares on a chess board.) Find an expression for:

a. the amount of grain on the last square of the board.

b. the total amount of grain needed to fulfill Sessa's request. (Don't be surprised at how big this is. This amount is said to represent many times the world's annual crop of wheat!)

Question #25

Reference Q.12996

A mother, during a hectic day, was convinced by her son that he should have a weekly allowance that is doubled every two weeks. In weeks one and two he would receive 1 cent per week, in weeks three and four he would receive 2 cents per week. If his allowance continues to double every two weeks, determine

a. the amount of his allowance in week 30.

b. the total amount he would receive in allowance during the thirty weeks.

Question #26

Reference Q.12999

The sum of n terms of the series $2 + 8 + 32 + \ldots$ is $174\,762.$
Determine the number of terms in the series by

a. solving an equation with a common base

b. using the intersect feature of a graphing calculator

Question #27

Reference Q.13000

How many terms are required in the series
$(-6) + (-12) + (-24) \ldots$ to add to a sum of $-378?$

Question #28

Reference Q.13001

a. In a geometric sequence, the first term is 8 and the sum of the first three terms is 78. Use technology to determine the common ratio of the sequence.

b. In a geometric sequence, the first term is 8 and the sum of the first six terms is 74 648.
Use technology to determine the third term of the sequence.

Question #29

Reference Q.13028

Consider the geometric series where $S_n = \frac{75}{4}(5^n - 1).$

a. Determine the first four terms of the geometric series.

b. Show how to calculate the value of t_{12} using two different methods.
iii. Method 1
iv. Method 2

Question #30

Reference Q.13003

In the winter, if the weather gets too severe, a works manager will close the factory. He has to devise a plan so that every employee is contacted before setting out to go to work. He sets up a telephone fan-out system. He will phone r employees (level 1). Each of these employees will phone r other employees (level 2). Each of the people contacted in level 2 will phone r other employees and this continues until every employee has been contacted.

If 3279 employees have to be contacted and this is done in 7 levels of the fan-out system, use techonology to determine the number of employees that each person has to phone.

Question #31

Reference Q.13004

A rubber ball is dropped on to a concrete driveway from a garage roof 10 feet above the ground. With each rebound the ball loses 10% of its previous vertical height.

a. Calculate, to the nearest hundredth of a foot, the vertical height to which the ball rebounds after the sixth bounce.

b. Calculate, to the nearest hundredth of a foot, the total vertical distance (down and up) travelled by the ball when it contacts the ground for the fourth time.

c. How many times does the ball needs to bounce to travel approximately 112.5 feet in vertical distance?

Question #32

Reference Q.13023

The first term of a gemetric series is 3. The sum of the first two terms of the series is 15 and the sum of the first 3 terms of the series is 63. The common ratio is

A. 3
B. 4
C. 5
D. $\frac{63}{15}$

Question #33

Reference Q.13024

The general term of a geometric sequence is $t_n = 3(2)^{n-1}, n \geq 1.$

The sum of the firt seven terms of the corresponding series, to the nearest whole number, is _____.

Question #34

Reference Q.13025

A hard rubber ball is dropped from a building with a height of 5m. After each bounce, the ball rises to $\frac{4}{5}$ of its previous height. The total vertical distance the ball has travelled at the moment it hits the ground for the eighth time, to the nearest tenth of a metre, is _____.

Question #35

Reference Q.13026

If $S_n = 2(3^n - 1)$ represents the sum of n terms of a geometric sequence, then the value of the seventh term, t_7, to the nearest whole number, is _____.

Question #36

Reference Q.13027

Students were asked to calculate the sum of four terms of a sequence in which the first term is 0.5, the third term is 18, and all the terms are positive. Jordan assumed the sequence was arithmetic and calculated a value X for the sum. Andrea assumed the sequence was geometric and calculated a value Y for the sum.

The difference $Y - X$ is _____.