Date: _____

Today's Learning Goal(s):

By the end of the class, I will be able to:

a) calculate the sum of the terms of a geometric series.

Last day's work: pp. 452-453 #(1 – 7)ace, 11, 13 [15,16]

Review:

Sequence: An ordered set of numbers separated by commas .
Each individual number is called a TERM.
The terms are t_1 , t_2 , t_3 , t_4 , ... , t_n

Arithmetic Sequence: has a common ***difference*** between the terms.
In an arithmetic sequence, the first term is ***a*** and the common **difference** is ***d***
$t_1 = a$, and the terms are $a, a+d, a+2d, a+3d, \ldots$

The general term is $t_n = a + (n - 1)d$

Geometric Sequence: has a common ***ratio*** between the terms.
In a geometric sequence, the first term is ***a*** and the common **ratio** is ***r***
$t_1 = a$, and the terms are $a, ar, ar^2, ar^3, \ldots$
The general term is $t_n = ar^{n-1}$

Series: An ordered set of numbers separated by addition and/or subtraction signs .
Each individual number is called a TERM.
But now we have: $t_1 + t_2 + t_3 + t_4 + \ldots + t_n$

$S_1 = t_1 \ (= a)$

$S_2 = t_1 + t_2$

$S_3 = t_1 + t_2 + t_3$

$S_n = t_1 + t_2 + t_3 + t_4 + \ldots + t_n$

An **Arithmetic Series** is the **sum** of the terms of an arithmetic sequence.

The Arithmetic Series Formula:

$$S_n = \frac{n}{2}[2a + (n-1)d] \quad \text{or} \quad S_n = \frac{n}{2}[t_1 + t_n]$$

where n is the term's position number,
$a = t_1$,
d is the common difference, and
t_n = last term

7.6 Geometric Series

Date: May 31/18

A **Geometric Series** is the **sum** of the terms of a geometric sequence.

Ex.1 Your grandma agrees to give you 1 cent on Dec.1, 2 cents on Dec.2, 4 cents on December 3, etc. until Christmas Day. What will be your total sum?

$t_n = ar^{n-1}$ $t_{25} = (1)(2)^{25-1}$

$= 2^{24}$

t_{25}

$S_{25} = 1 + 2 + 4 + 8 + \ldots + 2^{23} + 2^{24}$ ①

② (multiply by "r") $2S_{25} = 2 + 4 + 8 + \ldots + 2^{23} + 2^{24} + 2^{25}$

③ (subtract up)

④ $2S_{25} - S_{25} = 2^{25} - 1$

⑤ $S_{25} = 2^{25} - 1$

$= 33554431$ cents ⑥

$= \$335\,544.31$

Thank you grandma!

In general:

$ar^{n-1} \cdot r^1 = ar^{n-1+1}$

① $S_n = a + ar + ar^2 + \ldots + ar^{n-3} + ar^{n-2} + ar^{n-1}$

② $rS_n = ar + ar^2 + \ldots + ar^{n-3} + ar^{n-2} + ar^{n-1} + ar^n$

③ $S_n = a + ar + ar^2 + \ldots + ar^{n-3} + ar^{n-2} + ar^{n-1}$

Same

④ (subtract)

⑤ $rS_n - S_n = ar^n - a$

⑥ (factor both sides)

$(r - 1)S_n = a(r^n - 1)$

$t_n = ar^{n-1}$

The Geometric Series Formula:

$$S_n = \frac{a(r^n - 1)}{r - 1}, \quad r \neq 1$$

where n is the term's position number,
$a = t_1$, and
r is the common ratio

Ex.2 Find S_{10} for $5 + 15 + 45 + \ldots$

$S_{10} = 147\,620$

g. series $t_n = ar^{n-1}$ $S_n = \frac{a(r^n-1)}{r-1}$

$r = 3$

$a = 5$

$n = 10$

$S_{10} = \frac{5(3^{10}-1)}{3-1}$

$= \frac{5(3^{10}-1)}{2}$

$= 147\,620$

Ex.3 Find the sum of: $3 - 6 + 12 - 24 + \ldots + 768$

$n = 9$

$S_9 = 513$

g series $S_n = \frac{a(r^n-1)}{r-1}$ $t_n = ar^{n-1}$

$r = -2$

$a = 3$

$n = 9$

$S_9 = \frac{3((-2)^9-1)}{-2-1}$

$= \frac{3((-2)^9-1)}{-3}$

$= 513$

$t_n = 3(-2)^{n-1}$

$768 = 3(-2)^{n-1}$

$\frac{768}{3} = (-2)^{n-1}$

$256 = (-2)^{n-1}$

$\therefore n = 9$

$2^? = 256$

$? = 8$

$\therefore 2^8 = 256$

$(-2)^8 = 256$

Are there any Homework Questions you would like to see on the board?

Last day's work: pp. 452-453 #(1 – 7)ace, 11, 13 [15,16]

Today's Homework Practice includes:

pp. 459-461 #(1 – 6)ace, 9, 11, 13 [16,18]