Learning Targets

a. I can find the sum of a finite geometric series

b. I can use my knowledge of geometric series and apply them to application problems

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Warm-up:

Find the SUM of the first 10 terms of an arithmetic sequence if $a_1 = 8$, and $a_{10} = 35$. Show your work.

$$S_n = \frac{n}{2}(a_1 + a_n)$$

$$S_{10} = \frac{10}{2}(8 + 35)$$

$$\boxed{S_{10} = 215}$$

Geometric Series :

Sum of terms of a Geometric Sequence

We can find the **partial sum** of **n** number of terms of a geometric sequence using the formula:

first term # terms

$$S_n = \frac{a_1(1 - r^n)}{(1 - r)} \quad r \neq 1$$

common ratio

Geometric Partial Sum $\quad S_n = \dfrac{a_1(1 - r^n)}{(1 - r)} \quad r \neq 1$

1.) Find the sum of the first 7 terms when $a_1 = 4$ and $r = 3$

$S_7 = \dfrac{4(1-3^7)}{(1-3)}$

2.) Find the sum of the first 6 terms of the series below

{ 2 + 8 + 32 + ...

$a_1 = 2 \quad n = 6$

$r = 4$

$S_6 = \dfrac{2(1-4^6)}{(1-4)}$

$\boxed{S_6 = 2{,}730}$

Geometric Partial Sum $S_n = \frac{a_1(1 - r^n)}{(1 - r)}$ $r \neq 1$

3.) A virus goes through a computer infecting files. If 1 file was infected initially and the number of new files infected doubles every minute.

a. Write the next 4 terms of the series representing the situation

1 + 2 + 4 + 8 + 16 + 32 + 64 + ...

b. Write the Formula that represents the series described above

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

c. Using the Formula from part B, find the TOTAL number of files infected after 20 minutes

$S_{20} = \frac{1(1-2^{20})}{(1-2)} = \boxed{1{,}048{,}575 \text{ files}}$

Geometric Partial Sum $S_n = \frac{a_1(1 - r^n)}{(1 - r)}$ $r \neq 1$

4.) You are saving up for car. You begin by setting aside \$15. The following month you set aside \$45. The month after that you set aside \$135. You plan to continue this pattern for 8 months.

a. Write the Formula that represents the series described above

$S_n = \frac{15(1-3^n)}{(1-3)}$

b. Using the Formula from part A, find your TOTAL savings after 8 months.

$\frac{15(1-3^8)}{(1-3)} = 49{,}200$