Name:_____ Date:_____

HW M12P Section 8.2 Geometric Series

1. What formula should you use to find the sum of a geometric series if you have only the first term, last term and common ratio? [number of terms in the sequence is unknown]. Explain:

2. When using the formula for the sum of a geometric series, why do we multiply the last term by the common ratio one more time in the equation? Explain:

3. What formula should we use to find the sum of a geometric series if we have only the first term, common ratio, and the number of terms? Explain:

4. Are these two formulas the same? Which formula should we use to find the sum of a geometric series?

   Explain: $S_n = \frac{a\left(r^n - 1\right)}{r-1}$ vs $S_n = \frac{a\left(1 - r^n\right)}{1-r}$ vs $S_n = \frac{a\left(r^n - 1\right)}{1-r}$

5. For any geometric series, what is the value of $S_{n+1} - S_n$ equal to? Explain:

6. Suppose $S_{30} = 14562$ and $S_{31} = 14692$, which term can we find? t_1, t_{31}, or t_{30}? Explain:

7. How would you find the sum of this sequence? $2+13+17+4+8+16+32+.....+1024$

8. If the first term of a geometric series is ab^2, common ratio is b^3, and last term is ab^{83}, what is the sum of the geometric series in terms of "a" and "b"?

9. Find the sum for the following geometric series. Show all your work and steps:

a) $S = 8+4+2+.....\frac{1}{128}$	b) $S = 3+6+12+.....3072$
c) $S = \sqrt{2}+2+2\sqrt{2}+.....256$	d) $S = -\frac{1}{8}+0.25+-0.5+.....256$
e) $S = \frac{64}{81}+\frac{32}{27}+\frac{16}{9}+.....\frac{729}{16}$	f) $S = \frac{125}{64}-\frac{25}{16}+\frac{5}{4}-.....+\frac{1024}{3125}$
g) $S = \frac{32}{27}+\frac{16}{9}+.....+t_{11}$	h) $S = 3\sqrt{2}+6+6\sqrt{2}+.....+t_{15}$

10. Given the information of a geometric sequence, find the indicated unknown value:

a) $S_2 = 5,\ S_4 = 85,\ r =$	b) $a = 12,\ r = 2,\ S_n = 762,\ n = ?$
c) $r = -2,\ S_8 = 1020,\ a = ?$	d) $t_2 = 4,\ \ t_4 = 36,\ \ S_{10} = ?$
e) $t_1 + t_2 = 4,\ \ t_3 + t_4 = 36,\ \ S_8 = ?$	f) $a = x + 2,\ t_2 = 3x,\ t_3 = x^2 + 8,\ S_5 =$

11. A ball is dropped from a height of 2.0m to a floor. After each bounce, the ball rises to 63% of its previous height. What is the total vertical distance the ball has travelled after 5 bounces? What is the total vertical distance the ball travelled after it comes to rest?

12. An oil well produces 30,000,000 barrels of oil during its first month of production. Suppose its production drops by 5% each month. What is the total production of barrels of oil after 20 years?

13. A contest winner is given two prizes to choose from. Prize A is given $20,000,000 right away. Prize "B" is given $1 in the first year, $2 in the next year, $4, $8, ….. each following year for the next 30 years. After how many years will sum of Prize B surpass the Prize A?

14. Sherry invests 15% of her annual income of $85,000 each year into a mutual fund that earns an average return of 10% annually. How much will she have in her investment have after 20 years?

b) How much will she have in her investment after 40 years?

c) After how many years will she have over $1,000,000 in her investment?

15. Marko plans to invest $8000 every year into two investment plans. The first plan is into a mutual fund that purchase an index fund with a management fee of 3% each year. The second is a self directed plan with no management fee. Suppose the index gives an average annual return of 10.5%, what is the difference in value of the two investment plans after 25 years? Show all your work and steps.

16. Suppose Marko increases the amount he invests into each plan by $5000 every 5 years, how much will he have in each plan after 25 years? Ie: first five year he adds $8000 each year, next five years $13,000 each year, next five years $18,000 each year, and so on.

17. Melody's invests $10,000 into her RRSP each year. In 2015 her portfolio was worth $10,000. In 2023 [8years later] her portfolio grew to 130,210.36. What is her average annual rate of return?