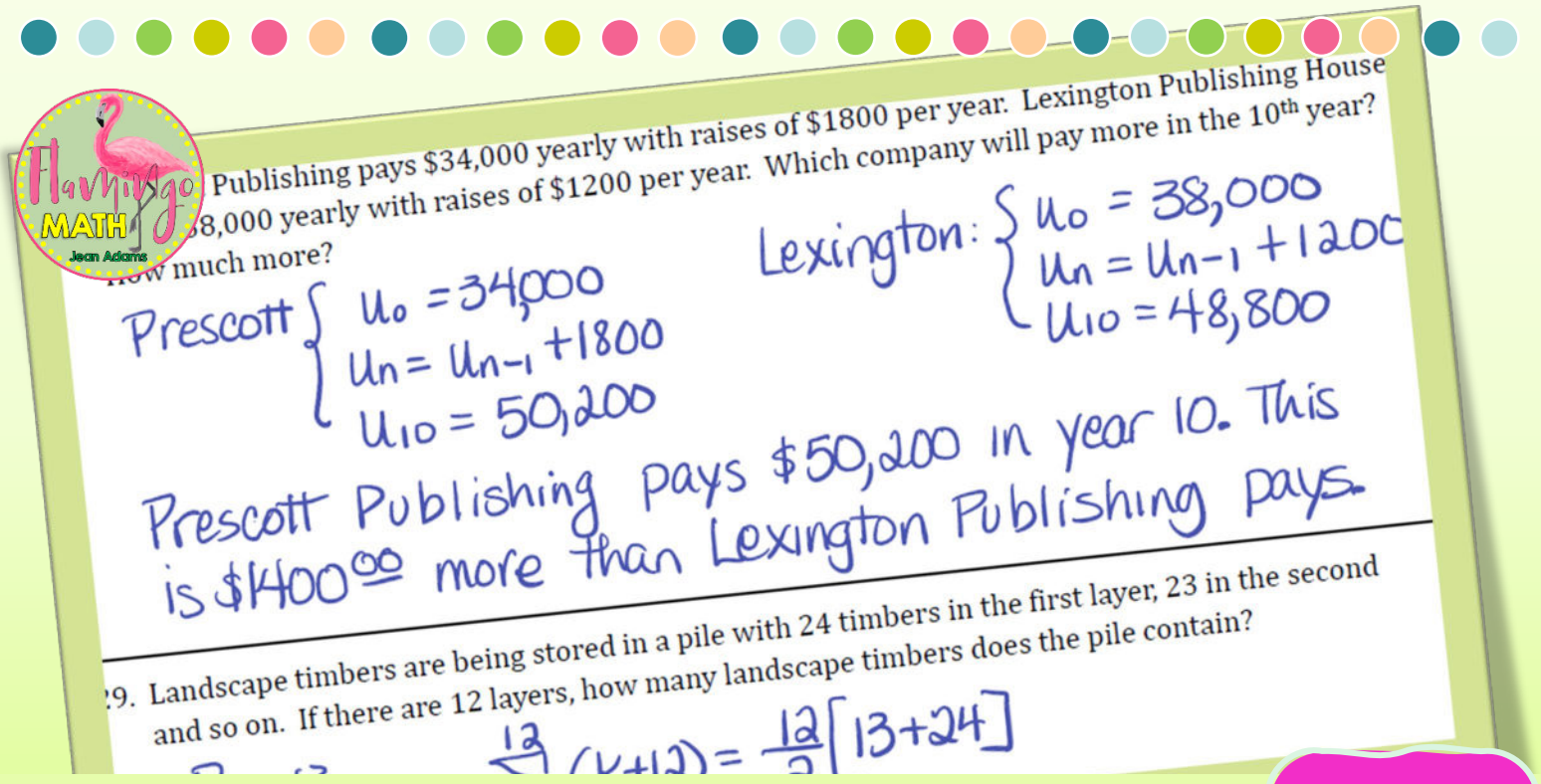
Precalculus Honors

Sequences & Series
Discrete Mathematics



Homework 9

Completely Editable

PRECALCULUS CURRICULUM

Scope and Sequence

Unit 9: Sequences and Series

Lesson	Skills & Learning Objectives
[9.1] Sequences and Summation Notation	❑ Write the terms of a recursively-defined sequence ❑ Use factorial notation ❑ Use summation notation to write sums ❑ Find the sum of a sequence algebraically and using technology ❑ Solve annuity, amortization, and real-world applications
[9.2] Arithmetic Sequences and Partial Sums	❑ Recognize, write and find the *n*th terms of arithmetic sequences ❑ Find *n*th term partial sums of arithmetic sequences ❑ Use arithmetic sequences and series to model real-world problems ❑ Find limits of converging sequences
[9.3] Geometric Sequences and Series	❑ Recognize, write and find the *n*th terms of geometric sequences ❑ Find *n*th term partial sums of geometric sequences ❑ Find sums of infinite geometric series ❑ Use geometric sequences to model real-world problems
[9.4] Mathematical Induction	❑ Use mathematical induction to prove statements involving a positive integer *n*. ❑ Find the sums of powers of integers ❑ Find finite differences of sequences
[9.5] Binomial Theorem	❑ Evaluate $\binom{n}{r}$ ❑ Use the Binomial Theorem

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9.1 Sequences & Summation Notation Homework

Name _____

Date _____ Period _____

Problems 1 – 4, write the first five terms of each sequence.

1. $a_n = \frac{n}{n+2}$

2. $b_n = \frac{n}{e^n}$

3. $s_n = \frac{n^2}{2^n}$

4. $d_n = \frac{(-1)^n}{(n+1)\,(n+2)}$

Problems 5 – 8, find the *n*th term of a sequence $\{a_n\}$ from the given pattern.

5. $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \ldots$

6. $3, -6, 9, -12, 15, \ldots$

7. $1, -1, 1, -1, 1, -1, \ldots$

8. $\frac{1}{1\cdot 2}, \frac{1}{2\cdot 3}, \frac{1}{3\cdot 4}, \frac{1}{4\cdot 5}, \ldots$

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Problems 29-30, solve.

29. Max bought a car by taking out a loan for $23,500 at 2.5% interest per month. His normal payment is $417 per month, but he wants to pay an extra $100 toward the balance each month. His balance each month is modeled by the recursively defined sequence

$B_0 = \$23{,}500,\ B_n = \left(1 + \frac{0.025}{12}\right) B_{n-1} - 517.$

A. Using a graphing utility, determine when Max's balance will be below $12,000. How many payments of $517 have been made?

B. When will Max pay off the balance? What is the total of all the payments?

C. What was the total interest Max paid on the loan?

30. Andrea deposited $500 at the end of each quarter beginning January 1, 2010, into a Mutual Fund Account.

A. Write a recursive formula that represents Andrea's balance at the end of each quarter if the rate of return is assumed to be 8.5% per year compounded quarterly.

B. How long will it take before the value of the account exceeds $50,000?

C. What will be the value of the account in 30 years when Andrea plans to retire?

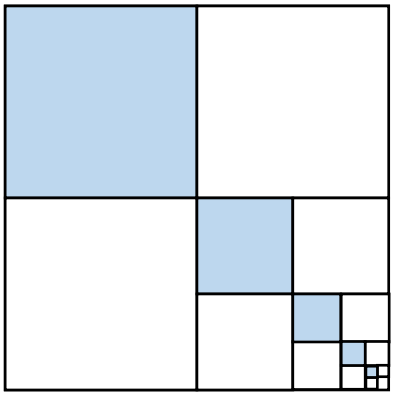
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Problems 25 – 29, solve.

25. You are offered your dream job with an annual salary of $35,000 to start, with an expected annual increase of 5%. Find your salary at the start of your fifth year.

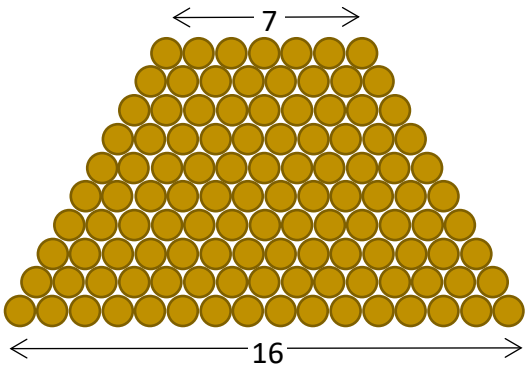
26. Caliber One Construction purchased a new service vehicle for $25,000. Each year they will depreciate the value of the vehicle for tax purposes by 12%. What will be the value of the vehicle after 5 years?

27. In the figure shown at right, what fraction of the square is eventually shaded if the indicated shading process continues indefinitely?



28. A family-owned screen-printing company sells t-shirts and earns a $24,000 profit during its first year. The owners set a goal of increasing profits by $5000 each year for the next four years. Assuming that this goal is met, what is the total profit earned during their first 5 years of business?

29. A tree farm is harvesting trees to be used in making pulp for paper manufacturing. They are required to stack the trimmed logs in the configuration shown at right. How many logs are in each pile?



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9.4 Mathematical Induction Homework

Name _____

Date _____ Period _____

Use the principle of mathematical induction to show that the given statement is true for all natural numbers, *n*.

1. P_n is true for $n = 1$
2. Spse P_k is true
3. Then, P_{k+1}
4. $\therefore P_n$ is true for all integers, *n*.

1. $1 + 5 + 9 + \ldots + (4n - 3) = n(2n - 1)$

2. $3 + 5 + 7 + \ldots + (2n + 1) = n(n + 2)$

3. $3 + 4 + 5 + \ldots + (n + 2) = \frac{n}{2}(n + 5)$

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9.5 The Binomial Theorem Homework

Name _____

Date _____ Period _____

Problems 1-6, evaluate each expression.

1. $\binom{6}{3}$	**2.** $\binom{8}{6}$
3. $\binom{15}{15}$	**4.** $\binom{45}{0}$
5. $\binom{30}{29}$	**6.** $\binom{26}{17}$

Problems 7-12, expand each expression using the Binomial Theorem.

7. $(x+1)^4$

8. $(x-1)^5$

9. $(x+2)^4$

10. $(x-2)^6$

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