

PRE-CALCULUS

Unit II

The collage features several worksheets with the following content:

- SEQUENCE**: Includes sections for 'FINITE Sequence' and 'INFINITE Sequence' with 'Example:' fields.
- ARITHMETIC SEQUENCE**: Includes 'COMMON DIFFERENCE' and 'EXAMPLES'.
- SERIES**: Includes 'PARTIAL SUMS' with directions: 'Find the partial sum for each given sequence. 1. $\{29, 37, 45, 53, 61, \dots\}$ 2. $\{1, -2, 4, -8, 16, \dots\}$; find S_n '.
- GEOMETRIC SERIES**: Includes 'To find the sum of a geometric' and a table for 'Hour' and 'Milligrams'.
- CONJECTURES**: Includes 'Patterns & CONJECTURES' with a table of sums: $1 =$, $1 + 3 =$, $1 + 3 + 5 =$, $1 + 3 + 5 + 7 =$, $1 + 3 + 5 + 7 + 9 =$. It also includes instructions: 'Discovery and proof are two aspects of mathematics. Math facts are generally established by discovering a pattern, making a conjecture, and finally proving the conjecture. Follow the example below: Find a pattern: Look for a pattern in the sum of the first 5 positive odd integers to the left. Make a conjecture: If the n th odd number can be written as $2n - 1$, write a conjecture about the sum of the first n positive odd integers: $1 + 3 + 5 + 7 + 9 + \dots + (2n - 1) =$ '.

SEQUENCES & SERIES

NOTES • HOMEWORK • QUIZZES • TEST

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Unit 11 - Sequences & Series: Sample Unit Outline

	TOPIC	HOMEWORK
DAY 1	Explicit and Recursive Sequences	HW #1
DAY 2	Arithmetic Sequences	HW #2
DAY 3	Geometric Sequences	HW #3
DAY 4	Quiz 11-1	None
DAY 5	Series & Sigma Notation; Arithmetic Series	HW #4
DAY 6	Geometric Series (Finite and Infinite)	HW #5
DAY 7	Arithmetic vs. Geometric Sequences and Series (including mixed applications)	HW #6
DAY 8	Quiz 11-2	None
DAY 9	Mathematical Induction	HW #7
DAY 10	Binomial Expansion: Pascal's Triangle & The Binomial Theorem	HW #8
DAY 11	Unit 11 Review	Study For Test
DAY 12	UNIT 11 TEST	None

Name: _____ Date: _____
 Topic: _____ Class: _____

Main Ideas/Questions	Notes/Examples
SEQUENCE	
FINITE Sequence	Example:
INFINITE Sequence	Example:
TERM NOTATION	<ul style="list-style-type: none"> The first term in a sequence Each subsequent term is a fixed number times the previous term number in the sequence Example: Given $\{2, 5, 8, \dots\}$

Name: _____ Date: _____
 Topic: _____ Class: _____

Main Ideas/Questions	Notes/Examples
ARITHMETIC SEQUENCE	
COMMON DIFFERENCE	
Directions: Determine the common difference of the sequence.	
1. $\{29, 37, 45, \dots\}$	2. $\{512, -12, \dots\}$

Name: _____ Date: _____
 Topic: _____ Class: _____

Main Ideas/Questions	Notes/Examples
GEOMETRIC SEQUENCE	
COMMON RATIO	
Directions: Determine the common ratio, then find the common ratio of the sequence.	
1. $\{8, 24, 72, 216, \dots\}$	2. $\{512, -12, \dots\}$
EXAMPLES	

Name: _____ Date: _____
 Topic: _____ Class: _____

Main Ideas/Questions	Notes/Examples
SERIES	
Sequence	
Directions: Determine whether the sequence is arithmetic, geometric, or neither. If arithmetic or geometric, write an explicit formula to find the n^{th} term, then find a_n .	
1. $\{14, -42, 126, -378, \dots\}$	2. $\{1, -1, 2, -2, \dots\}$
3. $\{53, 44, 35, 26, \dots\}$	4. $\left\{\frac{15}{4}, -\frac{13}{4}, -\frac{11}{4}, \frac{9}{4}, \dots\right\}$
5. $\{320, 80, 20, 5, \dots\}$	

Name: _____ Date: _____
 Topic: _____ Class: _____

Main Ideas/Questions	Notes/Examples
ARITHMETIC SERIES	To find the sum of an arithmetic series, use the following formula:

Name: _____ Date: _____
 Topic: _____ Class: _____

Main Ideas/Questions	Notes/Examples
GEOMETRIC SERIES	To find the sum of a geometric series, use the following formula:
$S_n = \frac{a_1(1 - r^n)}{1 - r}$ where n is the number of terms.	
EXAMPLES	

Name: _____ Date: _____
 Topic: _____ Class: _____

Main Ideas/Questions	Notes/Examples
Arithmetic vs. Geometric SEQUENCES	Directions: Determine whether the sequence is arithmetic, geometric, or neither. If arithmetic or geometric, write an explicit formula to find the n^{th} term, then find a_n .
1. $\{14, -42, 126, -378, \dots\}$	2. $\{1, -1, 2, -2, \dots\}$
3. $\{53, 44, 35, 26, \dots\}$	4. $\left\{\frac{15}{4}, -\frac{13}{4}, -\frac{11}{4}, \frac{9}{4}, \dots\right\}$
5. $\{320, 80, 20, 5, \dots\}$	

Name: _____ Date: _____
 Topic: _____ Class: _____

Main Ideas/Questions	Notes/Examples								
SEQUENCE Applications	<p>1. A library book that is one day late is charged a \$0.20 fee. Thereafter, it is charged an extra \$0.20. Find the total charge for a book that is 5 days late.</p> <p>2. Tucker took an 800-milligram dose of medicine for the first hour. The amount of medicine remaining after each of the first three hours. After how many hours will the amount of medicine reach 50 milligrams?</p> <table border="1"> <thead> <tr> <th>Hour</th> <th>Milligrams</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>800</td> </tr> <tr> <td>2</td> <td>680</td> </tr> <tr> <td>3</td> <td>578</td> </tr> </tbody> </table>	Hour	Milligrams	1	800	2	680	3	578
Hour	Milligrams								
1	800								
2	680								
3	578								
SERIES Applications	<p>3. Stocks at a company were initially issued at \$9.80 per share. The shares have increased by 25% each year. If an investor bought 100 shares, how much more money would they have if they had bought the shares 10 years ago?</p> <p>4. Evan got a job with a starting salary of \$36,000 per year. His salary increases by 5% each subsequent year. How many years will it take for his salary to reach \$1,000,000?</p>								
MIXED Applications	<p>5. A ball is dropped from a tower. The table below shows the height of the ball after each of the first three bounces. Find the height of the ball after the 12th bounce.</p> <table border="1"> <thead> <tr> <th>Bounce</th> <th>Height (ft)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>50</td> </tr> <tr> <td>2</td> <td>45</td> </tr> <tr> <td>3</td> <td>40.5</td> </tr> </tbody> </table>	Bounce	Height (ft)	1	50	2	45	3	40.5
Bounce	Height (ft)								
1	50								
2	45								
3	40.5								

Name: _____ Date: _____
 Topic: _____ Class: _____

Main Ideas/Questions	Notes/Examples
PATTERNS & CONJECTURES	Discovery and proof are two different processes. A conjecture is a statement that is believed to be true but has not yet been proven. A proof is a logical argument that shows a conjecture is true. The process of proving a conjecture is called a proof.
PROOF BY MATHEMATICAL INDUCTION	<p>The Principle of Mathematical Induction: Let P_n be a statement depending on n. If P_1 is true and $P_n \Rightarrow P_{n+1}$ is true for all positive integers n, then P_n is true for all positive integers n.</p> <p>The main steps to prove a conjecture by induction are:</p> <ol style="list-style-type: none"> Base Case: Prove P_1 is true. Inductive Hypothesis: For any positive integer k, assume P_k is true. Inductive Step: Prove P_{k+1} is true.
EXAMPLES	<p>1. $1 + 3 + 5 + 7 + \dots + (2n-1) = n^2$</p>

Unit 11 Test Study Guide (Sequences & Series)

Name: _____ Date: _____

Topic 1: Recursive & Explicit Sequences	Directions: List the first five terms of each sequence.
1. $a_1 = -4; a_n = -3a_{n-1} + 7$ ($n \geq 2$)	2. $a_1 = 70; a_2 = 30; \frac{a_n - a_{n-1}}{2}$ ($n \geq 2$)
3. $a_n = n^2 - (2n + 1)^2$	4. $a_n = 5n + n!$
Topic 2: Arithmetic vs. Geometric Sequences	Directions: Determine whether the sequence is arithmetic, geometric, or neither. If arithmetic, give the common difference or common ratio.
3. $\left\{\frac{5}{6}, \frac{5}{36}, \frac{5}{216}, \dots\right\}$	4. $\{1, -16, 81, -256, \dots\}$
5. $\{-16, -9, -2, 5, \dots\}$	
Directions: Write an explicit and recursive formula to find the n^{th} term of each sequence.	
6. $\{-7, -14, -28, -56, \dots\}$	7. $\left\{\frac{3}{2}, \frac{13}{6}, \frac{17}{6}, \frac{7}{2}, \dots\right\}$
Explicit: _____	Explicit: _____
Recursive: _____	Recursive: _____
8. $\{160, 120, 90, 67.5, \dots\}$	9. $\{8, 3, -2, -7, \dots\}$
Explicit: _____	Explicit: _____
Recursive: _____	Recursive: _____

Unit 11 Test Sequences & Series

Name: _____ Date: _____ Per: _____

List the first five terms of each sequence:		
1. $a_1 = 80; a_n = \frac{1}{2}a_{n-1} + 8$ ($n \geq 2$)	2. $a_1 = \frac{1}{4}; a_2 = \frac{3}{8}; a_n = \frac{a_{n-1}}{a_{n-2}}$ ($n \geq 3$)	
3. $a_n = (n-5)^2 + 2n$	4. $a_n = n - \frac{2}{n}$	
Describe the sequence as arithmetic, geometric, or neither. If arithmetic or geometric, give the common difference or common ratio.		
5. $\{3, -15, 75, -375, 1875, \dots\}$	6. $\{-18, -6, 6, 18, 30, \dots\}$	7. $\left\{256, 96, 36, \frac{27}{2}, \frac{81}{16}, \dots\right\}$
Type of Sequence: _____	Type of Sequence: _____	Type of Sequence: _____
Common Difference/Ratio: _____	Common Difference/Ratio: _____	Common Difference/Ratio: _____
Write an explicit and recursive formula to find the n^{th} term of each sequence.		
8. $\{-2880, -720, -180, -45, \dots\}$	9. $\left\{\frac{25}{24}, \frac{7}{8}, \frac{17}{24}, \frac{13}{8}, \dots\right\}$	
Explicit: _____	Explicit: _____	
Recursive: _____	Recursive: _____	