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11.1 Arithmetic Sequences

nth Term of an Arithmetic Sequence

You can use the formula to find a term in a sequence given the first term and the common difference OR given the first term and some successive terms.

Example 1: Find a Particular Term
Find the indicated term of each arithmetic sequence.

a) $a_1 = -4$, $d = -9$, $n = 20$

b) a_{12} for 8, 3, -2,...

c) The table below shows typical costs for a construction company to rent a crane for 1-4 months. If the sequence continues, will the company be able to afford the crane rental for a job that is expected to last 18 months if they have a budget of $350,000 for crane rental?

Months	Cost ($)
1	75,000
2	90,000
3	105,000
4	120,000

Example 2: The nth Term

a) Write an equation for the nth term of the arithmetic sequence: -26, -15, -4, 7,....

b) Complete: 68 is the ____th term of the arithmetic sequence -2, 3, 8,...

Example 3: Find Arithmetic Means
→ the terms between any two nonsuccessive terms of an arithmetic sequence

Find the arithmetic means in each sequence.

a) 10, ___, ___, -8

b) 3, ___, ___, ___, ___, ___, 27

11.2 Arithmetic Series

Sum of an Arithmetic Series

Example 1: Find the Sum of an Arithmetic Series
Find S_n for each arithmetic series described.

a) $a_1 = 4$, $a_n = 100$, $n = 25$

b) $a_1 = 7$, $d = -2$, $n = 9$

c) $d = -3$, $n = 21$, $a_n = -64$

d) $12 + 17 + 22 + ... + 102$

Example 2: Find the First Three Terms
Find the first three terms of each arithmetic series described.

a) $a_1 = 11$, $a_n = 110$, $S_n = 726$

b) $n = 8$, $a_n = 36$, $S_n = 120$

Example 3: Evaluate a Sum in Sigma Notation
Find the sum of each arithmetic series.

a) $\sum_{n=10}^{50} (3n - 1)$

b) $\sum_{n=26}^{50} (-2n + 100)$

11.3 Geometric Sequences

nth Term of a Geometric Sequence

Example 1: Find Terms of a Geometric Sequence

a) Find the next two terms of the geometric sequence 16, 24, 36,...

b) Find the first 5 terms of the geometric sequence: $a_1 = -3$

c) Find a_9 for the geometric sequence 60, 30, 15,...

d) $a_4 = 16$, $r = 0.5$, $n = 8$

e) An investment pays interest so that each year the value of the investment increases by 10%. How much is an initial investment of $1000 worth after 5 years?

Example 2: Write an Equation for the nth Term

Write an equation for the nth term of the geometric sequence 18, -3, 1/2, -1/12,...

Example 3: Find Geometric Means

Find the geometric means in each sequence.

a) 9, ___, ___, ___, 144

b) 32, ___, ___, ___, ___, 1

11.4 Geometric Series

Sum of a Geometric Series

Example 1: Find the Sum of the First n Terms
Find S_n for each geometric series described.

a) $a_1 = 4$, $r = -3$, $n = 5$

b) $a_1 = 1296$, $a_n = 1$, $r = -1/6$

c) $a_1 = 2$, $a_6 = 486$, $r = 3$

d) 4096 - 512 + 64 - ... to 5 terms

e) Maria arranges some rows of dominos so that after she knocks over the first one, each domino knocks over two more dominos when it falls. If there are ten rows, how many dominos does Maria use?

Example 2: Evaluate a Sum Written in Sigma Notation
Find the sum of each geometric series.

a) $\sum_{n=1}^{5} -4 \cdot 3^{n-1}$

b) $\sum_{n=1}^{9} 5 \cdot 2^{n-1}$

Example 3: Find the First Term of a Series
Find the indicated term for each geometric series described.

a) $S_n = 165$, $a_n = 48$, $r = -2/3$; a_1

b) $S_n = -364$, $r = -3$, $n = 6$; a_1

11.5 Infinite Geometric Series

Sum of an Infinite Geometric Series

Example 1: Sum of an Infinite Geometric Series
Find the sum of each infinite geometric series, if it exists.

a) a = 36, r = 2/3

b) 16 + 24 + 36 + ...

c) Altovese's grandfather clock is broken. When she sets the pendulum in motion by holding it against the side of the clock and letting it go, it swings 24 centimeters to the other side, then 18 centimeters back, then 13.5 centimeters, and so on. What is the total distance that the pendulum swings before it stops?

Example 2: Infinite Series in Sigma Notation
Find each sum of each infinite geometric series, if it exists.

a) $\sum_{n=1}^{\infty} 6(-0.4)^{n-1}$

b) $\sum_{n=1}^{\infty} 35\left(-\frac{3}{4}\right)^{n-1}$

Example 3: Write a Repeating Decimal as a Fraction
Write each repeating decimal as a fraction.

a) $0.\overline{123}$

b) $0.0\overline{123}$

c) $1.2\overline{34}$

11.6 Recursion and Special Sequences

Recursive Formula

Example 1: Use a Recursive Formula
Find the first five terms of each sequence.

a) $a_1 = 3$, $a_{n+1} = a_n + 5$

b) $a_1 = -3$, $a_{n+1} = 3a_n + 2$

c) $a_1 = 3$, $a_2 = 1$, $a_{n+1} = a_n - a_{n-1}$

d) $a_1 = 2$, $a_2 = -3$, $a_{n+1} = 5a_n - 8a_{n-1}$

Example 2: Find and Use a Recursive Formula
Dr. Elliott is growing cells in lab dishes. She starts with 108 cells Monday morning and then removes 20 of these for her experiment. By Tuesday the remaining cells have multiplied in number by 1.5. She again removes 20. This patter repeats each day of the week.

a) Write a recursive formula for the number of cells Dr. Elliott finds each day before she removes any.

b) How many cells will she find on Friday morning?