

Arithmetic and Geometric Series – The Formulas

Sum of the first “n” terms in an arithmetic series:
Formula 1: Formula 2:

Sum of the first “n” terms
in a geometric series, where $r \neq 1$:

Sample:

The first three terms of an arithmetic sequence are: 23, 15, 7, ... Find S_{80} .

Find the sum of this series.
-3 1 5 9 ... 81

- a Write an expression for S_n , the sum of the first n terms, of the series $64 + 60 + 56 + \dots$
- b Hence, find the value of n for which $S_n = 0$

Sample:

Find the sum of the series: $\sum_{i=1}^8 6(-2)^{i-1}$

- The geometric sequence 16, 8, p , ... has common ratio 0.5.
- a Find the value of p .
 - b Find the value of the seventh term.
 - c Find the sum of the first 15 terms.

Problem 1:

Note the pattern created by the coins at right. Row 1 is the top row and it has 1 coin. Row 2 has 2 coins, and so on.

Row (n)	1	2	3	4	5
Sequence for # of coins in each row					
Sequence for Sum of Coins					



- a. Fill the table above.
- b. Create a general rule for the number of coins in each row.
- c. The sequence for the sum of coins is quadratic: $S_n = 0.5n^2 + 0.5n$
 - i) Use this rule to find S_2 and S_4 . Confirm that the results match the values that you have in the table.
 - ii) Using the sum of arithmetic sequence formula that we discovered at the top of this page, derive the rule given in c).

Problem 2:

Avi does chores around his house to earn money to buy his family presents for Hanukkah. On the first day of December, he earns \$0.50. On the second, he earns \$1.75 and on the third, he earns \$3. If this pattern continues for the first two weeks of December, how much money will he have in total on the first night of Hanukkah on 14 December?

Problem 3:

For each infinite series below, decide whether it is arithmetic or geometric, then find the sum to the given term:

a $1 + 5 + 9 + \dots u_8$

c $-2 - 4 - 8 - \dots u_9$

e $132 + 124 + 116 + \dots u_7$

b $6 + 12 + 18 + \dots u_7$

d $100 + 50 + 25 + \dots u_6$

f $\frac{1}{8} - \frac{1}{4} + \frac{1}{2} - \dots u_{12}$

Problem 4:

For each finite series below, decide whether it is arithmetic or geometric, then find the sum:

a $5 + 7 + 9 + \dots 39$

b $\sum_{n=1}^{15} -2(3)^n$

c $\frac{5}{4} + \frac{5}{8} + \frac{5}{16} + \dots \frac{5}{256}$

