LESSON MAKER PRO

Patterns That Add Up

Find terms and totals in growing patterns.

HIGH SCHOOL · A3.N.2

A3.N.2 "Evaluate and apply formulas for arithmetic and geometric sequences and series."

NAME _____ DATE _____

TERMS AND SUMS

In an arithmetic sequence, add the same difference d each time: $a_n = a_1 + (n - 1)d$, and $S_n = n(a_1 + a_n)/2$. In a geometric sequence, multiply by the same ratio r each time: $a_n = a_1 r^{n-1}$, and $S_n = a_1(r^n - 1)/(r - 1)$ when r is not 1. S_n means the sum of the first n terms.

WORKED EXAMPLE

A geometric sequence starts at 13 and triples each term. Find the sum of its first 4 terms.

1. Identify $a_1 = 13$, $r = 3$, and $n = 4$.
2. Substitute: $S_4 = 13(3^4 - 1)/(3 - 1)$.
3. Calculate: $S_4 = 13(81 - 1)/2 = 520$.

Answer: 520

PRACTICE 6 problems

1 An arithmetic sequence has $a_1 = 8$ and $d = 5$. Find a_{10}.

ANSWER _____

2 An arithmetic sequence has $a_1 = 30$ and $d = -2$. Find a_9.

ANSWER _____

3 An arithmetic sequence has $a_1 = 6$ and $d = 8$. Find S_5.

ANSWER _____

4 A geometric sequence has $a_1 = 2$ and $r = 5$. Find a_5.

ANSWER _____

5 A geometric sequence has $a_1 = 64$ and $r = 1/2$. Find a_7.

ANSWER _____

6 A geometric sequence has $a_1 = 2$ and $r = 2$. Find S_6.

ANSWER _____

APPLY IT Show your work

1 You save $15 in the first week for a concert ticket. Each week after that, you save $5 more than the week before. How much do you save in total over 10 weeks?

WORK SPACE

ANSWER _____

2 A short video gets 2 new shares on Monday. The number of new shares doubles each day for 8 days, with Monday as day 1. How many new shares does the video get in total during those 8 days?

WORK SPACE

ANSWER _____

CHALLENGE One step up

An arithmetic sequence has $a_2 = 12$ and $a_6 = 32$. Find the sum of its first 10 terms. Show how you found the common difference.

WORK SPACE AND ANSWER

Patterns That Add Up

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	An arithmetic sequence has $a_1 = 8$ and $d = 5$. Find a_{10}.	**53**
2	An arithmetic sequence has $a_1 = 30$ and $d = -2$. Find a_9.	**14**
3	An arithmetic sequence has $a_1 = 6$ and $d = 8$. Find S_5.	**110**
4	A geometric sequence has $a_1 = 2$ and $r = 5$. Find a_5.	**1250**
5	A geometric sequence has $a_1 = 64$ and $r = 1/2$. Find a_7.	**1**
6	A geometric sequence has $a_1 = 2$ and $r = 2$. Find S_6.	**126**

PART 2 · APPLY IT

1. **$375** The weekly amounts form an arithmetic sequence with $a_{10} = 15 + 9(5) = 60$. The total is $S_{10} = 10(15 + 60)/2 = 375$.
2. **510 new shares** The daily shares form a geometric sequence with $a_1 = 2$ and $r = 2$. The total is $S_8 = 2(2^8 - 1)/(2 - 1) = 510$.

CHALLENGE

The common difference is (32 - 12)/(6 - 2) = 5. Then $a_1 = 7$ and $a_{10} = 52$, so $S_{10} = 10(7 + 52)/2 = 295$.

Accept equivalent substitution or term-by-term addition for the sums. In the challenge, the explanation must account for the four equal steps between a_2 and a_6.