

Algebra 1 · Arithmetic and Geometric Sequences · Worksheet Answer Key

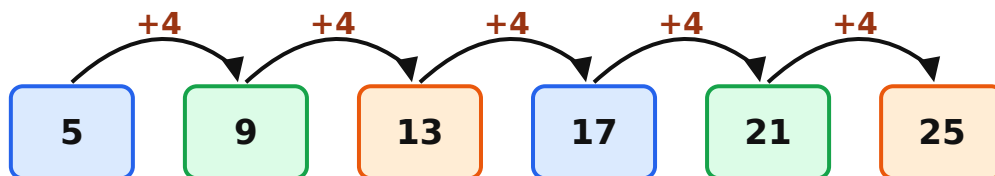
Common Core F-IF.A.3, F-BF.A.2, F-LE.A.2 · mathovore.fr

Each solution shows how the type of sequence is decided, the formula, and the arithmetic for the requested term, followed by a check. If your answer differs, compare the common difference or ratio first, since most errors start there.

Algebra 1 Common Core: F-IF.A.3 · F-BF.A.2 · F-LE.A.2

Problem 1: Arithmetic: next terms

$9 - 5 = 4$, $13 - 9 = 4$, $17 - 13 = 4$. The common difference is $d = 4$. The next terms are 21 and 25.



Each term is 4 more than the previous one.

Problem 2: Geometric: next terms

$12 \div 4 = 3$, $36 \div 12 = 3$, $108 \div 36 = 3$. The common ratio is $r = 3$. Next: $108 \cdot 3 = 324$ and $324 \cdot 3 = 972$. The terms are 324 and 972.

Problem 3: Decreasing arithmetic

$43 - 50 = -7$ and $36 - 43 = -7$, so $d = -7$. The next terms are $36 - 7 = 29$, $29 - 7 = 22$ and $22 - 7 = 15$: 29, 22, 15.

Problem 4: A ratio less than 1

$40 \div 80 = \frac{1}{2}$ and $20 \div 40 = \frac{1}{2}$, so $r = \frac{1}{2}$. Halve each term: 10, 5 and 2.5. The next terms are 10, 5, 2.5.

Problem 5: Arithmetic, geometric or neither

- Differences: 2, 4, 6 (not equal). Ratios: 2, 2, 1.75 (not equal). **Neither**.
- Ratios: $\frac{-2}{1} = -2$, $\frac{4}{-2} = -2$, $\frac{-8}{4} = -2$. **Geometric** with $r = -2$.
- Differences: -5 , -5 , -5 . **Arithmetic** with $d = -5$.

Problem 6: Explicit rule: arithmetic

$a_1 = 6$ and $d = 5$. Then $a_n = 6 + 5(n-1) = 5n + 1$. The formula is $a_n = 6 + 5(n-1)$.

$a_{20} = 6 + 5(19) = 6 + 95 = 101$. The 20th term is 101.

Problem 7: Explicit rule: geometric

$a_1 = 5$ and $r = 2$. The formula is $a_n = 5 \cdot 2^{n-1}$.

$a_8 = 5 \cdot 2^7 = 5 \cdot 128 = 640$. The 8th term is 640.

Problem 8: Recursive: arithmetic

$d = 17 - 20 = -3$. The recursive formula is $a_1 = 20$, $a_n = a_{n-1} - 3$.

Continue: $11 - 3 = 8$, $8 - 3 = 5$. So $a_6 = 5$. Check: $20 + 5(-3) = 5$.

Problem 9: Recursive: geometric

$r = 3 \div 1.5 = 2$. The recursive formula is $a_1 = 1.5$, $a_n = 2 \cdot a_{n-1}$.

The terms are 1.5, 3, 6, 12, 24, 48, 96, so $a_7 = 96$. Check: $1.5 \cdot 2^6 = 1.5 \cdot 64 = 96$.

Problem 10: Use a_1 and d

$a_n = -8 + 6(n-1) = 6n - 14$. The formula is $a_n = -8 + 6(n-1)$.

$a_{15} = -8 + 6(14) = -8 + 84 = 76$. So $a_{15} = 76$.

Problem 11: From a recursive rule

a. $a_1 = 4$, $a_2 = 12$, $a_3 = 36$, $a_4 = 108$, $a_5 = 324$.

b. The sequence is geometric with $r = 3$: $a_n = 4 \cdot 3^{n-1}$. Then $a_5 = 4 \cdot 3^4 = 4 \cdot 81 = 324$, which matches.

Problem 12: Find the rule from two terms

From term 3 to term 7 there are 4 steps, so $4d = 27 - 11 = 16$ and $d = 4$. Then

$a_1 = a_3 - 2d = 11 - 8 = 3$. The formula is $a_n = 3 + 4(n-1) = 4n - 1$.

Check: $a_3 = 4(3) - 1 = 11$ and $a_7 = 4(7) - 1 = 27$.

n	1	2	3	4	5	6	7
a_n	3	7	11	15	19	23	27

Terms 1 to 7: terms 3 and 7 match the given values.

Problem 13: Geometric from two terms

From term 2 to term 5 the ratio is used 3 times: $r^3 = \frac{162}{6} = 27$, so $r = 3$. Then $a_1 = 6 \div 3 = 2$. The formula is $a_n = 2 \cdot 3^{n-1}$.

Check: $a_5 = 2 \cdot 3^4 = 2 \cdot 81 = 162$.

Problem 14: Which term?

$a_n = 4 + 6(n-1)$. Set it equal to 154: $4 + 6(n-1) = 154$, so $6(n-1) = 150$ and $n-1 = 25$. Then $n = 26$. The 26th term is 154.

Problem 15: Sequence from a graph

- The terms are 10, 7, 4, 1. The differences are all -3 , so it is **arithmetic** with $d = -3$.
- $a_n = 10 - 3(n-1) = 13 - 3n$. Then $a_8 = 13 - 3(8) = -11$, so $a_8 = -11$.

Problem 16: Decay by a third

$a_n = 243 \left(\frac{1}{3}\right)^{n-1}$. So $a_6 = 243 \left(\frac{1}{3}\right)^5 = \frac{243}{243} = 1$. The answer is $a_6 = 1$. Check by listing: 243, 81, 27, 9, 3, 1.

Problem 17: Weekly savings

- $a_n = 15 + 6(n-1) = 6n + 9$.
- $a_{12} = 15 + 6(11) = 15 + 66 = 81$. He deposits **\$81**.
- $15 + 6(n-1) > 100$ gives $6(n-1) > 85$, so $n-1 > 14.17$ and $n = 16$. Check: $a_{15} = 99$ is too small and $a_{16} = 105$ works. It is **week 16**.

Problem 18: Doubling views

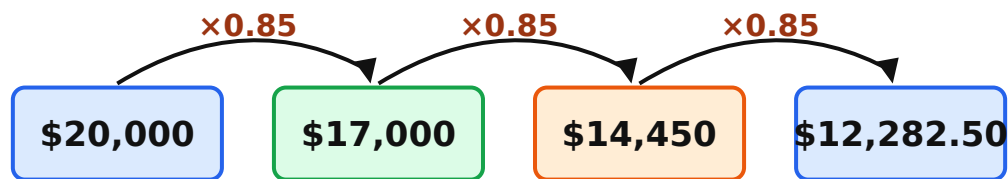
- Recursive: $a_1 = 50$, $a_n = 2 \cdot a_{n-1}$. Explicit: $a_n = 50 \cdot 2^{n-1}$.
- $a_7 = 50 \cdot 2^6 = 50 \cdot 64 = 3200$. The video gets **3,200 views** on day 7.

Problem 19: Stadium rows

- $a_n = 18 + 2(n-1) = 2n + 16$.
- $a_{25} = 18 + 2(24) = 66$. Row 25 has **66 seats**.
- $18 + 2(n-1) = 50$, so $2(n-1) = 32$ and $n = 17$. It is **row 17**.

Problem 20: Car depreciation

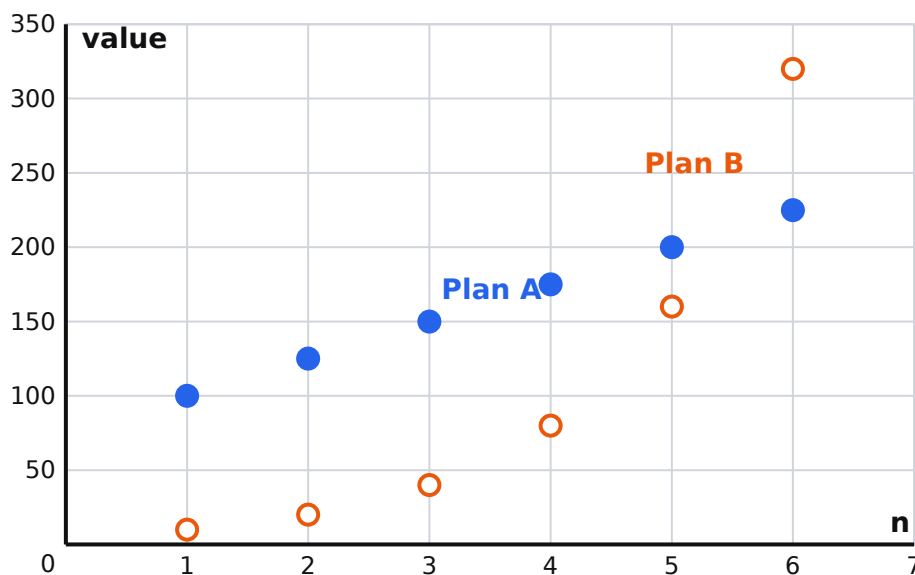
- a. Losing 15% leaves 85%, so $r = 0.85$: $a_n = 20000(0.85)^{n-1}$.
- b. $a_4 = 20000(0.85)^3 = 20000(0.614125) = 12282.5$. The value is **\$12,282.50**.
- c. $a_5 = 20000(0.85)^4 \approx 10440.13$ is still above \$10,000, and $a_6 = 20000(0.85)^5 \approx 8874.11$ is below. It happens at the start of **year 6**.



Value at the start of years 1 to 4.

Problem 21: Two growth plans

- a. Plan A (arithmetic): $A_n = 100 + 25(n-1)$. Plan B (geometric): $B_n = 10 \cdot 2^{n-1}$.
- b. Compare month by month. Month 5: $A_5 = 200$ and $B_5 = 160$. Month 6: $A_6 = 225$ and $B_6 = 320$. Plan B first exceeds Plan A in **month 6**.



Filled points are Plan A; open points are Plan B.

Problem 22: Bouncing ball

- a. $a_n = 16\left(\frac{3}{4}\right)^{n-1}$.
- b. $a_4 = 16\left(\frac{3}{4}\right)^3 = 16 \cdot \frac{27}{64} = \frac{27}{4} = 6.75$. The 4th bounce reaches **6.75 feet**.