Arithmetic Sequences

Name: _____	Date: _____	Score: _____ / 24

Quick Review

An **arithmetic sequence** is a list of numbers where you add the *same amount* each step. That fixed amount is the **common difference** d — find it by subtracting any term from the one after it. To jump straight to the nth term, use the rule $a_n = a_1 + (n-1)d$, where a_1 is the first term. For example, in $3, 7, 11, 15, \ldots$ the common difference is $d = 4$, and the 10th term is $a_{10} = 3 + (10-1)(4) = 39$. This is really a linear function in disguise — the term number is the input!

◇ **Example:** Find the 10th term of the arithmetic sequence $3, 8, 13, 18, \ldots$

⇒ First spot the common difference: $8 - 3 = 5$, and $13 - 8 = 5$ too, so $d = 5$. The first term is $a_1 = 3$. Now use the rule $a_n = a_1 + (n-1)d$ with $n = 10$: $a_{10} = 3 + (10-1)(5) = 3 + 9 \times 5 = 3 + 45 = 48$. So the 10th term is 48. The rule lets you skip ahead without listing every term!

Answer: $a_{10} = 48$

PRACTICE

Find the requested term of each arithmetic sequence.

1. $3, 8, 13, 18, \ldots;\ a_{10}$ _____

2. $7, 5, 3, 1, \ldots;\ a_8$ _____

3. $2, 6, 10, 14, \ldots;\ a_{12}$ _____

4. $10, 13, 16, 19, \ldots;\ a_{15}$ _____

5. $-5, 1, 7, 13, \ldots;\ a_{20}$ _____

6. $100, 93, 86, 79, \ldots;\ a_{11}$ _____

7. $4, 8, 12, 16, \ldots;\ a_{25}$ _____

8. $0, 9, 18, 27, \ldots;\ a_{10}$ _____

9. $12, 9, 6, 3, \ldots;\ a_9$ _____

10. $1, 3, 5, 7, \ldots;\ a_{50}$ _____

11. $5, 11, 17, 23, \ldots;\ a_8$ _____

12. $20, 17, 14, 11, \ldots;\ a_7$ _____

13. $6, 10, 14, 18, \ldots;\ a_{10}$ _____

14. $-10, -6, -2, 2, \ldots;\ a_{12}$ _____

15. $50, 45, 40, 35, \ldots;\ a_9$ _____

16. $8, 15, 22, 29, \ldots;\ a_{10}$ _____

17. $3, 3.5, 4, 4.5, \ldots;\ a_{11}$ _____

18. Find d for $14, 21, 28, 35, \ldots$ _____

19. Find a_1 if $a_5 = 23$ and $d = 4$ _____

20. Is 100 a term of $4, 8, 12, 16, \ldots$? _____

Word Problems

21. A theater has 18 seats in the first row, 22 in the second, 26 in the third, and so on. How many seats are in the 10th row?

_____

22. A diver descends so that her depth is 5 ft after 1 minute, 8 ft after 2 minutes, 11 ft after 3 minutes, and so on. How deep is she after 12 minutes?

_____

23. A savings jar starts with \$60 and \$7 is added each week. Treating week 1 as the \$60 start, how much is in the jar in week 15?

_____

24. A stack of boxes shrinks: the bottom layer has 40 boxes, the next has 36, then 32, and so on, losing 4 each layer. How many boxes are in the 9th layer?

_____

Answer Keys

1. $\boxed{48}$	**13.** $\boxed{42}$
2. $\boxed{-7}$	**14.** $\boxed{34}$
3. $\boxed{46}$	**15.** $\boxed{10}$
4. $\boxed{52}$	**16.** $\boxed{71}$
5. $\boxed{109}$	**17.** $\boxed{8}$
6. $\boxed{30}$	**18.** $\boxed{7}$
7. $\boxed{100}$	**19.** $\boxed{7}$
8. $\boxed{81}$	**20.** $\boxed{\text{yes}}$
9. $\boxed{-12}$	**21.** $\boxed{54 \text{ seats}}$
10. $\boxed{99}$	**22.** $\boxed{38 \text{ feet}}$
11. $\boxed{47}$	**23.** $\boxed{\$158}$
12. $\boxed{2}$	**24.** $\boxed{8 \text{ boxes}}$

Step-by-Step Explanations

1. Here $d = 5$ and $a_1 = 3$, so $a_{10} = 3 + 9(5) = 48$.
2. Here $d = -2$ and $a_1 = 7$, so $a_8 = 7 + 7(-2) = 7 - 14 = -7$.
3. Here $d = 4$ and $a_1 = 2$, so $a_{12} = 2 + 11(4) = 2 + 44 = 46$.
4. Here $d = 3$ and $a_1 = 10$, so $a_{15} = 10 + 14(3) = 10 + 42 = 52$.
5. Here $d = 6$ and $a_1 = -5$, so $a_{20} = -5 + 19(6) = -5 + 114 = 109$.
6. Here $d = -7$ and $a_1 = 100$, so $a_{11} = 100 + 10(-7) = 100 - 70 = 30$.
7. Here $d = 4$ and $a_1 = 4$, so $a_{25} = 4 + 24(4) = 4 + 96 = 100$.
8. Here $d = 9$ and $a_1 = 0$, so $a_{10} = 0 + 9(9) = 81$.
9. Here $d = -3$ and $a_1 = 12$, so $a_9 = 12 + 8(-3) = 12 - 24 = -12$.
10. Here $d = 2$ and $a_1 = 1$, so $a_{50} = 1 + 49(2) = 1 + 98 = 99$.
11. Here $d = 6$ and $a_1 = 5$, so $a_8 = 5 + 7(6) = 5 + 42 = 47$.
12. Here $d = -3$ and $a_1 = 20$, so $a_7 = 20 + 6(-3) = 20 - 18 = 2$.
13. Here $d = 4$ and $a_1 = 6$, so $a_{10} = 6 + 9(4) = 6 + 36 = 42$.
14. Here $d = 4$ and $a_1 = -10$, so $a_{12} = -10 + 11(4) = -10 + 44 = 34$.
15. Here $d = -5$ and $a_1 = 50$, so $a_9 = 50 + 8(-5) = 50 - 40 = 10$.
16. Here $d = 7$ and $a_1 = 8$, so $a_{10} = 8 + 9(7) = 8 + 63 = 71$.
17. Here $d = 0.5$ and $a_1 = 3$, so $a_{11} = 3 + 10(0.5) = 3 + 5 = 8$.
18. Subtract consecutive terms: $21 - 14 = 7$, so the common difference is $d = 7$.
19. Use $a_5 = a_1 + 4d$: $23 = a_1 + 4(4) = a_1 + 16$, so $a_1 = 7$.
20. This sequence is the multiples of 4, and $100 = 4 \times 25$, so 100 is the 25th term — yes.
21. This is arithmetic with $a_1 = 18$ and $d = 4$. The 10th row has $a_{10} = 18 + 9(4) = 18 + 36 = 54$ seats.
22. The depths form an arithmetic sequence with $a_1 = 5$ and $d = 3$. After 12 minutes the depth is $a_{12} = 5 + 11(3) = 5 + 33 = 38$ feet.
23. With $a_1 = 60$ and $d = 7$, week 15 has $a_{15} = 60 + 14(7) = 60 + 98 = 158$ dollars.
24. This is arithmetic with $a_1 = 40$ and $d = -4$. The 9th layer has $a_9 = 40 + 8(-4) = 40 - 32 = 8$ boxes.

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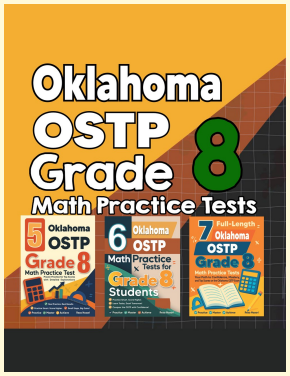

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