Arithmetic Sequences, Lines Made of Dots

Arithmetic: add the common difference d each time. Recursive: a1 and a_n = a_(n-1) + d.
Explicit: a_n = a1 + d(n - 1). d is the slope; the y-intercept is the zeroth term.

1 THE VOCABULARY
Words we use

Arithmetic sequence adds the same amount each time; dots on a line.

Common difference d the amount added; the slope. Term minus the one before.

Recursive rule the stairs: next term from the one before.

Explicit rule the elevator: any term from its term number.

Zeroth term one step before the first: $a_1 - d$. The y-intercept.

- Watch out for these.
- Multiplying d by n instead of n – 1.
- Calling the first term the y-intercept. The y-intercept is at n = 0.
- Subtracting in the wrong order and losing a negative d.
- Forgetting the starting term in a recursive rule.

2 THE METHOD
Build the rules

1. FIND d a term minus the one before it.
2. RECURSIVE a_1 = start; $a_n = a_{n-1} + d$.
3. EXPLICIT $a_n = a_1 + d(n - 1)$.
4. FAR TERM put in n; the steps are n – 1.
5. WHICH TERM set the rule equal to the value; solve for n.

WHY N – 1
You stand on the first term before taking any step. Reaching the nth term takes n – 1 steps of d.

3 THE THEATER
60, 68, 76, ...

$d = 68 - 60 = 8$	the common difference, the slope
$a_1 = 60,\ a_n = a_{n-1} + 8$	recursive
$a_n = 60 + 8(n - 1)$	explicit
$a_{20} = 60 + 8 \times 19 = 212$	19 steps
$60 + 8(n - 1) = 8n + 52$	slope 8, y-intercept 52, the zeroth term

WHICH ROW HAS 94 SEATS?
58 + 4(n – 1) = 94. Subtract 58: 4(n – 1) = 36. Divide by 4: n – 1 = 9. n = 10.

SAY IT OUT LOUD
Adding gives arithmetic. The common difference is the slope. The zeroth term is the y-intercept.