1. x(n) = x(n-1) + 5, x(1) = 0 | n > 1

This is a linear recurrence where we add 5 at each step

Let's see the pattern: x(1) = 0 x(2) = 0 + 5 = 5 (added 5 once) x(3) = 5 + 5 = 10 (added 5 twice) x(4) = 10 + 5 = 15 (added 5 three times)

We can see that we're adding 5 exactly (n-1) times

Therefore, x(n) = 5(n-1)

1. x(n) = 3x(n-1) + 5, x(1) = 4 | n > 1

This is more complex because we multiply by 3 each time

Let's break down why: x(1) = 4 x(2) = 3(4) + 5 = 17 x(3) = 3(17) + 5 = 3(3(4) + 5) + 5 = 56

The first term (4) gets multiplied by 3 each time

The 5 gets added, then multiplied by 3, then more 5s get added

This forms a geometric sequence for the 5s

1. x(n) = x(n-1) + n, x(0) = 0 | n > 0

We're adding each number from 1 to n

This is the sum of first n natural numbers

The formula for sum of first n numbers is n(n+1)/2

We can verify: x(3) = 0 + 1 + 2 + 3 = 6 = 3(4)/2 x(4) = 0 + 1 + 2 + 3 + 4 = 10 = 4(5)/2

1. x(n) = x(n/2) + n, x(1) = 1 (for n = 2^k) | n > 1

This is a logarithmic recurrence

Let's see what happens with powers of 2: x(1) = 1 x(2) = 1 + 2 = 3 x(4) = 3 + 4 = 7 x(8) = 7 + 8 = 15

We can notice that x(n) = 2n - 1 works

This can be proven by substitution

1. x(n) = x(n/3) + 1, x(1) = 1 (for n = 3^k) | n > 1

Each step divides n by 3 and adds 1

For powers of 3: x(1) = 1 x(3) = 1 + 1 = 2 x(9) = 2 + 1 = 3 x(27) = 3 + 1 = 4

The pattern shows we're counting how many times we can divide by 3

This is equivalent to log\_3(n) + 1