Solving Recurrence Relations of degree 1 & 2

1. For Recurrence Relations of the form an = c an-1 + bn , where c is a constant and bn is a function of n (possibly a constant) subject to the initial condition a1, the solution is

an = cn-1 a1 +

Example: an = 2 an-1 + (n-1) subject to a1 = 5. Hence c = 2 and bn = n -1.

1. For Recurrence Relations of the form an = c an-1 + bn , where c is a constant and bn is a function of n (possibly a constant) subject to the initial condition a0, the solution is

an = cn a0 +

Helpful formulas:

Example: an = 2 an-1 + (n-1) subject to a1 = 5. Hence c = 2 and bn = n -1.

1. For Recurrence Relations of the form an = c1 an-1 + c2 an-2 , where c1 and c2are constants subject to the initial conditions a1 and a2,

* Solve the characteristic equation t2 – c1t – c2 = 0.
* If the characteristic equation has distinct roots r1 and r2, the solution is

Where

* If the characteristic equation has a repeated root r, the solution is

Where

1. For Recurrence Relations of the form an = c1 an-1 + c2 an-2 , where c1 and c2are constants subject to the initial conditions a0 and a1,

* Solve the characteristic equation t2 – c1t – c2 = 0.
* If the characteristic equation has distinct roots r1 and r2, the solution is

Where

* If the characteristic equation has a repeated root r, the solution is

Where

Example: an = 4 an-1 + 5 an-2 , a1 = 2, a2 = 6.