Moran process

Fitness

$N = 3$ and $A = \begin{pmatrix} 0 & 3 \\ 1 & 2 \end{pmatrix}$

	f(Hawk)	f(Dove)
1 Hawk, 2 Doves	$0 \times 0 + 3 \times 2$=6	
2 Hawks, 1 Dove		

Probabilities

	Select	Selection: Birth	Selection: Death
1 Hawk, 2 Doves	Hawk	$\frac{f(\text{Hawk})}{f(\text{Hawk})+2f(\text{Dove})} = \frac{6}{12}$	$\frac{1}{3}$
	Dove		
2 Hawks, 1 Dove	Hawk		
	Dove		

Simulation

Use a D12 (12 sided dice) to simulate 1 Hawk taking over a population of Doves.

State	Select Hawk values (birth)	Select Hawk values (death)
1 Hawk	$\{1, 2, 3, 4, 5, 6\}$	$\{1, 2, 3, 4\}$
2 Hawks	$\{1, 2, 3, 4, 5, 6, 8, 9\}$	$\{1, 2, 3, 4, 6, 7, 8\}$

Example

State	Birth: value rolled	Death: value rolled	Next state
1 Hawk	2 (Select Hawk)	1 (Select Hawk)	1 Hawk
1 Hawk	3 (Select Hawk)	5 (Select Dove)	2 Hawks
2 Hawks	10 (Select Dove)	2 (Select Hawk)	1 Hawk
1 Hawk	9 (Select Dove)	1 (Select Hawk)	0 Hawks

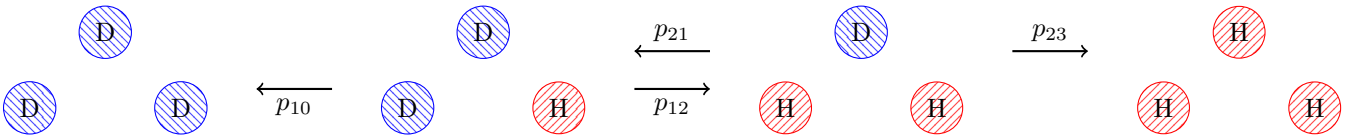
Activity

Every time you arrive at 0 **or** 3 Hawks:

1. Stop;
2. Circle your final state
3. Draw a line in the table (next page);
4. Start again.

Current state	Birth: value rolled	Death: value rolled	Next state
1 Hawk			

Computation



Which gives:

$$p_{10} = \frac{6}{12}\frac{1}{3} = \frac{1}{6} \qquad p_{12} = \qquad\qquad p_{21} = \qquad\qquad p_{23} =$$