Moran process

Fitness

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

	$f(\text{Hawk})$	$f(\text{Dove})$
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 the appropriate dice to simulate 1 Hawk taking over a population of Doves.

Decide what dice you will use to sample birth/death selection at all possible states:

State	Birth: dice used	Select Hawk values	Death: dice used	Select Hawk values
1 Hawk	6	$\{1, 2, 3\}$	6	$\{1, 2\}$
2 Hawks				

Example

| State	Birth: dice used	Birth: value rolled	Death: dice used	Death: value rolled	Next state
1 Hawk	6	2 (Select Hawk)	6	1 (Select Hawk)	1 Hawk
1 Hawk	6	3 (Select Hawk)	6	5 (Select Dove)	2 Hawks
2 Hawks	4	4 (Select Dove)	6	2 (Select Hawk)	1 Hawk
1 Hawk	6	4 (Select Dove)	6	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: dice used	Birth: value rolled	Death: dice used	Death: value rolled	Next state
1 Hawk	6				

Computation
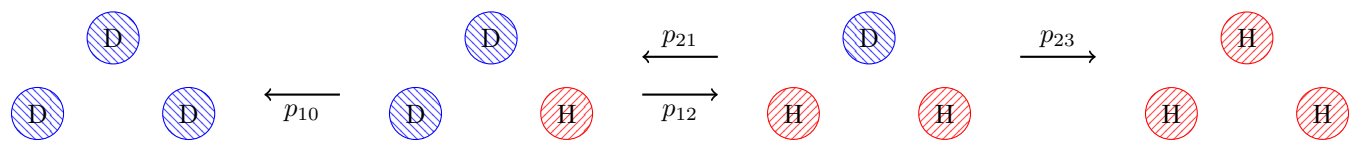
Which gives:

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