*Solve coin tossing problems using Transition matrix of Markov chains*

**HT: Expected numbers of tossing a fair coin until you get two Heads in a row?**

|  |  |  |  |
| --- | --- | --- | --- |
|  | 0 | 1 | 2 |
| 0 | 0.5 | 0.5 | 0 |
| 1 | 0 | 0.5 | 0.5 |
| 2 | 0 | 0 | 1 |

*ϕ(2) = 0*

ϕ(0)=0.5∗(1+ϕ(0))+0.5∗(1+ϕ(1))+0∗(1+ϕ(2))

ϕ(1)=0∗(1+ϕ(0))+0.5∗(1+ϕ(1))+0.5∗(1+ϕ(2))

**HT: ϕ(0) = 4**

**HH: Expected numbers of tossing a fair coin until you get Head, Tail successively?**

|  |  |  |  |
| --- | --- | --- | --- |
|  | 0 | 1 | 2 |
| 0 | 0.5 | 0.5 | 0 |
| 1 | 0.5 | 0 | 0.5 |
| 2 | 0 | 0 | 1 |

*ϕ(2) = 0*

ϕ(0)=0.5∗(1+ϕ(0))+0.5∗(1+ϕ(1))+0∗(1+ϕ(2))

ϕ(1)=0.5∗(1+ϕ(0))+0∗(1+ϕ(1))+0.5∗(1+ϕ(2))

**HH: ϕ(0) = 6**

**HHH: Expected number of coin flips until you get three heads in a row?**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 0 | 1 | 2 | 3 |
| 0 | 0.5 | 0.5 | 0 | 0 |
| 1 | 0.5 | 0 | 0.5 | 0 |
| 2 | 0.5 | 0 | 0 | 0.5 |
| 3 | 0 | 0 | 0 | 1 |

*ϕ(3) = 0*

ϕ(0)=0.5∗(1+ϕ(0))+0.5∗(1+ϕ(1))+0∗(1+ϕ(2))+0\*(1+ϕ(3))

ϕ(1)=0.5∗(1+ϕ(0))+0∗(1+ϕ(1))+0.5∗(1+ϕ(2))+0\*(1+ϕ(3))

ϕ(2)=0.5∗(1+ϕ(0))+0∗(1+ϕ(1))+0∗ϕ(2) +0.5\*(1+ϕ(3))

**HHH: ϕ(0) = 14**

**H^n: expected number of coin flips until you get n heads in a row?**

**H^n: ϕ(0) =**