
CAMBRIDGE

Mathematics



The n-camel stack problem



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Who are you?



Probability vs Intuition

At the start, what is the probability of a 5 camel stack occurring?

- a) $\frac{1}{81}$ b) $\frac{1}{243}$ c) $\frac{1}{3}$ d) $\frac{1}{27}$

At the start, what is the probability of no stacks occurring?

- a) $\frac{1}{81}$ b) $\frac{1}{2}$ c) 0 d) $\frac{1}{243}$

At the start, what is the probability of an n-stack occurring, where n is the number of camels?

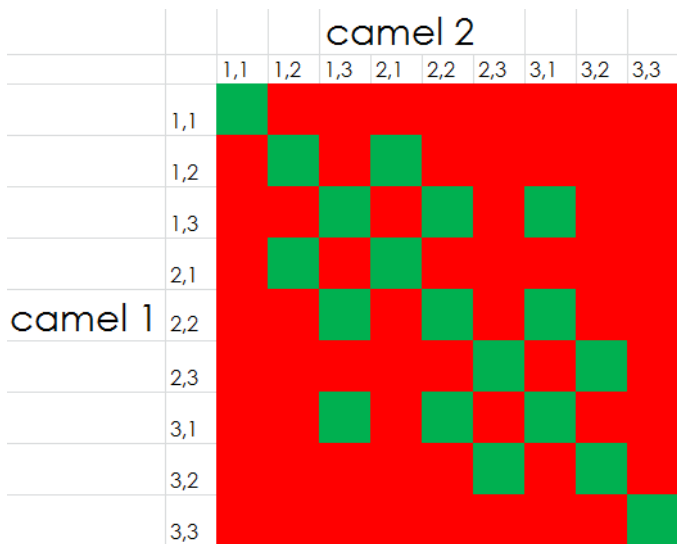
- a) $\frac{1^{n-1}}{3}$ b) $\frac{1}{3n}$ c) $\frac{1^n}{3}$ d) $\frac{1^3}{n}$

The big question...

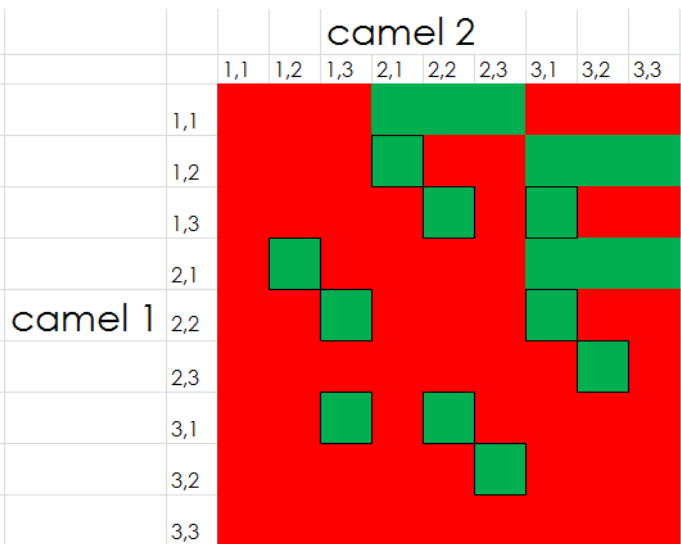
If n camels start in a stack on the same square, what is the probability that after x legs, they finish in an n -stack?

- How would you get started?
- What simpler questions might you ask first?
- What variables might you fix?
- How can the maths be represented?

Representations



stacking



no stacking

Simulation elation!

2 camels, 2 turns, no stacking, no problem!

Stack	0	Launch Simulation
no stack	0	

2 camels, 3 turns, no stacking, no problem!

Stack	0	Launch Simulation
no stack	0	

```
Sub trials()  
Dim stackCount As Integer  
Dim noStackCount As Integer  
  
stackCount = Range("B2").Value  
noStackCount = Range("B3").Value  
  
For i = 1 To 8100  
  
    player1 = WorksheetFunction.RandBetween(1, 3) + WorksheetFunction.RandBetween(1, 3)  
    player2 = WorksheetFunction.RandBetween(1, 3) + WorksheetFunction.RandBetween(1, 3)  
  
    finalPosition = player1 - player2  
  
    If finalPosition = 0 Then  
        stackCount = stackCount + 1  
        Range("B2").Value = stackCount  
    Else  
        noStackCount = noStackCount + 1  
        Range("B3").Value = noStackCount  
    End If  
Next i  
  
End Sub
```

Not so trivial now...

2 Camels, with stacking

Number of trials	810													
number of rolls	2													
	1	2		2										
	2	1		1	2									
Start	1	2	3	4	5	6	7	8	9	10	11	12		
No stack	598													
Stack	212													

Launch Simulation!



Not so trivial now...

3 Camels, with stacking

Number of trials	810											
number of rolls	2											
	1		2		3		4		5		6	
	1	2	3	4	5	6	7	8	9	10	11	12
No stack	766											
Stack	45											
	Run Simulation											
Dice rolls	1	1	3	1	3	3						



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