IBM models 1-2

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		le 1	chien 2	noir 3
	0			
the	1			
	2			
	3			
Margina	al			

		le 1	chien 2	noir 3
NULL	0	$a_1 = 0$		
the	1			
	2			
dog	3			
Margina	al			

		le 1	chien 2	noir 3
NULL	0	$a_1 = 0$	$a_2 = 0$	
the	1			
black	2			
dog	3			
Margin	nal			

		le 1	chien 2	noir 3
NULL	0	$a_1 = 0$	$a_2 = 0$	$a_3 = 0$
the	1			
black	2			
dog	3			
Margin	ıal			

		le 1	chien 2	noir 3
Null	0	$a_1 = 0$	$a_2 = 0$	$a_3 = 0$
				.,
the	1	$a_1 = 1$		
black	2			
dog	3			
Margir	nal			

		le 1	chien 2	noir 3
Null	0	$a_1 = 0$	$a_2 = 0$	$a_3 = 0$
the	1	$a_1 = 1$	$a_2 = 1$	
black	2			
dog	3			
Margir	nal			

		le 1	chien 2	noir 3
NULL	0	$a_1 = 0$	$a_2 = 0$	$a_3 = 0$
the	1	$a_1 = 1$	$a_2 = 1$	$a_3 = 1$
black	2			
dog	3			
Margii	nal			

	le le	chien	noir
	1	2	3
	- II		
Null 0	$a_1 = 0$	$a_2 = 0$	$a_3 = 0$
the 1	$ a_1 = 1$	$a_2 = 1$	$a_3 = 1$
black 2	$a_1 = 2$		
dog 3			
Marginal			

		le 1	chien 2	noir 3
NULL	0	$a_1 = 0$	$a_2 = 0$	$a_3 = 0$
	1	$a_1 = 1$	$a_2 = 1$	$a_3 = 1$
	2	$a_1 = 2$	$a_2 = 2$	
dog	3			
Margin	al			

		le 1	chien 2	noir 3
NULL	0	$a_1 = 0$	$a_2 = 0$	$a_3 = 0$
the	1	$a_1 = 1$	$a_2 = 1$	$a_3 = 1$
black	2	$a_1 = 2$	$a_2 = 2$	$a_3 = 2$
dog	3			
Margin	al			

		le 1	chien 2	noir 3
Null	0	$a_1 = 0$	$a_2 = 0$	$a_3 = 0$
the	1	$a_1 = 1$	$a_2 = 1$	$a_3 = 1$
	2	$a_1 = 2$	$a_2 = 2$	$a_3 = 2$
	3	$a_1 = 3$		
Margina	I			

	le 1	chien 2	noir 3
NULL 0	$a_1 = 0$	$a_2 = 0$	$a_3 = 0$
the 1	$a_1 = 1$	$a_2 = 1$	$a_3 = 1$
black 2	$a_1 = 2$	$a_2 = 2$	$a_3 = 2$
dog 3	$a_1 = 3$	$a_2 = 3$	
Marginal			

	le 1	chien 2	noir 3
NULL 0	$a_1 = 0$	$a_2 = 0$	$a_3 = 0$
the 1	$a_1 = 1$	$a_2 = 1$	$a_3 = 1$
black 2	$a_1 = 2$	$a_2 = 2$	$a_3 = 2$
dog 3	$a_1 = 3$	$a_2 = 3$	$a_3 = 3$
Marginal			

	le 1	chien 2	noir 3
Null 0	$a_1 = 0$ lex: NULL-le	$a_2 = 0$	$a_3 = 0$
the 1	$a_1 = 1$	$a_2 = 1$	$a_3 = 1$
black 2	$a_1 = 2$	$a_2 = 2$	$a_3 = 2$
dog 3	$a_1 = 3$	$a_2 = 3$	$a_3 = 3$
Marginal			

	le 1	chien 2	noir 3
Null 0	$a_1 = 0$ lex: NULL-le	$a_2 = 0$ lex: NULL-chien	$a_3 = 0$
the 1	$a_1 = 1$	$a_2 = 1$	$a_3 = 1$
black 2	$a_1 = 2$	$a_2 = 2$	$a_3 = 2$
dog 3	$a_1 = 3$	$a_2 = 3$	$a_3 = 3$
Marginal			

		le 1	chien 2	noir 3
Null (0	$a_1=0$ lex: NULL-le	$a_2 = 0$ lex: NULL-chien	$a_3 = 0$ lex: NULL-noir
the 1	1	$a_1 = 1$	$a_2 = 1$	$a_3 = 1$
black 2	2	$a_1 = 2$	$a_2 = 2$	$a_3 = 2$
	3	$a_1 = 3$	$a_2 = 3$	$a_3 = 3$
Marginal				

		le 1	chien 2	noir 3
NULL	0	$a_1=0$ lex: NULL-le	$a_2 = 0$ lex: NULL-chien	a ₃ = 0 lex: NULL-noir
the	1	$a_1 = 1$ lex: the-le	$a_2 = 1$	$a_3 = 1$
black	2	$a_1 = 2$	$a_2 = 2$	$a_3 = 2$
	3	$a_1 = 3$	$a_2 = 3$	$a_3 = 3$
Margina	ıl			

	le 1	chien 2	noir 3
NULL 0	$a_1 = 0$ lex: NULL-le	$a_2 = 0$ lex: NULL-chien	a ₃ = 0 lex: NULL-noir
the 1	$a_1 = 1$ lex: the-le	$a_2 = 1$ lex: the-chien	$a_3 = 1$
black 2	$a_1 = 2$	$a_2 = 2$	$a_3 = 2$
dog 3	$a_1 = 3$	$a_2 = 3$	$a_3 = 3$
Marginal			

		le 1	chien 2	noir 3
Null (0	$a_1 = 0$ lex: NULL-le	$a_2 = 0$ lex: NULL-chien	a ₃ = 0 lex: NULL-noir
the 1	1	$a_1 = 1$ lex: the-le	$a_2 = 1$ lex: the-chien	$a_3 = 1$ lex: the-noir
black 2	2	$a_1 = 2$	$a_2 = 2$	$a_3 = 2$
	3	$a_1 = 3$	$a_2 = 3$	$a_3 = 3$
Marginal				

	le 1	chien 2	noir 3
Null 0	$a_1 = 0$ lex: NULL-le	$a_2 = 0$ lex: NULL-chien	a ₃ = 0 lex: NULL-noir
the 1	$a_1 = 1$ lex: the-le	$a_2 = 1$ lex: the-chien	$a_3 = 1$ lex: the-noir
black 2	$a_1 = 2$ lex: black-le	$a_2 = 2$	$a_3 = 2$
dog 3	$a_1 = 3$	$a_2 = 3$	$a_3 = 3$
Marginal			

		le 1	chien 2	noir 3
NULL (0	$a_1 = 0$ lex: NULL-le	$a_2 = 0$ lex: NULL-chien	a ₃ = 0 lex: NULL-noir
the 1	1	$a_1=1$ lex: the-le	$a_2=1$ lex: the-chien	$a_3 = 1$ lex: the-noir
black 2	2	$a_1=2$ lex: black-le	$a_2 = 2$ lex: black-chien	$a_3 = 2$
	3	$a_1 = 3$	$a_2 = 3$	$a_3 = 3$
Marginal				

		le 1	chien 2	noir 3
NULL C)	$a_1 = 0$ lex: NULL-le	$a_2 = 0$ lex: NULL-chien	a ₃ = 0 lex: NULL-noir
the 1	L	$a_1=1$ lex: the-le	$a_2=1$ lex: the-chien	$a_3 = 1$ lex: the-noir
black 2	2	$a_1=2$ lex: black-le	$a_2 = 2$ lex: black-chien	a ₃ = 2 lex: black-noir
dog 3		$a_1 = 3$	$a_2 = 3$	$a_3 = 3$
Marginal				

	1	e L	chien 2	noir 3
NULL 0	- 11	$a_1=0$ ex: NULL-le	$a_2 = 0$ lex: NULL-chien	$a_3 = 0$ lex: NULL-noir
the 1		$u_1 = 1$ ex: the-le	$a_2=1$ lex: the-chien	$a_3 = 1$ lex: the-noir
black 2	11	$a_1=2$ ex: black-le	$a_2 = 2$ lex: black-chien	a ₃ = 2 lex: black-noir
dog 3	- 11	$u_1=3$ ex: dog-le	$a_2 = 3$	$a_3 = 3$
Marginal				

		le 1	chien 2	noir 3
NULL	0	$a_1 = 0$ lex: NULL-le	$a_2 = 0$ lex: NULL-chien	a ₃ = 0 lex: NULL-noir
the	1	$a_1 = 1$ lex: the-le	$a_2 = 1$ lex: the-chien	$a_3 = 1$ lex: the-noir
black	2	$a_1 = 2$ lex: black-le	$a_2 = 2$ lex: black-chien	a ₃ = 2 lex: black-noir
dog	3	$a_1 = 3$ lex: dog-le	$a_2 = 3$ lex: dog-chien	$a_3 = 3$
Margina	al			

	le 1	chien 2	noir 3
NULL 0	$a_1 = 0$ lex: NULL-le	$a_2 = 0$ lex: NULL-chien	a ₃ = 0 lex: NULL-noir
the 1	$a_1 = 1$ lex: the-le	$a_2 = 1$ lex: the-chien	$a_3 = 1$ lex: the-noir
black 2	$a_1 = 2$ lex: black-le	$a_2 = 2$ lex: black-chien	a ₃ = 2 lex: black-noir
dog 3	$a_1 = 3$ lex: dog-le	$a_2 = 3$ lex: dog-chien	a ₃ = 3 lex: dog-noir
Marginal			

	le 1	chien 2	noir 3
NULL 0	$\begin{bmatrix} a_1 = 0 \\ \text{lex: NULL-le} \\ \text{jump: } 0 - \lfloor 1 \times \frac{3}{3} \rfloor \end{bmatrix}$	$a_2 = 0$ lex: NULL-chien	$a_3 = 0$ lex: NULL-noir
the 1	$a_1=1$ lex: the-le	$a_2 = 1$ lex: the-chien	$a_3 = 1$ lex: the-noir
black 2	$a_1=2$ lex: black-le	$a_2 = 2$ lex: black-chien	a ₃ = 2 lex: black-noir
dog 3	$a_1=3$ lex: dog-le	$a_2 = 3$ lex: dog-chien	a ₃ = 3 lex: dog-noir
Marginal			

		le 1	chien 2	noir 3
			_	
Null	0	$a_1 = 0$	$a_2 = 0$	$a_3 = 0$
		lex: NULL-le jump: $0 - \lfloor 1 \times \frac{3}{3} \rfloor$	lex: NULL-chien jump: $0 - \lfloor 2 \times \frac{3}{3} \rfloor$	lex: NULL-noir
		Jump. $0 - \lfloor 1 \times \frac{1}{3} \rfloor$	Jump. $0 - \lfloor 2 \wedge \frac{1}{3} \rfloor$	
the	1	$a_1 = 1$	$a_2 = 1$	$a_3 = 1$
		lex: the-le	lex: the-chien	lex: the-noir
black	2	$a_1 = 2$	$a_2 = 2$	$a_3 = 2$
		lex: black-le	lex: black-chien	lex: black-noir
dog	3	$a_1 = 3$	$a_2 = 3$	$a_3 = 3$
		lex: dog-le	lex: dog-chien	lex: dog-noir
		_	-	-
Margina	, l			
ivialgilla	21			

	1	e 1	chien 2	noir 3
NULL 0		$a_1=0$ ex: NULL-le tump: $0-\left\lfloor 1 imes rac{3}{3} ight floor$	$\begin{array}{l} a_2=0\\ \text{lex: NULL-chien}\\ \text{jump: } 0-\left\lfloor2\times\frac{3}{3}\right\rfloor \end{array}$	$\begin{array}{c} a_3 = 0 \\ \text{lex: NULL-noir} \\ \text{jump: } 0 - \lfloor 3 \times \frac{3}{3} \rfloor \end{array}$
the 1	- 11	$a_1=1$ ex: the-le	$a_2 = 1$ lex: the-chien	$a_3 = 1$ lex: the-noir
black 2	. 11	$a_1=2$ ex: black-le	$a_2 = 2$ lex: black-chien	a ₃ = 2 lex: black-noir
dog 3		$a_1=3$ ex: dog-le	$a_2 = 3$ lex: dog-chien	a ₃ = 3 lex: dog-noir
Marginal				

	le 1	chien 2	noir 3
NULL 0	$\begin{array}{c} a_1 = 0 \\ \text{lex: NULL-le} \\ \text{jump: } 0 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$\begin{array}{c} a_2 = 0 \\ \text{lex: NULL-chien} \\ \text{jump: } 0 - \left\lfloor 2 \times \frac{3}{3} \right\rfloor \end{array}$	$\begin{array}{c} a_3 = 0 \\ \text{lex: NULL-noir} \\ \text{jump: } 0 - \left\lfloor 3 \times \frac{3}{3} \right\rfloor \end{array}$
the 1	$\begin{array}{c} a_1 = 1 \\ \text{lex: the-le} \\ \text{jump: } 1 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$a_2 = 1$ lex: the-chien	$a_3 = 1$ lex: the-noir
black 2	$a_1=2$ lex: black-le	$a_2=2$ lex: black-chien	a ₃ = 2 lex: black-noir
dog 3	$a_1 = 3$ lex: dog-le	a ₂ = 3 lex: dog-chien	a ₃ = 3 lex: dog-noir
Marginal			

	le 1	chien 2	noir 3
NULL 0	$\begin{array}{c} a_1 = 0 \\ \text{lex: NULL-le} \\ \text{jump: } 0 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$\begin{array}{c} a_2 = 0 \\ \text{lex: NULL-chien} \\ \text{jump: } 0 - \left\lfloor 2 \times \frac{3}{3} \right\rfloor \end{array}$	$\begin{array}{c} a_3 = 0 \\ \text{lex: NULL-noir} \\ \text{jump: } 0 - \lfloor 3 \times \frac{3}{3} \rfloor \end{array}$
the 1	$\begin{array}{c} a_1 = 1 \\ \text{lex: the-le} \\ \text{jump: } 1 - \lfloor 1 \times \frac{3}{3} \rfloor \end{array}$	$\begin{array}{c} a_2 = 1 \\ \text{lex: the-chien} \\ \text{jump: } 1 - \lfloor 2 \times \frac{3}{3} \rfloor \end{array}$	$a_3 = 1$ lex: the-noir
black 2	$a_1=2$ lex: black-le	$a_2 = 2$ lex: black-chien	a ₃ = 2 lex: black-noir
dog 3	$a_1 = 3$ lex: dog-le	a ₂ = 3 lex: dog-chien	a ₃ = 3 lex: dog-noir
Marginal			

	le 1	chien 2	noir 3
NULL 0	$\begin{array}{c} a_1 = 0 \\ \text{lex: NULL-le} \\ \text{jump: } 0 - \lfloor 1 \times \frac{3}{3} \rfloor \end{array}$	$\begin{array}{l} a_2 = 0 \\ \text{lex: NULL-chien} \\ \text{jump: } 0 - \lfloor 2 \times \frac{3}{3} \rfloor \end{array}$	$a_3=0$ lex: NULL-noir jump: $0-\lfloor 3 \times \frac{3}{3} \rfloor$
the 1	$\begin{array}{c} a_1 = 1 \\ \text{lex: the-le} \\ \text{jump: } 1 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$a_2=1$ lex: the-chien jump: $1-\lfloor 2 imes rac{3}{3} floor$	$a_3=1$ lex: the-noir jump: $1-\lfloor 3 imes rac{3}{3} floor$
black 2	$a_1=2$ lex: black-le	$a_2 = 2$ lex: black-chien	a ₃ = 2 lex: black-noir
dog 3	$a_1 = 3$ lex: dog-le	a ₂ = 3 lex: dog-chien	a ₃ = 3 lex: dog-noir
Marginal			

	le 1	chien 2	noir 3
Null 0	$\begin{array}{c c} a_1 = 0 \\ \text{lex: NULL-le} \\ \text{jump: } 0 - \lfloor 1 \times \frac{3}{3} \rfloor \end{array}$	$\begin{array}{c} a_2 = 0 \\ \text{lex: NULL-chien} \\ \text{jump: } 0 - \left\lfloor 2 \times \frac{3}{3} \right\rfloor \end{array}$	$\begin{array}{c} a_3 = 0 \\ \text{lex: NULL-noir} \\ \text{jump: } 0 - \lfloor 3 \times \frac{3}{3} \rfloor \end{array}$
the 1	$\begin{array}{c} a_1 = 1 \\ \text{lex: the-le} \\ \text{jump: } 1 - \lfloor 1 \times \frac{3}{3} \rfloor \end{array}$	$a_2 = 1$ lex: the-chien jump: $1 - \lfloor 2 \times \frac{3}{3} \rfloor$	$\begin{array}{c} a_3 = 1 \\ \text{lex: the-noir} \\ \text{jump: } 1 - \lfloor 3 \times \frac{3}{3} \rfloor \end{array}$
black 2	$\begin{array}{c} a_1 = 2 \\ \text{lex: black-le} \\ \text{jump: } 2 - \lfloor 1 \times \frac{3}{3} \rfloor \end{array}$	$a_2 = 2$ lex: black-chien	a ₃ = 2 lex: black-noir
dog 3	$a_1 = 3$ lex: dog-le	$a_2 = 3$ lex: dog-chien	a ₃ = 3 lex: dog-noir
Marginal			

	le 1	chien 2	noir 3
Null 0	$\begin{array}{c} a_1 = 0 \\ \text{lex: NULL-le} \\ \text{jump: } 0 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$\begin{array}{c} a_2 = 0 \\ \text{lex: NULL-chien} \\ \text{jump: } 0 - \lfloor 2 \times \frac{3}{3} \rfloor \end{array}$	$\begin{array}{c} a_3 = 0 \\ \text{lex: NULL-noir} \\ \text{jump: } 0 - \lfloor 3 \times \frac{3}{3} \rfloor \end{array}$
the 1	$\begin{array}{c} a_1 = 1 \\ \text{lex: the-le} \\ \text{jump: } 1 - \lfloor 1 \times \frac{3}{3} \rfloor \end{array}$	$\begin{array}{l} a_2 = 1 \\ \text{lex: the-chien} \\ \text{jump: } 1 - \lfloor 2 \times \frac{3}{3} \rfloor \end{array}$	$a_3 = 1$ lex: the-noir jump: $1 - \lfloor 3 \times \frac{3}{3} \rfloor$
black 2	$\begin{array}{c} a_1=2\\ \text{lex: black-le}\\ \text{jump: } 2-\left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$a_2 = 2$ lex: black-chien jump: $2 - \lfloor 2 \times \frac{3}{3} \rfloor$	a ₃ = 2 lex: black-noir
dog 3	$a_1 = 3$ lex: dog-le	$a_2 = 3$ lex: dog-chien	a ₃ = 3 lex: dog-noir
Marginal			

	le 1	chien 2	noir 3
Null 0	$\begin{array}{c} a_1 = 0 \\ \text{lex: NULL-le} \\ \text{jump: } 0 - \lfloor 1 \times \frac{3}{3} \rfloor \end{array}$	$\begin{array}{c} a_2 = 0 \\ \text{lex: NULL-chien} \\ \text{jump: } 0 - \lfloor 2 \times \frac{3}{3} \rfloor \end{array}$	$\begin{array}{l} a_3 = 0 \\ \text{lex: NULL-noir} \\ \text{jump: } 0 - \lfloor 3 \times \frac{3}{3} \rfloor \end{array}$
the 1	$\begin{array}{c} a_1 = 1 \\ \text{lex: the-le} \\ \text{jump: } 1 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$\begin{array}{l} a_2 = 1 \\ \text{lex: the-chien} \\ \text{jump: } 1 - \lfloor 2 \times \frac{3}{3} \rfloor \end{array}$	$a_3=1$ lex: the-noir jump: $1-\lfloor 3 imes rac{3}{3} floor$
black 2	$\begin{array}{c} a_1 = 2 \\ \text{lex: black-le} \\ \text{jump: } 2 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$a_2=2$ lex: black-chien jump: $2-\lfloor 2 imes rac{3}{3} floor$	$a_3=2$ lex: black-noir jump: $2-\lfloor 3 imes rac{3}{3} floor$
dog 3	$a_1 = 3$ lex: dog-le	$a_2 = 3$ lex: dog-chien	a ₃ = 3 lex: dog-noir
Marginal			

	le 1	chien 2	noir 3
Null 0	$\begin{array}{c} a_1 = 0 \\ \text{lex: NULL-le} \\ \text{jump: } 0 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$\begin{array}{c} a_2 = 0 \\ \text{lex: NULL-chien} \\ \text{jump: } 0 - \left\lfloor 2 \times \frac{3}{3} \right\rfloor \end{array}$	$\begin{array}{l} a_3 = 0 \\ \text{lex: NULL-noir} \\ \text{jump: } 0 - \lfloor 3 \times \frac{3}{3} \rfloor \end{array}$
the 1	$\begin{array}{c} a_1 = 1 \\ \text{lex: the-le} \\ \text{jump: } 1 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$\begin{array}{l} a_2 = 1 \\ \text{lex: the-chien} \\ \text{jump: } 1 - \lfloor 2 \times \frac{3}{3} \rfloor \end{array}$	$a_3=1$ lex: the-noir jump: $1-\lfloor 3 imes rac{3}{3} floor$
black 2	$\begin{array}{c} a_1 = 2 \\ \text{lex: black-le} \\ \text{jump: } 2 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$a_2=2$ lex: black-chien jump: $2-\lfloor 2 imes rac{3}{3} floor$	$a_3=2$ lex: black-noir jump: $2-\lfloor 3 imes rac{3}{3} floor$
dog 3	$\begin{array}{c} a_1 = 3 \\ \text{lex: dog-le} \\ \text{jump: } 3 - \lfloor 1 \times \frac{3}{3} \rfloor \end{array}$	$a_2 = 3$ lex: dog-chien	a ₃ = 3 lex: dog-noir
Marginal			

	le 1	chien 2	noir 3
NULL 0	$\begin{array}{c} a_1 = 0 \\ \text{lex: NULL-le} \\ \text{jump: } 0 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$\begin{array}{c} a_2 = 0 \\ \text{lex: NULL-chien} \\ \text{jump: } 0 - \left\lfloor 2 \times \frac{3}{3} \right\rfloor \end{array}$	$\begin{array}{c} a_3 = 0 \\ \text{lex: NULL-noir} \\ \text{jump: } 0 - \lfloor 3 \times \frac{3}{3} \rfloor \end{array}$
the 1	$\begin{array}{c} a_1 = 1 \\ \text{lex: the-le} \\ \text{jump: } 1 - \lfloor 1 \times \frac{3}{3} \rfloor \end{array}$	$a_2 = 1$ lex: the-chien jump: $1 - \lfloor 2 \times \frac{3}{3} \rfloor$	$\begin{array}{c} a_3 = 1 \\ \text{lex: the-noir} \\ \text{jump: } 1 - \lfloor 3 \times \frac{3}{3} \rfloor \end{array}$
black 2	$\begin{array}{c} a_1 = 2 \\ \text{lex: black-le} \\ \text{jump: } 2 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$a_2=2$ lex: black-chien jump: $2-\lfloor 2 imes rac{3}{3} floor$	$\begin{array}{c} a_3 = 2 \\ \text{lex: black-noir} \\ \text{jump: } 2 - \lfloor 3 \times \frac{3}{3} \rfloor \end{array}$
dog 3	$\begin{array}{c} a_1 = 3 \\ \text{lex: dog-le} \\ \text{jump: } 3 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$a_2=3$ lex: dog-chien jump: $3-\lfloor 2 imes rac{3}{3} floor$	$a_3 = 3$ lex: dog-noir
Marginal			

	le 1	chien 2	noir 3
Null 0	$\begin{array}{c} a_1 = 0 \\ \text{lex: NULL-le} \\ \text{jump: } 0 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$\begin{array}{c} a_2 = 0 \\ \text{lex: NULL-chien} \\ \text{jump: } 0 - \left\lfloor 2 \times \frac{3}{3} \right\rfloor \end{array}$	$\begin{array}{c} a_3 = 0 \\ \text{lex: NULL-noir} \\ \text{jump: } 0 - \lfloor 3 \times \frac{3}{3} \rfloor \end{array}$
the 1	$\begin{array}{c} a_1 = 1 \\ \text{lex: the-le} \\ \text{jump: } 1 - \lfloor 1 \times \frac{3}{3} \rfloor \end{array}$	$a_2 = 1$ lex: the-chien jump: $1 - \lfloor 2 \times \frac{3}{3} \rfloor$	$\begin{array}{c} a_3 = 1 \\ \text{lex: the-noir} \\ \text{jump: } 1 - \lfloor 3 \times \frac{3}{3} \rfloor \end{array}$
black 2	$\begin{array}{c} a_1 = 2 \\ \text{lex: black-le} \\ \text{jump: } 2 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$a_2=2$ lex: black-chien jump: $2-\lfloor 2 imes rac{3}{3} floor$	$\begin{array}{c} a_3 = 2 \\ \text{lex: black-noir} \\ \text{jump: } 2 - \lfloor 3 \times \frac{3}{3} \rfloor \end{array}$
dog 3	$\begin{array}{c} a_1 = 3 \\ \text{lex: dog-le} \\ \text{jump: } 3 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$a_2=3$ lex: dog-chien jump: $3-\lfloor 2 imes rac{3}{3} floor$	$a_3=3$ lex: dog-noir jump: $3-\lfloor 3 imes rac{3}{3} floor$
Marginal			

	le 1	chien 2	noir 3
Null 0	$\begin{array}{c} a_1 = 0 \\ \text{lex: NULL-le} \\ \text{jump: } 0 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{Null}} \times \delta_{-1} \end{array}$	$a_2 = 0$ lex: NULL-chien jump: $0 - \lfloor 2 \times \frac{3}{3} \rfloor$	$a_3 = 0$ lex: NULL-noir jump: $0 - \lfloor 3 \times \frac{3}{3} \rfloor$
the 1	$\begin{array}{c} a_1 = 1 \\ \text{lex: the-le} \\ \text{jump: } 1 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$a_2 = 1$ lex: the-chien jump: $1 - \lfloor 2 \times \frac{3}{3} \rfloor$	$\begin{array}{c} a_3 = 1 \\ \text{lex: the-noir} \\ \text{jump: } 1 - \lfloor 3 \times \frac{3}{3} \rfloor \end{array}$
black 2	$\begin{array}{c} a_1 = 2 \\ \text{lex: black-le} \\ \text{jump: } 2 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$a_2=2$ lex: black-chien jump: $2-\lfloor 2 imes rac{3}{3} floor$	$a_3=2$ lex: black-noir jump: $2-\lfloor 3 imes rac{3}{3} floor$
dog 3	$\begin{array}{c} a_1 = 3 \\ \text{lex: dog-le} \\ \text{jump: } 3 - \lfloor 1 \times \frac{3}{3} \rfloor \end{array}$	$a_2=3$ lex: dog-chien jump: $3-\lfloor 2 imes rac{3}{3} floor$	$a_3=3$ lex: dog-noir jump: $3-\lfloor 3 imes rac{3}{3} floor$
Marginal			

	le	chien	noir
	1	2	3
Null 0	$\begin{array}{c} a_1 = 0 \\ \text{lex: NULL-le} \\ \text{jump: } 0 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{Null}} \times \delta_{-1} \end{array}$	$\begin{array}{l} a_2 = 0 \\ \text{lex: NULL-chien} \\ \text{jump: } 0 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{Null}} \times \delta_{-2} \end{array}$	$\begin{array}{c} a_3 = 0 \\ \text{lex: NULL-noir} \\ \text{jump: } 0 - \lfloor 3 \times \frac{3}{3} \rfloor \end{array}$
the 1	$\begin{array}{c c} a_1=1\\ \text{lex: the-le}\\ \text{jump: } 1-\left\lfloor 1\times\frac{3}{3}\right\rfloor \end{array}$	$\begin{array}{l} a_2 = 1 \\ \text{lex: the-chien} \\ \text{jump: } 1 - \lfloor 2 \times \frac{3}{3} \rfloor \end{array}$	$a_3 = 1$ lex: the-noir jump: $1 - \lfloor 3 \times \frac{3}{3} \rfloor$
black 2	$\begin{array}{c} a_1 = 2 \\ \text{lex: black-le} \\ \text{jump: } 2 - \lfloor 1 \times \frac{3}{3} \rfloor \end{array}$	$\begin{array}{c} a_2 = 2 \\ \text{lex: black-chien} \\ \text{jump: } 2 - \lfloor 2 \times \frac{3}{3} \rfloor \end{array}$	$\begin{array}{c} a_3 = 2 \\ \text{lex: black-noir} \\ \text{jump: } 2 - \lfloor 3 \times \frac{3}{3} \rfloor \end{array}$
dog 3	$\begin{array}{c} a_1 = 3 \\ \text{lex: dog-le} \\ \text{jump: } 3 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$\begin{array}{c} a_2 = 3 \\ \text{lex: dog-chien} \\ \text{jump: } 3 - \lfloor 2 \times \frac{3}{3} \rfloor \end{array}$	$a_3=3$ lex: dog-noir jump: $3-\lfloor 3 imes rac{3}{3} floor$
Marginal			

	le 1	chien 2	noir 3
NULL 0	$\begin{array}{c} a_1 = 0 \\ \text{lex: NULL-le} \\ \text{jump: } 0 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{Null}} \times \delta_{-1} \end{array}$	$\begin{array}{c} a_2 = 0 \\ \text{lex: NULL-chien} \\ \text{jump: } 0 - \left\lfloor 2 \times \frac{3}{3} \right\rfloor \\ \text{joint: } \theta_{\text{chien} \text{Null}} \times \delta_{-2} \end{array}$	$\begin{array}{c} a_3 = 0 \\ \text{lex: NULL-noir} \\ \text{jump: } 0 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{Null}} \times \delta_{-3} \end{array}$
the 1	$\begin{array}{c} a_1 = 1 \\ \text{lex: the-le} \\ \text{jump: } 1 - \lfloor 1 \times \frac{3}{3} \rfloor \end{array}$	$a_2=1$ lex: the-chien jump: $1-\lfloor 2 imes rac{3}{3} floor$	$a_3 = 1$ lex: the-noir jump: $1 - \lfloor 3 \times \frac{3}{3} \rfloor$
black 2	$\begin{array}{c} a_1 = 2 \\ \text{lex: black-le} \\ \text{jump: } 2 - \lfloor 1 \times \frac{3}{3} \rfloor \end{array}$	$a_2=2$ lex: black-chien jump: $2-\lfloor 2 imes rac{3}{3} floor$	$a_3=2$ lex: black-noir jump: $2-\lfloor 3 imes rac{3}{3} floor$
dog 3	$\begin{array}{c c} a_1 = 3 \\ \text{lex: dog-le} \\ \text{jump: } 3 - \lfloor 1 \times \frac{3}{3} \rfloor \end{array}$	$\begin{array}{c} a_2 = 3 \\ \text{lex: dog-chien} \\ \text{jump: } 3 - \lfloor 2 \times \frac{3}{3} \rfloor \end{array}$	$a_3 = 3$ lex: dog-noir jump: $3 - \lfloor 3 \times \frac{3}{3} \rfloor$
Marginal			

	le 1	chien 2	noir 3
Null 0	$\begin{array}{c} a_1 = 0 \\ \text{lex: NULL-le} \\ \text{jump: } 0 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{Null}} \times \delta_{-1} \end{array}$	$\begin{array}{c} a_2 = 0 \\ \text{lex: NULL-chien} \\ \text{jump: } 0 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{Null}} \times \delta_{-2} \end{array}$	$\begin{array}{c} a_3 = 0 \\ \text{lex: NULL-noir} \\ \text{jump: } 0 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{Null}} \times \delta_{-3} \end{array}$
the 1	$\begin{array}{c} a_1 = 1 \\ \text{lex: the-le} \\ \text{jump: } 1 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{the}} \times \delta_0 \end{array}$	$a_2=1$ lex: the-chien jump: $1-\lfloor 2 imes rac{3}{3} floor$	$a_3=1$ lex: the-noir jump: $1-\lfloor 3 imes rac{3}{3} floor$
black 2	$\begin{array}{c} a_1 = 2 \\ \text{lex: black-le} \\ \text{jump: } 2 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$a_2=2$ lex: black-chien jump: $2-\lfloor 2 imes rac{3}{3} floor$	$a_3=2$ lex: black-noir jump: $2-\lfloor 3 imes rac{3}{3} floor$
dog 3	$\begin{array}{c} a_1 = 3 \\ \text{lex: dog-le} \\ \text{jump: } 3 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$a_2=3$ lex: dog-chien jump: $3-\lfloor 2 imes rac{3}{3} floor$	$a_3=3$ lex: dog-noir jump: $3-\lfloor 3 imes rac{3}{3} floor$
Marginal			

	le 1	chien 2	noir 3
Null 0	$\begin{array}{c} a_1 = 0 \\ \text{lex: NULL-le} \\ \text{jump: } 0 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{Null}} \times \delta_{-1} \end{array}$	$\begin{array}{c} a_2 = 0 \\ \text{lex: NULL-chien} \\ \text{jump: } 0 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{Null}} \times \delta_{-2} \end{array}$	$\begin{array}{l} a_3 = 0 \\ \text{lex: NULL-noir} \\ \text{jump: } 0 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{Null}} \times \delta_{-3} \end{array}$
the 1	$\begin{array}{c} a_1 = 1 \\ \text{lex: the-le} \\ \text{jump: } 1 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{the}} \times \delta_0 \end{array}$	$\begin{array}{c} a_2 = 1 \\ \text{lex: the-chien} \\ \text{jump: } 1 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{the}} \times \delta_{-1} \end{array}$	$\begin{array}{c} a_3 = 1 \\ \text{lex: the-noir} \\ \text{jump: } 1 - \lfloor 3 \times \frac{3}{3} \rfloor \end{array}$
black 2	$\begin{array}{c} a_1 = 2 \\ \text{lex: black-le} \\ \text{jump: } 2 - \lfloor 1 \times \frac{3}{3} \rfloor \end{array}$	$a_2=2$ lex: black-chien jump: $2-\lfloor 2 imes rac{3}{3} floor$	$a_3=2$ lex: black-noir jump: $2-\lfloor 3 imes rac{3}{3} floor$
dog 3	$\begin{array}{c} a_1 = 3 \\ \text{lex: dog-le} \\ \text{jump: } 3 - \lfloor 1 \times \frac{3}{3} \rfloor \end{array}$	$a_2=3$ lex: dog-chien jump: $3-\lfloor 2 imes rac{3}{3} floor$	$a_3=3$ lex: dog-noir jump: $3-\lfloor 3 imes rac{3}{3} floor$
Marginal			

	le 1	chien 2	noir 3
Null 0	$\begin{array}{c} a_1 = 0 \\ \text{lex: NULL-le} \\ \text{jump: } 0 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \\ \text{joint: } \theta_{\text{le} \text{Null}} \times \delta_{-1} \end{array}$	$\begin{array}{c} a_2 = 0 \\ \text{lex: NULL-chien} \\ \text{jump: } 0 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{Null}} \times \delta_{-2} \end{array}$	$\begin{array}{c} a_3 = 0 \\ \text{lex: NULL-noir} \\ \text{jump: } 0 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{Null}} \times \delta_{-3} \end{array}$
the 1	$\begin{array}{c} a_1 = 1 \\ \text{lex: the-le} \\ \text{jump: } 1 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{the}} \times \delta_0 \end{array}$	$\begin{array}{l} a_2 = 1 \\ \text{lex: the-chien} \\ \text{jump: } 1 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{the}} \times \delta_{-1} \end{array}$	$\begin{array}{l} a_3 = 1 \\ \text{lex: the-noir} \\ \text{jump: } 1 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{the}} \times \delta_{-2} \end{array}$
black 2	$\begin{array}{c} a_1 = 2 \\ \text{lex: black-le} \\ \text{jump: } 2 - \lfloor 1 \times \frac{3}{3} \rfloor \end{array}$	$\begin{array}{c} a_2 = 2 \\ \text{lex: black-chien} \\ \text{jump: } 2 - \lfloor 2 \times \frac{3}{3} \rfloor \end{array}$	$\begin{array}{c} a_3 = 2 \\ \text{lex: black-noir} \\ \text{jump: } 2 - \lfloor 3 \times \frac{3}{3} \rfloor \end{array}$
dog 3	$a_1 = 3$ lex: dog-le jump: $3 - \lfloor 1 \times \frac{3}{3} \rfloor$	$a_2=3$ lex: dog-chien jump: $3-\lfloor 2 imes rac{3}{3} floor$	$a_3=3$ lex: dog-noir jump: $3-\lfloor 3 imes rac{3}{3} floor$
Marginal			

Null 0	$\begin{vmatrix} & & & \\ & 1 & & \\ & & a_1 = 0 & & \end{vmatrix}$	$ \begin{array}{ c c } \hline \text{chien} \\ \hline 2 \\ \hline a_2 = 0 \\ \hline \end{array} $	noir 3 $a_3 = 0$
	$\begin{array}{c} \text{lex: NULL-le} \\ \text{jump: } 0 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{Null}} \times \delta_{-1} \end{array}$	lex: NULL-chien jump: $0 - \lfloor 2 \times \frac{3}{3} \rfloor$ joint: $\theta_{\text{chien} \text{Null}} \times \delta_{-2}$	lex: NULL-noir jump: $0 - \lfloor 3 \times \frac{3}{3} \rfloor$ joint: $\theta_{\text{noir} \text{Null}} \times \delta_{-3}$
the 1	$\begin{array}{l} a_1 = 1 \\ \text{lex: the-le} \\ \text{jump: } 1 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{the}} \times \delta_0 \end{array}$	$\begin{array}{l} a_2 = 1 \\ \text{lex: the-chien} \\ \text{jump: } 1 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{the}} \times \delta_{-1} \end{array}$	$a_3=1$ lex: the-noir jump: $1-\lfloor 3 imes rac{3}{3} floor$ joint: $ heta_{ m noir the} imes \delta_{-2}$
black 2	$\begin{array}{c} a_1 = 2 \\ \text{lex: black-le} \\ \text{jump: } 2 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{black}} \times \delta_1 \end{array}$	$a_2=2$ lex: black-chien jump: $2-\lfloor 2 imes rac{3}{3} floor$	$a_3=2$ lex: black-noir jump: $2-\lfloor 3 imes rac{3}{3} floor$
dog 3	$\begin{array}{c} a_1 = 3 \\ \text{lex: dog-le} \\ \text{jump: } 3 - \lfloor 1 \times \frac{3}{3} \rfloor \end{array}$	$a_2=3$ lex: dog-chien jump: $3-\lfloor 2 imes rac{3}{3} floor$	$a_3=3$ lex: dog-noir jump: $3-\lfloor 3 imes rac{3}{3} floor$
Marginal			

	le 1	chien 2	noir 3
Null 0	$\begin{array}{c} a_1 = 0 \\ \text{lex: NULL-le} \\ \text{jump: } 0 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \\ \text{joint: } \theta_{\text{le} \text{Null}} \times \delta_{-1} \end{array}$	$\begin{array}{c} a_2 = 0 \\ \text{lex: NULL-chien} \\ \text{jump: } 0 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{Null}} \times \delta_{-2} \end{array}$	$\begin{array}{c} a_3 = 0 \\ \text{lex: NULL-noir} \\ \text{jump: } 0 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{Null}} \times \delta_{-3} \end{array}$
the 1	$\begin{array}{c} a_1 = 1 \\ \text{lex: the-le} \\ \text{jump: } 1 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le the}} \times \delta_0 \end{array}$	$\begin{array}{l} a_2 = 1 \\ \text{lex: the-chien} \\ \text{jump: } 1 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{the}} \times \delta_{-1} \end{array}$	$\begin{array}{l} a_3 = 1 \\ \text{lex: the-noir} \\ \text{jump: } 1 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{the}} \times \delta_{-2} \end{array}$
black 2	$\begin{array}{c} a_1 = 2 \\ \text{lex: black-le} \\ \text{jump: } 2 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{black}} \times \delta_1 \end{array}$	$\begin{array}{l} a_2 = 2 \\ \text{lex: black-chien} \\ \text{jump: } 2 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{black}} \times \delta_0 \end{array}$	$a_3=2$ lex: black-noir jump: $2-\lfloor 3 imes rac{3}{3} floor$
dog 3	$\begin{array}{c} a_1 = 3 \\ \text{lex: dog-le} \\ \text{jump: } 3 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$a_2=3$ lex: dog-chien jump: $3-\lfloor 2 imes rac{3}{3} floor$	$a_3=3$ lex: dog-noir jump: $3-\lfloor 3 imes rac{3}{3} floor$
Marginal			

NULL 0	$ \begin{vmatrix} \text{le} & 1 & \\ & 1 & \\ & \text{lex: NULL-le} & \\ & \text{jump: } 0 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor $	chien 2 $a_2=0$ lex: NULL-chien jump: $0-\lfloor 2 \times \frac{3}{2} \rfloor$	noir 3 $a_3 = 0$ lex: NULL-noir jump: $0 - \lfloor 3 \times \frac{3}{3} \rfloor$
	joint: $\theta_{le Null} imes \delta_{-1}$	joint: $\theta_{\text{chien} \text{Null}} \times \delta_{-2}$	joint: $\theta_{noir Null} \times \delta_{-3}$
the 1	$\begin{array}{l} a_1 = 1 \\ \text{lex: the-le} \\ \text{jump: } 1 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{the}} \times \delta_0 \end{array}$	$\begin{array}{l} a_2 = 1 \\ \text{lex: the-chien} \\ \text{jump: } 1 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{the}} \times \delta_{-1} \end{array}$	$a_3=1$ lex: the-noir jump: $1-\lfloor 3 imes rac{3}{3} floor$ joint: $ heta_{ m noir the} imes \delta_{-2}$
black 2	$\begin{array}{c} a_1 = 2 \\ \text{lex: black-le} \\ \text{jump: } 2 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{black}} \times \delta_1 \end{array}$	$\begin{array}{l} a_2 = 2 \\ \text{lex: black-chien} \\ \text{jump: } 2 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{black}} \times \delta_0 \end{array}$	$\begin{array}{l} a_3 = 2 \\ \text{lex: black-noir} \\ \text{jump: } 2 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{black}} \times \delta_{-1} \end{array}$
dog 3	$\begin{array}{c} a_1 = 3 \\ \text{lex: dog-le} \\ \text{jump: } 3 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array}$	$a_2=3$ lex: dog-chien jump: $3-\lfloor 2 imes rac{3}{3} floor$	$a_3=3$ lex: dog-noir jump: $3-\lfloor 3 imes rac{3}{3} floor$
Marginal			

	le 1	chien 2	noir 3
Null 0	$\begin{array}{c} a_1 = 0 \\ \text{lex: NULL-le} \\ \text{jump: } 0 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \\ \text{joint: } \theta_{\text{le Null}} \times \delta_{-1} \end{array}$	$\begin{array}{c} a_2 = 0 \\ \text{lex: NULL-chien} \\ \text{jump: } 0 - \left\lfloor 2 \times \frac{3}{3} \right\rfloor \\ \text{joint: } \theta_{\text{chien} \text{Null}} \times \delta_{-2} \end{array}$	$\begin{array}{c} a_3 = 0 \\ \text{lex: NULL-noir} \\ \text{jump: } 0 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{Null}} \times \delta_{-3} \end{array}$
the 1	$\begin{array}{c} a_1 = 1 \\ \text{lex: the-le} \\ \text{jump: } 1 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{the}} \times \delta_0 \end{array}$	$\begin{array}{l} a_2 = 1 \\ \text{lex: the-chien} \\ \text{jump: } 1 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{the}} \times \delta_{-1} \end{array}$	$\begin{array}{l} a_3 = 1 \\ \text{lex: the-noir} \\ \text{jump: } 1 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{the}} \times \delta_{-2} \end{array}$
black 2	$\begin{array}{c} a_1 = 2 \\ \text{lex: black-le} \\ \text{jump: } 2 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{black}} \times \delta_1 \end{array}$	$a_2=2$ lex: black-chien jump: $2-\lfloor 2 imes rac{3}{3} floor$ joint: $ heta_{ m chien black} imes \delta_0$	$\begin{array}{l} a_3 = 2 \\ \text{lex: black-noir} \\ \text{jump: } 2 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{black}} \times \delta_{-1} \end{array}$
dog 3	$\begin{array}{l} a_1 = 3 \\ \text{lex: dog-le} \\ \text{jump: } 3 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{dog}} \times \delta_2 \end{array}$	$a_2=3$ lex: dog-chien jump: $3-\lfloor 2 imes rac{3}{3} floor$	$a_3=3$ lex: dog-noir jump: $3-\lfloor 3 imes rac{3}{3} floor$
Marginal			

	le 1	chien 2	noir 3
Null 0	$\begin{array}{c} a_1 = 0 \\ \text{lex: NULL-le} \\ \text{jump: } 0 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \\ \text{joint: } \theta_{\text{le Null}} \times \delta_{-1} \end{array}$	$\begin{array}{c} a_2 = 0 \\ \text{lex: NULL-chien} \\ \text{jump: } 0 - \left\lfloor 2 \times \frac{3}{3} \right\rfloor \\ \text{joint: } \theta_{\text{chien} \text{Null}} \times \delta_{-2} \end{array}$	$\begin{array}{c} a_3 = 0 \\ \text{lex: NULL-noir} \\ \text{jump: } 0 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{Null}} \times \delta_{-3} \end{array}$
the 1	$\begin{array}{c} a_1 = 1 \\ \text{lex: the-le} \\ \text{jump: } 1 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{the}} \times \delta_0 \end{array}$	$\begin{array}{l} a_2 = 1 \\ \text{lex: the-chien} \\ \text{jump: } 1 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{the}} \times \delta_{-1} \end{array}$	$\begin{array}{l} a_3 = 1 \\ \text{lex: the-noir} \\ \text{jump: } 1 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{the}} \times \delta_{-2} \end{array}$
black 2	$\begin{array}{c} a_1 = 2 \\ \text{lex: black-le} \\ \text{jump: } 2 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{black}} \times \delta_1 \end{array}$	$\begin{array}{l} a_2=2\\ \text{lex: black-chien}\\ \text{jump: } 2-\lfloor 2\times\frac{3}{3}\rfloor\\ \text{joint: } \theta_{\text{chien} \text{black}}\times\delta_0 \end{array}$	$\begin{array}{l} a_3 = 2 \\ \text{lex: black-noir} \\ \text{jump: } 2 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{black}} \times \delta_{-1} \end{array}$
dog 3	$\begin{array}{c} a_1 = 3 \\ \text{lex: dog-le} \\ \text{jump: } 3 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{dog}} \times \delta_2 \end{array}$	$\begin{array}{l} a_2 = 3 \\ \text{lex: dog-chien} \\ \text{jump: } 3 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{dog}} \times \delta_1 \end{array}$	$a_3=3$ lex: dog-noir jump: $3-\lfloor 3 imes rac{3}{3} floor$
Marginal			

	le	chien	noir
	1	2	3
NULL 0	$\begin{array}{c} a_1 = 0 \\ \text{lex: NULL-le} \\ \text{jump: } 0 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{Null}} \times \delta_{-1} \end{array}$	$\begin{array}{l} a_2 = 0 \\ \text{lex: NULL-chien} \\ \text{jump: } 0 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{Null}} \times \delta_{-2} \end{array}$	$\begin{array}{l} a_3 = 0 \\ \text{lex: NULL-noir} \\ \text{jump: } 0 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{Null}} \times \delta_{-3} \end{array}$
the 1	$\begin{array}{l} a_1 = 1 \\ \text{lex: the-le} \\ \text{jump: } 1 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{the}} \times \delta_0 \end{array}$	$\begin{array}{l} a_2 = 1 \\ \text{lex: the-chien} \\ \text{jump: } 1 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{the}} \times \delta_{-1} \end{array}$	$\begin{array}{l} a_3 = 1 \\ \text{lex: the-noir} \\ \text{jump: } 1 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{the}} \times \delta_{-2} \end{array}$
black 2	$\begin{array}{c} a_1 = 2 \\ \text{lex: black-le} \\ \text{jump: } 2 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{black}} \times \delta_1 \end{array}$	$a_2=2$ lex: black-chien jump: $2-\lfloor 2 imes rac{3}{3} floor$ joint: $ heta_{ m chien black} imes \delta_0$	$\begin{array}{l} a_3 = 2 \\ \text{lex: black-noir} \\ \text{jump: } 2 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{black}} \times \delta_{-1} \end{array}$
dog 3	$\begin{array}{c} a_1 = 3 \\ \text{lex: dog-le} \\ \text{jump: } 3 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{dog}} \times \delta_2 \end{array}$	$\begin{array}{l} a_2 = 3 \\ \text{lex: dog-chien} \\ \text{jump: } 3 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{dog}} \times \delta_1 \end{array}$	$\begin{array}{l} a_3 = 3 \\ \text{lex: dog-noir} \\ \text{jump: } 3 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{dog}} \times \delta_0 \end{array}$
Marginal			

	le	chien	noir
	1	2	3
Null 0	$\begin{array}{ c c c c c }\hline a_1 = 0 \\ \text{lex: NULL-le} \\ \text{jump: } 0 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{Null}} \times \delta_{-1} \\ \hline \end{array}$	$\begin{array}{c} a_2 = 0 \\ \text{lex: NULL-chien} \\ \text{jump: } 0 - \left\lfloor 2 \times \frac{3}{3} \right\rfloor \\ \text{joint: } \theta_{\text{chien} \text{Null}} \times \delta_{-2} \end{array}$	$\begin{array}{c} a_3 = 0 \\ \text{lex: NULL-noir} \\ \text{jump: } 0 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{Null}} \times \delta_{-3} \end{array}$
the 1	$\begin{array}{c} a_1 = 1 \\ \text{lex: the-le} \\ \text{jump: } 1 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{the}} \times \delta_0 \end{array}$	$\begin{array}{l} a_2 = 1 \\ \text{lex: the-chien} \\ \text{jump: } 1 - \left\lfloor 2 \times \frac{3}{3} \right\rfloor \\ \text{joint: } \theta_{\text{chien} \text{the}} \times \delta_{-1} \end{array}$	$\begin{array}{l} a_3 = 1 \\ \text{lex: the-noir} \\ \text{jump: } 1 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{the}} \times \delta_{-2} \end{array}$
black 2	$\begin{array}{c} a_1 = 2 \\ \text{lex: black-le} \\ \text{jump: } 2 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{black}} \times \delta_1 \end{array}$	$\begin{array}{l} a_2 = 2 \\ \text{lex: black-chien} \\ \text{jump: } 2 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{black}} \times \delta_0 \end{array}$	$\begin{array}{l} a_3 = 2 \\ \text{lex: black-noir} \\ \text{jump: } 2 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{black}} \times \delta_{-1} \end{array}$
dog 3	$\begin{array}{c} a_1 = 3 \\ \text{lex: dog-le} \\ \text{jump: } 3 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{dog}} \times \delta_2 \end{array}$	$\begin{array}{l} a_2 = 3 \\ \text{lex: dog-chien} \\ \text{jump: } 3 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{dog}} \times \delta_1 \end{array}$	$\begin{array}{l} a_3 = 3 \\ \text{lex: dog-noir} \\ \text{jump: } 3 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{dog}} \times \delta_0 \end{array}$
Marginal	$\sum_{a_1=0}^m joint(a_1)$		

	le 1	chien 2	noir 3
NULL 0	$\begin{array}{c} a_1 = 0 \\ \text{lex: NULL-le} \\ \text{jump: } 0 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{Null}} \times \delta_{-1} \end{array}$	$\begin{array}{l} a_2 = 0 \\ \text{lex: NULL-chien} \\ \text{jump: } 0 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{Null}} \times \delta_{-2} \end{array}$	$\begin{array}{l} a_3 = 0 \\ \text{lex: NULL-noir} \\ \text{jump: } 0 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{Null}} \times \delta_{-3} \end{array}$
the 1	$\begin{array}{c} a_1 = 1 \\ \text{lex: the-le} \\ \text{jump: } 1 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le the}} \times \delta_0 \end{array}$	$\begin{array}{l} a_2 = 1 \\ \text{lex: the-chien} \\ \text{jump: } 1 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{the}} \times \delta_{-1} \end{array}$	$\begin{array}{l} a_3 = 1 \\ \text{lex: the-noir} \\ \text{jump: } 1 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{the}} \times \delta_{-2} \end{array}$
black 2	$\begin{array}{c} a_1 = 2 \\ \text{lex: black-le} \\ \text{jump: } 2 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{black}} \times \delta_1 \end{array}$	$\begin{array}{l} a_2 = 2 \\ \text{lex: black-chien} \\ \text{jump: } 2 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{black}} \times \delta_0 \end{array}$	$\begin{array}{l} a_3 = 2 \\ \text{lex: black-noir} \\ \text{jump: } 2 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{black}} \times \delta_{-1} \end{array}$
dog 3	$\begin{array}{l} a_1 = 3 \\ \text{lex: dog-le} \\ \text{jump: } 3 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{dog}} \times \delta_2 \end{array}$	$\begin{array}{l} a_2 = 3 \\ \text{lex: dog-chien} \\ \text{jump: } 3 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{dog}} \times \delta_1 \end{array}$	$\begin{array}{l} a_3 = 3 \\ \text{lex: dog-noir} \\ \text{jump: } 3 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{dog}} \times \delta_0 \end{array}$
Marginal	$\sum_{a_1=0}^m joint(a_1)$	$\sum_{a_2=0}^m joint(a_2)$	

	le	chien	noir
	1	2	3
Null 0	$\begin{array}{c} a_1 = 0 \\ \text{lex: NULL-le} \\ \text{jump: } 0 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{Null}} \times \delta_{-1} \end{array}$	$\begin{array}{l} a_2 = 0 \\ \text{lex: NULL-chien} \\ \text{jump: } 0 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{Null}} \times \delta_{-2} \end{array}$	$\begin{array}{l} a_3 = 0 \\ \text{lex: NULL-noir} \\ \text{jump: } 0 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{Null}} \times \delta_{-3} \end{array}$
the 1	$\begin{array}{l} a_1 = 1 \\ \text{lex: the-le} \\ \text{jump: } 1 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{the}} \times \delta_0 \end{array}$	$\begin{array}{l} a_2 = 1 \\ \text{lex: the-chien} \\ \text{jump: } 1 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{the}} \times \delta_{-1} \end{array}$	$\begin{array}{l} a_3 = 1 \\ \text{lex: the-noir} \\ \text{jump: } 1 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{the}} \times \delta_{-2} \end{array}$
black 2	$\begin{array}{c} a_1 = 2 \\ \text{lex: black-le} \\ \text{jump: } 2 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{black}} \times \delta_1 \end{array}$	$\begin{array}{l} a_2=2\\ \text{lex: black-chien}\\ \text{jump: } 2-\lfloor 2\times\frac{3}{3}\rfloor\\ \text{joint: } \theta_{\text{chien} \text{black}}\times\delta_0 \end{array}$	$\begin{array}{l} a_3 = 2 \\ \text{lex: black-noir} \\ \text{jump: } 2 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{black}} \times \delta_{-1} \end{array}$
dog 3	$\begin{array}{l} a_1 = 3 \\ \text{lex: dog-le} \\ \text{jump: } 3 - \lfloor 1 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{le} \text{dog}} \times \delta_2 \end{array}$	$\begin{array}{l} a_2 = 3 \\ \text{lex: dog-chien} \\ \text{jump: } 3 - \lfloor 2 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{chien} \text{dog}} \times \delta_1 \end{array}$	$\begin{array}{l} a_3 = 3 \\ \text{lex: dog-noir} \\ \text{jump: } 3 - \lfloor 3 \times \frac{3}{3} \rfloor \\ \text{joint: } \theta_{\text{noir} \text{dog}} \times \delta_0 \end{array}$
Marginal	$\sum_{a_1=0}^m joint(a_1)$	$\sum_{a_2=0}^m joint(a_2)$	$\sum_{a_3=0}^m joint(a_3)$

	le	chien	noir
	1	2	3
Null 0	$a_1 = 0$	$a_2 = 0$	$a_3 = 0$
	lex: NULL-le	lex: NULL-chien	lex: NULL-noir
	jump: $0 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $0 - \lfloor 2 \times \frac{3}{3} \rfloor$	$\left \text{ jump: } 0 - \left\lfloor 3 \times \frac{3}{3} \right\rfloor \right $
	joint: $\theta_{le Null} imes \delta_{-1}$	joint: $\theta_{chien Null} \times \delta_{-2}$	joint: $\theta_{noir Null} \times \delta_{-3}$
	post: $\frac{joint(a_1=0)}{marginal(le)}$, i	·
the 1	$a_1 = 1$	$a_2 = 1$	$a_3 = 1$
	lex: the-le	lex: the-chien	lex: the-noir
	jump: $1 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $1 - \lfloor 2 \times \frac{3}{3} \rfloor$	$\left \text{ jump: } 1 - \left\lfloor 3 \times \frac{3}{3} \right\rfloor \right $
	joint: $\theta_{le the} imes \delta_0$	joint: $\theta_{chien the} \times \delta_{-1}$	joint: $\theta_{noir the} imes \check{\delta}_{-2}$
black 2	$a_1 = 2$	$a_2 = 2$	$a_3 = 2$
	lex: black-le	lex: black-chien	lex: black-noir
	jump: $2 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $2 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $2 - \lfloor 3 \times \frac{3}{3} \rfloor$
	joint: $ heta_{le black} imes ilde{\delta}_1$	joint: $\theta_{chien black} imes \delta_0$	joint: $\theta_{noir black} \times \delta_{-1}$
dog 3	$a_1 = 3$	$a_2 = 3$	2
dog 3		_	$a_3 = 3$
	lex: dog-le	lex: dog-chien	lex: dog-noir
	jump: $3 - \lfloor 1 \times \frac{3}{3} \rfloor$ joint: $\theta_{le dog} \times \delta_2$	jump: $3 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $3 - \left\lfloor 3 \times \frac{3}{3} \right\rfloor$
	Joint: σ _{le dog} × σ ₂	joint: $\theta_{chien dog} imes \delta_1$	joint: $\theta_{noir dog} imes \delta_0$
Marginal	$\sum_{a_1=0}^m joint(a_1)$	$\sum_{a_2=0}^m joint(a_2)$	$\sum_{a_3=0}^m joint(a_3)$

	le	chien	noir
	1	2	3
Null 0	$a_1 = 0$	$a_2 = 0$	$a_3 = 0$
	lex: NULL-le	lex: NULL-chien	lex: NULL-noir
	jump: $0 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $0 - \lfloor 2 \times \frac{3}{3} \rfloor$	$\int Jump \cdot 0 - \lfloor 3 \times \frac{3}{3} \rfloor$
	joint: $\theta_{le Null} imes \delta_{-1}$	joint: $\theta_{\text{chien} \text{Null}} \times \delta_{-2}$	joint: $\theta_{noir Null} \times \delta_{-3}$
	post: $\frac{\text{joint}(a_1=0)}{\text{marginal}(\text{le})}$	post: $\frac{\text{joint}(a_2=0)}{\text{marginal}(\text{chien})}$	
the 1	$a_1 = 1$	$a_2 = 1$	$a_3 = 1$
	lex: the-le	lex: the-chien	lex: the-noir
	$\left\ \text{ jump: } 1 - \left[1 \times \frac{3}{3}\right] \right\ $	jump: $1 - \lfloor 2 \times \frac{3}{3} \rfloor$	$\left \text{ jump: } 1 - \left\lfloor 3 \times \frac{3}{3} \right\rfloor \right $
	joint: $\theta_{le the} \times \delta_0$	joint: $\theta_{\text{chien} \text{the}} \times \delta_{-1}$	joint: $\theta_{noir the} imes \check{\delta}_{-2}$
	·	·	
black 2	$a_1 = 2$	$a_2 = 2$	$a_3 = 2$
	lex: black-le	lex: black-chien	lex: black-noir
	jump: $2 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $2 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $2 - \lfloor 3 \times \frac{3}{3} \rfloor$
	joint: $ heta_{le black} imes ilde{\delta}_1$	joint: $\theta_{chien black} \times \delta_0$	joint: $\theta_{noir black} \times \delta_{-1}$
dog 3	$a_1 = 3$	$a_2 = 3$	$a_3 = 3$
l dog 3	$a_1 = 3$ lex: dog-le	lex: dog-chien	lex: dog-noir
		jump: $3 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $3 - \lfloor 3 \times \frac{3}{3} \rfloor$
	jump: $3 - \lfloor 1 \times \frac{3}{3} \rfloor$ joint: $\theta_{le dog} \times \delta_2$		
	John. Vle dog × 02	joint: $\theta_{chien dog} imes \delta_1$	joint: $\theta_{noir dog} imes \delta_0$
Marginal	$\sum_{a_1=0}^m joint(a_1)$	$\sum_{a_2=0}^m joint(a_2)$	$\sum_{a_3=0}^m joint(a_3)$

	le	chien	noir
	1	2	3
Null 0	$a_1 = 0$	$a_2 = 0$	$a_3 = 0$
	lex: NULL-le	lex: NULL-chien	lex: NULL-noir
	\parallel jump: $0 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $0 - \lfloor 2 \times \frac{3}{3} \rfloor$	$\left \text{ jump: } 0 - \left\lfloor 3 \times \frac{3}{3} \right\rfloor \right $
	joint: $\theta_{le Null} imes \delta_{-1}$	joint: $\theta_{\text{chien} \text{Null}} \times \delta_{-2}$	joint: $\theta_{noir Null} \times \delta_{-3}$
	post: $\frac{\text{joint}(a_1=0)}{\text{marginal}(\text{le})}$	post: $\frac{\text{joint}(a_2=0)}{\text{marginal}(\text{chien})}$	post: $\frac{\text{joint}(a_3=0)}{\text{marginal}(\text{noir})}$
the 1	$a_1 = 1$	$a_2 = 1$	$a_3 = 1$
	lex: the-le	lex: the-chien	lex: the-noir
	\parallel jump: $1 - \lfloor 1 \times \frac{3}{3} \rfloor$	$\left \text{ jump: } 1 - \left\lfloor 2 \times \frac{3}{3} \right\rfloor \right $	$\left \text{ jump: } 1 - \left\lfloor 3 \times \frac{3}{3} \right\rfloor \right $
	joint: $\theta_{le the} \times \delta_0$	joint: $\theta_{\text{chien} \text{the}} \times \delta_{-1}$	joint: $\theta_{noir the} imes \check{\delta}_{-2}$
	'	'	'
black 2	$a_1 = 2$	$a_2 = 2$	$a_3 = 2$
	lex: black-le	lex: black-chien	lex: black-noir
	$\left\ \text{ jump: } 2 - \left[1 \times \frac{3}{3}\right] \right\ $	jump: $2 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $2 - \lfloor 3 \times \frac{3}{3} \rfloor$
	joint: $ heta_{le black} imes ilde{\delta}_1$	joint: $\theta_{chien black} \times \delta_0$	joint: $\theta_{noir black} \times \delta_{-1}$
dog 3	$a_1 = 3$	$a_2 = 3$	$a_3 = 3$
dog 3	$a_1 = 3$ lex: dog-le	lex: dog-chien	lex: dog-noir
	jump: $3 - \lfloor 1 \times \frac{3}{3} \rfloor$		
	joint: $\theta_{le dog} \times \delta_2$	jump: $3 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $3 - \left\lfloor 3 \times \frac{3}{3} \right\rfloor$
	Joint. $v_{\text{le} \text{dog}} \times v_2$	joint: $\theta_{chien dog} imes \delta_1$	joint: $\theta_{noir dog} imes \delta_0$
Marginal	$\sum_{a_1=0}^m joint(a_1)$	$\sum_{a_2=0}^m joint(a_2)$	$\sum_{a_3=0}^m joint(a_3)$

	le	chien	noir
	1	2	3
Null 0	$a_1 = 0$	$a_2 = 0$	$a_3 = 0$
	lex: NULL-le	lex: NULL-chien	lex: NULL-noir
	jump: $0 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $0 - \lfloor 2 \times \frac{3}{3} \rfloor$	$\left \text{ jump: } 0 - \left\lfloor 3 \times \frac{3}{3} \right\rfloor \right $
	joint: $\theta_{le Null} imes \delta_{-1}$	joint: $\theta_{chien Null} \times \delta_{-2}$	joint: $\theta_{noir Null} \times \delta_{-3}$
	post: $\frac{joint(a_1=0)}{marginal(le)}$	post: $\frac{\text{joint}(a_2=0)}{\text{marginal}(\text{chien})}$	post: $\frac{\text{joint}(a_3=0)}{\text{marginal}(\text{noir})}$
the 1	$a_1 = 1$	$a_2 = 1$	$a_3 = 1$
	lex: the-le	lex: the-chien	lex: the-noir
	jump: $1 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $1 - \lfloor 2 \times \frac{3}{3} \rfloor$	$\left[\begin{array}{c} jump: \ 1 - \left[3 \times \frac{3}{3}\right] \end{array}\right]$
	joint: $\theta_{le the} imes \delta_0$	joint: $\theta_{chien the} \times \delta_{-1}$	joint: $\theta_{noir the} \times \check{\delta}_{-2}$
	post: $\frac{\text{joint}(a_1=1)}{\text{marginal}(\text{le})}$		
black 2	$a_1 = 2$	$a_2 = 2$	$a_3 = 2$
	lex: black-le	lex: black-chien	lex: black-noir
	jump: $2 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $2 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $2 - \lfloor 3 \times \frac{3}{3} \rfloor$
	joint: $ heta_{le black} imes ilde{\delta}_1$	joint: $\theta_{chien black} \times \delta_0$	joint: $\theta_{noir black} \times \delta_{-1}$
	9		9
dog 3	$a_1 = 3$	$a_2 = 3$	$a_3 = 3$
	lex: dog-le	lex: dog-chien	lex: dog-noir
	jump: $3 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $3 - \left\lfloor 2 \times \frac{3}{3} \right\rfloor$	jump: $3 - \lfloor 3 \times \frac{3}{3} \rfloor$
	joint: $\theta_{le dog} imes \delta_2$	joint: $\theta_{chien dog} imes \delta_1$	joint: $\theta_{noir dog} \times \delta_0$
Marginal	$\sum_{a_1=0}^m joint(a_1)$	$\sum_{a_2=0}^m joint(a_2)$	$\sum_{a_3=0}^m joint(a_3)$

	le	chien	noir
	1	2	3
Null 0	$a_1 = 0$	$a_2 = 0$	$a_3 = 0$
	lex: NULL-le	lex: NULL-chien	lex: NULL-noir
	$\left \int Jump \cdot \left[0 - \left[1 \times \frac{3}{3} \right] \right] \right $	jump: $0 - \lfloor 2 \times \frac{3}{3} \rfloor$	$\left \text{ jump: } 0 - \left\lfloor 3 \times \frac{3}{3} \right\rfloor \right $
	joint: $\theta_{le Null} imes \delta_{-1}$	joint: $\theta_{chien Null} \times \delta_{-2}$	joint: $\theta_{noir Null} \times \delta_{-3}$
	post: $\frac{joint(a_1=0)}{marginal(le)}$	post: $\frac{\text{joint}(a_2=0)}{\text{marginal}(\text{chien})}$	post: $\frac{\text{joint}(a_3=0)}{\text{marginal}(\text{noir})}$
the 1	$a_1 = 1$	$a_2 = 1$	$a_3 = 1$
	lex: the-le	lex: the-chien	lex: the-noir
	$\left \begin{array}{c} \text{jump: } 1 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array} \right $	jump: $1 - \lfloor 2 \times \frac{3}{3} \rfloor$	$\left[\begin{array}{c} jump: \ 1 - \left[3 \times \frac{3}{3}\right] \end{array}\right]$
	joint: $\theta_{le the} imes \delta_0$	joint: $\theta_{chien the} \times \delta_{-1}$	joint: $\theta_{noir the} \times \check{\delta}_{-2}$
	post: $\frac{\text{joint}(a_1=1)}{\text{marginal}(\text{le})}$	post: $\frac{\text{joint}(a_2=1)}{\text{marginal}(\text{chien})}$	
black 2	$a_1 = 2$	$a_2 = 2$	$a_3 = 2$
	lex: black-le	lex: black-chien	lex: black-noir
	jump: $2 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $2 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $2 - \lfloor 3 \times \frac{3}{3} \rfloor$
	joint: $ heta_{le black} imes ilde{\delta}_1$	joint: $\theta_{chien black} \times \delta_0$	joint: $\theta_{noir black} \times \delta_{-1}$
dog 3	$a_1 = 3$	$a_2 = 3$	$a_3 = 3$
dog 5	$\begin{vmatrix} a_1 - 3 \\ lex: dog-le \end{vmatrix}$	lex: dog-chien	lex: dog-noir
	jump: $3 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $3 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $3 - \lfloor 3 \times \frac{3}{3} \rfloor$
		- 0-	
	joint: $\theta_{le dog} imes \delta_2$	joint: $\theta_{chien dog} imes \delta_1$	joint: $\theta_{noir dog} imes \delta_0$
Marginal	$\sum_{a_1=0}^m joint(a_1)$	$\sum_{a_2=0}^m joint(a_2)$	$\sum_{a_3=0}^m joint(a_3)$

	le	chien	noir
	1	2	3
Null 0	$a_1 = 0$	$a_2 = 0$	$a_3 = 0$
	lex: NULL-le	lex: NULL-chien	lex: NULL-noir
	$\left \begin{array}{c} \text{jump: } 0 - \left[1 \times \frac{3}{3}\right] \end{array} \right $	jump: $0 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $0 - \lfloor 3 \times \frac{3}{3} \rfloor$
	joint: $\theta_{le Null} imes \delta_{-1}$	joint: $\theta_{chien Null} \times \delta_{-2}$	joint: $\theta_{noir Null} \times \delta_{-3}$
	post: $\frac{joint(a_1=0)}{marginal(le)}$	post: $\frac{\text{joint}(a_2=0)}{\text{marginal}(\text{chien})}$	post: $\frac{\text{joint}(a_3=0)}{\text{marginal}(\text{noir})}$
the 1	$a_1 = 1$	$a_2 = 1$	$a_3 = 1$
	lex: the-le	lex: the-chien	lex: the-noir
	$\left \int Jump: \ 1 - \left[1 \times \frac{3}{3}\right] \right $	jump: $1 - \lfloor 2 \times \frac{3}{3} \rfloor$	$\left \text{ jump: } 1 - \left\lfloor 3 \times \frac{3}{3} \right\rfloor \right $
	joint: $\theta_{le the} \times \delta_0$	joint: $\theta_{chien the} \times \delta_{-1}$	joint: $\theta_{noir the} imes ilde{\delta}_{-2}$
	post: $\frac{\text{joint}(a_1=1)}{\text{marginal}(\text{le})}$	post: $\frac{\text{joint}(a_2=1)}{\text{marginal}(\text{chien})}$	post: $\frac{\text{joint}(a_3=1)}{\text{marginal}(\text{noir})}$
black 2	$a_1 = 2$	$a_2 = 2$	$a_3 = 2$
	lex: black-le	lex: black-chien	lex: black-noir
	jump: $2 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $2 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $2 - \lfloor 3 \times \frac{3}{3} \rfloor$
	joint: $ heta_{le black} imes \delta_1$	joint: $\theta_{chien black} imes \delta_0$	joint: $\theta_{noir black} \times \delta_{-1}$
dog 3	$a_1 = 3$	$a_2 = 3$	$a_3 = 3$
	lex: dog-le	lex: dog-chien	lex: dog-noir
	jump: $3 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $3 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $3 - \lfloor 3 \times \frac{3}{3} \rfloor$
	joint: $\theta_{le dog} imes \delta_2$	joint: $\theta_{chien dog} \times \delta_1$	joint: $\theta_{noir dog} \times \delta_0$
Marginal	$\sum_{a_1=0}^m joint(a_1)$	$\sum_{a_2=0}^m joint(a_2)$	$\sum_{a_3=0}^m joint(a_3)$

	le	chien	noir
	1	2	3
Null 0	$a_1 = 0$	$a_2 = 0$	$a_3 = 0$
	lex: NULL-le	lex: NULL-chien	lex: NULL-noir
	$\left \right $ jump: $0 - \left[1 \times \frac{3}{3}\right]$	jump: $0 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $0 - \lfloor 3 \times \frac{3}{3} \rfloor$
	joint: $\theta_{le Null} \times \delta_{-1}$	joint: $\theta_{chien Null} \times \delta_{-2}$	joint: $\theta_{noir Null} \times \delta_{-3}$
	post: $\frac{\text{joint}(a_1=0)}{\text{marginal}(\text{le})}$	post: $\frac{\text{joint}(a_2=0)}{\text{marginal}(\text{chien})}$	post: $\frac{\text{joint}(a_3=0)}{\text{marginal}(\text{noir})}$
the 1	$a_1 = 1$	$a_2 = 1$	$a_3 = 1$
	lex: the-le	lex: the-chien	lex: the-noir
	$\left \right $ jump: $1 - \left[1 \times \frac{3}{3}\right]$	jump: $1 - \lfloor 2 \times \frac{3}{3} \rfloor$	$\left \text{ jump: } 1 - \left\lfloor 3 \times \frac{3}{3} \right\rfloor \right $
	joint: $\theta_{le the} imes \delta_0$	joint: $\theta_{chien the} imes \delta_{-1}$	joint: $\theta_{noir the} imes \delta_{-2}$
	post: $\frac{\text{joint}(a_1=1)}{\text{marginal}(\text{le})}$	post: $\frac{\text{joint}(a_2=1)}{\text{marginal}(\text{chien})}$	post: $\frac{\text{joint}(a_3=1)}{\text{marginal(noir)}}$
black 2	$a_1 = 2$	$a_2 = 2$	$a_3 = 2$
	lex: black-le	lex: black-chien	lex: black-noir
	$\left \right $ jump: $2 - \left[1 \times \frac{3}{3}\right]$	jump: $2 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $2 - \lfloor 3 \times \frac{3}{3} \rfloor$
	joint: $\theta_{le black} imes \check{\delta}_1$	joint: $\theta_{chien black} imes \delta_0$	joint: $\theta_{noir black} imes \delta_{-1}$
	post: $\frac{\text{joint}(a_1=2)}{\text{marginal}(\text{le})}$		
dog 3	$a_1 = 3$	$a_2 = 3$	$a_3 = 3$
	lex: dog-le	lex: dog-chien	lex: dog-noir
	$\left \right $ jump: $3 - \left[1 \times \frac{3}{3}\right]$	jump: $3 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $3 - \lfloor 3 \times \frac{3}{3} \rfloor$
	joint: $ heta_{le dog} imes \delta_2$	joint: $\theta_{chien dog} \times \delta_1$	joint: $\theta_{noir dog} imes \delta_0$
Marginal	$\sum_{a_1=0}^m joint(a_1)$	$\sum_{a_2=0}^m joint(a_2)$	$\sum_{a_3=0}^m joint(a_3)$

	le	chien	noir
	1	2	3
Null 0	$a_1 = 0$	$a_2 = 0$	$a_3 = 0$
	lex: NULL-le	lex: NULL-chien	lex: NULL-noir
	jump: $0 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $0 - \lfloor 2 \times \frac{3}{3} \rfloor$	$\left \text{ jump: } 0 - \left\lfloor 3 \times \frac{3}{3} \right\rfloor \right $
	joint: $\theta_{le Null} imes \delta_{-1}$	joint: $\theta_{chien Null} \times \delta_{-2}$	joint: $\theta_{noir Null} \times \delta_{-3}$
	post: $\frac{\text{joint}(a_1=0)}{\text{marginal}(\text{le})}$	post: $\frac{\text{joint}(a_2=0)}{\text{marginal}(\text{chien})}$	post: $\frac{\text{joint}(a_3=0)}{\text{marginal}(\text{noir})}$
the 1	$a_1 = 1$	$a_2 = 1$	$a_3 = 1$
	lex: the-le	lex: the-chien	lex: the-noir
	jump: $1 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $1 - \lfloor 2 \times \frac{3}{3} \rfloor$	$\left \text{ jump: } 1 - \left\lfloor 3 \times \frac{3}{3} \right\rfloor \right $
	joint: $\theta_{le the} imes \delta_0$	joint: $\theta_{chien the} \times \delta_{-1}$	joint: $\theta_{noir the} imes \check{\delta}_{-2}$
	post: $\frac{joint(a_1=1)}{marginal(le)}$	post: $\frac{\text{joint}(a_2=1)}{\text{marginal}(\text{chien})}$	post: $\frac{\text{joint}(a_3=1)}{\text{marginal}(\text{noir})}$
black 2	$a_1 = 2$	$a_2 = 2$	$a_3 = 2$
	lex: black-le	lex: black-chien	lex: black-noir
	jump: $2 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $2 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $2 - \lfloor 3 \times \frac{3}{3} \rfloor$
	joint: $ heta_{le black} imes ilde{\delta}_1$	joint: $\theta_{chien black} imes \delta_0$	joint: $\theta_{noir black} imes \delta_{-1}$
	post: $\frac{joint(a_1=2)}{marginal(le)}$	post: $\frac{\text{joint}(a_2=2)}{\text{marginal}(\text{chien})}$	
dog 3	$a_1 = 3$	$a_2 = 3$	$a_3 = 3$
	lex: dog-le	lex: dog-chien	lex: dog-noir
	jump: $3 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $3 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $3 - \lfloor 3 \times \frac{3}{3} \rfloor$
	joint: $\theta_{le dog} imes \delta_2$	joint: $\theta_{chien dog} \times \delta_1$	joint: $\theta_{noir dog} imes \delta_0$
Marginal	$\sum_{a_1=0}^m joint(a_1)$	$\sum_{a_2=0}^m joint(a_2)$	$\sum_{a_3=0}^m joint(a_3)$

	le	chien	noir
	1	2	3
Null 0	$a_1 = 0$	$a_2 = 0$	$a_3 = 0$
	lex: NULL-le	lex: NULL-chien	lex: NULL-noir
	$\left \right $ jump: $0 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor$	jump: $0 - \lfloor 2 \times \frac{3}{3} \rfloor$	$\left \text{ jump: } 0 - \left\lfloor 3 \times \frac{3}{3} \right\rfloor \right $
	joint: $\theta_{le Null} imes \delta_{-1}$	joint: $\theta_{chien Null} \times \delta_{-2}$	joint: $\theta_{noir Null} \times \delta_{-3}$
	post: $\frac{joint(a_1=0)}{marginal(le)}$	post: $\frac{\text{joint}(a_2=0)}{\text{marginal}(\text{chien})}$	post: $\frac{\text{joint}(a_3=0)}{\text{marginal}(\text{noir})}$
the 1	$a_1 = 1$	$a_2 = 1$	$a_3 = 1$
	lex: the-le	lex: the-chien	lex: the-noir
	$\left \begin{array}{c} \text{jump: } 1 - \left\lfloor 1 \times \frac{3}{3} \right\rfloor \end{array} \right $	jump: $1 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $1 - \lfloor 3 \times \frac{3}{3} \rfloor$
	joint: $\theta_{le the} imes \delta_0$	joint: $\theta_{chien the} imes \delta_{-1}$	joint: $\theta_{noir the} imes \delta_{-2}$
	post: $\frac{joint(a_1=1)}{marginal(le)}$	post: $\frac{\text{joint}(a_2=1)}{\text{marginal}(\text{chien})}$	post: $\frac{\text{joint}(a_3=1)}{\text{marginal(noir)}}$
black 2	$a_1 = 2$	$a_2 = 2$	$a_3 = 2$
	lex: black-le	lex: black-chien	lex: black-noir
	jump: $2 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $2 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $2 - \lfloor 3 \times \frac{3}{3} \rfloor$
	joint: $ heta_{le black} imes \delta_1$	joint: $\theta_{chien black} imes \delta_0$	joint: $\theta_{noir black} imes \delta_{-1}$
	post: $\frac{joint(a_1=2)}{marginal(le)}$	post: $\frac{\text{joint}(a_2=2)}{\text{marginal}(\text{chien})}$	post: $\frac{\text{joint}(a_3=2)}{\text{marginal}(\text{noir})}$
dog 3	$a_1 = 3$	$a_2 = 3$	$a_3 = 3$
	lex: dog-le	lex: dog-chien	lex: dog-noir
	jump: $3 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $3 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $3 - \lfloor 3 \times \frac{3}{3} \rfloor$
	joint: $\theta_{le dog} imes \delta_2$	joint: $\theta_{chien dog} imes \delta_1$	joint: $\theta_{noir dog} \times \delta_0$
Marginal	$\sum_{a_1=0}^m joint(a_1)$	$\sum_{a_2=0}^m joint(a_2)$	\sum^{m} ioint(a ₂)
iviargilial	$ \angle a_1 = 0$ Joint(a_1)	$ \angle a_2 = 0 $ John (a_2)	$\sum_{a_3=0}^m joint(a_3)$

		le	chien	noir
		1	2	3
Null	0	$a_1 = 0$	$a_2 = 0$	$a_3 = 0$
		lex: NULL-le	lex: NULL-chien	lex: NULL-noir
		jump: $0 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $0 - \lfloor 2 \times \frac{3}{3} \rfloor$	$\left[\text{ jump: } 0 - \left[3 \times \frac{3}{3} \right] \right]$
		joint: $\theta_{le Null} \times \delta_{-1}$	joint: $\theta_{chien Null} \times \delta_{-2}$	joint: $\theta_{noir Null} \times \delta_{-3}$
		post: $\frac{joint(a_1=0)}{marginal(le)}$	post: $\frac{\text{joint}(a_2=0)}{\text{marginal}(\text{chien})}$	post: $\frac{\text{joint}(a_3=0)}{\text{marginal}(\text{noir})}$
the	1	$a_1 = 1$	$a_2 = 1$	$a_3 = 1$
		lex: the-le	lex: the-chien	lex: the-noir
		jump: $1 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $1 - \lfloor 2 \times \frac{3}{3} \rfloor$	$\left[\begin{array}{c} jump: \ 1 - \left[3 \times \frac{3}{3}\right] \end{array}\right]$
		joint: $\theta_{le the} imes \delta_0$	joint: $\theta_{chien the} \times \delta_{-1}$	joint: $\theta_{noir the} imes \delta_{-2}$
		post: $\frac{joint(a_1=1)}{marginal(le)}$	post: $\frac{\text{joint}(a_2=1)}{\text{marginal}(\text{chien})}$	post: $\frac{\text{joint}(a_3=1)}{\text{marginal}(\text{noir})}$
black	2	$a_1 = 2$	$a_2 = 2$	$a_3 = 2$
		lex: black-le	lex: black-chien	lex: black-noir
		jump: $2 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $2 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $2 - \left\lfloor 3 \times \frac{3}{3} \right\rfloor$
		joint: $\theta_{le black} imes \delta_1$	joint: $ heta_{\sf chien black} imes \delta_0$	joint: $ heta_{noir black} imes \delta_{-1}$
		post: $\frac{joint(a_1=2)}{marginal(le)}$	post: $\frac{\text{joint}(a_2=2)}{\text{marginal}(\text{chien})}$	post: $\frac{\text{joint}(a_3=2)}{\text{marginal}(\text{noir})}$
dog	3	$a_1 = 3$	$a_2 = 3$	$a_3 = 3$
		lex: dog-le	lex: dog-chien	lex: dog-noir
		jump: $3 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $3 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $3 - \lfloor 3 \times \frac{3}{3} \rfloor$
		joint: $\theta_{le dog} imes \delta_2$	joint: $\theta_{chien dog} imes \delta_1$	joint: $\theta_{noir dog} \times \delta_0$
		post: $\frac{joint(a_1=3)}{marginal(le)}$		
Margin	al	$\sum_{a_1=0}^m joint(a_1)$	$\sum_{a_2=0}^m joint(a_2)$	$\sum_{a_3=0}^m joint(a_3)$

		le	chien	noir
		1	2	3
Null	0	$a_1 = 0$	$a_2 = 0$	$a_3 = 0$
		lex: NULL-le	lex: NULL-chien	lex: NULL-noir
		jump: $0 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $0 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $0 - \lfloor 3 \times \frac{3}{3} \rfloor$
		joint: $\theta_{le Null} \times \delta_{-1}$	joint: $\theta_{chien Null} \times \delta_{-2}$	joint: $\theta_{noir Null} \times \delta_{-3}$
		post: $\frac{joint(a_1=0)}{marginal(le)}$	post: $\frac{\text{joint}(a_2=0)}{\text{marginal}(\text{chien})}$	post: $\frac{\text{joint}(a_3=0)}{\text{marginal}(\text{noir})}$
the	1	$a_1 = 1$	$a_2 = 1$	$a_3 = 1$
		lex: the-le	lex: the-chien	lex: the-noir
		jump: $1 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $1 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $1 - \lfloor 3 \times \frac{3}{3} \rfloor$
		joint: $\theta_{le the} imes \delta_0$	joint: $\theta_{chien the} imes \delta_{-1}$	joint: $ heta_{noir the} imes \delta_{-2}$
		post: $\frac{joint(a_1=1)}{marginal(le)}$	post: $\frac{\text{joint}(a_2=1)}{\text{marginal}(\text{chien})}$	post: $\frac{\text{joint}(a_3=1)}{\text{marginal}(\text{noir})}$
black	2	$a_1 = 2$	$a_2 = 2$	$a_3 = 2$
		lex: black-le	lex: black-chien	lex: black-noir
		jump: $2 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $2 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $2 - \lfloor 3 \times \frac{3}{3} \rfloor$
		joint: $\theta_{le black} \times \delta_1$	joint: $\theta_{\sf chien black} imes \delta_0$	joint: $\theta_{noir black} \times \delta_{-1}$
		post: $\frac{joint(a_1=2)}{marginal(le)}$	post: $\frac{\text{joint}(a_2=2)}{\text{marginal}(\text{chien})}$	post: $\frac{\text{joint}(a_3=2)}{\text{marginal}(\text{noir})}$
dog	3	$a_1 = 3$	$a_2 = 3$	$a_3 = 3$
		lex: dog-le	lex: dog-chien	lex: dog-noir
		jump: $3 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $3 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $3 - \lfloor 3 \times \frac{3}{3} \rfloor$
		joint: $\theta_{le dog} imes \delta_2$	joint: $ heta_{chien dog} imes \delta_1$	joint: $\theta_{noir dog} \times \delta_0$
		post: $\frac{joint(a_1=3)}{marginal(le)}$	post: $\frac{\text{joint}(a_2=3)}{\text{marginal}(\text{chien})}$	
Margin	al	$\sum_{a_1=0}^m joint(a_1)$	$\sum_{a_2=0}^m joint(a_2)$	$\sum_{a_3=0}^m joint(a_3)$
		-	-	

	le	chien	noir
	1	2	3
Null 0	$a_1 = 0$	$a_2 = 0$	$a_3 = 0$
	lex: NULL-le	lex: NULL-chien	lex: NULL-noir
	jump: $0 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $0 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $0 - \lfloor 3 \times \frac{3}{3} \rfloor$
	joint: $\theta_{le Null} \times \delta_{-1}$	joint: $\theta_{chien Null} \times \delta_{-2}$	joint: $\theta_{noir Null} \times \delta_{-3}$
	post: $\frac{\text{joint}(a_1=0)}{\text{marginal}(\text{le})}$	post: $\frac{\text{joint}(a_2=0)}{\text{marginal}(\text{chien})}$	post: $\frac{\text{joint}(a_3=0)}{\text{marginal}(\text{noir})}$
the 1	$a_1 = 1$	$a_2 = 1$	$a_3 = 1$
	lex: the-le	lex: the-chien	lex: the-noir
	jump: $1 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $1 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $1 - \lfloor 3 \times \frac{3}{3} \rfloor$
	joint: $\theta_{le the} \times \delta_0$	joint: $\theta_{chien the} \times \delta_{-1}$	joint: $\theta_{noir the} imes \check{\delta}_{-2}$
	post: $\frac{joint(a_1=1)}{marginal(le)}$	post: $\frac{\text{joint}(a_2=1)}{\text{marginal}(\text{chien})}$	post: $\frac{\text{joint}(a_3=1)}{\text{marginal}(\text{noir})}$
black 2	$a_1 = 2$	$a_2 = 2$	$a_3 = 2$
	lex: black-le	lex: black-chien	lex: black-noir
	jump: $2 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $2 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $2 - \lfloor 3 \times \frac{3}{3} \rfloor$
	joint: $\theta_{le black} \times \delta_1$	joint: $\theta_{chien black} \times \delta_0$	joint: $\theta_{noir black} \times \delta_{-1}$
	post: $\frac{joint(a_1=2)}{marginal(le)}$	post: $\frac{\text{joint}(a_2=2)}{\text{marginal}(\text{chien})}$	post: $\frac{\text{joint}(a_3=2)}{\text{marginal}(\text{noir})}$
dog 3	$a_1 = 3$	$a_2 = 3$	$a_3 = 3$
	lex: dog-le	lex: dog-chien	lex: dog-noir
	jump: $3 - \lfloor 1 \times \frac{3}{3} \rfloor$	jump: $3 - \lfloor 2 \times \frac{3}{3} \rfloor$	jump: $3 - \lfloor 3 \times \frac{3}{3} \rfloor$
	joint: $\theta_{le dog} imes \delta_2$	joint: $\theta_{chien dog} imes \delta_1$	joint: $\theta_{noir dog} \times \delta_0$
	post: $\frac{\text{joint}(a_1=3)}{\text{marginal(le)}}$	post: $\frac{\text{joint}(a_2=3)}{\text{marginal(chien)}}$	post: $\frac{\text{joint}(a_3=3)}{\text{marginal}(\text{noir})}$
Marginal	$\sum_{a_1=0}^m joint(a_1)$	$\sum_{a_2=0}^m joint(a_2)$	$\sum_{a_3=0}^m joint(a_3)$