

	.	ADJ	ADV	CONJ	DET	NOUN	PREP	PRON	START	VERB
.	1	1	1	1	1	1	1	1	1	3
ADJ	2	1	2	2	1	1	1	2	1	1
ADV	1	1	1	1	1	2	1	1	3	1
CONJ	1	1	1	1	1	1	1	1	3	1
DET	1	1	1	1	1	1	4	1	1	1
END	1	2	1	1	1	4	2	1	1	3
NOUN	1	4	1	1	4	1	1	2	1	1
PREP	1	1	1	1	1	2	2	1	3	2
PRON	1	1	3	2	1	1	1	2	1	3
VERB	2	1	1	1	1	3	1	4	2	3

	ADJ	ADV	CONJ	DET	NOUN	PREP	PRON	START	VERB	
.	0.083333	0.071429	0.076923	0.083333	0.076923	0.058824	0.066667	0.0625	0.058824	0.157895
ADJ	0.166667	0.071429	0.153846	0.166667	0.076923	0.058824	0.066667	0.1250	0.058824	0.052632
ADV	0.083333	0.071429	0.076923	0.083333	0.076923	0.117647	0.066667	0.0625	0.176471	0.052632
CONJ	0.083333	0.071429	0.076923	0.083333	0.076923	0.058824	0.066667	0.0625	0.176471	0.052632
DET	0.083333	0.071429	0.076923	0.083333	0.076923	0.058824	0.266667	0.0625	0.058824	0.052632
END	0.083333	0.142857	0.076923	0.083333	0.076923	0.235294	0.133333	0.0625	0.058824	0.157895
NOUN	0.083333	0.285714	0.076923	0.083333	0.307692	0.058824	0.066667	0.1250	0.058824	0.052632
PREP	0.083333	0.071429	0.076923	0.083333	0.076923	0.117647	0.133333	0.0625	0.176471	0.105263
PRON	0.083333	0.071429	0.230769	0.166667	0.076923	0.058824	0.066667	0.1250	0.058824	0.157895
VERB	0.166667	0.071429	0.076923	0.083333	0.076923	0.176471	0.066667	0.2500	0.117647	0.157895

[illegible]

Question 1.4

		ADJ	ADV	CONJ	DET	NOUN	PREP	PRON	VERB
,	0.083333	0.026316	0.027027	0.027778	0.027027	0.02439	0.025641	0.025	0.023256
I	0.027778	0.026316	0.027027	0.027778	0.027027	0.02439	0.025641	0.050	0.023256
a	0.027778	0.026316	0.027027	0.027778	0.054054	0.02439	0.025641	0.025	0.023256
above	0.027778	0.026316	0.027027	0.027778	0.027027	0.02439	0.051282	0.025	0.023256
are	0.027778	0.026316	0.027027	0.027778	0.027027	0.02439	0.025641	0.025	0.046512
blazing	0.027778	0.052632	0.027027	0.027778	0.027027	0.02439	0.025641	0.025	0.023256
diamond	0.027778	0.026316	0.027027	0.027778	0.027027	0.04878	0.025641	0.025	0.023256
gone	0.027778	0.026316	0.027027	0.027778	0.027027	0.02439	0.025641	0.025	0.046512
he	0.027778	0.026316	0.027027	0.027778	0.027027	0.02439	0.025641	0.050	0.023256
high	0.027778	0.052632	0.027027	0.027778	0.027027	0.02439	0.025641	0.025	0.023256
how	0.027778	0.026316	0.054054	0.027778	0.027027	0.02439	0.025641	0.025	0.023256
in	0.027778	0.026316	0.027027	0.027778	0.027027	0.02439	0.051282	0.025	0.023256
is	0.027778	0.026316	0.027027	0.027778	0.027027	0.02439	0.025641	0.025	0.069767
light	0.027778	0.026316	0.027027	0.027778	0.027027	0.04878	0.025641	0.025	0.023256
like	0.027778	0.026316	0.027027	0.027778	0.027027	0.02439	0.051282	0.025	0.023256
little	0.027778	0.078947	0.027027	0.027778	0.027027	0.02439	0.025641	0.025	0.023256
nothing	0.027778	0.026316	0.027027	0.027778	0.027027	0.04878	0.025641	0.025	0.023256
shining	0.027778	0.026316	0.027027	0.027778	0.027027	0.02439	0.025641	0.025	0.046512
show	0.027778	0.026316	0.027027	0.027778	0.027027	0.02439	0.025641	0.025	0.046512
sky	0.027778	0.026316	0.027027	0.027778	0.027027	0.04878	0.025641	0.025	0.023256
so	0.027778	0.026316	0.054054	0.027778	0.027027	0.02439	0.025641	0.025	0.023256
star	0.027778	0.026316	0.027027	0.027778	0.027027	0.04878	0.025641	0.025	0.023256
sun	0.027778	0.026316	0.027027	0.027778	0.027027	0.04878	0.025641	0.025	0.023256
the	0.027778	0.026316	0.027027	0.027778	0.081081	0.02439	0.025641	0.025	0.023256
then	0.027778	0.026316	0.054054	0.027778	0.027027	0.02439	0.025641	0.025	0.023256
twinkle	0.027778	0.026316	0.027027	0.027778	0.027027	0.02439	0.025641	0.025	0.069767
up	0.027778	0.026316	0.027027	0.027778	0.027027	0.02439	0.051282	0.025	0.023256
upon	0.027778	0.026316	0.027027	0.027778	0.027027	0.02439	0.051282	0.025	0.023256
what	0.027778	0.026316	0.027027	0.027778	0.027027	0.02439	0.025641	0.050	0.023256
when	0.027778	0.026316	0.027027	0.083333	0.027027	0.02439	0.025641	0.025	0.023256
wonder	0.027778	0.026316	0.027027	0.027778	0.027027	0.02439	0.025641	0.025	0.046512
world	0.027778	0.026316	0.027027	0.027778	0.027027	0.04878	0.025641	0.025	0.023256
you	0.027778	0.026316	0.027027	0.027778	0.027027	0.02439	0.025641	0.075	0.023256
your	0.027778	0.026316	0.027027	0.027778	0.027027	0.02439	0.025641	0.050	0.023256

Question 2.1.a)

1.1416299098e-18

Question 2.1.b

4.48683957067e-17

Question 2.1.c

1.16873838012e-17

Question 2.2

	END	START	is	light	nothing
.	6.373424e-17	1	3.235234e-14	9.554237e-08	8.810621e-12
ADJ	3.450275e-17	1	3.864308e-14	1.810277e-07	1.052380e-11
ADV	1.953394e-17	1	3.713890e-14	9.296015e-08	5.404112e-12
CONJ	2.124475e-17	1	2.273920e-14	9.554237e-08	5.554227e-12
DET	1.953394e-17	1	3.907691e-14	1.114933e-07	1.064194e-11
NOUN	6.900237e-17	1	7.986450e-14	4.894829e-07	1.168018e-11
PREP	6.275371e-17	1	3.523434e-14	8.819296e-08	5.421921e-12
PRON	4.302061e-17	1	3.124252e-14	1.719763e-07	9.997608e-12
VERB	2.022021e-16	1	1.743769e-13	3.199559e-07	7.376334e-12

	shining	show	when	your
.	7.648109e-16	0.001634	1.403315e-09	0.000024
ADJ	2.415192e-16	0.001548	7.577134e-10	0.000021
ADV	2.539412e-16	0.004769	1.556384e-09	0.000011
CONJ	2.549370e-16	0.004902	2.399426e-09	0.000011
DET	2.539412e-16	0.001590	7.781922e-10	0.000033
NOUN	2.932601e-16	0.001435	1.261517e-09	0.000012
PREP	4.706529e-16	0.004525	1.476570e-09	0.000015
PRON	6.883298e-16	0.001471	1.262984e-09	0.000055
VERB	1.280614e-15	0.005472	2.008822e-09	0.000020

Tag sequence

['PREP', 'DET', 'NOUN', 'CONJ', 'PRON', 'VERB', 'VERB']

End State Probability is:

2.02202145195e-16

As you can see, instead of putting END and START as tags, I put them with the word sequence.

This is because START and END don't really serve any purpose unless we are in the beginning or the end of the sentence. Therefore, I simply added a START column of 1 and calculated the probability of 'show' with START as the previous tag. Similarly, with END, I put it as a column that records the end state for each of the tags being the last tag conditioned to the END tag.

This allows me to attain the max end state a lot more easily.

The tag sequence I get, though not accurate in a human sense, reflects the limited size of the corpus and the non-optimal nature of add-one smoothing, as PREP is predominant in the beginning of the sentence, and a lot of the sequences with previously large transition and emission probabilities got thinned down after add-one smoothing.