A: $a_{ij} = P(X_{t+1} = j \mid X_t = i)$

$X_t \mid X_{t+1}$	A	B	H	S
A	0.6	0.1	0.1	0.2
B	0.0	0.3	0.2	0.5
H	0.8	0.1	0.0	0.1
S	0.2	0.0	0.1	0.7

B: $b_{ik} = P(O_t = k \mid X_t = i)$

$X_t \mid O_t$	p	e	b	l
A	0.6	0.2	0.1	0.1
B	0.1	0.4	0.1	0.4
H	0.0	0.0	0.7	0.3
S	0.0	0.0	0.1	0.9

Step 1: Initialize $\delta_1(i)$

O_1 = _____

$$\delta_1(i) = \begin{bmatrix} \_\_\_ \\ \_\_\_ \\ 0.0 \\ \_\_\_ \end{bmatrix} \odot \begin{bmatrix} \_\_\_ \\ 0.1 \\ \_\_\_ \\ \_\_\_ \end{bmatrix} = \begin{bmatrix} \_\_\_ \\ \_\_\_ \\ \_\_\_ \\ \_\_\_ \end{bmatrix}$$

$\pi = P(X_1 = i)$:

A	B	H	S
0.5	0.0	0.0	0.5

Observations:

$O_{1:4}$ = {b,p,l,e}

Find:
Most likely hidden state sequence:

$X^*_{1:4}$

O_2 = ___

$\delta_2(i)$ =

		max probability	argmax state
max (0.05 x 0.6 x 0.6 , ___ x ___ x ___ , ___ x 0.8 x ___ , ___ x ___ x 0.6)	=	___	(__)
max (0.05 x ___ x ___ , ___ x ___ x 0.1 , 0 x ___ x ___ , 0.05 x ___ x ___)		0.0005	(__)
max (___ x ___ x ___ , 0 x ___ x ___ , ___ x ___ x ___ , 0.05 x ___ x ___)		___	(__)
max (___ x ___ x ___ , ___ x ___ x ___ , 0 x ___ x ___ , ___ x 0.7 x ___)		0	(__)

O_3 = ___

$\delta_3(i)$ =

		max. probability	argmax state
max (0.018 x ___ x ___ , ____ x ___ x 0.1 , ____ x ___ x 0.1 , ____ x ___ x 0.1)	=	_______	(__)
max (____ x ___ x 0.4 , 0.0005 x ___ x ___ , ____ x ___ x ___ , ____ x 0 x ___)		_______	(__)
max (____ x ___ x ___ , ____ x ___ x 0.3 , ____ x ___ x ___ , ____ x ___ x 0.3)		_______	(A)
max (____ x ___ x ___ , ____ x 0.5 x ___ , ____ x ___ x 0.9 , ____ x ___ x ___)		_______	(A)

O_4 = ___

$\delta_4(i)$ =

max (0.00108 x ___ x ___ , _______ x ___ x 0.2 , 0.00054 x ___ x ___ , _______ x ___ x ___)		
max (_______ x ___ x 0.4 , _______ x ___ x ___ , _______ x 0.1 x ___ , _______ x ___ x ___)		
max (_______ x ___ x ___ , _______ x ___ x ___ , _______ x ___ x 0.0 , _______ x ___ x ___)		
max (_______ x 0.2 x ___ , _______ x ___ x ___ , 0.00054 x ___ x ___ , 0.00324 x ___ x ___)		

=

max. probability	argmax state
_______	(_,_)
_______	(__)
_______	(__)
_______	(__)

States and deltas over time:

$\delta_1(i)$	state
_______	___
_______	___
_______	___
_______	___

$\delta_2(i)$	state
_______	___
_______	___
_______	___
_______	___

$\delta_3(i)$	state
_______	___
_______	___
_______	___
_______	___

$\delta_4(i)$	state
_______	__ , __
_______	___
_______	___
_______	___

Backtracking gives two answers: **$X^*_{1:4}$ = { __ , __ , __ , __ }** **and** **$X^*_{1:4}$ = { __ , __ , __ , __ }**