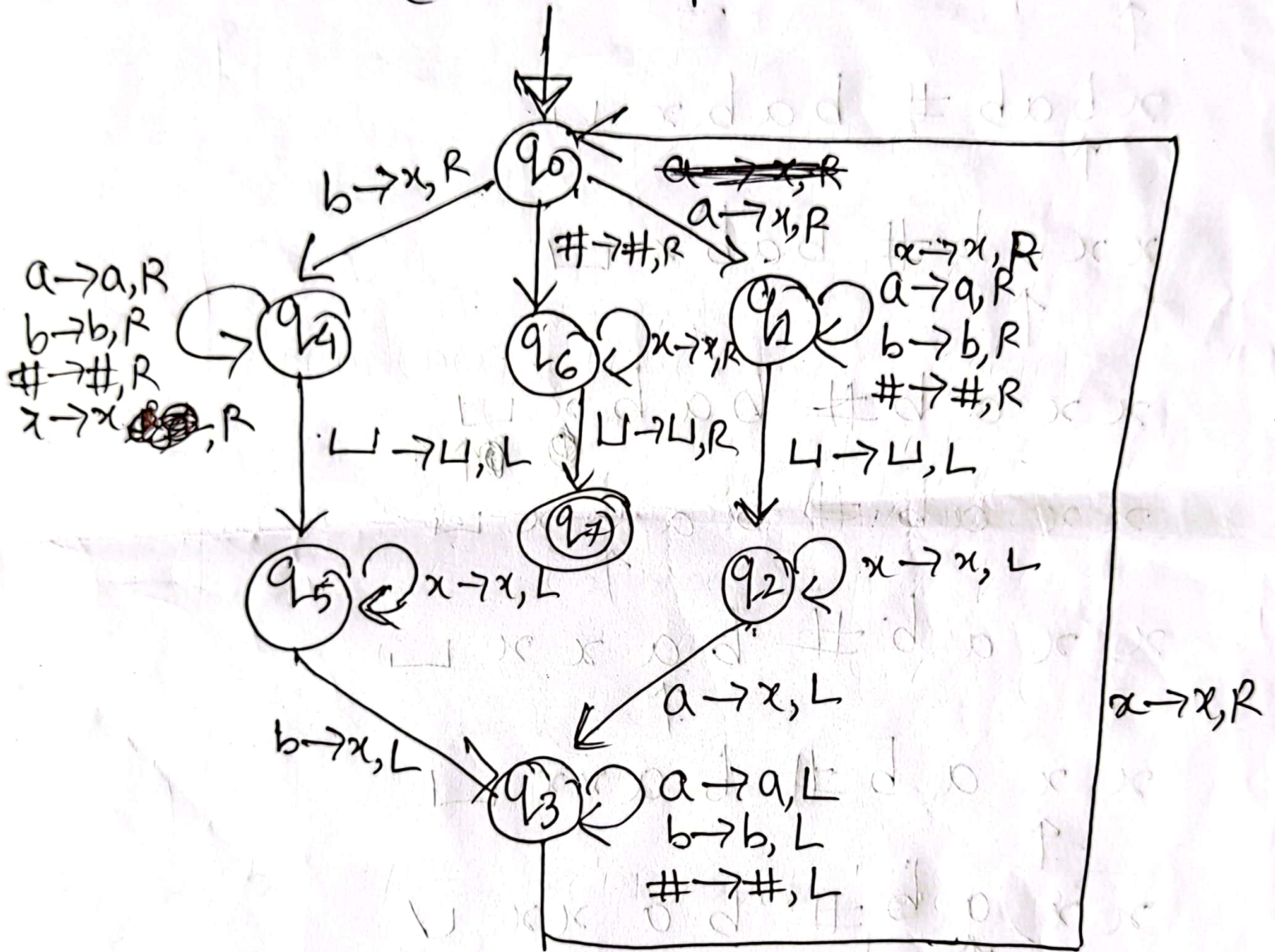


# Turing Machine

(1)

$$L = \{ \omega \# \omega^R \mid \omega \in \{a, b\}^* \}$$



a b a b # b a b a ⊔  
 ↑  
 x b a b # b a b a ⊔  
 ↑  
 x b a b # b a b a ⊔  
 ↑

~~x~~ bab # bab  $\sqcup$

~~x~~ bab # bab  $\overset{\uparrow}{x}$   $\sqcup$

x bab # bab  $\overset{\uparrow}{x}$   $\sqcup$

$\uparrow$

x bab # bab x  $\sqcup$

$\uparrow$

xxab # bab x  $\sqcup$

$\uparrow$

xxab # bab  $\overset{\uparrow}{x}$   $\sqcup$

xxab # ba  $\overset{\uparrow}{b}$  x  $\sqcup$

xxab # ba  $\overset{\uparrow}{x}$  x  $\sqcup$

xxab # ba xx  $\sqcup$

$\uparrow$

xx  $\overset{\uparrow}{a}$  b # ba xx  $\sqcup$

xx  $\overset{\uparrow}{x}$  b # ba xx  $\sqcup$

xxx b # ba xx  $\sqcup$

$\uparrow$

xxx b # ba  $\overset{\uparrow}{x}$  xx  $\sqcup$



~~Approach: For each a~~ ~~if a[i] = b[j] and~~ ~~i, j, k > 1~~

x x x b # b x x x  $\square$

$\uparrow$

x x x b # b x x x  $\square$

$\uparrow$

x x x b # b x x x  $\square$

$\uparrow$

x x x x # b x x x  $\square$

$\uparrow$

x x x x # b x x x  $\square$

$\uparrow$

x x x x # b x x x  $\square$

$\uparrow$

x x x x # x x x x  $\square$

$\uparrow$

x x x x # x x x x  $\square$

$\uparrow$

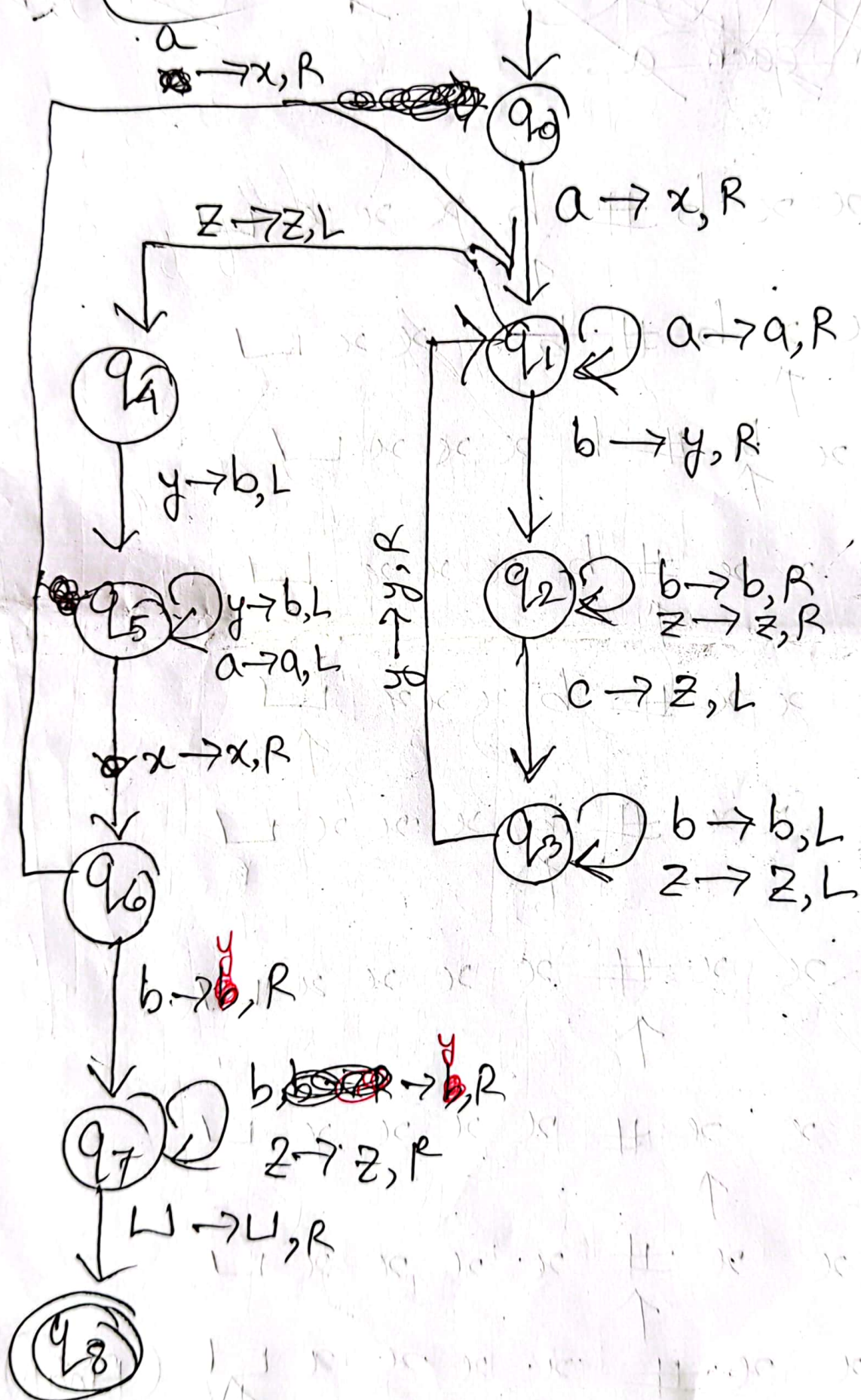
x x x x # x x x x  $\square$

$\uparrow$

x x x x # x x x x  $\square$  (Final)



$$L = \{a^i b^j c^k \mid i \neq j = k \text{ and } i, j, k \geq 1\}$$







# United International University

Name  
(Optional)

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Section

*Farih*

*18.07.2023*

Invigilator's  
Signature with date

Course Code

Trimester / Semester : Spring / Summer / Fall, 20.....

Name of Exam : Class Test / Mid-term / Final

Date: .....

a	a	b	b	b	c	c	c	c	c	c	c	□
---	---	---	---	---	---	---	---	---	---	---	---	---

↑

x a b b b c c c c c c c

↑

x a b b b c c c c c c c

↑

x a y b b c c c c c c c

↑

x a y b b c c c c c c c

↑

x a y b b z c c c c c c

↑

x a y b b z c c c c c c

↑

x a y b b z c c c c c c

↑

x a y y b z c c c c c c

↑



x a y y b z c c c c c w  
↑

x a y y b z z c c c c c w  
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x a y y b z z c c c c c w  
↑

x a y y b z z c c c c c w  
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x a y y y z z c c c c c w  
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x a y y y z z c c c c c w  
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x a y y y z z z c c c c c w  
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x a y y y z z z c c c c c w  
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x a y y y z z z c c c c c w  
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x a y y b z z z c c c c c w  
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~~x a y y b z z z c c c c c w~~  
↑

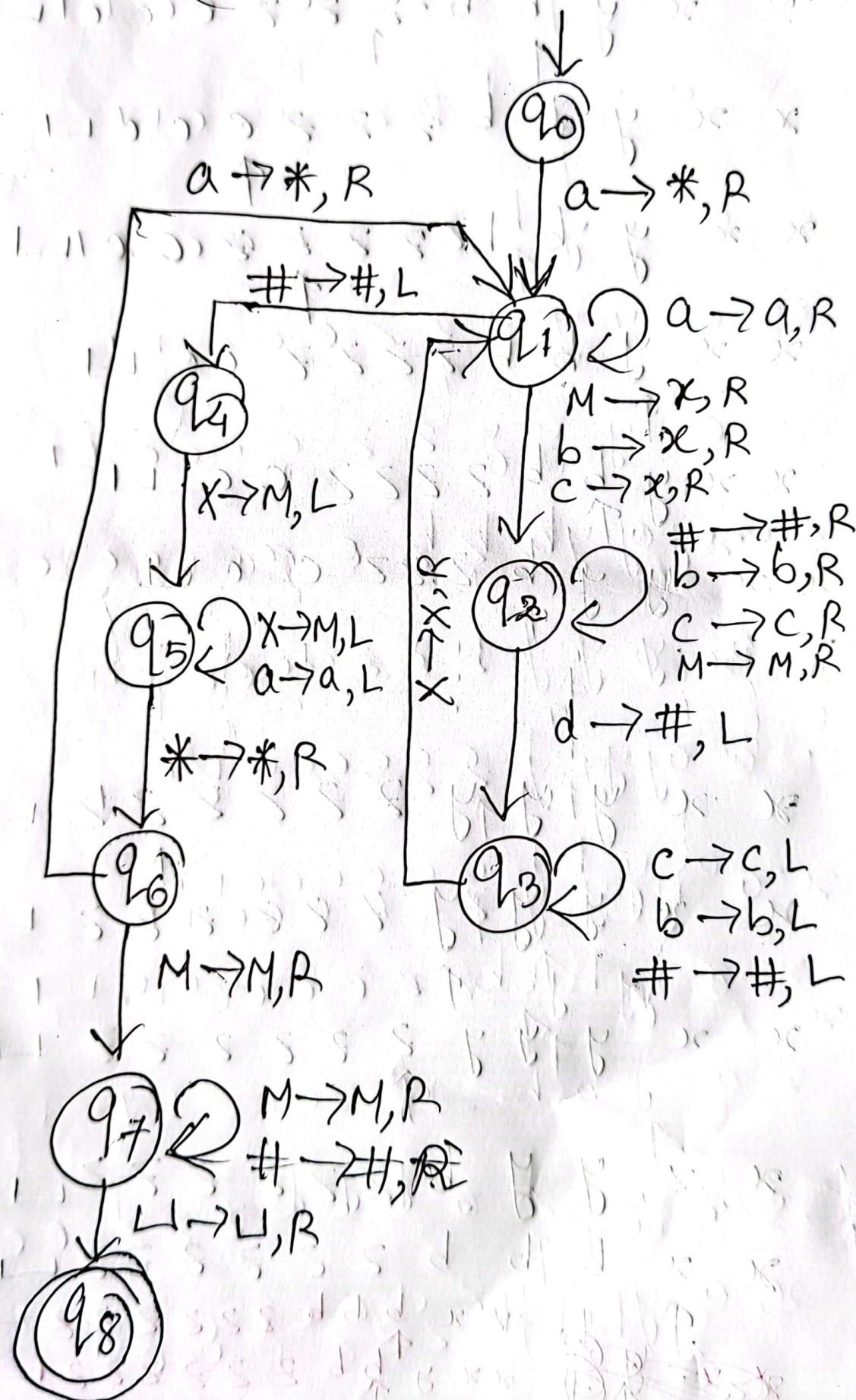
x a b b b z z z c c c c c w  
↑







3.  $L = \{a^l b^m c^n d^k \mid k \geq (m+n) * L \text{ and } l, m, n, k \geq 1\}$







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Date: .....

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*18/09/23*

a | a | b | b | c | d | d | d | d | d | d | W | W | - -

\* a b b c d d d d d d W \*  
↑

\* a b b c d d d d d d W X \*  
↑

\* a x b c d d d d d d W X X X \*  
↑

\* a x b c d d d d d d W X X X \*  
↑

\* a x b c d d d d d d W X X X \*  
↑

\* a x b c # d d d d d W X X X \*  
↑

\* a x b c # d d d d d W X X X \*  
↑

\* a x b c # d d d d d W X X X \*  
↑



\* a x b c # d d d d d L  
↑

\* a x x c # # d d d d L  
↑

\* a x x c # # d d d d L  
↑

\* a x x e # # d d d d L  
↑

\* a x x x # # d d d d L  
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\* a x x x # # d d d d L  
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\* a x x x # # # d d d L  
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\* a x x x # # # d d d L  
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\* a ~~xxx~~ M M M # # # d d d L  
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\* a M M M # # # d d d L  
↑

\* a M M M # # # d d d L  
↑



\* \* M M M # # # d d d L

\* \* X M M # # # d d d L

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\* \* X X X # # # # # L

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\* \* X X X # # # # # L



\*\* XXM #####  
↑

\*\* MMM #####  
↑

\*\* NMM #####  
↑

\*\* MMM #####  
↑ (Final)