

# CPSC 354 Report

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# 1 The MU-Puzzle

MI  $\rightarrow$  MU

**Rule 1:** If you possess a string whose last letter is I, add U.

**Rule 2:** Suppose you have Mx, you may add Mxx.

**Rule 3:** If III occurs in one of the strings, you may make a new string with U in place of III.

**Rule 4:** If UU, you can drop it.

MI  
MII *Mxx*  
MIII *Mxx*  
MIIIIIIII *Mxx*  
MUIIU *MIU*  
 $\emptyset$

MI  $\rightarrow$  use *Mxx* rule  $\infty$  times  
MIIII...

No matter what Rule you use you will never be able to get 0 Mod3, because I will always be 1 mod 3 or 2 mod 3

MUUU  
MIII

**Rule 1** does not affect # of I's.

**Rule 2** does not give 0 mod 3.

**Rule 3** does not solve the problem as removing 3 I's does not change the output of mod3.

**Rule 4** does not change the # of I's.

We can never get rid of all of the I's, 0 mod 3 is not possible. Thus you cannot get MU from MI.

## 2 Rewriting Assignment

1.  $A = \{\}$   
 $R = \{\}$



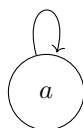
This diagram is terminating because there are no infinite loops, confluent because all paths lead to the same result, and has a unique normal form as there is only one final state.

2.  $A = \{a\}$   
 $R = \{\}$



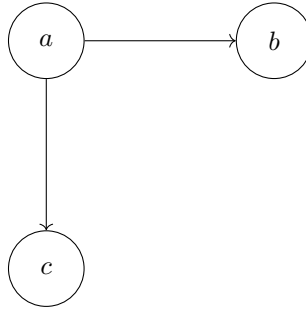
This diagram is terminating because there are no infinite loops, confluent because all paths lead to the same result, and has a unique normal form as there is only one final state.

3.  $A = \{a\}$   
 $R = \{(a, a)\}$



This diagram is not terminating due to the presence of infinite loops, confluent because all paths merge, but does not have a unique normal form as multiple results are possible.

4.  $A = \{a, b, c\}$   
 $R = \{(a, b), (a, b)\}$



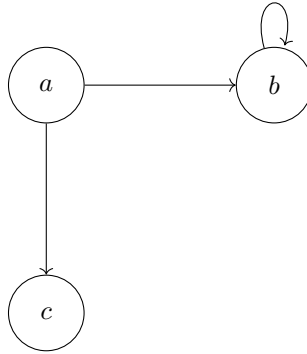
This diagram is terminating as there are no infinite loops, not confluent because paths diverge, and does not have a unique normal form due to multiple end states.

5.  $A = \{a, b\}$   
 $R = \{(a, a), (a, b)\}$



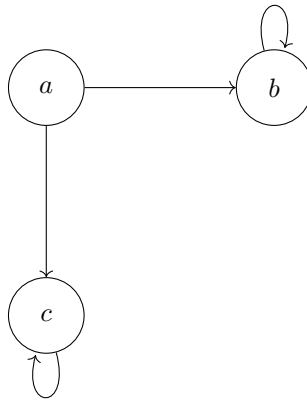
This diagram is not terminating due to the presence of infinite loops, not confluent because paths diverge, and has a unique normal form due to having a single end state on b.

6.  $A = \{a, b, c\}$   
 $R = \{(a, b), (b, b), (a, c)\}$



This diagram is not terminating due to the presence of infinite loops, not confluent because paths diverge, and has a unique normal form due to having a single end state on c.

7.  $A = \{a, b, c\}$   
 $R = \{(a, b), (b, b), (a, c), (c, c)\}$



This diagram is not terminating due to the presence of infinite loops, not confluent because paths diverge, and does not have a unique normal form due to no end states.

## Properties

	T	C	N
1.	✓	✓	✓
2.	✓	✓	✓
3.	×	✓	×
4.	✓	×	×
5.	×	×	✓
6.	×	×	✓
7.	×	×	×

Terminating, Confluent, Unique Normal Form