# Example of applying write-ahead logging to recovery

A database is recovering after a hardware failure caused it to crash. We consider two database locations labeled $X$ and $Y$. When the recovery process begins, the values stored on the disk are $X="abc"$ and $Y="jk"$. The contents of the log file on the disk are:

|  |  |
| --- | --- |
| transactionID | operation |
| 43 | begin transaction |
| 43 | change $Y$ from “def” to “jk” |
| 997 | begin transaction |
| 997 | change $X$ from “pq” to “abc” |
| 43 | change $Y$ from “jk” to “mno” |
| 997 | change $X$ from “abc” to “gh” |
| 43 | commit |

Once the recovery is complete, what values are stored at locations $X$ and $Y$? Explain your answer.

[Solution is on next page]

## Solution

Transaction 43 was committed, so we need to replay its actions. This includes the following updates to $Y$: “def” → “jk”→ “mno”. So final value of $Y$ is “mno”.

Transaction 997 was not committed, so we need to roll it back. Undoing its actions in reverse order gives the following sequence of changes to location $X$: “gh” → “abc”→ “pq”. So final value of $X$ is “pq”.