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Consider that:

$$B_n = \{a^k \mid k \text{ is a multiple of } n\}$$

In order to prove that the given expression is regular, the value of *n* is chosen as greater than or equal to 1.

Suppose, $k = ni$, where *i* is any positive integer. In starting, suppose value of *i* is chosen to be 1.

When $i = 1$ and $n = 1$

$$\begin{aligned} B_1 &= \{a^k\} \\ &= \{a^{ni}\} \\ &= \{a^{1\times 1}\} \\ &= \{a\} \end{aligned}$$

Then, the String comes out to be $\{a\}$

Increase the value of *n* keeping the value of *i* equal to 1. When $i = 1$ and $n = 2$

$$\begin{aligned} B_2 &= \{a^k\} \\ &= \{a^{ni}\} \\ &= \{a^{2\times 1}\} \\ &= \{aa\} \end{aligned}$$

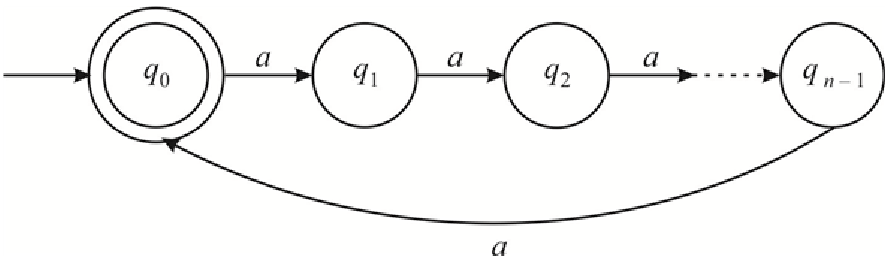
Then, the String comes out to be $\{aa\}$

Increase the value of *n* keeping the value of *i* equal to 1. When $i = 1$ and $n = 3$

$$\begin{aligned} B_3 &= \{a^k\} \\ &= \{a^{ni}\} \\ &= \{a^{3\times 1}\} \\ &= \{aaa\} \end{aligned}$$

Then, the String comes out to be $\{aaa\}$ and so on.

Finite automation of the regular expression is as shown:



In the above finite automaton, q_o is the initial and final state and q_1, q_2, q_3 and q_{n-1} are the subsequent states.

The language B_n is the regular language. According to the closure property of the regular expression, it is clearly seen that the specific expression is a regular expression when the value of *n* is greater than and equal to 1.

Closure property includes various operations such as union, intersection, set complement, set reversal, set difference and many more. Assume that B_n is regular.

• Union of B_1 and B_2 results in the third string and it is also a regular expression.

• Similarly, if user applies any property of closure, then the result is the regular expression.

Hence, it is proved that the above expression is the regular expression.