

### Bloom Filter:-

A bloom filter is a space-efficient data structure that lets you quickly check whether or not an item is in a set.

It's definitely  
not there

It might be there

Step 1:-

0	1	2	3	4	5	6	7
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## Insert Phase.

Step 2:-

0	0	0	1	0	0	0	0
0	1	2	3	4	5	6	7

$$\text{hash}(\text{'chocolate'}) \% 8 = 3$$

Step 3:

0	0	0	1	0	0	1	0
0	1	2	3	4	5	6	7

$$\text{hash('red velvet')} \% 8 = 6$$

Step 4:- query = chocolate  $\rightarrow$  hash('chocolate') % 8 = 3

0	0	0	1	0	0	1	0
0	1	2	3	4	5	6	7

⇒ might be there (correct an)

*=> might be there correct (an)*

JAN	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
2025	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	

query = 'carrot'  $\rightarrow$  hash('carrot') % 8 = 6

0	0	0	1	0	0	1	0
0	1	2	3	4	5	6	7

$\Rightarrow$  Might be there

False Positive

query = 'apple'  $\rightarrow$  hash('apple') % 8 = 2

0	0	0	1	0	0	1	0
0	1	2	3	4	5	6	7

$\Rightarrow$  For apple, not there (correct case)

Note: The false positive is not a bug, it's a tradeoff we have made to keep checks fast.