

# Resource estimation and verification in Q#

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Majority-of-three  $f = \langle x_1 x_2 x_3 \rangle = [x_1 + x_2 + x_3 \geq 2]$

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*Task:* Implement  $Q\#$  operation that maps  $|x_1 x_2 x_3\rangle |y\rangle \mapsto |x_1 x_2 x_3\rangle |y \oplus f\rangle$

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Truth table

i	$x_3$	$x_2$	$x_1$	f
0	0	0	0	0
1	0	0	1	0
2	0	1	0	0
3	0	1	1	1
4	1	0	0	0
5	1	0	1	1
6	1	1	0	1
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Boolean expression

$$f = x_1 x_2 \oplus x_1 x_3 \oplus x_2 x_3$$

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### Truth table

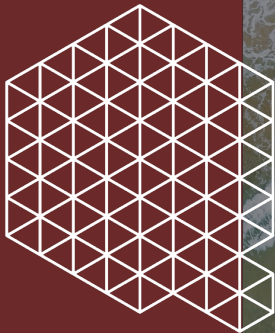
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### Boolean expression

$$f = x_1 x_2 \oplus x_1 x_3 \oplus x_2 x_3$$

### Alternative Boolean expression

$$f = (x_1 \oplus x_2)(x_2 \oplus x_3) \oplus x_2$$



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