

12 Q2) Measure  $|0\rangle$  in basis  
 $|+X+1\rangle, |-X-1\rangle$

1 a) Probabilities of outcomes  $+$  and  $-$  resp.

2 b) What are post measurement states if one  
3 obtain outcome  $+$  or  $-$ , resp?

4 Soln) These are also called the measurement  
5 operators

6 
$$M_+ = | +X+1 \rangle = \frac{1}{\sqrt{2}} (|0\rangle + |1\rangle) (\langle 0| + \langle 1|)$$

7 
$$M_- = | -X-1 \rangle = \frac{1}{\sqrt{2}} (|0\rangle - |1\rangle) (\langle 0| - \langle 1|)$$

Since  $|0\rangle = \frac{1}{\sqrt{2}} (|+\rangle + |-\rangle)$

a) The probabilities of outcome  $|+\rangle$  and  $|-\rangle$  both  
are 50% or  $\frac{1}{2}$ .

2023 AUGUST

	7	14	21	28
1	8	15	22	29
2	9	16	23	30
3	10	17	24	31
4	11	18		
5	12	19	26	
6	13	20	27	

Notes



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(b) After the measurement, the wavefunction collapses

If one obtains the outcome +, the final

$$\text{state is } |+\rangle = \frac{1}{\sqrt{2}} (|0\rangle + |1\rangle)$$

If one obtains the outcome -, the final state

$$\text{is } |-\rangle = \frac{1}{\sqrt{2}} (|0\rangle - |1\rangle)$$