e) $|\psi\rangle = \frac{2i}{\sqrt{5}}\left(H|0\rangle\right)|1\rangle - \frac{1}{\sqrt{5}}\left(H|1\rangle\right)|0\rangle$

$$= \frac{2i}{\sqrt{5}}\left(\frac{|0\rangle + |1\rangle}{\sqrt{2}}\right)|1\rangle - \frac{1}{\sqrt{5}}\left(\frac{|0\rangle - |1\rangle}{\sqrt{2}}\right)|0\rangle$$

$$= \frac{2i}{\sqrt{2}\sqrt{5}}|01\rangle + \frac{2i}{\sqrt{2}\sqrt{5}}|11\rangle - \frac{1}{\sqrt{2}\sqrt{5}}|00\rangle - \frac{1}{\sqrt{2}\sqrt{5}}|10\rangle$$

$$N = \frac{2i\cdot(-2i)}{2\cdot 5} + \frac{2i(-2i)}{2\cdot 5} + \frac{1}{2\cdot 5} + \frac{1}{2\cdot 5}$$

$$= \frac{2}{5} + \frac{2}{5} + \frac{1}{10} + \frac{1}{10} \quad \checkmark$$

So the probiblity of Alice measuring one after Hadamard and bob measures one is $\frac{2}{5}$ or 40%