Finding Matrix Elements

1) Carry out the following matrix calculations.

$$
\begin{pmatrix} 0 & 1 & 0 \end{pmatrix}
\begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix}
\begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}
$$

and

$$
\begin{pmatrix} 0 & 1 & 0 \end{pmatrix}
\begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix}
\begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}
$$

2) What matrix multiplication would you do if you wanted the answer to be a_{13}?

3) The bra-ket language for the calulations in question 1 are

$$
\langle 2|A|1 \rangle =? \quad \text{and} \quad \langle 2|A|2 \rangle =?
$$

Write question number 2 in bra-ket language.