This is a 2-by-2 matrix: 
\[
\begin{bmatrix}
1 & 2 \\
3 & 4
\end{bmatrix}
\]

This is a 3-by-3 matrix: 
\[
\begin{bmatrix}
1 & 2 & 3 \\
4 & 5 & 6 \\
7 & 8 & 9
\end{bmatrix}
\]

The way to do determinants seems arbitrary, but it's not. Determinants are quite useful!

For a generic 3 by 3 matrix \[
\begin{bmatrix}
a & b & c \\
d & e & f \\
g & h & i
\end{bmatrix}
\]
the determinant can be done by what's called a cofactor expansion about the top row. So \[
\det(A) = a(ei - fh) - b(di - fg) + c(dh - eg)
\]
For a generic 2 by 2 matrix \[
\begin{bmatrix}
a & b \\
c & d
\end{bmatrix}
\]
the determinant is \[
\det(A) = ad - bc
\]

Absolute-value-looking things on a matrix denote the determinant of the matrix.
\[ \langle z', 1 - g \rangle = \left( \langle z, 1 - g \rangle + \frac{r}{2} \right) + \frac{r}{2} - \left( \langle z, 1 - g \rangle + \frac{r}{2} \right) = \left( \frac{1}{2} \right) + \frac{r}{2} = \frac{1}{2} + \frac{r}{2} \]

The factor of \( a \) is:

\[ f \]

Since \( f = 1 - g \),

\[ \text{which is} \quad 1 - g \]

\[ \text{which is} \quad (d - f) \]

\[ \text{which is} \quad e = a \]

\[ \text{So, the factor of} \quad a \text{ is:} \]

\[ a \]

\[ a \]

\[ a \]

\[ a \]

\[ a \]