`Mixed Strategies`
If both show same face, then $P_1$ wins. $P_2$ pays 1 Rs to $P_1$.

On the other hand, if both show a different face, then $P_2$ wins. $P_1$ has to pay 1 Rs to $P_2$. 
<table>
<thead>
<tr>
<th></th>
<th>P</th>
<th>( \bar{P} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( P_i )</td>
<td>H</td>
<td>-1, 1</td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>( -1, 1 )</td>
</tr>
<tr>
<td>( P_2 )</td>
<td>H</td>
<td>( 1, -1 )</td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>( -1, 1 )</td>
</tr>
</tbody>
</table>

No intersection of best responses!

Pure strategies where each player is choosing one action.
Games in which players can randomly choose a particular action with a certain probability.

- Mixed Strategy
- Randomized Strategy
\[ P \leq p \leq 1 \]

\[ P = \frac{1}{4} \] — Player 1 is choosing H with probability \( \frac{1}{4} \) randomly with frequency 25\% he is choosing H.

\[ \text{Probability of Tails} = 1 - \frac{1}{4} = \frac{3}{4} \]

on an average 75\% of the time he is choosing T.
<table>
<thead>
<tr>
<th></th>
<th>( a )</th>
<th>( 1-a )</th>
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</thead>
<tbody>
<tr>
<td>( p )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( P_2 )</td>
<td>( p_1 )</td>
<td>( H )</td>
</tr>
<tr>
<td>( H )</td>
<td>( 1, -1 )</td>
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</tr>
<tr>
<td>( T )</td>
<td>( -1, 1 )</td>
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</tbody>
</table>

\[
U_2(H) = p \times (-1) + (1-p)(1) = 1 - 2p.
\]

\[
U_2(T) = p \times 1 + (1-p)(-1) = 2p - 1
\]
Therefore, \( P_2 \) would 'Mix' or 'Randomly' choose between \( H \) and \( T \) only if both payoffs are equal!

For a mixed strategy equilibrium,

\[
U_2(H) = U_2(T) \\
1 - 2p = 2p - 1
\]
\[ 1 - 2p = 2p - 1 \]
\[ 4p = 2 \]
\[ p = \frac{1}{2} \]

\[ 0 \leq q \leq 1 \]

Player 2 chooses H with probability \( q \) \( / \) chooses T with prob \( 1 - q \)
\[ U_i(H) = q \times 1 + (1-q)(-1) = 2q - 1 \]
\[ U_i(T) = q \times (-1) + (1-q) \times 1 = 1 - 2q \]

\( P_i \) will 'mix' only when,
\[ U_i(H) = U_i(T) \]
\[ \Rightarrow 2q - 1 = 1 - 2q \]
\[2q - 1 = 1 - 2q\]
\[4q = 2\]
\[q = \frac{1}{2}\]

\[q = \frac{1}{2}, \quad 1-q = \frac{1}{2}\]

\(P_2\) is mixing \(HH, TT\) with prob. \(\frac{1}{2}, \frac{1}{2}\).
Similarly, \( p = \frac{1}{2} \rightarrow 1 - p = \frac{1}{2} \).

Therefore, \( P_i \) is mixing H, T with prob \( \frac{1}{2}, \frac{1}{2} \).

<table>
<thead>
<tr>
<th>Mixed Strategy NE</th>
</tr>
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<tbody>
<tr>
<td>( \left( \frac{1}{2}, \frac{1}{2} \right) )</td>
</tr>
</tbody>
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Mixed Strategy \( P_1 \)

Mixed Strategy \( P_2 \)