The first part of the solution requires a bit of mathematical gymnastics using our old school-friend, ALGEBRA. We will concentrate on calculating the potential percentages, ignoring pair origins for the moment. We have enough information from Clues 3 and 7 to find the sessional percentages for the USA, the overall winners and one of the pairs ranked joint second.

From Clue 3, we know that the first session score for the USA = the average sessional score for the winners. So if \( x \) = the first session score for the USA then \( 2x \) = the aggregate score for the winners. From Clue 7, we know the winners improved their percentage by 1.58. So if \( y \) = first session score from winners the second session score must = \( y + 1.58 \). From this paragraph we know the aggregate total, in terms of \( x \), of the winners so the sum of their 2 sessions (\( y \) and \( y + 1.58 \)) must = \( 2x \).

Also from Clue 3, we know the Americans had the same 2nd session score as one of the pairs who came second and this pair scored 5.41% more than the winners in the first session. So the first session score for this 2nd placed pair has to be \( y + 5.41 \). Let us make \( z \) their 2nd session percentage. As the Americans averages 52.05% their aggregate score for the 2 sessions has to be 104.1%. But this equals \( x + z \).

From Clue 7, we know that the average for either of the 2nd placed pairs was 2.36% less than the winners. So their aggregate score has to be twice this percentage less than the winners. i.e. \( 2x - 4.72 \). But this must equal the sum of their first session (\( y+5.41 \)) and their second session score, \( z \). To express these relationships algebraically, and to solve them, let us recap.

Let \( x \) = first session score for the US, \( y \) = first session score for winners and \( z \) = second session score for US.

So,

\[
\begin{align*}
x + z &= 104.1 \quad (1) \\
y + (y + 1.58) &= 2x \quad (2) \\
y + 5.41 + z &= 2x - 4.72 \quad (3)
\end{align*}
\]

From (2) \( 2y + 1.58 = 2x \). Dividing through by 2

\[
x = y + 0.79 \quad (4)
\]

From (3) \( y + z = 2x - 4.72 - 5.41 \). Substituting \( y + (y + 1.58) \) for \( 2x \) (2) we get

\[
y + z = y + y + 1.58 - 4.72 - 5.41 = 2y - 8.55 \Rightarrow y = z + 8.55 \quad (5)
\]

Substituting (4) into (5)

\[
x - 0.79 = z + 8.55 \Rightarrow x - z = 8.55 + 0.79 = 9.34 \quad (6)
\]

Adding together both sides of (1) and (6) - basically a simultaneous equation

\[
x + z + x - z = 9.34 + 104.1 \Rightarrow 2x = 113.44 \Rightarrow x = 56.72
\]

\[
z = 104.01 - x = 47.38 \text{ from (1)}
\]

\[
y = 56.72 - 0.79 = 55.93 \text{ from (4)}
\]

Solution For Logic Problem 5
BBO Invitational Tourney
So, the winners had 55.93% in first session and 57.51% (55.93 + 1.58) in second session with an average % age of 56.72% (\([55.93 + 57.51]/2\)).

One of the pairs in second place had first session %age of 61.34% (55.93 + 5.41) and a second session %age of 47.38% (\(z\)) giving them an average of 54.36% (\([61.34 + 47.38]/2\)).
The American pair scored 56.72% in first session and 47.38% (\(z\)) in the second session with an average sessional %age of 52.05% (given).

Clue 3 states that ‘...the other pair who came joint second overall, scored **1.86%** less in the second set than they did in the first...’. This pair must have scored the same average %age as the other joint 2nd pair, that is 54.36%. As they scored 1.86 less in second set than the first, let us make \(x = \) first session %age then

\[x + (x—1.86) = 54.36 \times 2 \Rightarrow 2x = 110.58 \Rightarrow \text{this pair scored 55.29% in first session and 53.43% (55.29-1.86) in the second session (with an average of 54.36%).}

From Clue 7, the 5th placed first session score was 50.24%. Therefore, we now have the top 5 first session scores (61.34, 57.51, 56.72, 55.29 and 50.24).

As the total first session scores for all the pairs in the first session must = 400 (50*8), the bottom 3 pairs must have an aggregate score of 400— (61.34 + 57.51 + 56.72 + 55.29 + 50.24) = 120.48.

From Clue 5, let us say that the 7th placed pair scored \(x\). The 6th placed pair must have scored \(x + 1.19\) and the 8th placed pair must have score \(x—6.17\).

So \(x + (x + 1.19) + (x—6.17) = 120.48 \Rightarrow 3x = 120.48 + 1.19 = 125.36 \Rightarrow x = 41.82\%

The 6th placed pair after first session scored 43.01%, the 7th placed pair scored 41.82% and the 8th placed pair scored 35.65%.

So the 7th placed pair must also have score 41.82% in second session and averaged, of course, 41.82%.

From Clue 8, ‘**the pair who came last in the first session had a storming 2nd session and improved their %age by 23.88%**.’ means that the pair who scored 35.65% in the first session must have scored 59.53% (35.65 + 23.88) and thus averaging 47.59% (\([35.65 + 59.53]/2\)) over the 2 sessions.

From Clue 4 which states ‘**The 2 pairs who came 1st and last in the event originated from the same continent, their final average score differing by **17.83%**.’ As the %age for the winning pair was calculated to be 56.72%, the pair in last place must have achieved an average of 38.89% (56.72—17.83).

As we have 7 average percentages assigned, we can calculate the 8th average as the average percentages for the whole group must = 50%. This average percentage is 54.21%.

There are now 2 possible solutions.

There are only 2 pairs who have not both sessional percentages assigned. The pair who scored 50.24% after first session, and the pair who came 6th with 43.01%. All the rest have been paired up.

If the pair who came 6th averaged 38.89%, then this pair scored 34.77% in the second session (\([43.01 + 34.77]/2 = 38.89\)) and the pair who had 50.24% must have scored 58.18% (\([50.24 + 58.18]/2 = 54.21\)).

If the pair who came 5th averaged 38.89% then this pair scored 27.54% in the second session (\([52.04 + 27.54]/2 = 38.89\)). The pair who came 6th must then have scored 65.41% in the 2nd session to get an average of 54.21% (\([43.01 + 65.41]/2 = 54.21\)).
The 2 Possible Scenarios For The MP Scores and Rankings For The Eight Pairs
In The Competition

<table>
<thead>
<tr>
<th>1st Sess %</th>
<th>1st Sess Rank</th>
<th>2nd Sess %</th>
<th>2nd Sess Rank</th>
<th>Agg. %</th>
<th>Average %</th>
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<td>56.72</td>
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<td>108.72</td>
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<tr>
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<tr>
<td>41.82</td>
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<td>41.82</td>
<td>7</td>
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<td>8</td>
</tr>
</tbody>
</table>

Now we can go about calculating the countries the pairs originate from. We know the United States are the pair who came ranked 5th as they averaged 52.05%. The 2 European pairs, namely Norway and the United Kingdom, must have been 7th and 4th (3 rankings apart). As the United Kingdom cannot be position next to the United States in 5th (Clue 1), Norway must be 4th and the United Kingdom in 7th.

Clue 4 states that 'the 2 pairs who came 1st and last in the event originated from the same continent' They cannot be the North Americans as the States came 5th, nor can they be the Europeans who came 4th and 7th. As the Chinese did not win the competition (Clue 6) and the Uruguayans outperformed the North Koreans (Clue 9), the winners and losers cannot be the Asians either, so must be the South Americans. As the Uruguayans outperformed the North Koreans (Clue 9), the winners have to be from Uruguay and the pair in 8th place from Chile. Three teams, the Canadians, the North Koreans and the Chinese have yet to be placed and the equal second and 6th rankings yet to be appointed.

The Canadians cannot be 6th as they would be positioned next to the United States, which contravenes Clue 1. So the Canadians have to be one of the joint second ranking pairs. As no countries with same initial cannot be positioned one after the other (Clue 2) the North Koreans must be joint second and the Chinese 6th. As Norway was 4th in the list, the North Koreans cant be 3rd in the list (Clue 2) so must be 2nd in the list and the Canadians 3rd, both these 2 countries having joined second ranking.

Puzzle solved!