16.5. Teams A and B play a hockey game consisting of three periods. The number of goals (points) scored in each period satisfies the following conditions:

(i) The total number of points scored by both teams in any one period is one or two.

(ii) The teams are never tied at the end of any period.

(iii) Neither team is ahead by more than 2 points at the end of any period.

(iv) Team A is leading at the end of the first period.

Find the number of ways the scoring can occur if the above conditions are satisfied. In how many ways will team B win?

Note first, by condition (i), that the scoring in any one period can occur in only five ways:

\[
\begin{array}{ccccc}
2 & 1 & 1 & 0 & 0 \\
0 & 0 & 1 & 1 & 2 \\
\end{array}
\]

The number at the top is the number of points scored by team A, and the number at the bottom by team B.

Construct the appropriate tree diagram:

Observe that condition (iv) allows only two of the above five scores to occur in the first period. By the tree diagram, the scoring can occur in only 13 ways, and in 4 of these which are exhibited on the right of the diagram, Team B will win.