Internship preliminary solution

Ans :-

To calculate the probability that two of the quarter-finals involve New Zealand playing against Ireland and France playing against South Africa, we can break the problem down into steps. We need to consider the pool standings and then determine the matchups in the quarter-finals based on those standings.

Step 1: Analyze the Pools

We have 4 pools (A, B, C, D), and the relevant teams for this problem are:

- Pool A: France (WR Rank 3), New Zealand (WR Rank 4)
- Pool B: Ireland (WR Rank 1), South Africa (WR Rank 2)
- Pool C: Australia (WR Rank 9), Fiji (WR Rank 7), Wales (WR Rank 10)
- Pool D: Argentina (WR Rank 6), England (WR Rank 8)

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Step 2: Possible Pool Standings

Given that the probability of the WR top ten teams maintaining the order relations is 0.6, we can determine the probability for different pool outcomes.

Pool A:

- The order relation probability: France > New Zealand (0.6)
- The reverse order (New Zealand > France): 0.4

Pool B:

- The order relation probability: Ireland > South Africa (0.6)
- The reverse order (South Africa > Ireland): 0.4

Pools C and D:

For the given problem, the specific outcomes of Pools C and D don't directly affect the quarter-finals of interest (NZ vs. Ireland and France vs. South Africa).

Step 3: Quarter-Final Matchups

For the desired quarter-final matchups:

- New Zealand must either be 1st in Pool A, and Ireland 2nd in Pool B, or vice versa.
- France must either be 1st in Pool A, and South Africa 2nd in Pool B, or vice versa.

The following cases lead to the desired quarter-final matchups:

1. **Case 1:**
    - Pool A: France 1st, New Zealand 2nd
    - Pool B: Ireland 1st, South Africa 2nd
2. Matchups:
   QF2: France vs. South Africa
   QF4: Ireland vs. New Zealand
3. **Case 2:**
    - Pool A: New Zealand 1st, France 2nd
    - Pool B: South Africa 1st, Ireland 2nd
4. Matchups:
   QF2: South Africa vs. France
   QF4: New Zealand vs. Ireland

Step 4: Probability Calculation

- **Case 1 Probability:**
    - Pool A: France 1st, New Zealand 2nd (Probability = 0.6)

    - Pool B: Ireland 1st, South Africa 2nd (Probability = 0.6)
- Combined Probability for Case 1 = 0.6×0.6=0.36
- **Case 2 Probability:**
    - Pool A: New Zealand 1st, France 2nd (Probability = 0.4)
    - Pool B: South Africa 1st, Ireland 2nd (Probability = 0.4)
- Combined Probability for Case 2 = 0.4×0.4=0.16

Step 5: Total Probability

Since either Case 1 or Case 2 would satisfy the desired quarter-final matchups, we sum their probabilities:

Total Probability=0.36+0.16=0.52\text{Total Probability} = 0.36 + 0.16 = 0.52Total Probability=0.36+0.16=0.52

Final Answer:

The probability that two of the quarter-finals involved New Zealand playing against Ireland and France playing against South Africa is 0.52 or 52%.