

Problem

A sports team has a name, and consists of a number of players. When the team has the required number of players, it can compete.

A player has a name, a team and a position. The position may be "Attack" or "Defence", and is set only when the player is allocated to a team. If the player is not allocated to a team, the position must be blank (i.e. "").

A player can only be in one team at a time. A player cannot be added to a team if he or she is already in the team.

A team cannot have more than the required number of players, although it can have fewer.

A team's required number of players must be one or more.

Write and test code to implement these requirements.

Requirements

- R1 A team has a name
- R2 A team has a required number of players, which must be one or more
- R3 A player has a name
- R4 A player's position is either "Attack" or "Defence" only when in a team
- R5 A player's position must be blank (i.e. "") when the player is not in a team
- R6 A team has zero or more players
- R7 A player can be added to a team
- R8 A player is in no team
- R9 A player is in one team
- R10 A player cannot be in more than one team at a time
- R11 A player cannot be added to a team if already in the team
- R12 A player can be removed from a team
- R13 When the number of players in a team is equal to the team's required number of players, the team can compete
- R14 A team cannot have more than the required number of players

Test cases

Normal values

- N1 Team name = "A-Team" (R1)
- N2 Required number of players = 5 (R2)
- N3 Player name = "Jimmy" (R3)
- N4 Player position = "Attack" (R4)

Invalid values

- I1 Team name = "" (R1)
- I2 Required number of players = -4 (R2)
- I3 Player name = "" (R3)
- I4 Player position = "Wing" (R4)

Boundary values

- B1 Required number of players = 0 (R2)
- B2 Required number of players = 1 (R2)
- B3 Number of players in a team is one less than the team's required number of players (R13)
- B4 Number of players in a team is equal to the team's required number of players (R13)

Special cases

- S1 Add player (Jimmy) to team (A-Team) in position "Defence" (R4, R7, R9)
- S2 Player (Jimmy) is removed from team (A-Team) (R5, R8, R12)
- S3 Remove a player from a team that has no players (R6)
- S4 Add a player to a team that already has the required number of players (R14)
- S5 Add a player to a team (B-Team) when the player is already in team (A-Team) (R10)
- S6 Add a player to a team (A-Team) when the player is already in team (A-Team) (R11)

Test plan

Test plans should not be cumulative; i.e. a test must not rely on the prior successful execution of another test. Each test should be independent of all other tests.

Note: UT = Unit Test; IT = Integration Test

Test	Instruction (Satisfies test cases)	Expected
UT1	Create a team called "A-Team" requiring 5 players (N1, N2)	There is a team whose name is "A-Team" requiring 5 players
UT2	Create a player named "Jimmy" (N3)	There is a player whose name is "Jimmy", and whose position is blank
UT3	Create a team with a blank name requiring 5 players (I1)	Error: team not created
UT4	Create a team called "Z-Team" requiring -4 players (I2)	Error: team not created
UT5	Create a player with a blank name (I3)	Error: player not created
UT6	Create a team called "Y-Team" requiring zero players (B1)	Error: team not created
UT7	Create a team called "B-Team" requiring 1 player (B2, B3)	There is a team whose name is "B-Team" requiring 1 player The team cannot compete
IT8	Create a player named "Jimmy" Create a team called "B-Team" requiring 1 player Add player "Jimmy" to team "B-Team" in position "Defence" (B4, S1)	Team "B-Team" has only one player, and that player's name is "Jimmy" The team can compete Player "Jimmy" has a team with name = "B-Team", and a position = "Defence"

Test	Instruction (Satisfies test cases)	Expected
IT9	<p>Create a player named "Jimmy"</p> <p>Create a team called "B-Team" requiring 1 player</p> <p>Add player "Jimmy" to team "B-Team" in position "Defence"</p> <p>Create player ("John"), and add this new player to team "B-Team" in position "Attack"</p> <p>(S4)</p>	<p>Player "John" is not added to team B-Team</p> <p>Player "John" does not have a team, and a position that is blank</p> <p>The team "B-Team" has one player whose name is "Jimmy"</p>
IT10	<p>Create a player named "Jimmy"</p> <p>Create a team called "B-Team" requiring 1 player</p> <p>Add player "Jimmy" to team "B-Team" in position "Defence"</p> <p>Remove player "Jimmy" from team "B-Team"</p> <p>(S2)</p>	<p>Team "B-Team" has no players</p> <p>The team cannot compete</p> <p>Player "Jimmy" has no team, and a position that is blank</p>
IT11	<p>Create a player named "Jimmy"</p> <p>Create a team called "B-Team" requiring 1 player</p> <p>Add player "Jimmy" to team "B-Team" in position "Defence"</p> <p>Remove player "Jimmy" from team "B-Team"</p> <p>Remove player "Jimmy" from team "B-Team"</p> <p>(S3)</p>	<p>Player "Jimmy" is not removed</p> <p>The team "B-Team" has no players</p>
IT12	<p>Create a team called "A-Team" requiring 5 players</p> <p>Create a team called "B-Team" requiring 1 player</p> <p>Create a player named "Jimmy"</p> <p>Add player "Jimmy" to team "A-Team" in position "Attack"</p> <p>Add player "Jimmy" to team "B-Team" in position "Defence"</p> <p>(N4, S5)</p>	<p>Team "A-Team" has only one player, and that player's name is "Jimmy"</p> <p>The team cannot compete</p> <p>Player "Jimmy" has a team with name = "A-Team", and a position = "Attack"</p> <p>Team "B-Team" has no players, and cannot compete</p>
IT13	<p>Create a team called "A-Team" requiring 5 players</p> <p>Create a player named "Jimmy"</p> <p>Add player "Jimmy" to team "A-Team" in position "Attack"</p> <p>Add player "Jimmy" to team "A-Team" in position "Defence"</p> <p>(S6)</p>	<p>Player "Jimmy" is not added</p> <p>Team "A-Team" has only one player, and that player's name is "Jimmy"</p> <p>The team cannot compete</p> <p>Player "Jimmy" has a team with name = "A-Team", and a position = "Attack"</p>

Test	Instruction (Satisfies test cases)	Expected
IT14	Create a team called "A-Team" requiring 5 players Create a player named "John" Add player "John" to team "A-Team" in position "Wing" (I4)	Player "John" is not added, has no team, and a position that is blank Team "A-Team" has no players