User Entity:

Attributes:

User ID (Primary Key)

Username

Email

Password (hashed and salted)

First Name

Last Name

Date of Birth

Profile Picture

Registration Date

Pantry Item Entity:

Attributes:

Item ID (Primary Key)

User ID (Foreign Key to User)

Item Name

Quantity

Category

Expiry Date

Relationship:

Many-to-One relationship with User (Each pantry item is associated with one user)

Recipe Entity

Attributes:

Recipe ID (Primary Key)

Recipe Name

Description

Preparation Time

Cooking Time

Serving Size

Instructions

Image

Source (e.g., cookbook, website)

User ID (Foreign Key to User)

Relationship:

Many-to-One relationship with User (Each recipe is associated with one user)

Ingredient Entity

Attributes:

Ingredient ID (Primary Key)

Ingredient Name

Relationship:

Many-to-Many relationship with Recipe (A recipe can have multiple ingredients, and an ingredient can be used in multiple recipes)

Meal Plan Entity:

Attributes:

Meal Plan ID (Primary Key)

User ID (Foreign Key to User)

Plan Name

Start Date

End Date

Relationship:

Many-to-One relationship with User (Each meal plan is associated with one user)

Meal Entity:

Attributes:

Meal ID (Primary Key)

Meal Plan ID (Foreign Key to Meal Plan)

Recipe ID (Foreign Key to Recipe)

Meal Date

Meal Time

Relationship:

Many-to-One relationship with Meal Plan (Each meal is part of one meal plan)

Many-to-One relationship with Recipe (Each meal uses one recipe)

Grocery List Entity:

Attributes:

Grocery List ID (Primary Key)

User ID (Foreign Key to User)

List Name

Creation Date

Relationship:

Many-to-One relationship with User (Each grocery list is associated with one user)

Grocery Item Entity:

Attributes:

Grocery Item ID (Primary Key)

Grocery List ID (Foreign Key to Grocery List)

Item Name

Quantity

Status (e.g., purchased or not purchased)

Relationship:

Many-to-One relationship with Grocery List (Each grocery item is part of one grocery list)

Normalization is a process used to organize the data in a relational database to reduce data redundancy and improve data integrity. Based on the entities listed above, here are the related attributes that should be recorded while considering normalization rules:

User Entity: Already in at least First Normal Form (1NF) as each attribute contains atomic values.

Pantry Item Entity: In 1NF, attributes are atomic. The relationship between User and Pantry Item represents a foreign key relationship (2NF).

Recipe Entity: In 1NF, attributes are atomic. The relationship between User and Recipe is a foreign key relationship (2NF).

Ingredient Entity: In 1NF, attributes are atomic. This entity may not need further normalization since it primarily serves as reference data for recipes.

Meal Plan Entity: In 1NF, attributes are atomic. The relationship between User and Meal Plan is a foreign key relationship (2NF).

Meal Entity: In 1NF, attributes are atomic. The relationships with Meal Plan and Recipe are foreign key relationships (2NF).

Grocery List Entity: In 1NF, attributes are atomic. The relationship between User and Grocery List is a foreign key relationship (2NF).

Grocery Item Entity: In 1NF, attributes are atomic. The relationship with Grocery List is a foreign key relationship (2NF).