

Lab 9: Normalization 3

1) Here are all of the formal dependencies as well as the set ups for each of the tables:

People table:

```
create table people(  
    pid text NOT NULL,  
    firstName text,  
    lastName text,  
    addressNumber int,  
    addressStreet text,  
    addressTown text,  
    addressZipCode int,  
    phoneNumber int,  
    age int,  
    primary key (pid)  
);
```

pid → firstName, lastName, addressNumber, addressStreet, addressTown, addressZipCode, phoneNumber, age

Coaches table:

```
create table coaches(  
    pid NOT NULL references people(pid),  
    yearsOfCoaching int,  
    primary key (pid)  
);
```

pid → yearsOfCoaching

HeadCoaches table:

```
create table headCoaches(  
    pid NOT NULL references coaches(pid),  
    primary key (pid)  
);
```

pid →

AssistantCoaches

```
create table assistantCoaches(  
    pid NOT NULL references coaches(pid),  
    primary key (pid)  
);
```

pid →

Teams table:

```
create table teams(  
    tid NOT NULL text,  
    teamName text,  
    primary key (tid)  
);
```

tid → teamName

HeadUnder10League

```
create table HeadUnder10League(  
    tid NOT NULL references teams(tid),  
    pid NOT NULL references headcoaches(pid),  
    primary key(tid, pid)  
);
```

tid, pid →

Head10To14League

```
create table Head10To14League(  
    tid NOT NULL references teams(tid),  
    pid NOT NULL references headcoaches(pid),  
    primary key(tid, pid)  
);
```

tid, pid →

HeadUnder10League

```
create table HeadOver14League(  
    tid NOT NULL references teams(tid),  
    pid NOT NULL references headcoaches(pid),  
    primary key(tid, pid)  
);
```

tid, pid →

AssistantCoachesU10

```
create table assistantCoachesU10(  
    tid NOT NULL references teams(tid),  
    pid NOT NULL references assistantCoaches(pid),  
    primary key(pid)  
);
```

pid → tid

AssistantCoachesU10

```
create table assistantCoachesU10 (
    tid NOT NULL references teams(tid),
    pid NOT NULL references assistantCoaches(pid),
    primary key(pid)
);
pid → tid
```

AssistantCoaches10to14

```
create table assistantCoaches10to14 (
    tid NOT NULL references teams(tid),
    pid NOT NULL references assistantCoaches(pid),
    primary key(pid)
);
pid → tid
```

AssistantCoachesOver14

```
create table assistantCoachesOver14 (
    tid NOT NULL references teams(tid),
    pid NOT NULL references assistantCoaches(pid),
    primary key(pid)
);
pid → tid
```

PlayersU10

```
create table playersU10 (
    tid NOT NULL references teams(tid),
    pid NOT NULL references players(pid),
    primary key(pid)
);
pid → tid
```

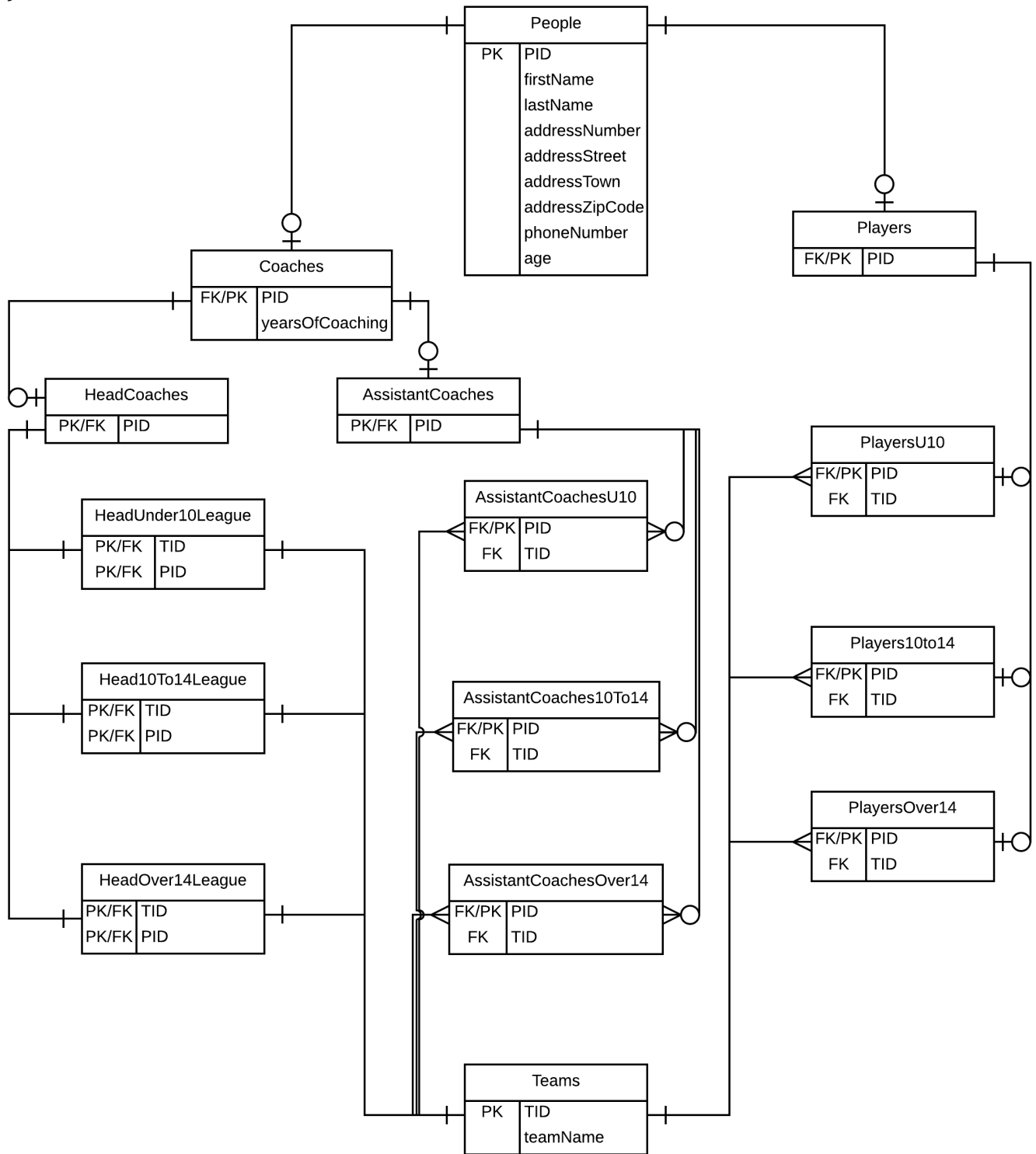
Players10to14

```
create table players10to14 (
    tid NOT NULL references teams(tid),
    pid NOT NULL references players(pid),
    primary key(pid)
);
pid → tid
```

PlayersOver14

```
create table playersOver14 (
    tid NOT NULL references teams(tid),
    pid NOT NULL references players(pid),
    primary key(pid)
);
pid → tid
```

2)



3) To prove that this is in 3rd Normal Form, we must first prove that it is in 1st, 2nd, and 3rd normal form.

- Proof of 1st normal form: To prove that this is in first normal form, we must show that each intersection of rows and columns will be autonomous. In the *people* table, we can see that each row has only one text structure and each row corresponds to 1 object. This is similar to every other table, and therefore, since every single intersection of rows and columns is autonomous, we can state confidently that this is in first normal form.
- Proof of 2nd normal form: To prove that the database is in second normal form, we must show that 1st normal form is held and that there are no partial key dependencies. Since we just proved 1st normal form, we will spend time proving if there are no partial key dependencies. Throughout each table, we can state that all of the non-key attributes are functionally dependent on all of the attributes that correspond to the primary key. Since each table does not have any partial key dependencies, we can then state that this is in 2nd normal form.
- Proof of 3rd normal form: To prove that the database is in third normal form, we must show that 1st normal form and 2nd normal form are held and all attributes are dependent on the primary key and only the primary key. 1st and 2nd normal form have been proven true, so we will continue with proving that all attributes are dependent on the primary key and only the primary key. Throughout each of the 15 tables, each attribute that is not the primary key is dependent on the primary key and only the primary key. There is no table in which an attribute is depending on anything other than a primary key. Thus, we can then state that this database is in 3rd normal form.