University of British Columbia, Vancouver
Department of Computer Science

CPSC 304 Project Cover Page

Milestone #: 2

Date: Feb. 28, 2024

Group Number: 25

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By typing our names and student numbers in the above table, we certify that the work in the attached assignment was performed solely by those whose names and student IDs are included above. (In the case of Project Milestone 0, the main purpose of this page is for you to let us know your e-mail address, and then let us assign you to a TA for your project supervisor.)

In addition, we indicate that we are fully aware of the rules and consequences of plagiarism, as set forth by the Department of Computer Science and the University of British Columbia

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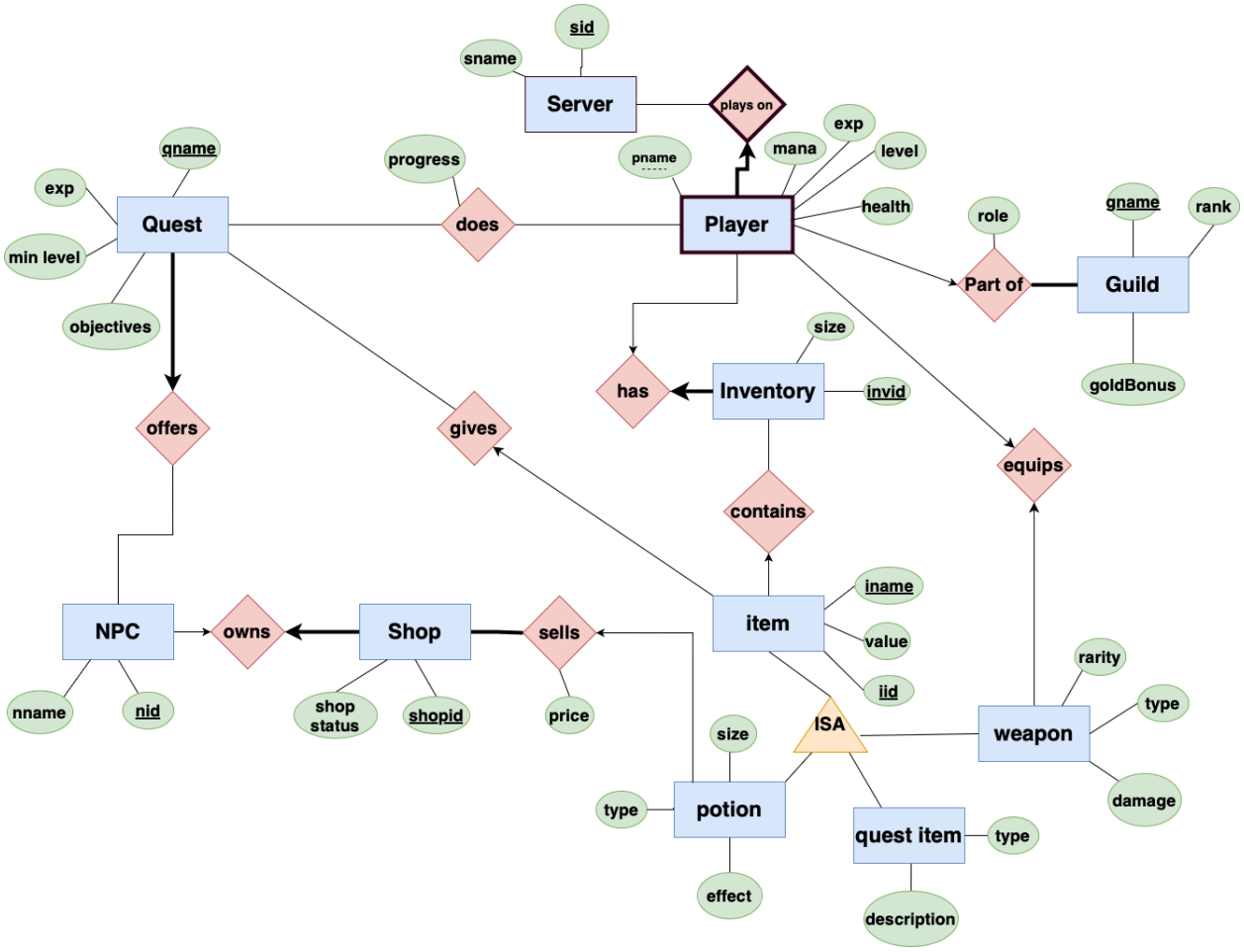
Project Summary

The domain of this project is player data management for an RPG game. In creating it we're trying to figure out the best way to organize the various bits of data relating to a character as well as the NPCS, items, and other elements it interacts with in our RPG game.

ER Diagram



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Initial Schema

- Server(sid: int, sname: varchar, region: varchar)
    - PK: sid

- Player(pname: varchar, sid: int, wname: varchar, wid: int, gname: varchar, mana: int, exp: int, level: int, health: int, role: varchar)
    - PK: pname, sid
    - FK: sid references Server(sid), wname references Weapon(wname), wid references Weapon(wid), gname references Guild (gname)
    - mana, exp, level, int, health, sid are NOT NULL

- Quest(qname: varchar, giverid: int, exp: int, minlevel: int, objectives: varchar)
    - PK: qname
    - CK: objectives
    - FK: giverid references NPC(nid)
    - giverid, exp, minlevel, objectives are NOT NULL
    - objectives is UNIQUE

- Inventory(invid: int, pname: varchar, sid: int, size: int)
    - PK: invid
    - CK: pname, sid
    - FK: pname references Player(pname), sid references Server(sid)
    - pname, sid are UNIQUE, NOT NULL
    - size is NOT NULL

- Guild(gname: varchar, rank: varchar, goldBonus: int)
    - PK: gname

- NPC(nid: int, nname: varchar)
    - PK: nid
    - nname is NOT NULL

- Shop(shopid: int, ownerid: int, status: varchar)
    - PK: shopid
    - CK: ownerid
    - FK: ownerid references NPC(nid)
    - ownerid is NOT NULL, UNIQUE
    - status is NOT NULL

Note: Only Shop and Owns are combined, not all three of Shop, Owns, and NPC.

- Item(iname: varchar, iid: int, invid: int, questname: int, value: int)
    - PK: iname, iid
    - FK: questname references Quest(qname), invid references Inventory(invid)
    - value is NOT NULL

- Potion(ptname: varchar, ptid: int, shopid: int, type: varchar, size: varchar, effect: varchar, price: int)
    - PK: ptname, ptid
    - FK: shopid references Shop(shopid), name references Item(iname), id references Item(iid)
    - type, size, effect are NOT NULL

- QuestItem(qiname: varchar, qiid: int, type: varchar, description: varchar)
    - PK: qiname, qiid
    - FK: qiname references Item(iname), qiid references Item(iid)
    - type, description are NOT NULL

- Weapon(wname: varchar, wid: int, type: varchar, rarity: varchar, damage: int)
    - PK: wname, wid
    - FK: wname references Item(iname), wid references Item(iid)
    - type, rarity, damage are NOT NULL

- Does(qname: varchar, pname: varchar, sid: int, progress: int)
    - PK: qname, pname, sid
    - FK: qname references Quest(qname), pname references Player(pname), sid references Server(sid)
    - progress is NOT NULL

Functional Dependencies (* = primary or candidate key)

Server**:**
- sid → sname, region *

Player**:**
- pname, sid → mana, exp, level, health, wname, wid, gname, role *
- exp → level
- level → mana, health

Quest**:**
- qname → giverid, exp, minlevel, objectives *
- objectives → qname, giverid, exp, minlevel *

Inventory**:**

- invid → pname, sid, size *
- pname, sid → invid, size *

Guild:
- gname → rank, goldBonus *
- rank → goldBonus

NPC:
- nid → nname *

Shop:
- shopid → ownerid, status *
- ownerid → shopid, status *

Item:
- iid, iname → invid, questname, value *

Potion:
- iid, ptname → shopid, type, size, effect, price *
- type, size → effect

QuestItem:
- qiid, qiname → type, description *

Weapon:
- wname, wid → type, rarity, damage *
- type, rarity → damage

Does:
- qname, pname, sid → progress *

Normalization into BCNF

The four tables that needed to be normalized were Player, Guild, Potion and Weapon. The process of doing so is as follows:

Player

The minimal key in this relation is {pname, sid}.

The FD exp → level violates BCNF as exp is not a superkey.

We decompose on this FD to get

Player_2(exp, level) and Player_3(pname, sid, wname, wid, mana, exp, health, gname, role) where Player_3(exp) references Player_2(exp).

The implicit FD exp → mana violates BCNF as exp is not a superkey for Player_3.

We decompose on this FD to get
Player_4(exp, mana) and Player_5(pname, sid, wname, wid, exp, health, gname, role) where Player_5(exp) references Player_4(exp).

The implicit FD exp → health violates BCNF as exp is not a superkey for Player_5.

We decompose on this FD to get
Player_6(exp, health) and Player_7(pname, sid, wname, wid, exp, gname, role) where Player_7(exp) references Player_6(exp).

Guild

The minimal key in this relation is {gname}.
The FD rank → goldBonus violates BCNF as rank is not a superkey for this relation.

We decompose on this FD to get
Guild_2(rank, goldBonus) and Guild_3(gname, rank).

Potion

The minimal key in this relation is {ptname}.
The FD type, size → effect violates BCNF as {type, size} is not a superkey for this relation.

We decompose on this FD to get

Potion_2(type, size, effect), Potion_3(ptname, id, sid, type, size, price).

Weapon

The minimal key in this relation is {wname}.
The FD type, rarity → damage violates BCNF as {type, rarity} is not a superkey for this relation.

We decompose on this FD to get

Weapon_2(type, rarity, damage), Weapon_3(wname, wid, type, rarity).

All Table Schemas after Normalization

- Server(sid: int, sname: varchar, region: varchar)
    - PK: sid

- Player_2(exp: int, level: int)
    - PK: exp
    - level is NOT NULL

- Player_4(exp: int, mana: int)
    - PK: exp
    - FK: exp references Player_2(exp)
    - mana is NOT NULL

- Player_6(exp: int, health: int)
    - PK: exp
    - FK: exp references Player_4(exp)
    - health is NOT NULL

- Player_7(pname: varchar, sid: int, wname: varchar, wid: int, exp: int, gname: varchar, role: varchar)
    - PK: name, sid
    - FK: exp references Player_6(exp), wname references Weapon_3(wname), wid references Weapon_3(wid), gname references Guild_3(gname), sid references Server(sid)
    - exp is NOT NULL

- Guild_2(rank: int, goldBonus: int)
    - PK: rank

- Guild_3(gname: varchar, rank: int)
    - PK: gname
    - FK: rank references Guild_2(rank)

- Quest(qname: varchar, giverid: int, exp: int, minlevel: int, objectives: varchar)
    - PK: qname
    - CK: objectives
    - FK: giverid references NPC(nid)
    - giverid, exp, minlevel, objectives are NOT NULL
    - objectives is UNIQUE

- Inventory(invid: int, pname: varchar, sid: int, size: int)
    - PK: invid

    - CK: pname, sid
    - FK: pname references Player_7(pname), sid references Server(sid)
    - pname, sid are UNIQUE, NOT NULL
    - size is NOT NULL

- NPC(nid: int, nname: varchar)
    - PK: nid
    - nname is NOT NULL

- Shop(shopid: int, ownerid: int, status: varchar)
    - PK: shopid
    - CK: ownerid
    - FK: ownerid references NPC(nid)
    - ownerid is NOT NULL, UNIQUE
    - status is NOT NULL

- Item(iname: varchar, iid: int, invid: int, questname: int, value: int)
    - PK: iname, iid
    - FK: questname references Quest(name), invid references Inventory(invid)
    - value is NOT NULL

- QuestItem(qiname: varchar, qiid: int, type: varchar, description: varchar)
    - PK: qiname, qiid
    - FK: qiname references Item(iname), qiid references Item(iid)
    - type, description are NOT NULL

- Potion_2(type: varchar, size: varchar, effect: varchar)
    - PK: type, size
    - effect is NOT NULL

- Potion_3(ptname: varchar, ptid: int, shopid: int, type: varchar, size: varchar, price: int)
    - PK: ptname, ptid
    - FK: type, size reference Potion_2(type, size), shopid references Shop(shopid), ptname references Item (iname), ptid references Item (iid)
    - type, size are NOT NULL

- Weapon_2(type: varchar, rarity: varchar, damage: int)
    - PK: type, rarity
    - damage is NOT NULL
    - type, rarity are NOT NULL

- Weapon_3(wname: varchar, wid: int, type: varchar, rarity: varchar)
    - PK: wname, wid

- FK: type, rarity represent Weapon_2(type, rarity), wid represents Item(iid), wname references Item(iname)
- type, rarity are NOT NULL

- Does(qname: varchar, pname: varchar, sid: int, progress: int)
  - PK: qname, pname, sid
  - FK: qname references Quest(qname), pname references Player_7(pname), sid references Server(sid)
  - progress is NOT NULL

Table creation SQL DDL Statements

CREATE TABLE Server(sid INT PRIMARY KEY, sname VARCHAR, region VARCHAR);

CREATE TABLE Player_2(exp INT PRIMARY KEY, level INT NOT NULL);

CREATE TABLE Player_4(exp INT PRIMARY KEY, mana INT NOT NULL, FOREIGN KEY (exp) REFERENCES Player_2 (exp));

CREATE TABLE Player_6(exp INT PRIMARY KEY, health INT NOT NULL, FOREIGN KEY (exp) REFERENCES Player_4 (exp));

CREATE TABLE Player_7(pname VARCHAR, sid INT, wname VARCHAR, wid INT, exp INT NOT NULL, gname VARCHAR, role VARCHAR, PRIMARY KEY(pname, sid), FOREIGN KEY (sid) REFERENCES Server (sid), FOREIGN KEY (exp) REFERENCES Player_6 (exp), FOREIGN KEY (wname) REFERENCES Weapon_3 (wname), FOREIGN KEY (wid) REFERENCES Weapon_3 (wid), FOREIGN KEY (gname) REFERENCES Guild_3 (gname));

CREATE TABLE Guild_2(rank INT PRIMARY KEY, goldBonus INT);

CREATE TABLE Guild_3(gname VARCHAR PRIMARY KEY, rank INT, FOREIGN KEY (rank) REFERENCES Guild_2 (rank));

CREATE TABLE Quest(qname VARCHAR PRIMARY KEY, giverid INT NOT NULL, exp INT NOT NULL, minlevel INT NOT NULL, objectives VARCHAR NOT NULL, UNIQUE(objectives), FOREIGN KEY (giverid) REFERENCES NPC (nid));

CREATE TABLE Inventory(invid INT PRIMARY KEY, pname VARCHAR NOT NULL, sid INT NOT NULL, size INT NOT NULL, UNIQUE(pid, sid), FOREIGN KEY (pname) REFERENCES Player_7 (pname), FOREIGN KEY (sid) REFERENCES Server (sid));

CREATE TABLE NPC(nid INT PRIMARY KEY, nname VARCHAR NOT NULL);

CREATE TABLE Shop(shopid INT PRIMARY KEY, ownerid INT NOT NULL, status VARCHAR NOT NULL, UNIQUE (ownerid), FOREIGN KEY (ownerid) REFERENCES NPC (nid));

CREATE TABLE Item(iname VARCHAR, iid VARCHAR, invid INT, questname VARCHAR, value INT NOT NULL, PRIMARY KEY (iname, iid), FOREIGN KEY (questname) REFERENCES Quest (qname), FOREIGN KEY (invid) REFERENCES Inventory (invid));

CREATE TABLE Potion_2(type VARCHAR, size VARCHAR, effect VARCHAR NOT NULL, PRIMARY KEY(type, size));

CREATE TABLE Potion_3(ptname VARCHAR, ptid INT, type VARCHAR NOT NULL, size VARCHAR NOT NULL, shopid INT, price INT, PRIMARY KEY (ptname, ptid), FOREIGN KEY (ptname) REFERENCES Item (iname), FOREIGN KEY (ptid) REFERENCES Item (iid), FOREIGN KEY (type) REFERENCES Potion_2 (type), FOREIGN KEY (size) REFERENCES Potion_2 (size), FOREIGN KEY (shopid) REFERENCES Shop (shopid));

CREATE TABLE QuestItem(qiname VARCHAR, qiid INT, type VARCHAR NOT NULL, description VARCHAR NOT NULL, PRIMARY KEY (qiname, qiid), FOREIGN KEY (qiname) REFERENCES Item (name), FOREIGN KEY (qiid) REFERENCES Item (iid), FOREIGN KEY (qiname) REFERENCES Item (iname));

CREATE TABLE Weapon_2(type VARCHAR NOT NULL, rarity VARCHAR NOT NULL, damage INT NOT NULL, PRIMARY KEY(type, rarity));

CREATE TABLE Weapon_3(wname VARCHAR, wid INT, type VARCHAR NOT NULL, rarity VARCHAR NOT NULL, PRIMARY KEY (wname, wid), FOREIGN KEY (wname) REFERENCES Item (iname), FOREIGN KEY (wid) REFERENCES Item (iid), FOREIGN KEY (type) REFERENCES Weapon_2 (type), FOREIGN KEY (rarity) REFERENCES Weapon_2 (rarity));

CREATE TABLE Does (qname VARCHAR, pname VARCHAR, sid INT, progress INT NOT NULL, PRIMARY KEY(qname, pname, sid), FOREIGN KEY (qname) REFERENCES Quest (qname), FOREIGN KEY (pname) REFERENCES Player_7 (pname), FOREIGN KEY (sid) REFERENCES Server (sid));

INSERT statements to populate tables with at least 5 tuples

Server

INSERT INTO Server VALUES (1, ‘ServerCA’, ‘Canada);
INSERT INTO Server VALUES (2, ‘ServerUS’, ‘USA’);
INSERT INTO Server VALUES (3, ‘ServerSA’, ‘South America’);
INSERT INTO Server VALUES (4, ‘ServerAS’, ‘Asia’);

INSERT INTO Server VALUES (5, 'ServerEU', 'Europe');

Player_2

INSERT INTO Player_2 VALUES (100, 1);
INSERT INTO Player_2 VALUES (500, 3);
INSERT INTO Player_2 VALUES (1000, 7);
INSERT INTO Player_2 VALUES (10000, 20);
INSERT INTO Player_2 VALUES (100000, 50);

Player_4

INSERT INTO Player_2 Values (100, 50);
INSERT INTO Player_2 Values (500, 100);
INSERT INTO Player_2 Values (1000, 200);
INSERT INTO Player_2 Values (10000, 500);
INSERT INTO Player_2 Values (100000, 800);

Player_6

INSERT INTO Player_6 VALUES (100, 50);
INSERT INTO Player_6 VALUES (500, 90);
INSERT INTO Player_6 VALUES (1000, 180);
INSERT INTO Player_6 VALUES (10000, 400);
INSERT INTO Player_6 VALUES (100000, 750);

Player_7

INSERT INTO Player_7 Values ('Player1', 1, NULL, NULL, 100, NULL, NULL);
INSERT INTO Player_7 Values ('Leeroy Jenkins', 1, 'Diamond Hammer', 20, 500, 'Pals for Life', 'officer');
INSERT INTO Player_7 Values ('Chuck E. Cheese', 2, NULL, NULL, 1000, 'Beginner Guild', 'recruit');
INSERT INTO Player_7 Values ('Homer Simpsonn', 3, 'Wooden Sword', 16, 100000, NULL, NULL);
INSERT INTO Player_7 Values ('GandalfTheCool', 5, 'Iron Sword', 19, 100000, 'Advanced Guild', 3);

Inventory

INSERT INTO Inventory VALUES (1, 'Player1', 1, 10);
INSERT INTO Inventory VALUES (2, 'Leeroy Jenkins', 1, 20);

INSERT INTO Inventory VALUES (3, 'Chuck E. Cheese', 2, 25);
INSERT INTO Inventory VALUES (4, 'Homer Simpsonn', 3, 30);
INSERT INTO Inventory VALUES (5, 'GandalfTheCool', 5, 50);

Guild_2

INSERT INTO Guild_2 VALUES (1, 500);
INSERT INTO Guild_2 VALUES (2, 1000);
INSERT INTO Guild_2 VALUES (3, 1500);
INSERT INTO Guild_2 VALUES (4, 2000);
INSERT INTO Guild_2 VALUES (5, 2500);

Guild_3

INSERT INTO Guild_3 VALUES ('Beginner Guild', 1);
INSERT INTO Guild_3 VALUES ('Intermediate Guild', 2);
INSERT INTO Guild_3 VALUES ('Advanced Guild', 3);
INSERT INTO Guild_3 VALUES ('Expert Guild', 4);
INSERT INTO Guild_3 VALUES ('Pals for Life', 5);

Quest

INSERT INTO Quest VALUES ('Buy a Weapon', 1, 100, 1, 'Buy your first weapon');
INSERT INTO Quest VALUES ('Buy a Potion', 2, 150, 5, 'Buy your first potion');
INSERT INTO Quest VALUES ('Slay a Monster', 3, 500, 3, 'Defeat one slime');
INSERT INTO Quest VALUES ('Join a Guild', 4, 1000, 10, 'Join the Beginner's Guild');
INSERT INTO Quest VALUES ('Deliver a Letter', 5, 300, 8, 'Deliver the letter to Bob');

NPC

INSERT INTO NPC VALUES (1, 'Alice');
INSERT INTO NPC VALUES (2, 'Bob');
INSERT INTO NPC VALUES (3, 'Charles');
INSERT INTO NPC VALUES (4, 'David');
INSERT INTO NPC VALUES (5, 'Emily');
INSERT INTO NPC VALUES (6, 'Frank');

Shop

INSERT INTO Shop VALUES(1, 1, 'open');
INSERT INTO Shop VALUES(2, 2, 'open');
INSERT INTO Shop VALUES(3, 3, 'closed);
INSERT INTO Shop VALUES(4, 5, 'closed');

INSERT INTO Shop VALUES(5, 6, 'open');

Item

INSERT INTO Item VALUES('iron ingot', 1, 1, NULL, 5);
INSERT INTO Item VALUES(bronze ingot', 2, 1, NULL, 3);
INSERT INTO Item VALUES('tuna', 3, 2, NULL, 2);
INSERT INTO Item VALUES('blue hat', 4, 1, NULL, 10);
INSERT INTO Item VALUES('dandelion', 5, 1, NULL, 1);

INSERT INTO Item VALUES('Small Potion of Health', 6, 3, 'Deliver a Letter', 10)
INSERT INTO Item VALUES('Medium Potion of Speed', 7, 5, NULL, 20);
INSERT INTO Item VALUES('Large Potion of Strength', 8, 1, NULL, 30);
INSERT INTO Item VALUES('Small Potion of Defense', 9, NULL, NULL, 10);
INSERT INTO Item VALUES('Extra-Large Potion of Evasion', 10, NULL, NULL, 40);

INSERT INTO Item VALUES('Steamy Love Letter', 11, 'Deliver a Letter', -1);
INSERT INTO Item VALUES(Boar Tusk', 12, 'Slay a Monster', -1);
INSERT INTO Item VALUES('Poisoned Vial', 13, 'Buy your first Potion', -1);
INSERT INTO Item VALUES('Hero's Sword', 14, 'Buy your First Weapon', -1);
INSERT INTO Item VALUES('Quil of Destiny', 15, 'Join a Guild', -1);

INSERT INTO Item VALUES('Wooden Sword', 16, 1, 'Buy a Weapon', 5);
INSERT INTO Item VALUES('Stone Hammer', 17, NULL, NULL, 10);
INSERT INTO Item VALUES('Quality Bow', 18, NULL, NULL, 100);
INSERT INTO Item VALUES('Iron Sword', 19, NULL, NULL, 1000);
INSERT INTO Item VALUES('Diamond Hammer', 20, 2, NULL, 10000);

Weapon_2

INSERT INTO Weapon_2 VALUES ('sword', 'common', 5);
INSERT INTO Weapon_2 VALUES ('hammer', 'common', 10);
INSERT INTO Weapon_2 VALUES ('bow', 'uncommon', 15);
INSERT INTO Weapon_2 VALUES ('sword', 'rare', 25);
INSERT INTO Weapon_2 VALUES ('hammer', 'legendary', 100);

Weapon_3

INSERT INTO Weapon_3 VALUES ('Wooden Sword', 16, 'sword', 'common');
INSERT INTO Weapon_3 VALUES ('Stone Hammer', 17, 'hammer', 'common');
INSERT INTO Weapon_3 VALUES ('Quality Bow', 18, 'bow', 'uncommon');
INSERT INTO Weapon_3 VALUES ('Iron Sword', 19, 'sword', 'rare');
INSERT INTO Weapon_3 VALUES ('Diamond Hammer', 20, 'hammer', 'legendary');

Potion_2

INSERT INTO Potion_2 VALUES (‘health’, ‘small’, ‘+10 health’);
INSERT INTO Potion_2 VALUES (‘speed’, ‘medium’, ‘+20 speed’);
INSERT INTO Potion_2 VALUES (‘strength’, ‘large’, ‘+50 strength’);
INSERT INTO Potion_2 VALUES (‘defense’, ‘small’, ‘+10 defense’);
INSERT INTO Potion_2 VALUES (‘evasion’, ‘extra-large’, ‘+75 evasion’);

Potion_3

INSERT INTO Potion_3 VALUES (‘Small Potion of Health’, 6, 1, ‘health’, ‘small’);
INSERT INTO Potion_3 VALUES (‘Medium Potion of Speed’, 7, 1, ‘speed’, ‘medium’);
INSERT INTO Potion_3 VALUES (‘Large Potion of Strength’, 8, 1, ‘strength’, ‘large’);
INSERT INTO Potion_3 VALUES (‘Small Potion of Defense’, 9, 1, ‘defense’, ‘small’);
INSERT INTO Potion_3 VALUES (‘Extra-Large Potion of Evasion’, 10, 1, ‘evasion’, ‘extra-large’);

QuestItem

INSERT INTO Item VALUES(Love Letter, 11, ‘readable’, ‘A poorly written love letter - blech!’);
INSERT INTO Item VALUES(‘Boar Tusk’, 12, ‘useable’, ‘The tusk of a Boar’);
INSERT INTO Item VALUES(‘Poisoned Vial’, 13, ‘useable’, ‘Maybe don’t drink this…’);
INSERT INTO Item VALUES(‘Hero’s Sword’, 14, ‘useable’, ‘The stuff of Legends!’);
INSERT INTO Item VALUES(‘Quil of Destiny’, 15, ‘useable’, ‘Cue the Epic Music’);

Does

INSERT INTO Does VALUES(‘Buy a Weapon’, ‘Player1’, 1, 50);
INSERT INTO Does VALUES(‘Slay a Monster’, ‘Leeroy Jenkins’, 1, 100);
INSERT INTO Does VALUES(‘Deliver a Letter’, ‘Chuck E. Cheese’, 2, 90);
INSERT INTO Does VALUES(‘Buy a Potion’, ‘Homer Simpsonn’, 3, 80);
INSERT INTO Does VALUES(‘Join a Guild’, ‘GandalfTheCool’, 5, 2);