

# CPSC 3720 Project

## Requirements Specification

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## Table of Contents

<b>Atomic Requirements Shell .....</b>	<b>4</b>
<b>1. The Purpose of the Project .....</b>	<b>5</b>
Goal of the Project .....	9
<b>2. The Stakeholders .....</b>	<b>10</b>
The Players .....	10
User Priority .....	10
<b>3. Constraints .....</b>	<b>11</b>
Solution Constraints .....	11
Budget Constraints: .....	12
<b>4. Naming Conventions and Terminology .....</b>	<b>13</b>
4a. Glossary of All Terms, Including Acronyms, Used by Stakeholders Involved in the Project .....	13
<b>5. Assumptions .....</b>	<b>14</b>
<b>6. The Scope of the Product .....</b>	<b>15</b>
Use Case Diagram .....	15

Use Cases .....	16
7. Functional Requirements .....	18
8. Look and Feel Requirements .....	24
9. Risks .....	25

## Atomic Requirements Shell

**Requirement #:** 1                      **Requirement Type:** Functional                      **UC #:** 2

**Description:** Player can input their name

**Rational:** To display which players turn it is during gameplay, and player score at game end.

**Fit Criterion:** The player must be able to input their name prior to a game beginning

**Priority:** 8

**Requirement #:** 2                      **Requirement Type:** Functional                      **UC #:** 3

**Description:** System AI deals cards

**Rational:** System AI must be able to deal cards in order for players (Both AI and User) to play the game

**Fit Criterion:** System AI deals the correct number of cards for the specific round from a randomly shuffled list. Once dealt, those cards are to be removed from that list.

**Priority:** 1

**Requirement #:** 3                      **Requirement Type:** Functional                      **UC #:** 4

**Description:** Players (Both AI and User) draw a card at the beginning of their turn

**Rational:** Players must be able to draw a card at the beginning of their turn in accordance to gameplay rules

**Fit Criterion:** The Players are able to draw a card at random from the list of cards that have not been drawn in the original hand deal (requirement 3). After that card has been drawn, it is removed from the list.

**Priority:** 2

**Requirement #:** 4                      **Requirement Type:** Functional                      **UC #:** 5

**Description:** Players (Both AI and User) are able to Play applicable cards from their hand (Set or Run, see Game Rules for full information)

**Rational:** Players must be able to play cards out of their hand in order to score points and progress the game, in accordance to game rules.

**Fit Criterion:** Players are able to play applicable sets or runs, discarding those cards from their hand and removing them from play until the next round.

**Priority:** 3

**Requirement #: 5**                      **Requirement Type:** Functional                      **UC #: 6**

**Description:** Players (Both System AI and User) discard a card of their choice at the end of their turn

**Rational:** Players must be able to discard a card at the end of their turn in accordance to gameplay rules

**Fit Criterion:** The Players are able to discard a card of their choosing at the end of their turn. Once discarded, that card is removed from play until the next round

**Priority:** 4

**Requirement #: 6**                      **Requirement Type:** Functional                      **UC #: 7**

**Description:** Round Ends

**Rational:** There must be a way to tell when the round ends in order to begin a new round

**Fit Criterion:** If either Player (AI or User) has an empty hand at the end of their turn, the round ends, is incremented, and Use Cases 3-6 repeat until 10 rounds have been played.

**Priority:** 5

**Requirement #: 7**      **Requirement Type:** Functional      **UC #: 8-10**

**Description:** Game Ends after 11 rounds, with the score displayed and the option to replay or quit the game.

**Rational:** The game must be able to come to a conclusion.

**Fit Criterion:** After 11 rounds of gameplay, the score is printed to screen along with the player names and winner. The User has the option to begin a new game or terminate the program.

**Priority:** 6

**Requirement #: 8**      **Requirement Type:** Functional      **UC #: 11**

**Description:** User must be able to access game rules

**Rational:** The User must be able to access the game rules in order to know how to play

**Fit Criterion:** If the player inputs 'help' at any time while the program is running, a list of game rules and commands will be printed to screen.

**Priority:** 7

**Requirement #: 9**      **Requirement Type:** Non-Functional      **UC #:** N/A

**Description:** Program is developed using C++

**Rational:** The Program must meet the Clients criteria

**Fit Criterion:** The game is developed using C++

**Priority:** 1

**Requirement #: 10**      **Requirement Type:** Non-Functional      **UC #:** N/A

**Description:** The Program will run as a text-console based game in the Linux environment of the University of Lethbridge computer science labs.

**Rational:** The program must run in console of University of Lethbridge computer science labs in order to meet Clients criteria

**Fit Criterion:** The program runs in console in the University of Lethbridge computer science lab computers.

**Priority:** 1



# 1. The Purpose of the Project

## Goal of the Project

The goal of this Project is to have a working, bug free game of 5 crowns programmed, with one player vs an AI.

The game has 11 rounds. It starts out with three cards and the threes are wild. Next the game moves on to fours and the fours are wild and we keep repeating that process until Kings go wild. The game is going to consist of two decks of 58 cards. The deck consists of three jokers, and it has five suits. The five suits are stars, hearts, clubs, spades, diamonds. Within the five suits each suit is made up of 11 cards 3-11 King, Queen, and the Jack.

The game's objective is to be a player who has the lowest score at the end of the eleventh round. This could be accomplished by making it into sets or into runs. So, to summarize at the end of the game the player with the lowest score wins.

The goal of the player would be to make a set of 3 or higher or make a run of 3 or higher.

Full game rules can be found at

<https://howdoyouplayit.com/five-crowns-card-game-rules/>

The goals of this project will be measured by setting deadlines, including specific amount of work that needs to be done, having regular meetings to ensure the goals are being achieved and if there are any issues, they are resolved sooner than later, and by remeasuring progress to see how much work has exactly been done and what needs to be done.

## 2. The Stakeholders

### The Players

This game is playable by one person at a time against an AI, and in order to account for all types of players the game will need to be coded in a robust yet simple manner.

**Example 1:** We may have a player named Betsy.

Betsy is an older Individual who lives alone and is looking for a game to pass the time. She used to play 5 Crowns when her grandkids still visited here, so is familiar with the rules.

In order for Betsy to be satisfied with the program, the program must be designed to be extremely easy to play for someone with novice computer abilities.

**Example 2:** We may have a player named Steve.

Steve is a TA at the University of Lethbridge, he is a master with technology but hates card games. In order for Steve to be satisfied, the game must run smoothly and bug free, and must have sufficient help options available to explain the gameplay rules.

### User Priority

#### Key Users:

Dr. Anvik, the Client, is the key user of this program. As he is the one responsible for contracting the development of this game out, his satisfaction with the final product is paramount to his project's success.

#### Secondary Users:

The Players: Those who play the game are considered a secondary user. Their opinion and satisfaction remains very important to the project's success, but they are still a lower priority than the Client, Dr. Anvik.

#### Development Team:

The development team are the other stakeholders in this Project.

As a team of three developers, all group members are expected to share an equal workload in both programming and bug testing the Program.

If the development team is not happy with the state of the final Project, the Secondary and Key Users are not likely to approve of it either.

That said, the satisfaction of the Key Users and Secondary Users remains paramount.

### 3. Constraints

#### Solution Constraints

##### 1) Program must run on lab computers

**Description:** The game must compile and run on the lab computers. The code of the game must be written using the programming language C++.

**Rationale:** The development team is familiar with C++ and has enough experience with C++ to implement the card game.

**Fit Criterion:** The finished product shall operate, and the code overall must be clean and free of errors impacting the ability of the game's performance.

**Solutions:** The code must be implemented and created by the development team. The development team shall frequently test their code to ensure it compiles and runs on the lab computers. Input must be validated to ensure the program remains stable.

##### 2) Program must follow 5 Crowns gameplay rules

**Description:** The card game Crown 5 consists of two decks which include 58 cards in each deck the game must be able to operate correctly as it is played with the five suit deck of cards. The game should be straightforward enough to implement which means there is no need to overlook any functionality of the game.

**Rationale:** Based on the game once it has been implemented the team who created it would be demonstrating their capabilities.

**Fit Criterion:** The team who finished creating the product should be able to show others how the game works.

**Solutions:** The team developing the card game should play the card game before and while developing it so they would have a better understanding of the rules and how the game works. The development team while working on the card game should review the rules and the functionality of the game as they work on it to ensure the game is being built correctly.

### **3) Program must run efficiently**

**Description:** Program must run efficiently

**Rationale:** A card game which responds back to the player quickly is more likely to be enjoyed by the client.

**Fit Criterion:** The product shall be working with no errors which would slow down the performance of the game for the user.

**Solution:** Using algorithms and data structures to optimize the speed of the game. While developing the game, keeping performance as one of the top priorities.

### **Budget Constraints:**

The program is to be implemented by a 3-person team in 2 weeks. Assume that each person will work 1-2 hours per day for 5 days per week (i.e. 15-30 man-hours). The team must be able to finish the Essential and the desirable constraints within the given time.

## 4. Naming Conventions and Terminology

### 4a. Glossary of All Terms, Including Acronyms, Used by Stakeholders Involved in the Project

**Players:** This includes both players of the game, the AI and the User.

**AI:** The artificial intelligence the User is playing against.

**Client:** The Client is Dr. Anvik.

**User:** The user is the person playing the game.

**Sets:** A set of cards is defined as 3 or more of the same card value of any suit. (Example: three 8's)

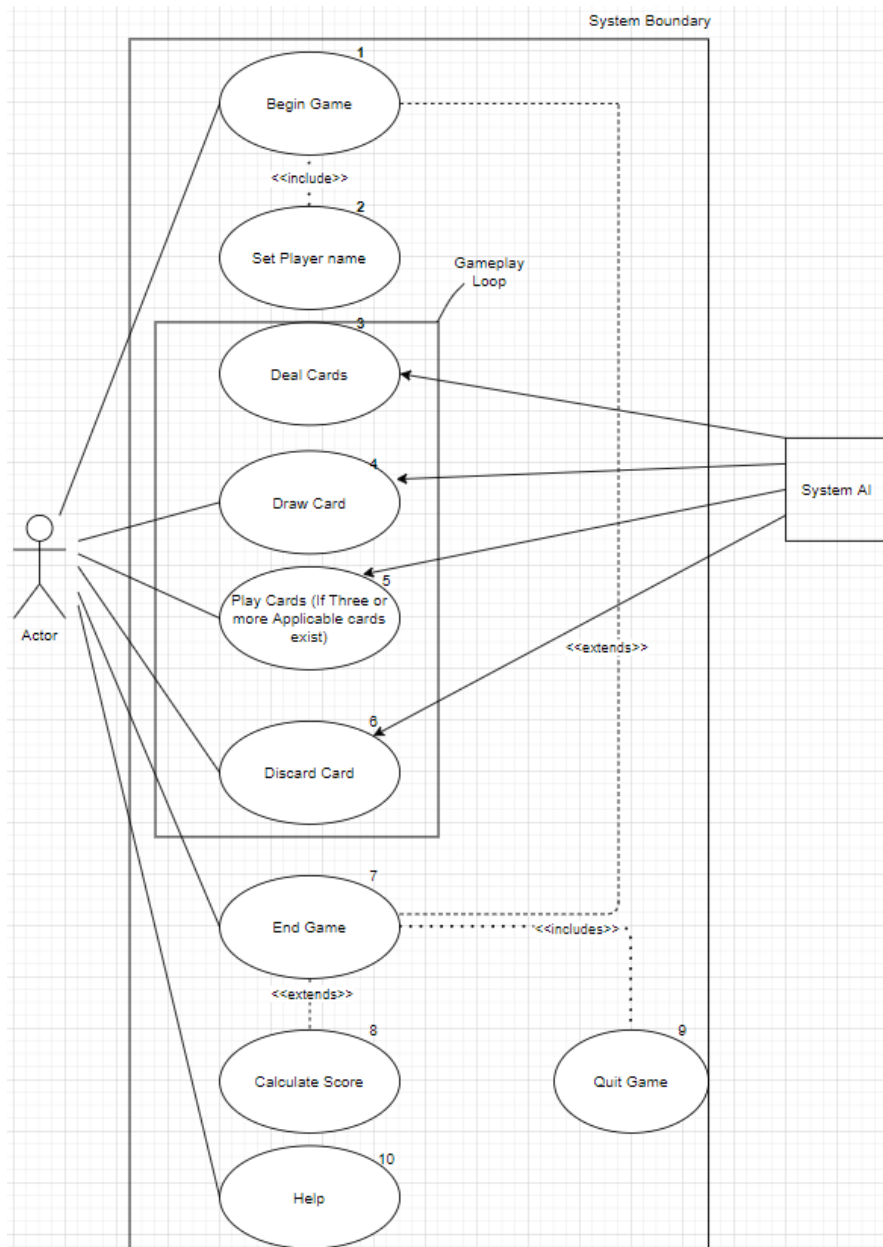
**Runs:** A run of cards is defined as 3 or more cards with consecutive values belonging to the same suit. (Example: 3 of spades, 4 of spades, 5 of spades)

## 5. Assumptions

1. All developers have access to 3720 Gitlab servers, and the knowledge required to use this form of version control
2. This project will be developed using C++
3. All developers have access to a computer and IDE of their choosing, however the project must compile and run on lab C513 and D519 computers
4. The project will be developed following the software development lifecycle and schedule as stated by the Client (Dr. Anvik)
5. The player has a basic understanding of card games, specifically knowing how basic card values and suits work
6. The player has basic computer literacy

## 6. The Scope of the Product

### Use Case Diagram



## Use Cases

### Use Case 1 - User begins game

The User first loads the program. They then type “start” to begin a new game, and enter their name as prompted.

### Use Case 2 - User enters their name

User is prompted to enter their name, does so, then hits enter to input it.

### Use Case 3 - System deals cards

The Players (System and User) are dealt a number of cards at the start of each round, being (Game round # + 2), with 13 being the maximum number of cards dealable by system. This has a constraint of a maximum of 11 rounds, beginning with Cards with a value of 3 and ending with Cards with a value of 12. Jacks have a card value of 11, Queens 12, and Kings 13.

### Use Case 4 - Player draws card

Player is given a card at random from a collection of cards not currently in play cards from the System.

### Use Case 5 - Player discards playable cards (sets or runs)

Player has the option available to discard playable sets or runs. For full game rules pertaining to sets, runs, and wildcards, see <https://howdoyouplayit.com/five-crowns-card-game-rules/>

### Use Case 6 - Player discards a single card of their choice, finishing their turn.

In the event the Players hand is empty, the round is finished and is incremented with a new draw. In the event the player's hand is not empty, use cases 4-6 repeat until one player has an empty hand.



**Use Case 7 - Player discards their last card, ending the round**

In the scenario that a player has discarded their last card, the round ends. Who won that round is added to a tally, the round is incremented, and use cases 3-6 repeat until the game is over.

**Use Case 8-10 - User Finishes Game**

After the 10th round is played, the game will end and the score will be displayed along with the player names and the winner. The user then has the option to begin a new game (see use case 1) or terminate the program.

**Use Case 11 - Game Help**

If at any time the player enters 'help' into the console, a print out of the game rules will appear on screen.

## 7. Functional Requirements

### 1: User can input their name

Priority	8
Use Cases	2
Rationale	To display which players turn it is during gameplay, and players score at game end
Fit Criterion	The player must be able to input their name prior to a game beginning
Story Points	1

### 2: System AI deals cards

Priority	1
Use Cases	3
Rationale	System AI must be able to deal cards in order for players to play the game

Fit Criterion	System AI deals the correct number of cards for the specific round from a randomly shuffled list. Once dealt, those cards are to be removed from the list.
Story Points	4

### 3: Players draw a card at the beginning of their turn

Priority	2
Use Cases	4
Rationale	Players must be able to draw a card at the beginning of their turn in accordance to gameplay rules
Fit Criterion	The players are able to draw a card at random from the list of cards that have not been drawn or dealt yet. After that card is drawn, it is removed from the list.
Story Points	2

**4: Players are able to play applicable cards from their hand**

Priority	3
Use Cases	5
Rationale	Players must be able to discard playable cards from their hand in order to progress the game in accordance to game rules.
Fit Criterion	Players are able to play applicable sets or runs, discarding those cards from their hand and removing them from play until the next round.
Story Points	3

**5: Players are able to discard a card of their choice at the end of each turn**

Priority	4
Use Cases	6
Rationale	Players must be able to discard a card at the end of their turn in accordance to gameplay rules.
Fit Criterion	The players are able to discard a card of their choosing at the end of their turn. Once discarded, that card is removed from play until the next round.
Story Points	1

## 6: Round ends

Priority	5
Use Cases	7
Rationale	There must be a way to tell when the round ends in order to begin a new round.
Fit Criterion	If either player has an empty hand at the end of their turn, the round ends, is incremented, and use cases 3-6 repeat until 11 rounds have been played.
Story Points	1

## 7: Game ends after 11 rounds

Priority	6
Use Cases	8-10
Rationale	The game must be able to come to a conclusion, with the winner displayed.
Fit Criterion	After 11 rounds of gameplay, the score is printed to screen along with the player names and the winner. The User has the option to begin a new game or terminate the program.
Story Points	2

**8:** User must be able to access game rules

Priority	7
Use Cases	11
Rationale	User must be able to access game rules in order to know how to play
Fit Criterion	If the player inputs 'help' at any time while the program is running, a list of game rules and commands will be printed to screen.
Story Points	1

## Non-functional Requirements

**9:** Program is developed using C++

Priority	1
Rationale	The program must meet the Clients criteria
Fit Criterion	The game is developed using C++.
Story Points	1

**8: Program runs in console in University of Lethbridge labs**

Priority	1
Rationale	The program must run in console of University of Lethbridge computer science labs in order to meet Clients criteria
Fit Criterion	The program compiles and runs in console in the University of Lethbridge computer science labs
Story Points	1

## 8. Look and Feel Requirements

The game is text based, so a simplistic UI is to be expected. The game will be played using command prompt.

The game may not look exactly like the photos shown below; they are just examples to demonstrate the expected user interface of a text based card game.

```

+-----+ +-----+ +-----+ +-----+
|3H | |JS | | | | | Score: 0 YOU
|+-----+ |+-----+ | | | | *.....|
||5H | ||3S | | | | | *.....|
+| | | |+-----+ +-----+ | *.....|
| 5H| ||QS | | | | | | Score: 0 ME
+-----+ |+-----+ +-----+ +-----+
| | | | |+-----+ | | | |
| |2H | |+-----+ | | | |
|+-----+ |+-----+ | | | |
||5D | |+-----+ | | | |
+| | | |+-----+ | | | |
| 5D| |+-----+ | | | |
+-----+ +-----+
30

CRIB
+-----+
|4C |
| |
| 4C|
+-----+

Discard a card --> 8H
Discard a card --> AH
I cut the FOUR of CLUBS
Your play: 3S
Your play: 2H
You have a GO
*I get one point--More--

```

```

C:\Windows\system32\cmd.exe
Your Cards: 3 6 = 9
Computers Cards: 5 8 = 13
do you want a hit (Y/N)? y
Hit: 7 Your total is 16
do you want a hit (Y/N)? n

The Computer takes a card ?
Your Score: 16
Computer Score: 20

The Computer won!
Do you want to play another hand (y/n)?

```



## 9. Risks

### 1: Requirements/Design/Estimation Issues

***Event: Miscalculated time***

***Probability: Likely***

In an event where time was miscalculated to accomplish the given task since everyone has different amounts of skills so in a software project it could be hard to give an exact estimation of the time.

***Resolution:***

Making sure all the team members involved in the project are utilizing their time properly and are putting in enough effort to finish the required things for the project. There must be regular group meetings to receive feedback from everyone. By doing this we solve problems as we go instead of waiting till the last minute.

***Event: Major design changes are needed midway through the Project***

***Probability: Unlikely***

There may be an event in which major design changes are needed midway through the implementation of the Project

***Resolution:***

Ensure the design documents are well reviewed and all requirements are met prior to the implementation to this project.

***Event: Unable to finish Project***

***Probability: Likely***

There may be an event in which the group finds themselves unable to finish the Project.

***Resolution:***

Making sure all the team members involved in the project are utilizing their time properly and are putting in enough effort to finish the required things for the project. There must be regular group meetings to receive feedback from everyone. By doing this we solve problems as we go instead of waiting till the last minute.

## **2: People**

### ***Event: New Person Added***

#### ***Probability: Likely***

In an event where a new individual joins the team we have to ensure the new person who joins the team is aware of the expectations of the project and knows what needs to be done. In a software project things can get difficult if a new person joins the team as they might have to start working from where the other person left.

#### ***Resolution:***

The new team member must be given the project requirement and informed by the group leader on what they expect them to finish. The new person also should communicate well within the team to ensure they are receiving any support they require and that they are clear on what needs to be done.

### ***Event: Person Removed from group***

#### ***Probability: Likely***

There may be an event where a person is removed from the project given any number of reasons including COVID-19, dropping out of the course, or family related issues.

#### ***Resolution:***

The other two members are to assume the missing persons responsibilities. The Prof is to be contacted to ensure they remain aware of the situation.

### ***Event: Unproductive Team Member***

#### ***Probability: Likely***

There may be an event where a team member is unproductive to the projects progress.

#### ***Resolution:***

In order to avoid having unproductive team members we must use the agile practices which would ensure the team members are motivated and productive to work on the project.

The project is also split up into many different sprints which would make sure everyone gets the experience of working on a new project with new team members. If someone is being unproductive and not finishing what they are required to do, the project leader/manager should acknowledge the problem and follow up with the person. If the person still does not want to cooperate and work on finding a solution that is in the best interest for the project the issue would be discussed with the prof also it will be reflected on their group assessment.

### **3: Learning and Tools**

***Event: Programmer has a lack of C++ knowledge***

***Probability: Somewhat Likely***

There may be an event in which a group member has a lack of C++ experience or knowledge.

***Resolution:***

The person lacking experience is expected to fill their gaps in knowledge using tutorials, peer help, or other resources. This may slow down team progress but will not impede the overall Project.

***Event: Gitlab Issues***

***Probability: Likely***

There may be an event in which an issue with Gitlab arises, either with pipeline or individual members having issues with accessing or pushing the teams work.

***Resolution:***

The team's priority is getting the pipeline fixed and ensuring it is fully functional. Should there be an issue arising the team is unable to solve, the Universities technical support and/or Prof should be contacted for help.