ECE 175: Computer Programming for Engineering Applications

Final Project: *Go Fish*

Due Date: Wednesday November 29, 2017 at 1 PM, via D2L drobox

See Page 5 for late submission policy

Administrative details:

- The project is to be worked in a team of two students (maximum). You have an option to work by yourself. **Sign up for your team (group of 2 or by yourself (work alone))** using the sign-up link below by 5 pm on Thursday November 9, 2017. After this date, you cannot change your team.
  https://docs.google.com/spreadsheets/d/1qphgzm5HRqTMWhrJFZTUzBC7uw2j_LqF4bkhP2An88A/edit?usp=sharing

- The **final project demo** will **start from 2 pm on Wed November 29** in the lab. Your team can sign up the time for demo. The demo sign up link will be available about a week before the project due date.
  At the demo/check-off time, your team (***both students MUST be present***) will be asked various questions (similar to your lab check-off but in more details). The person who does NOT show up for demo gets 0 point for the project.
  It is your or your team's responsibility to demo your project to the TAs/ULAs. **Submitting code without demo in person results in 0 points.**

- **Honor code:** Your team is expected to write and submit your own code. You may ask others for advice, and, in general, discuss the project, but your team should
  WRITE YOUR OWN CODE!
  If any part of the code submitted by different teams is identical, **ALL involved parties will receive zero credit on the entire project and one letter reduction in their final grade**. This policy will be very aggressively enforced. ALL submitted code will be checked with a plagiarism detection tool (e.g., http://theory.stanford.edu/~aiken/moss/).

Suggestions: Make sure that you/your team

a) Use Modular programming
b) Write well-documented code
c) Test your code (come up with suitable test cases)

Information:

Go Fish (https://en.wikipedia.org/wiki/Go_Fish) is a card game that can be played by two or more players. The game is played by each player takes turn asking for a card with a specific rank or face from another player. The goal is to form a book (a set of 4 cards with the same face or rank). The winner is the player who has the most number of books at the end of the game.

a) For two players, each player starts with 7 cards. The rest of the cards are put in the center so that each player can take a card when needed.
   Let's call two players: Wilbur (a user) and PC (a computer). After each player gets 7 cards on his/her hand, the players take turn asking for the card.

b) Wilbur first asks PC for the card of a particular rank or face value
   - If PC has card(s) with that rank,
     - PC has to give all the cards with that rank to Wilbur and
     - Wilbur gets another turn (to ask for a card).
   - If PC has no card with that rank,
     - PC says "Go Fish" and
     - Wilbur has to take one card from the center pile and put it in his hand.
     If the card drawn from the center pile is the card that Wilbur originally asked for, he gets another turn (to ask for a card). Otherwise, it is another player's turn.

d) Next, it's PC turn to ask for a card from Wilbur (same rules above are applied).

- When any player has all 4 cards of the same face or rank value (the 4 cards form a "book", i.e., 9 of diamonds (♦), 9 of spade (♠), 9 of club (♣), 9 of heart (♥)), the book must be shown face up (to show that the player gets that book).

- If at any given time, the player has no card on his/her hand, he/she has to take 7 cards from the center pile to continue the game.

e) The game continues until all 13 books (2-9, J, Q, K, A) are found. The winner is the player with the most numbers of books.

Project requirements:

For this project your team will write the card game – Go Fish, for which you will use a standard deck of 52 cards. There will be only 2 players, the computer and one user. After each player gets 7 cards on his/her hand, the user will start first.

25% deduction in the final project score right away if you/your team implements the final project without using linked lists

To simulate the deck of 52 cards, and each of the hands, **your team MUST use a dynamic list of cards** with the following strict type:

```
typedef struct card_s {
        char suit;
        int face;
        struct card_s *list;
} card;
```

Each card consists of a suit [**c**lubs (♣), **s**pades (♠), **h**earts (♥), or **d**iamonds (♦))
A face (1(Ace) – 10, Jacks (J), Queens (Q), and Kings (K))

Note: you can modify the above strict (i.e. changing the data type of member(s), add more members,) but you cannot remove the already existing members in the given strict.

1) The 52-card deck must be implemented using the linked list. Each hand (computer or user) must be implemented using the linked list.

2) Your program then shuffles the deck. One algorithm that you may use to shuffle the deck.

   (a) For each card in the deck, get a random number in the range of 0 to 51 to be used as the index of the element to swap that card with, i.e.

   if deck[0] holds the Jack of clubs (J♣) and the random number generated was 24, and deck[24] holds the 9 of diamonds(9♦), then after the first swap, deck[0] would hold the 9 of diamonds (9♦), and deck[24] would hold the Jack of clubs (J ♣). You would then proceed to deck[1], find a random index of a card to swap with, and swap those cards, etc.

   (b) Repeat step a) at least 1000 times.

   Note: Your code must have a ***ShuffleCard( ) function*** and should work with *any size deck of cards*, i.e. shuffling 53 cards, 20 cards or 5 cards.

   (c) You should seed the random number generator with a call to time() with srand(). [see sec 2.22 Random numbers in your Zyante book]

3) After shuffling the deck, deal the cards by giving one card to the user/player, followed by one card to the computer, followed by one card to the user, etc. until each player/hand has 7 cards.

   The player (computer)'s hand is represented as a dynamic list of cards. The list is populated with the cards drawn by the player (computer).

Note:

a) the card(s) added to each of the player/computer's hand (drawn from the deck) must be added to that player/computer's linked list correctly and MUST be removed from the deck.

b) the cards removed from each of the player/computer's hand MUST BE deleted from that player/computer's linked list correctly (and free() function should be used appropriately).

4) The game stars with the player. The player asks the computer for the card of a particular rank or face value.
   Implementation:
   a) your code should check whether the user enters a valid card (e.g. valid face or rank value (2-10, J, Q,K, A)) – if not, ask a user to enter again
   b) if the user enters a valid card but the rank/face is NOT on his/her hand, ask whether he/she is sure to ask for that face/rank.

   If the computer has card(s) with that rank, it has to give all the cards with that rank to the player and the player gets another turn (to ask for a card).

   If the computer has no card with that rank, the computer says "Go Fish" and the player has to take one card from the center pile and put it in his/her hand. If the card drawn from the center pile is the card that the player originally asked for, he/she gets another turn (to ask for a card).

5) The deck should be shuffled (to emulate a "random" pile for the center pile).

6) Next is the computer's turn (same rules given in 4) are applied).

Computer with no strategy: randomly generate the face value that the computer will ask (from a user).

7) After the computer asks for a card with a specific face/rank value, there should be statements to ask whether a user has card(s) with that face value and check whether the user answers correctly (or honestly). Note: you can improve this in your code to make it more user friendly but the idea is below.

   For example, if a computer asks for a card with J,

   Do you have card(s) with J?

   Enter y to give the card(s) with J?
   Enter n to say 'Go Fish': n n is entered by a user given that the player's hand has no J

   Scenarios:

   a) If the user's hand has no card asked by the computer,
      - If a user enters n, the screen displays "Go Fish" and the computer then takes a card from the center pile.
      - If a user enters y, the screen displays "You do NOT have card(s) with J" and "Go Fish" and the computer then takes a card from the center pile.
        Note: J is used in this example but it can be any face value that the computer asked for.

   b) If the user's hand has card(s) asked by the computer,
      - If a user enters n, the screen displays "You DO have card(s) with J" and the cards are then given to the computer.
      - If a user enters y, the cards are given to the computer.

- When any player has all 4 cards of the same face or rank value, the book (i.e., 9 of diamonds (♦), 9 of spade (♠), 9 of club (♣), 9 of heart (♥)) must be shown face up (to show that the player gets that book).

- If at any given time, the player has no card on his/her hand, he/she has to take 7 cards from the center pile to continue the game.

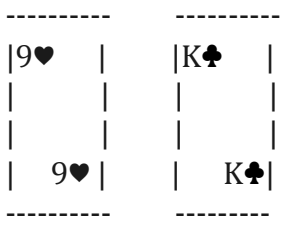
8) The game continues until all 13 books (2-9, J, Q, K, A) are found. The winner is the player with the most numbers of books.

9) At the end of the game, your code should announce the winner and ask whether a user wants to play a new game (or q or Q to quit).

See sample code executions on pages 6 – 16 (there are 1 complete game played and the next game continues in the sample code)

Optional Features for extra credit:

1) Graphics: Add graphics to your game.
   (+2 pt) If you can make the card for each card look like (at least)



2) Other bonus points will be announced later.

Points distribution: See Rubric for final project grading. **TBA**

Late submission policy (submit after 1 PM on Wed November 29, 2017):

- by 1 PM on Thursday November 30, 2017, deduct 10%
- by 1 PM on Friday December 1, 2017, deduct 20%
- by 1 PM on Saturday December 2, 2017, deduct 30%
- by 1 PM on Sunday December 3, 2017, deduct 40%
- by 1 PM on Monday December 4, 2017, deduct 50%
- by 1 PM on Tuesday December 5, 2017, deduct 60%
- by 1 PM on Wednesday December 6, 2017, deduct 70%

The last date of final project demo is by 5PM on Wednesday December 6, 2017. After this time the project will NOT be accepted/graded.

If you submit your code late, it is your team's responsibility to demo your project to the TAs/ULAs.
Submitting code without demo in person results in 0 points.

Sample Code Execution: **Red entered by a user**

Note: You are encouraged to make your output look more appealing than what is given below. However, your code should display very similar information in order for a user to be able to play the game.
It is VERY LIKELY that you will NOT get the exact same code execution shown below. This is used to show you how the game should be played.

Enter your name: Wilma

|--------- --------- --------- --------- |
|--------- --------- --------- --------- |
Wilma, Lets play Go Fish
|--------- --------- --------- --------- |
|--------- --------- --------- --------- |

Wilma's hand has 7 cards
A♠ A♥ 2♠ 2♥ 3♠ 3♥ 4♠

Computer's hand has 7 cards (debugging purpose)
A♦ A♣ 2♦ 2♣ 3♦ 3♣ 4♦

*** Hit C to Continue ***: C

Wilma, your turn

Wilma's hand has 7 cards
A♠ A♥ 2♠ 2♥ 3♠ 3♥ 4♠

Which card (2 - 10, J, Q, K, A) do you want to ask for? Y
Enter only 2 - 10, J, Q, K, A for the card

Which card (2 - 10, J, Q, K, A) do you want to ask for? 0
Enter only 2 - 10, J, Q, K, A for the card

Not a valid card, ask for another card

Which card (2 - 10, J, Q, K, A) do you want to ask for? 5

Wilma, No 5 on your hand.
Are you sure to ask for 5 (y or n)? N

Which card (2 - 10, J, Q, K, A) do you want to ask for? 9

Wilma, No 9 on your hand.
Are you sure to ask for 9 (y or n)? N

The user asks for a card that is not on his/her hand, ask whether a user is sure. If not, let a user enter another card.

Which card (2 - 10, J, Q, K, A) do you want to ask for? 4

Taking card(s) from Computer's hand

*** Hit C to Continue ***: c

Wilma, your turn

The user gets the card(s) from the computer's hand. The user gets another turn.

Wilma's hand has 8 cards
A♠ A♥ 2♠ 2♥ 3♠ 3♥ 4♠ 4♦

Which card (2 - 10, J, Q, K, A) do you want to ask for? 4

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><(((('> ><(((('>
~~~ Go Fish ~~~
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Wilma, you take 4 from the center pile

The card taken from the center pile has the same face value that the player first asked for, the user gets another turn

The card has the same face that you asked for, you will get another turn.

Wilma's hand has 9 cards
A♠ A♥ 2♠ 2♥ 3♠ 3♥ 4♠ 4♦
4♥

*** Hit C to Continue ***: C

Wilma, your turn

Wilma's hand has 9 cards
A♠ A♥ 2♠ 2♥ 3♠ 3♥ 4♠ 4♦
4♥

Which card (2 - 10, J, Q, K, A) do you want to ask for? 2

Taking card(s) from Computer's hand

After taking card "2" from the computer, a book of "2" is found and those 4 cards are removed from the user's hand.

Book of 2 is found on the hand

*** Hit C to Continue ***: C

Wilma, your turn

Wilma's hand has 7 cards
A♠ A♥ 3♠ 3♥ 4♠ 4♦ 4♥

Wilma's book(s) are
2

Still Wilma's turn since the user gets the card(s) from Computer.

Which card (2 - 10, J, Q, K, A) do you want to ask for? 3

Taking card(s) from Computer's hand

After taking card "3" from the computer, a book of "3" is found and those 4 cards are removed from the user's hand.

Book of 3 is found on the hand

*** Hit C to Continue ***: C

Wilma, your turn

Wilma's hand has 5 cards
A♠ A♥ 4♠ 4♦ 4♥

Wilma's book(s) are
2 3

Which card (2 - 10, J, Q, K, A) do you want to ask for? 6

Wilma, No 6 on your hand.
Are you sure to ask for 6 (y or n)? Y
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~~~ Go Fish ~~~
><((((('> ><((((('>
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Wilma, you take 4 from the center pile

Wilma's hand has 6 cards
A♠ A♥ 4♠ 4♦ 4♥ 4♣

Book of 4 is found on the hand

*** Hit C to Continue ***: C

Computer turn

Computer (debugging purpose):
A♦ A♣

Wilma's hand has 2 cards
A♠ A♥

Do you have card(s) with J?

Computer asked for "J" card from a user

Enter y to give the card(s) with J?
Enter n to say 'Go Fish': y

The user has no "J" card but answer 'y'. Your program will display the statement and play the game accordingly.

You do NOT have card(s) with J.

><((((('> ><((((('> ><((((('>
><((((('> ><((((('>
~~~ Go Fish ~~~
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><((((('> ><((((('> ><((((('>

The user has no "J" card, "Go Fish" is displayed and the computer takes a card from the center pile. Since the face of the card taken from the pile is not J, the next turn is Wilma's.

Computer takes one card from the center pile

*** Hit C to Continue ***: C

Wilma, your turn

Wilma's hand has 2 cards
A♠ A♥

Wilma's book(s) are
2 3 4

Which card (2 - 10, J, Q, K, A) do you want to ask for? **A**

Taking card(s) from Computer's hand

Book of A is found on the hand

*** Hit C to Continue ***: C

0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0

You have no card left.

Deck has 35 cards. Draw 7 cards from the pile.

The user has no card left. Seven cards should be drawn from the center pile in order to continue the game.

Check whether Wilma's newly drawn cards has a book

Book of 6 is found on the hand
You now have 3 cards.

Wilma's hand:
5♦ 5♥ 5♣

Wilma's book(s) are
2 3 4 A 6
0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0

*** Hit C to Continue ***: C

Wilma, your turn

Wilma's hand has 3 cards
5♦ 5♥ 5♣

Wilma's book(s) are
2 3 4 A 6

Which card (2 - 10, J, Q, K, A) do you want to ask for? 5

Taking card(s) from Computer's hand

Book of 5 is found on the hand

*** Hit C to Continue ***: C

0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0

You have no card left.

Deck has 28 cards. Draw 7 cards from the pile.

Check whether Wilma's newly drawn cards has a book

The user has no card left. Seven cards should be drawn from the center pile in order to continue the game.

Book of 7 is found on the hand
You now have 3 cards.

Wilma's hand:
8♠ 8♦ 8♥

Wilma's book(s) are
2 3 4 A 6 5 7
0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0

*** Hit C to Continue ***: C

0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0

Computer has no card left.

Deck has 21 cards. Draw 7 cards from the pile.

Computer has no card left. Seven cards should be drawn from the center pile in order to continue the game.

Check whether Computer's newly drawn cards has a book

Book of 9 is found on the hand
Computer now has 3 cards.

Computer's hand:
8♣ 10♠ 10♦

Computer s book(s) are
9
0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0

*** Hit C to Continue ***: C

Wilma, your turn

Wilma's hand has 3 cards
8♠ 8♦ 8♥

Wilma's book(s) are
2 3 4 A 6 5 7
8

Which card (2 - 10, J, Q, K, A) do you want to ask for? 8

Taking card(s) from Computer's hand

Book of 8 is found on the hand

*** Hit C to Continue ***: C

0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0

You have no card left.

Deck has 14 cards. Draw 7 cards from the pile.

Check whether Wilma's newly drawn cards has a book

Book of J is found on the hand
You now have 3 cards.

Wilma's hand:
10♥ 10♣ Q♠

Wilma's book(s) are
2 3 4 A 6 5 7 8 J
0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0

*** Hit C to Continue ***: C

Wilma, your turn

Wilma's hand has 3 cards
10♥ 10♣ Q♠

Wilma's book(s) are
2 3 4 A 6 5 7 8 J

Which card (2 - 10, J, Q, K, A) do you want to ask for? 10

Taking card(s) from Computer's hand

Book of 10 is found on the hand

*** Hit C to Continue ***: C

0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0

Computer has no card left.

Deck has 7 cards. Draw 7 cards from the pile.

Check whether Computer's newly drawn cards has a book

Book of K is found on the hand
Computer now has 3 cards.

Computer's hand:
Q♦ Q♥ Q♣

Computer s book(s) are
9 K
0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0 0-0-0-0-0-0-0-0-0

*** Hit C to Continue ***: C

Wilma, your turn

Wilma's hand has 1 cards
Q♠

Wilma's book(s) are
2 3 4 A 6 5 7 8 J 10

Which card (2 - 10, J, Q, K, A) do you want to ask for? K

Wilma, No K on your hand.
Are you sure to ask for K (y or n)? Y

><(((('> ><(((('> ><(((('>
><(((('> ><(((('>
~~~ Go Fish ~~~
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Deck has no card left.

Deck has no card left -> no card can be drawn after this point.

*** Hit C to Continue ***: c
~~~

Computer turn

Computer (debugging purpose):
Q♦ Q♥ Q♣

Computer's book(s) are
9 K

Wilma's hand has 1 cards
Q♠

Do you have card(s) with 5?

Enter y to give the card(s) with 5?
Enter n to say 'Go Fish': n

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><(((('> ><(((('>
~~~ Go Fish ~~~
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Deck has no card left.

*** Hit C to Continue ***: c

Wilma, your turn

Wilma's hand has 1 cards
Q♠

Wilma's book(s) are
2 3 4 A 6 5 7 8 J 10

Which card (2 - 10, J, Q, K, A) do you want to ask for? 5

Wilma, No 5 on your hand.
Are you sure to ask for 5 (y or n)? Y

><(((('> ><(((('> ><(((('>
><(((('> ><(((('>
~~~ Go Fish ~~~
><(((('> ><(((('>
><(((('> ><(((('> ><(((('>

Deck has no card left.

*** Hit C to Continue ***: c

Computer turn

Computer (debugging purpose):
Q♦ Q♥ Q♣

Computer's book(s) are
9 K

Wilma's hand has 1 cards
Q♠

Do you have card(s) with 10?

Enter y to give the card(s) with 10?
Enter n to say 'Go Fish': n

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><(((('> ><(((('>
~~~ Go Fish ~~~
><(((('> ><(((('>
><(((('> ><(((('> ><(((('>

Deck has no card left.

*** Hit C to Continue ***: c

Wilma, your turn

Wilma's hand has 1 cards
Q♠

Wilma's book(s) are
2 3 4 A 6 5 7 8 J 10

Which card (2 - 10, J, Q, K, A) do you want to ask for? Q

Taking card(s) from Computer's hand

Book of Q is found on the hand

Wilma's book(s) are
2 3 4 A 6 5 7 8 J 10 Q

Computer's book(s) are
9 K

@@@@@@@@@@@@@@@@@@@@@@@@@@@@@

Congratulations, YOU won.

All 13 books are found. Since you have more number of books, you won!

@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
Do you want to continue? (Q or Q to quit): y

The user enters 'y' to continue

Enter your name: James

|--------- --------- --------- --------- |
|--------- --------- --------- --------- |
James, Lets play Go Fish
|--------- --------- --------- --------- |
|--------- --------- --------- --------- |

James's hand has 7 cards
J♠ 7♦ 8♦ 7♠ A♥ Q♠ 7♣
~~~

Computer's hand has 7 cards
J♣ 3♦ J♥ 4♣ K♦ 2♣ 6♠

*** Hit C to Continue ***: c

James, your turn

James's hand has 7 cards
J♠ 7♦ 8♦ 7♠ A♥ Q♠ 7♣

Which card (2 - 10, J, Q, K, A) do you want to ask for? J

Taking card(s) from Computer's hand

*** Hit C to Continue ***: c

James, your turn

James's hand has 9 cards
J♠ 7♦ 8♦ 7♠ A♥ Q♠ 7♣ J♣
J♥

Which card (2 - 10, J, Q, K, A) do you want to ask for? A

><(((('> ><(((('> ><(((('>
><(((('> ><(((('>
~~~ Go Fish ~~~
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James, you take 9 from the center pile

James's hand has 10 cards
J♠ 7♦ 8♦ 7♠ A♥ Q♠ 7♣ J♣
J♥ 9♣

*** Hit C to Continue ***: c

Computer turn

Computer (debugging purpose):
3♦ 4♣ K♦ 2♣ 6♠

James's hand has 10 cards
J♠ 7♦ 8♦ 7♠ A♥ Q♠ 7♣ J♣
J♥ 9♣

Do you have card(s) with K?

Enter y to give the card(s) with K?
Enter n to say 'Go Fish': y
~~~

You do NOT have card(s) with K.

><(((('> ><(((('> ><(((('>
><(((('> ><(((('>
~~~ Go Fish ~~~
><(((('> ><(((('>
><(((('> ><(((('> ><(((('>

Computer takes one card from the center pile

*** Hit C to Continue ***: c

James, your turn

James's hand has 10 cards
J♠ 7♦ 8♦ 7♠ A♥ Q♠ 7♣ J♣
J♥ 9♣

Which card (2 - 10, J, Q, K, A) do you want to ask for? J

><(((('> ><(((('> ><(((('>
><(((('> ><(((('>
~~~ ~~~ Go Fish ~~~ ~~~
><(((('> ><(((('>
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James, you take 10 from the center pile

James's hand has 11 cards
J♠ 7♦ 8♦ 7♠ A♥ Q♠ 7♣ J♣
J♥ 9♣ 10♥

*** Hit C to Continue ***: c

Computer turn

Computer (debugging purpose):
3♦ 4♣ K♦ 2♣ 6♠ 3♠

James's hand has 11 cards
J♠ 7♦ 8♦ 7♠ A♥ Q♠ 7♣ J♣
J♥ 9♣ 10♥

Do you have card(s) with 5?

Enter y to give the card(s) with 5?
Enter n to say 'Go Fish': n

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><(((('> ><(((('>
~~~ Go Fish ~~~
><(((('> ><(((('>
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Computer takes one card from the center pile

*** Hit C to Continue ***: c

James, your turn

James's hand has 11 cards
J♠ 7♦ 8♦ 7♠ A♥ Q♠ 7♣ J♣
J♥ 9♣ 10♥

Which card (2 - 10, J, Q, K, A) do you want to ask for?

The game continues until all 13 books are found and the winner (one with more number of books) is announced.