Assignment 2

Archaeology: The Card Game

This project will allow you to implement a computer game, with some simple graphics. It is a card game, where you will implement some simple artificial intelligence and incorporate it in the computer player.

This project is worth 7.5% of your final grade. You must do this project on your own. The submission deadline is the last teaching day of semester, Friday 21st October 2022 at 5pm. Your submission will be marked out of 12 in the lab, then your C# code will be marked out of 8 after you submit your program.

Project Specification:

You have been asked to write a computer version of the "Archaeology: The Card Game", by Phil Walker-Harding. From the game description: "Discover the lost treasures of Egypt and make your fortune! You are an archaeologist working the dig sites of the Egyptian desert. Search for the right pieces to complete torn parchments, broken pots and other priceless artefacts. Explore an ancient pyramid hoping to uncover a huge stash of treasure! Trade shrewdly at the local marketplace to increase the value of your collection. Sell your treasures to the museum at just the right time for maximum profit. But beware; the desert also has its dangers! A devastating sandstorm can throw your expedition into disarray, and cunning thieves lurk around the dig site ready to steal your prize discovery!" Your program should implement a 2-player version of the game where the user plays against the computer.

Overview[1]

The aim of the game is to make the most money by finding treasures and selling them to the museum. Players find treasures by digging at the dig site (draw pile of cards). Sets of treasures are collected over the course of the game and players choose the best time to sell them to the museum. Once a player sells a treasure set to the museum the value of that set is credited to the player, and is no longer subject to loss or theft.

If a player finds any maps at the dig site, they can use them to explore an ancient pyramid where more treasures are hidden. Players can trade their treasures with the local marketplace to increase the value of their collection. If a player meets a thief at the dig site, they will use this thief to steal treasure from another player. If a sandstorm hits, all players are affected and may lose some of their treasure.

[1] Rules modified from http://boardgamegeek.com/boardgame/31105/archaeology-the-card-game/

The player with the most money at the end of the game is the winner.

Game Cards

Archaeology is played with a special deck of cards. There are *treasure* cards, *thief* cards and *sandstorm* cards. There is also a Pyramid (card), which has three hidden rooms holding treasure.

Treasure Cards

There are 72 treasure cards. Each treasure card has a rarity (how many of that type of card are in the game), a trade value (for trading at the marketplace) and a set of selling values (for selling sets of a given size of that treasure to the museum). For example, there are 6 broken cup cards, each with a trade value of 2 in the marketplace. If you sell 1 to a museum, then it is only worth 2, but if you sell a pair, then they are worth 15.

Card	**Rarity/ number**	**Trade Value**	**Selling value of a set**				
			1	**2**	**3**	**4**	**5**
Pot Shards	18	1	1	2	3	4	15
Parchment Scraps	16	1	1	2	3	10	-
Coins	14	2	2	5	10	18	30
Talismans	8	3	3	7	14	24	40
Broken Cups	6	2	2	15	-	-	-
Maps	6	3	3	-	-	-	-
Pharaoh's Masks	4	4	4	12	26	50	-

Thief Cards

There are 8 Thief cards.

Sandstorm Cards

There are 6 Sandstorm cards in the two-player game. Take one sandstorm card out for each additional player.

Preparation for a game

Separate the *thief*, *sandstorm* and *map* cards, and shuffle the remaining cards into one deck; deal 4 cards facedown to each player and 5 cards faceup to the middle of the table. These faceup treasures are the *marketplace* (arrange them by type).

Form the *Pyramid* treasure piles by dealing cards face down: 1 set of 3 cards, 1 set of 5 cards and 1 set of 7 cards.

Shuffle the sandstorm, thief and map cards into the rest of the deck and place it facedown on the table as the *dig site*.

Randomly choose a starting player.

Playing a turn

On your turn, you may first **dig for treasure** by drawing the top card from the dig site.

- **Treasure** cards are added to your hand.
- **Thief** cards are discarded faceup on the table. You must choose a player and take 1 random card from their hand and add it to your own.
- **Sandstorm** cards are discarded faceup on the table. Each player must choose half of their cards to discard, starting with the player who drew the card and going clockwise. All cards are placed faceup as part of the marketplace. When all players have discarded, the player who drew the card restarts their turn.

After digging for treasure, you may take any of the following actions any number of times and in any order:

- **Trade at the marketplace** You may trade any number of cards in hand for any number of cards in the marketplace of equal or lesser value (any difference is lost). A treasure's *trading value* is listed in the card's top corners.

- **Explore the pyramid** You may discard 1 *map* card from your hand to take the 3 treasure cards from the small chamber; 2 map cards to take the 5 treasure cards from the medium chamber, or 3 maps to take the 7 cards from the large chamber. Discarded maps are removed from the game. Each chamber may only be 'explored' once in the game.

- **Sell to the museum** You may sell a *set* of 1 or more treasure cards of the same type from your hand to the museum. The value of a set is determined by the *selling prices* at the bottom of the card. Announce what you are selling and place the cards faceup in front of you in an overlapping row. Once played, cards may not be added to sets, but cards are immune to the effects of Thief and Sandstorm cards. You may not sell a set containing more cards than the maximum number listed, though you may sell multiple sets of the same treasure.

When a player has finished taking actions for their turn, play passes clockwise to the next player.

Ending the Game

Play continues until the Dig Site deck is exhausted and all players have no more cards in their hand. After the Dig Site deck is exhausted, players may choose to pass and take no actions. If all players pass in succession, the following player must sell at least one card to the Museum.

The player with the highest value of sold artifacts is the winner. If there is a tie, the tied players count the total number of cards they sold to the museum: the lowest total wins.

Robot player

A computerised version of this game will need a robot player to play against. At each turn the robot player needs to draw a card and process it correctly if it is a Thief or Sandstorm card. The robot then needs to decide which actions to perform, if any, i.e. whether to explore the pyramid, which card(s) to swap at the marketplace, and which card(s) to sell to the museum. A purely random robot player would not be that interesting to play against. So your robot player must try to have some artificial intelligence. You may want to let the user choose from robots that play in different styles.

Tasks

Write a program that satisfies the specifications described above. It should make use of all of the programming features that you have learnt so far, including using classes and methods to structure your program and XML documentation where appropriate.

The project is compulsory and requires you to both get it verified in the lab and to hand in the source code. Half of the grade will be based on how the program runs and half on the object design, structure, code style and documentation.

Suggested Steps

We suggest that you build a simplified version of the game first, and then add in more features as time permits. Concentrate on getting the objects and simple turn play right before adding fancy graphics and controls.

Start with only one type of treasure. This means that checking the scoring is simplified to only looking at one treasure card.

You may want to generate the cards randomly to start with, and then add code that keeps track of cards to get the correct ratio of cards. It is easier to generate the cards in order and shuffle them than to randomly generate a card and see if it is one of the unused cards.

For testing purposes, specify how many cards (or types of cards) are used in the game, so a game can be shorter.

It is often easier to control both players, adding a computer player once you have a basic game going. Once you have a stupid computer player, then add more intelligence and heuristics as you have time.

COMPX102-22B

Assignment 2 Hand-in due 5pm 21st October 2022

Compress (Zip) the Visual Studio folder with your program code and submit it via Moodle.

Student Declaration of Originality

I declare that the program which I have had verified and submitted in Moodle is entirely my own work. I have not worked together with any other people. I have suitably acknowledged (referenced) any parts of other programs that I have used. I understand that if I have breached the above conditions, I will be sent to the University Disciplinary Committee.

Note: This project will only be marked if this Declaration of Originality is signed.

Name: _____

ID Number: _____

Signed: _____

Date: _____

Functionality and Usability (to be demonstrated in the lab)

Generates a deck with random (order of) cards	_____ /1 mark
Deals a hand of cards to each player	_____ /1 mark
Player can dig to get a new card	_____ /1 mark
User can sell cards to the museum	_____ /1 mark
User can trade a card at the marketplace	_____ /1 mark
Multiple cards can be used for a trade	_____ /1 mark
User can explore the pyramid using maps	_____ /1 mark
Thief card implemented	_____ /1 mark
Sandstorm cards implemented	_____ /1 mark
Game recognises finish conditions met	_____ /1 mark
Usability (layout, choice of controls, feedback, etc.):	_____ /2 marks
Functionality and Usability Total:	**_____ /12 marks**
Bonus: Save & load game state	_____ /+1 mark
Bonus: Robot player implemented	_____ /+1 mark
Bonus: Supports > 1 AI players (& vs each other)	_____ /+1 mark
Bonus: Supports > 2 players in game	_____ /+1 mark

Coding Style (marked by tutor after zip submitted)

Code Style (object design, docs, methods, etc.):	_____ /8 marks
Total:	**_____ /20 marks**