Design 4 Template: Hunt the Wumpus

Part 1: Understanding the Problem:
(1 pt) [Rephrase the problem statement here]

To ensure that you understand the problem correctly, answer the following guiding questions:
1. (3 pts) What are the required classes/structs that you need to implement?
   List every “has-a” relationship that you’ve observed between the required classes.
   List every “is-a” relationship that you’ve observed between the required classes.
   You may answer this question by drawing a diagram of the hierarchy of classes
   (hint: refer to recitation 7 worksheet)

2. (2 pts) To set up the game, what user input(s) do you need? When playing the game, what user input(s) do you need?

3. (1 pt) How often do you need to display the grid?

4. (1 pt) When printing the grid, what are the symbols that represent the Wumpus, the pits, the bats, the gold, and the player?

5. (1 pt) What is the winning condition and the losing condition of this game?

(1 pt) [List assumptions that you are planning to make for this program]
Part 2: Program Design:
To help you break the problem down into smaller subtasks, answer the following guiding questions:

This assignment seems to have a lot of components. Let's solve them piece by piece! First, set up the game.
(Tip: do not worry about any gaming functionalities until you have successfully set up the game!)
1. (1 pt) In your Event class, what member variable(s) and member function(s) are you planning to create so that you can tell the difference between the Wumpus, Bats, Pit, and Gold events?

2. (1 pt) In order to use the Event class polymorphically, what member variable should your Room class contain to reflect this?

3. (2 pts) What member variable should your Room class contain so it enforce that each Room contains at most one Event? How can you tell if the room has no event?

4. (1 pt) Take a look at the following website about vectors. What did you notice about vectors and dynamic arrays?
https://www.geeksforgeeks.org/vector-in-cpp-stl/
https://en.cppreference.com/w/cpp/container/vector

5. (2 pts) How would you make a grid of 2D vector of Room objects that initially have no events? In which class should it contain the grid?

6. (1 pt) How would you randomly assign the Gold event, the Wumpus event, two Pit events, and two Bat events into the grid? (Remember that each Room can have at most one Event)
7. (3 pts) Now add the player/adventurer.
   7.1. How could you tell if the Room contains the adventurer or not?

   7.2. How would you randomly pick the starting position of the adventurer so that she starts in a Room that contains no Event?

   7.3. How would you store the starting position of the adventurer since it is the position of the escaping rope?

8. (1 pt) Write pseudocode for the print function which prints the grid. Which class should have this function?

9. (1 pt) Of the required classes, which one(s) would need the Big three and why?

This completes the game setup! Now move on and design the gaming features. For 10-13, list what function(s) in which class(es) you are planning to create, and the pseudocode for those functions.

10. (1 pt) The adventurer is able to move to an adjacent room using WASD.

11. (2 pts) Display percepts if the adventurer is in a room directly adjacent to a room containing an event. What pure virtual function are you planning to create in your Event class to accomplish this?
12. (1 pt) When the adventurer enters the room that has an event, it will behave differently depending on the event type. What pure virtual function are you planning to create in your Event class to accomplish this?

12.1. (1 pt) The adventurer enters a room that contains the gold, she picks up the gold.

12.2. (1 pt) The adventurer enters a room that contains the Wumpus, she loses the game.

12.3. (1 pt) The adventurer enters a room that contains the pit, she loses the game.

12.4. (1 pt) The adventurer enters a room that contains the bats, she will move in the opposite direction as the user input for the next 5 moves.

13. (4 pts) The adventurer is able to fire up to three arrows in any direction. The arrow travels up to three rooms or until it hits a wall. The arrow would kill the Wumpus if enters the Wumpus’ Room. If misses, there is a 75% chance that the Wumpus will move to a random empty room.
14. (1 pt) Create a function that would test if the adventure has won the game. Write pseudocode of the function.

(4 pts) [Use your answer above, create pseudocode (or flowchart) for the remaining functions that you plan to create]

Very importantly, think about how you would connect all pieces together!

*Tip: in order to modularize your program, let each function handle one thing/task. When decompose a program into functions, try listing the verbs/tasks that are performed to solve the problem.*

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**Part 3: Program Testing**

To help you consider the possible test cases, answer the following guiding questions:

1. (1 pt) How would you test if the game is set up correctly?

2. (3 pts) For your answers in Part 2 Q10-13, how would you test if each feature is working as expected?

3. (1 pt) What user inputs need to be error handled?
4. (1 pt) How to ensure that your program does not have any memory leaks? How to locate the memory leaks if there is any?

(4 pts) [Create a testing table that has representative good, bad, and edge cases for each input, and their expected outputs]