**1.** Eve enjoys playing board games. Her favourite board game is called “Pot Luck”. This has a numbered grid of 10 squares by 10 squares. Each square has a number between 1 and 100.

Players place their game counters on square 1. A 30-minute timer is set which counts downwards. Each player rolls two 6-sided dice and then moves their game counter that number of squares. Some squares tell the player to pick up a card. These have instructions on, such as 'Move forward 10 spaces'. If the player lands on one of these squares they move according to the instruction on the card. The first player to land on square 100, is announced as the winner. If no winner is announced before the timer runs out, then it is a draw.

Eve would like to break the problem down into smaller sub problems so that each sub problem will complete one specific task.

Identify **three** sub problems that Eve can use in her game.

1 _____

_____

2 _____

_____

3 _____

_____ **[3]**

**2.** A program is being designed that will allow a user to log into an account on a website using a username and password.

Identify **two** possible sub-procedures that could be used in this program.

1 _____

_____

2 _____

_____ **[2]**

**3.** A programmer has partially developed a bubble sort algorithm in pseudocode.

This will partially sort an array of numbers called `numbers` that is passed as a parameter.

```
01 procedure bubbleSort(numbers : byRef)
02   flag = true
03   for x = 0 to numbers.length - 1
04     if numbers[x] > numbers[x + 1] then
05       holdValue = numbers[x]
06       numbers[x] = numbers[x + 1]
07       numbers[x + 1] = holdValue
08       flag = false
09     endif
10   next x
11 endprocedure
```

i. Explain why the procedure `bubbleSort` accepts the array `numbers` by reference and not by value.

**[3]**

ii. The programmer has used a `for` loop on line 3 in the procedure `bubbleSort`. A `for` loop is a count controlled loop.

State what is meant by the term 'count controlled loop'.

**[1]**

iii. State the purpose of the variable `holdValue` in the procedure `bubbleSort`.

**[3]**

iv. The procedure `bubbleSort` will only partially sort the array `numbers` into order.

Describe what the programmer would need to add to the algorithm to enable it to fully sort the numbers into order.

**[2]**

**4.** A card game uses a set of 52 standard playing cards. There are four suits; hearts, diamonds, clubs and spades. Each suit has a card with a number from; 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13.

The card game randomly gives 2 players 7 cards each. The unallocated cards become known as the deck.

The players then take it in turns to turn over a card. A valid move is a card of the same suit or the same number as the last card played.

The winner is the first player to play all of their cards.

One component of the game is checking if a move is valid.

Identify **three** other components of the game.

1

2

3

**[3]**

**END OF QUESTION PAPER**