



BSC(ENG) HONS Examination by course unit

Tuesday 16 May 2017 2:30 pm

ECS405U Arts Application Programming

Duration: 2 hours 30 minutes

**YOU ARE NOT PERMITTED TO READ THE CONTENTS OF THIS QUESTION PAPER UNTIL
INSTRUCTED TO DO SO BY AN INVIGILATOR**

Answer ALL Four Questions.

Cross out any answers that you do not wish to be marked.

Calculators are permitted in this examination. Please state on your answer book the name and type of machine used.

Complete all rough workings in the answer book and cross through any work that is not to be assessed.

Possession of unauthorised material at any time when under examination conditions is an assessment offence and can lead to expulsion from QMUL. Check now to ensure you do not have any notes, mobile phones, smartwatches or unauthorised electronic devices on your person. If you do, raise your hand and give them to an invigilator immediately.

It is also an offence to have any writing of any kind on your person, including on your body. If you are found to have hidden unauthorised material elsewhere, including toilets and cloakrooms it will be treated as being found in your possession. Unauthorised material found on your mobile phone or other electronic device will be considered the same as being in possession of paper notes. A mobile phone that causes a disruption in the exam is also an assessment offence.

EXAM PAPERS MUST NOT BE REMOVED FROM THE EXAM ROOM

Examiners:

Karen Shoop
Marcus Pearce

Question 1

a) Write Processing code to do the following:

- i) Create a variable and initialise it with the value 67;
- ii) Create a second variable and initialise it with the value 45.89;
- iii) Create an array that contains the letters c, a and z;
- iv) Print the last element of this array;
- v) Create a second array that will contain 6 words, although these words are not yet known.

[8 marks]

b) The code in Figure 1 needs to create a random positive number up to and including 23. If that number is greater than 13 and is also even, the code should print, in one statement, “accepted” followed by the number. Otherwise it should print “rejected”. Write the code for gaps A-E.

[8 marks]

```
int rand = _____ GAP A _____;
if (rand > 13 _____ GAP B _____ GAP C _____) {
    _____ GAP D _____
}
_____ GAP E _____
```

Figure 1

c) Why might a developer write the background function, e.g. `background(30, 200, 0);` as the first line of the Processing `draw()` function?

[1 mark]

d) An array, `nameAr`, contains names. Write code that iterates through the array to see if it contains the name “Dionna”, printing out the index where this name is located. You can assume that the array has already been initialised, that names are unique but you do not know the array size. Marks will be awarded for solutions that stop running once the name is found.

[8 marks]

Question 2

- a) The Processing code in Figure 2 calls a `changeColour()` function that assigns the value of `mouseX` to the variable called `green` and half the value of `green` to the variable called `blue`.

```
int green=200;
int blue=green/2;

void setup(){
}

void draw(){
    fill(150,blue,green);
    ellipse(mouseX,mouseY,40,20);
    if(mouseX>mouseY){
        changeColour();
    }
}
```

Figure 2

- i) Why does the developer not pass the `green` and `blue` variables as arguments into the `changeColour` function?
- ii) Write the `changeColour` function.
- iii) Briefly explain the difference between defining and calling a function.

[6 marks]

- b) Figure 3 shows two Java files. The first is the incomplete `Person` class. The second is the incomplete test class that creates `Person` objects.

```
public class Person{
    private String name;
    private int age;
    private double height;
    private int xlocation;

    public Person(String name, int a, double h){
        this.name=name;
        age=a;
        height=h;
    }

    .....
}

public class PersonTest{
    public ____GAP A____ void main(String [] args){
        Person p1 = ____GAP B____
        .....
    }
}
```

Figure 3

- i) What are the file names for both classes in Figure 3?
- ii) What is the name for this code block: `public Person(String name, int a, double h){}`?
- iii) What is the purpose of using `this.name` inside that block?
- iv) The variable `xlocation` is not initialised inside that block. Explain whether this is a problem.
- v) To allow other classes to access the value of the instance variables a developer has to write accessor/getter methods. Why? Write an accessor/getter for the `xlocation` variable.
- vi) To move a `Person` object in the game a user calls the `Person` object's `moveForwards` method, passing in the number of squares moved. This method increments the `xlocation` variable by that number. Write the `moveForwards` method.
- vii) What is the missing word in GAP A in the `PersonTest` class?
- viii) Complete the code, GAP B, to create a `Person` object, `p1`, using the blueprint defined in the `Person` class.
- ix) Move `p1` forwards by 8 squares, then move it again by 17 squares. Print `p1`'s final `xlocation`.

[17 marks]

- c) A `Person` object in the game is a type of `Player`. It should have all the properties and behaviors of `Person` as well as those of the `Player` class, such as wealth, being able to shoot etc. Briefly explain how this can be enabled.

[2 marks]

Question 3

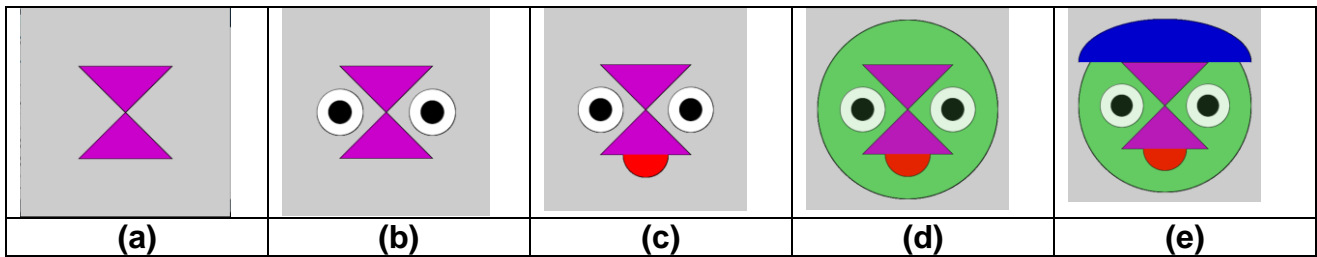


Figure 4

- a) The sketch shown in Figure 4(a) consists of two triangles. The vertices of the triangles meet at the centre point of the window. The horizontal edges of the triangles are d pixels from the centre point and are $2 * d$ pixels long, where d is an integer. Define 3 variables for the centre x position, the centre y position and d called cx , cy and d respectively.

[3 marks]

- b) Write the processing code to display the two triangles shown in Figure 4(a). Note that you do not know the size of the window but you can assume that it is square. Use the default colour space.

[7 marks]

- c) Write code to add circles to the sketch as shown in Figure 4(b) using cx , cy and d where possible. The diameter of the white outer circle is d .

[6 marks]

- d) Write code to add a red semicircle of diameter d to the sketch as shown in Figure 4(c).

[3 marks]

- e) Write code to add a green semi-transparent circle to the sketch as shown in Figure 4(d). The diameter of the circle is $4d$.

[3 marks]

- f) Write code to draw a blue hat as shown in Figure 4(e). The maximum width of the hat is $4d$ and the maximum height is $2d$.

[3 marks]

Question 4

- a) A digital artist has written a sketch to visualise weather data from Antarctica. The following is an extract from the CSV file of weather data. Each line of data in this file has an error in it. Rewrite the file contents correcting the errors.

```
Site,Altitude,Temperature,Pressure,Precipitation,Windspeed
A,220,-20,70,30 100
B,500,-20,100,
C,1000,-30,40,30;30
D,5,-5, 70,50,200,
E,600,-40,ninety,20,300
```

[5 marks]

- b) The artist has written the code shown in Figure 5 to read in the weather data to an array in processing. Write the missing code to replace GAP A to GAP F.

```
String file = "data.csv";
char splitChar _____ GAP A _____
int numLines _____ GAP B _____
int numColumns _____ GAP C _____

String[][] data = new String[numLines][numColumns];

void setup() {
    String[] lines _____ GAP D _____

    for (int i = 0; i < lines.length; i++) {
        String[] columns _____ GAP E _____

        for (int j = 0; j < columns.length; j++) {
            data[i][j] _____ GAP F _____
        }
    }
}
```

Figure 5**[8 marks]**

- c) Make three changes to the code to ensure that the first line of the csv file (containing the headers) will not be read in to the array.

[3 marks]

- d) The artist is developing a visualisation of the data. Write code to display the data in each line of the csv file according to the following mapping:
- For each line from the csv file squares are drawn with a random x and y position and size corresponding to the precipitation value.
 - The colour of the squares is red if the altitude is lower than 500 and blue otherwise.
 - The number of squares drawn corresponds to the pressure.

[9 marks]

End of Paper