THE UNIVERSITY OF WESTERN AUSTRALIA

CSSE

SEMESTER 1, 2017 EXAMINATIONS

CITS1001
Object-oriented Programming and Software Engineering

FAMILY NAME: _____ GIVEN NAMES: _____

STUDENT ID: | | | | | | | | | SIGNATURE: _____

This Paper Contains: **20** pages **(including title page)**
Time allowed: **2:00 hours**

INSTRUCTIONS:

Answer all questions. The paper contains eight questions, each worth ten marks.
Write your answers in the spaces provided on this question paper.
No other paper will be accepted for the submission of answers.
Do not write in this space.

1	2	3	4	5	6	7	8	TOTAL

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Examination candidates may only bring authorised materials into the examination room. If a supervisor finds, during the examination, that you have unauthorised material, in whatever form, in the vicinity of your desk or on your person, whether in the examination room or the toilets or en route to/from the toilets, the matter will be reported to the head of school and disciplinary action will normally be taken against you. This action may result in your being deprived of any credit for this examination or even, in some cases, for the whole unit. This will apply regardless of whether the material has been used at the time it is found.

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Question 1 Class Definitions (10 marks)

1a) Write a Java class called `Property` to represent a property such as a house or apartment for a property rental business. Include brief comments in your class definition as necessary, but full Javadoc is *not* required. The class should have:

- four fields that capture the property's street address, its rental price per month, the number of bedrooms, and whether the property has off-road parking; and
- a constructor that initialises the fields;
- a mutator method for setting the number of bedrooms field; it should check for a reasonable input value;

1b) Write a Java class `Rentals` for managing a group of properties that are available for rental. This class should have:

- one field to store all the currently available properties;
- a constructor that initialises this field;
- a method that takes a property as argument and removes it from the list;
- a method that takes two properties as arguments and returns the property with the lowest monthly rent.

Use the following pages for your answer to this question

Answer to Question 1a here

Answer to Question 1b here

Question 2 Conditionals (10 marks)

Complete the three segments of code marked `//TODO` below. Your methods should throw suitable exceptions if their parameter values are unsuitable. Implement the methods `emptyMachine` and `calculateFare` according to their Javadoc specifications.

```
public class TicketMachine {

   private int price;    //The price of a ticket.
   private int balance;  //The amount of money entered so far.
   private int total;    //The total amount of money collected.

   public TicketMachine( int price )  {
       //TODO
    }

    /** Simulate emptying the machine of money by
    * resetting the total to 0.
    * @return int amount of money that was in the machine
    * before it was reset.
    */
    public int emptyMachine()  {
        //TODO
    }

    /** Calculate a fare based on the standard ticket price,
    *   the zone of travel and a discount rate for special kinds
    *   of travellers (eg senior, school fare etc).
    *   @param boolean innerZone; if false the fare is 50% higher
    *   @param int discount percentage to reduce the fare by
    *   @return int fare, the calculated discounted price
    *   rounded to the nearest integer value.
    */
    public int calculateFare( boolean innerZone, int discountPct ) {
         //TODO
     }
}
```

Answer question 2 here

Answer question 2 here if needed

Question 3 List Collections (10 marks)

```
public void mystery3( ArrayList<Integer> list ) {
    for (int i = 0; i < list.size(); i++) {
        int element = list.get(i);
        list.remove(i);
        list.add(0, element + 1);
    }
}
```

3a) Fill in the table below to show the value of `list` after `mystery3` (above) is executed with a `list` parameter containing the given elements. Answer Question 3a in the table

`list` input	final contents of `list`
$10, 20, 30$	
$8, 2, 9, 7, 4$	
$-1, 3, 28, 17, 9, 33$	

3b) Write a short description to summarise what this method does.

Answer Question 3b here

Question 4 Map Collections (10 marks)

4a) Declare a field variable to represent a phone book that stores the names and phone numbers of a collection of people. (2 marks)

Answer Question 4a here

4b) Write a method called `lookupNumber` that returns the phone number of a given person in the phone book. (3 marks)

Answer Question 4b here

4c) Now consider a phone book *in reverse*. That is, given a phone number, finding the name of the person it belongs to. Write a method called `personWithNumber` that takes a phone number, and returns the name of a person with that number. If there are multiple people, then return the name of the first person you find; if no people have that number, just return `null`. (5 marks)

Answer Question 4c here

Question 5 Testing (10 marks)

A method `uwaSemesters` is required that takes two parameters representing a day and a month and returns a String indicating that type of activity for that date. An activity is one of: `"Classes"` (during semester), `"StudyBreak", "Examinations"` or `"Vacation"` as determined by the calendar below. The method only has to handle first semester dates for this question. Assume that months are specified as an integer between 1 and 12 (1 for January, 2 for February, and so on) and that the day of the month is a number between 1 and 31. You are *not* required to check for invalid month, day combinations such as month=2 and day=30.
We will first write the test cases and then the Java code.

February 27	First Semester classes commence
April 17 - 21	Non-teaching study break
June 2	First Semester classes end
June 5 - 9	Pre-examination study break
June 10 - 24	First semester examinations
June 26 - July 30	Student Vacation

5a) Add four (4) new test cases to the table below for testing the correctness of an implementation of this method. The first line (in italics) is given as an example. Include a brief reason for each test case in the Rationale column. (4 marks)

Answer Question 5a here

day	month	Expected output	Rationale
1	*4*	*"Classes"*	*normal case*

5b) Write Java code to implement the `uwaSemesters` method. State any assumptions that you make. Marks will be awarded for concise coding. (6 marks)

Answer Question 5b here

Question 6 Debugging (10 marks)

The program below is intended to produce the output, `a is the smallest!`. But the program contains at least 7 errors. Mark the errors on the code below. Additionally, for each error you identify, suggest a way to correct it.

Answer Question 6 here and on the next page

```
public class Oops{

public static void main(String[]args){
        int a = 7,b = 42;
        minimum(a,b);
        if {smaller = a} {
           System.out.println("ais thesmallest!");
        }
     }

     public static void minimum(int a,int b){
        if (a < b){
            int smaller = a;
        } else (a => b) {
            int smaller = b;
        }
        return int smaller;
    }
}
```

Continue answering Question 6 here if needed

Question 7 Algorithms (10 marks)

Some cognitive psychologists believe that people recognize words based on their shape. For this reason most people can make sense of the following mis-spelled text.

> It de'osnt mttaer in waht oredr the ltteers in a wrod are, the olny iprmoetnt tihng is taht frist and lsat ltteer is at the rghit pclae. The rset can be a toatl mses and you can sitll raed it wouthit porbelm. Tihs is bcuseae we do not raed ervey lteter by itslef but the wrod as a wlohe.

Suppose you are asked to write a Java program to help test this hypothesis. Write a method `scramble` that takes a single word as input and returns a string with the internal letters in random order but with the first and last letter unchanged. Write helper methods as required and state any assumptions you make.

Answer Question 7 here or over the page

Answer Question 7 here

Question 8 Code Quality (10 marks)

The methods `findMostSocialAAA` and `findMostSocialBBB` are intended to search an `ArrayList<Person>` object called `contacts` for the `Person` object with the highest activity level. Assume the `Person` class has a `getTotalActivity` method.

Compare and contrast these two methods. Comment on the strengths and weakness of each implementation, using the three criteria of: *correctness, design*, and *readability*. Mark up the code with your observations on its quality and then summarise your assessment against the given criteria.

```
public Person findMostSocialAAA() {
     int maxActivity = 0;
     int pActivity;
     Person maxPerson = null;
     for (Person p : contacts) {
         pActivity = p.getTotalActivity();
         if (pActivity <= maxActivity) {
             maxActivity = pActivity;
             maxPerson = p;
         }
     }
     return maxPerson;
}

public Person findMostSocialBBB() {
      Person mp;
      int ma = 0;
      Iterator<Person> it = contacts.iterator();
      while (it.hasNext()) {
        Person p = it.next();
        int a = p.getTotalActivity();
        if (a > ma) {
            ma = a;
            mp = p;
         }
     }
    return mp;
}
```

Continue answering Question 8 here

END OF PAPER

Spare page for working