CS1020 Mid-term Test
AY2012/2013 Semester 2

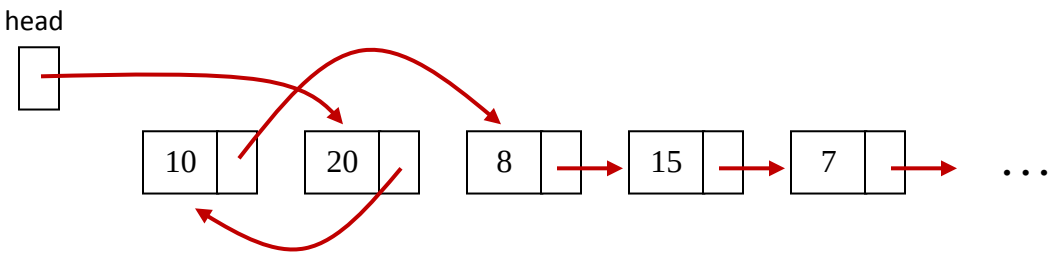
SECTION A

1.	D	2.	B	3.	B	4.	E	5.	E	6.	C
7.	E	8.	B	9.	C	10.	C	11.	B	12.	A

SECTION B

13. `[10, 9, 8, 7, 6, 5, 4, 3, 2, 1]`

14(a)



14(b) **Idea: Traverse each list till the last node. If the references of the last nodes in both list are the same, this implies that the lists are "joined" at some place.**

```
boolean isJoined(ListNode <Integer> list1,
                 ListNode <Integer> list2) {

  ListNode <Integer> tail1 = list1;
  while (tail1.getNext() != null) {
       tail1 = tail1.getNext();
  }

  ListNode <Integer> tail2 = list2;
  while (tail2.getNext() != null) {
       tail2 = tail2.getNext();
  }
  return tail1 == tail2;

}
```

15.

```
import java.awt.*;

class Rectangle {
  // Attributes: corner1: bottom-left; corner2: top-right
  Private Point corner1, corner2;

  // Constructors
  // Default constructor creates a rectangle at corners (0,0) and (1,1)
  // You are to write a single statement using 'this'
  public Rectangle() {                                          // 2 marks

    this(new Point(), new Point(1,1));

  }

  // Constructor to create rectangle at corners indicated by pt1 and pt2
  // You should call the setCorner() method
  public Rectangle(Point pt1, Point pt2) {                      // 2 marks

     setCorner(1, pt1);          or      corner1 = pt1;
     setCorner(2, pt2);                  corner2 = pt2;


  }

  // Set respective corner (which==1: corner1; which==2: corner2)
  // You may assume that which is either 1 or 2
  public void setCorner(int which, Point pt) {
    if (which == 1)
      corner1 = pt;
    else
      corner2 = pt;
  }

  // Get respective corner (which==1: corner1; which==2: corner2)
  // You may assume that which is either 1 or 2
  public Point getCorner(int which) {                           // 4 marks

     return (which == 1) ? corner1 : corner2;




  }
```

Many students did not know how to use "this" for this question.

```
  // Overriding toString() method
  public String toString() {

    return "{(" + getCorner(1).x + "," + getCorner(1).y + "):(" +
           getCorner(2).x + "," + getCorner(2).y + ")}";

  }


  // Overriding equals() method
  public boolean equals(Object obj) {                    // 6 marks

    if (obj instanceof Rectangle) {
      Rectangle rect = (Rectangle) obj;
      return this.getCorner(1).equals(rect.getCorner(1))
             &&
             this.getCorner(2).equals(rect.getCorner(2));
      }
      else
        return false;
```

Many students did not use the equals() method defined in the Point class. Instead they used the getX() and getY() methods to access the x- and y-coordinates of the corners (or they use .x and .y to access the public attributes x and y directly).

```
  }
}
```

Complete the following **TestRectangle.java** program. You should not modify any code that is given, or add any method that is not shown in the program. Read the comments above each method to understand what is expected.

```
import java.util.*;
import java.awt.*;

class TestRectangle {

  public static void main(String[] args) {
    ArrayList<Rectangle> rectangles = readInput();
    checkDuplicate(rectangles);
    System.out.println(rectangles);
  }

  // Read in data for a list of rectangles                8 marks
  public static ArrayList<Rectangle> readInput() {
    Scanner sc = new Scanner(System.in);
    Point pt1, pt2;

    ArrayList<Rectangle> list
                  = new ArrayList<Rectangle>();
    while (sc.hasNext()) {
       pt1 = new Point(sc.nextInt(), sc.nextInt());
       pt2 = new Point(sc.nextInt(), sc.nextInt());
       list.add(new Rectangle(pt1, pt2));
    }
    return list;


  }
```

Common mistakes:
Many students did not construct the 2 Point objects needed for the rectangle.
Some students did not construct the Rectangle object as well.

```
// To check if the last rectangle in the list is identical to
// any of the other preceding rectangles. If so, remove the
// last rectangle from the list.                    8 marks

public static void
checkDuplicate( ArrayList<Rectangle> rectangles ) {

  int size = rectangles.size();
  Rectangle lastRect = rectangles.get(size-1);

  // Check if last rectangle in list is a duplicate
  for (int i=0; i<size-1; i++) {
    if (lastRect.equals(rectangles.get(i))) {
      rectangles.remove(size-1);
      break;
    }
  }
```

Why do we assign the last rectangle in the ArrayList rectangles to lastRect? So that we don't keep accessing the last rectangle in our loop.
Some students also did not use the equals() method they wrote for the Rectangle class.

Alternatively:

```
  int size = rectangles.size();
  Rectangle lastRect = rectangles.get(size-1);

  // Check if last rectangle in list is a duplicate
  if (rectangles.indexOf(lastRect) != size-1)
     rectangles.remove(size-1);
```

Other alternative answers are possible.

```
}
}
```