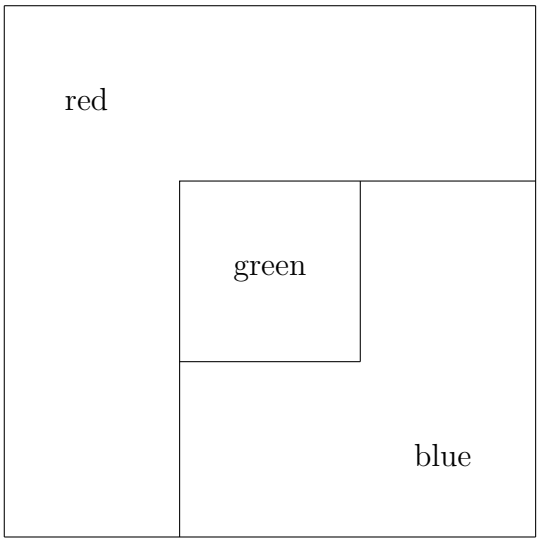
1.

The Noland national flag is a square showing the following pattern.




Write a method

```
public void drawNoland(int n)
```

that draws the Noland flag on the screen with a height of `n` pixels. Your method should create and use a `SimpleCanvas` (as used in lectures and laboratories) to draw on. All of the colours needed are pre-constructed `Color` objects.

PUT YOUR ANSWER ON THE NEXT PAGE

2.

The price of a ticket to use TransPerth services depends on your status (standard, concession, or school student) and the number of zones you travel in.

Standard (status=1) and Concession (status=2) passengers may pay by cash or use a SmartRider. If a SmartRider is used, then a discount of 15% applies on the cash fare. The following table shows the cash fares for Zones 1 and 2.

| Number of Zones | Status | Cash Fare (cents) |
|---|---|---|
| 1 | standard | 250 |
| 2 | standard | 370 |
| 1 | concession | 100 |
| 2 | concession | 150 |

Students travelling to or from school (status=3) pay 50 cents when travelling with a SmartRider, regardless of how many zones they travel in. Students must use a SmartRider to get the special fare.

Write a method `calculateFare` that returns the fare payable for any situation, or `-1` if the arguments are in error.

```
public int calculateFare(int status, int numZones, boolean smartRiderUsed)
```

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3.

Consider the class `BankAccount`, for use in a bank's account record system.

```
public class BankAccount {

  private String accName; // the account holder's name, e.g. Bill Gates
  private int balance;

  public String getAccName() {
   return accName;
  }

  public int getBalance()  {
   return balance;
  }

  // constructor and other details omitted
}
```

Write an efficient method

```
public String findHighest(BankAccount[] accList)
```

that returns the name of the account holder of the account with the highest balance in `accList`. `findHighest` should throw an exception if `accList` is empty or `null`.

You may assume that the records are sorted by their account names.

PUT YOUR ANSWER ON THE NEXT PAGE

4.

Write a method

```
public boolean subString(String str1, String str2)
```

that returns `true` if `str1` is a substring of `str2`, and `false` otherwise.

For example, `subString("abc", "abcd")` returns `true`, but `subString("de", "abcd")` and `subString("ac", "abcd")` both return `false`.

Implement the method from first principles. That is, you may use only the Java String library methods `charAt` and `length`. No other String methods (such as `indexOf`) may be used.

Write 3 (three) Junit4 `assertEquals` statements to test your `subString` method. Your tests should cover different cases for the method.

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5. Write a method

```
public char checkWinner(char[][] grid)
```

to identify the winner from a given game state in a TicTacToe game. The game is played on a square grid of size at least 3 x 3. Every position in the grid contains one of the characters 'X', 'O' or ' '. The method `checkWinner` should return the winner's character ('X' or 'O') if any row, column, or corner-to-corner diagonal in its argument array `grid` contains all the same non-blank character; it should return ' ' otherwise.

Write helper methods to make your code readable.

PUT YOUR ANSWER ON THE NEXT PAGE

6.

(a) Write a method

```
public boolean moreUpsThanDowns(int[] a)
```

that returns `true` if and only if the elements of `a` increase more often than they decrease.

For example, `moreUpsThanDowns({1,4,4,2,3,3})` returns `true`, because the elements increase twice (`1`–`4` and `2`–`3`) but they decrease only once (`4`–`2`);
but `moreUpsThanDowns({4,2,2,2,3})` returns `false`, because the elements increase once and decrease once.

(5 marks)

(b) Write a method

```
public int[][] separate(int[] a)
```

that returns a 2D array where the first row contains the even-indexed elements from `a`, and the second row contains the odd-indexed elements.

For example `separate({8,10,4,9,3,56})` returns `{{8,4,3},{10,9,56}}`.

(5 marks)