Code 1

```java
/** String processing exercise 1. */
public class LowerCase {
    public static void main(String[] args) {
        String str = args[0];
        System.out.println(lowerCase(str));
    }

    /**
     * Returns a string which is identical to the original string,
     * except that all the upper-case letters are converted to lower-case letters.
     * Non-letter characters are left as is.
     */
    public static String lowerCase(String s) {
        String newStr = "";
        for(int i = 0; i < s.length(); i++) {
            char ch = s.charAt(i);
            if ('A' <= ch && ch <= 'Z') {
                ch += 32;
            }
            newStr += ch;
        }
        return newStr;
    }
}
```

Code 2

```java
/** String processing exercise 2. */
public class UniqueChars {
    public static void main(String[] args) {
        String str = args[0];
        System.out.println(uniqueChars(str));
    }

    /**
     * Returns a string which is identical to the original string,
     * except that all the duplicate characters are removed,
     * unless they are space characters.
     */
    public static String uniqueChars(String s) {
        String newS = "";
        for (int i = 0; i < s.length(); i++) {
            char ch = s.charAt(i);
            if (ch == ' ' ||  s.indexOf(ch) == i) {
                newS += ch;
            }
        }
        return newS;
    }
}
```

Code 3

```
/**
* Computes the periodical payment necessary to re-pay a given loan.
*/
public class LoanCalc {

   static double epsilon = 0.001;  // The computation tolerance (estimation error)
   static int iterationCounter;    // Monitors the efficiency of the calculation

   /**
    * Gets the loan data and computes the periodical payment.
    * Expects to get three command-line arguments: sum of the loan (double),
    * interest rate (double, as a percentage), and number of payments (int).
    */
   public static void main(String[] args) {
      // Gets the loan data
      double loan = Double.parseDouble(args[0]);
      double rate = Double.parseDouble(args[1]);
      int n = Integer.parseInt(args[2]);

      System.out.println("Loan sum = " + loan + ", interest rate = " + rate + "%, periods = " + n);

      // Computes the periodical payment using brute force search
      System.out.print("Periodical payment, using brute force: ");
      System.out.printf("%.2f", bruteForceSolver(loan, rate, n, epsilon));
      System.out.println();
      System.out.println("number of iterations: " + iterationCounter);

      // Computes the periodical payment using bisection search
      System.out.print("Periodical payment, using bi-section search: ");
      System.out.printf("%.2f", bisectionSolver(loan, rate, n, epsilon));
      System.out.println();
      System.out.println("number of iterations: " + iterationCounter);
   }

   /**
   * Uses a sequential search method  ("brute force") to compute an approximation
```

```
 * of the periodical payment that will bring the ending balance of a loan close to 0.
 * Given: the sum of the loan, the periodical interest rate (as a percentage),
 * the number of periods (n), and epsilon, a tolerance level.
 */
// Side effect: modifies the class variable iterationCounter.
public static double bruteForceSolver(double loan, double rate, int n, double epsilon) {
    iterationCounter = 0;
    double payment = loan/n;
    while (endBalance(loan, rate, n, payment) > epsilon) {
        payment += epsilon;
        iterationCounter++;
    }
    return payment;
}

/**
 * Uses bisection search to compute an approximation of the periodical payment
 * that will bring the ending balance of a loan close to 0.
 * Given: the sum of theloan, the periodical interest rate (as a percentage),
 * the number of periods (n), and epsilon, a tolerance level.
 */
// Side effect: modifies the class variable iterationCounter.
public static double bisectionSolver(double loan, double rate, int n, double epsilon) {
    iterationCounter = 0;
    double lPay = loan/n, hPay = loan;
    double midPay = (lPay + hPay) / 2;
    double endBal = endBalance(loan, rate, n, midPay);
        while (Math.abs(endBal) > epsilon) {
            iterationCounter++;
            if (0 < endBal) {
                lPay = midPay;
            } else {
                hPay = midPay;
            }
            midPay = (lPay + hPay) / 2;
            endBal = endBalance(loan, rate, n, midPay);
        }
```

```
        return midPay;
    }

    /**
    * Computes the ending balance of a loan, given the sum of the loan, the periodical
    * interest rate (as a percentage), the number of periods (n), and the periodical payment.
    */
    private static double endBalance(double loan, double rate, int n, double payment) {
        for (int i = 1; i <= n; i++) {
            loan -= payment;
            loan *= (1 + (rate / 100));
            }
        return loan;
    }
}
```

Code 4

```
/*
 * Checks if a given year is a leap year or a common year,
 * and computes the number of days in a given month and a given year.
 */
public class Calendar0 {

   // Gets a year (command-line argument), and tests the functions isLeapYear and nDaysInMonth.
   public static void main(String args[]) {
      int year = Integer.parseInt(args[0]);
      isLeapYearTest(year);
      nDaysInMonthTest(year);
   }

   // Tests the isLeapYear function.
   private static void isLeapYearTest(int year) {
      String commonOrLeap = "common";
      if (isLeapYear(year)) {
         commonOrLeap = "leap";
      }
      System.out.println(year + " is a " + commonOrLeap + " year");
   }

   // Tests the nDaysInMonth function.
   private static void nDaysInMonthTest(int year) {
      for (int i=1; i<=12; i++){
         System.out.println("Month " + i + " has " + nDaysInMonth(i, year) + " days");
      }
   }

   // Returns true if the given year is a leap year, false otherwise.
   public static boolean isLeapYear(int year) {
      boolean isLeapYear = (year % 400 == 0);
      isLeapYear = isLeapYear || (((year % 4) == 0) && (year % 100 != 0));
      return isLeapYear;

   }
```

```
  // Returns the number of days in the given month and year.
  // April, June, September, and November have 30 days each.
  // February has 28 days in a common year, and 29 days in a leap year.
  // All the other months have 31 days.
  public static int nDaysInMonth(int month, int year) {
    int days = 0;
    switch (month) {
      case 1: days = 31;
              break;
      case 2: if (isLeapYear(year)) days = 29;
                    else days = 28;
              break;
      case 3: days = 31;
              break;
      case 4: days = 30;
              break;
      case 5: days = 31;
              break;
      case 6: days = 30;
              break;
      case 7: days = 31;
              break;
      case 8: days = 31;
              break;
      case 9: days = 30;
              break;
      case 10: days = 31;
               break;
      case 11: days = 30;
               break;
      case 12: days = 31;
               break;
    }
    return days;
  }
}
```

[redacted]

Code 5

```
/**
 * Prints the calendars of all the years in the 20th century.
 */
public class Calendar1 {
    // Starting the calendar on 1/1/1900
    static int dayOfMonth = 1;
    static int month = 1;
    static int year = 1900;
    static int dayOfWeek = 2;     // 1.1.1900 was a Monday
    static int nDaysInMonth = 31; // Number of days in January

    /**
     * Prints the calendars of all the years in the 20th century. Also prints the
     * number of Sundays that occured on the first day of the month during this period.
     */
    public static void main(String args[]) {
        // Advances the date and the day-of-the-week from 1/1/1900 till 31/12/1999, inclusive.
        // Prints each date dd/mm/yyyy in a separate line. If the day is a Sunday, prints "Sunday".
        int startingSundaysCounter = 0;
        while (year < 2000) {
            System.out.print(dayOfMonth + "/" + month + "/" + year);
            if (dayOfWeek == 1)  {
                System.out.print(" Sunday");
                if (dayOfMonth == 1) {
                    startingSundaysCounter++;
                }
            }
            System.out.println();
            advance();
            }
        System.out.println("During the 20th century, " + startingSundaysCounter + " Sundays fell on the first day of the
month");
}

    // Advances the date (day, month, year) and the day-of-the-week.
```

```
 // If the month changes, sets the number of days in this month.
 // Side effects: changes the static variables dayOfMonth, month, year, dayOfWeek, nDaysInMonth.
 private static void advance() {
    if (dayOfWeek < 7) {
        dayOfWeek++;        // advance counter for day in week
    } else {
        dayOfWeek = 1;      // end of week - reset day
    }
    if (dayOfMonth < nDaysInMonth) {
        dayOfMonth++;       // advance counter for date of month
    } else {                // reached end of month
        dayOfMonth = 1;     //reset date
        if (month < 12) {   // advance month
            month++;
        } else {            // end of year - reset month and advance year
            month = 1;
            year++;
        }
        nDaysInMonth = nDaysInMonth(month, year);
    }

 }

// Returns true if the given year is a leap year, false otherwise.
public static boolean isLeapYear(int year) {
    boolean isLeapYear = (year % 400 == 0);
    isLeapYear = isLeapYear || (((year % 4) == 0) && (year % 100 != 0));
    return isLeapYear;
}

// Returns the number of days in the given month and year.
// April, June, September, and November have 30 days each.
// February has 28 days in a common year, and 29 days in a leap year.
// All the other months have 31 days.
public static int nDaysInMonth(int month, int year) {
    int days = 0;
    switch (month) {
```

```
        case 1: days = 31;
                break;
        case 2: if (isLeapYear(year)) days = 29;
                    else days = 28;
                break;
        case 3: days = 31;
                break;
        case 4: days = 30;
                break;
        case 5: days = 31;
                break;
        case 6: days = 30;
                break;
        case 7: days = 31;
                break;
        case 8: days = 31;
                break;
        case 9: days = 30;
                break;
        case 10: days = 31;
                 break;
        case 11: days = 30;
                 break;
        case 12: days = 31;
                 break;
      }
      return days;

   }
}
```

Code 6

```
/**
 * Prints the calendar of a given year
 */
public class Calendar {
    // Starting the calendar on 1/1/1900
   static int dayOfMonth = 1;
   static int month = 1;
   static int year = 1900;
   static int dayOfWeek = 2;     // 1.1.1900 was a Monday
   static int nDaysInMonth = 31; // Number of days in January

   /**
    * Prints the calendars of the requested year
    * Also marks the Sundays that occured on the first day of the month.
    */
   public static void main(String args[]) {
      // Advances the date and the day-of-the-week from 1/1/1900 till the wanted year.
      // Prints each date dd/mm/yyyy in a separate line. If the day is a Sunday, prints "Sunday".
      // The following variable, used for debugging purposes, counts how many days were advanced so far.
      int requestedYear = Integer.parseInt(args[0]);
      while (year<requestedYear) {
         advance();
      }
      while (year == requestedYear) {
         System.out.print(dayOfMonth + "/" + month + "/" + year);
         if (dayOfWeek == 1) {
            System.out.print(" Sunday");
         }
         System.out.println();
         advance();
      }
   }

    // Advances the date (day, month, year) and the day-of-the-week.
    // If the month changes, sets the number of days in this month.
```

```java
 // Side effects: changes the static variables dayOfMonth, month, year, dayOfWeek, nDaysInMonth.
 private static void advance() {
    if (dayOfWeek < 7) {
        dayOfWeek++;        // advance counter for day in week
    } else {
        dayOfWeek = 1;      // end of week - reset day
    }
    if (dayOfMonth < nDaysInMonth) {
        dayOfMonth++;       // advance counter for date of month
    } else {                // reached end of month
        dayOfMonth = 1;     //reset date
        if (month < 12) {   // advance month
            month++;
        } else {            // end of year - reset month and advance year
            month = 1;
            year++;
        }
        nDaysInMonth = nDaysInMonth(month, year);
    }

 }

// Returns true if the given year is a leap year, false otherwise.
public static boolean isLeapYear(int year) {
    boolean isLeapYear = (year % 400 == 0);
    isLeapYear = isLeapYear || (((year % 4) == 0) && (year % 100 != 0));
    return isLeapYear;
}

// Returns the number of days in the given month and year.
// April, June, September, and November have 30 days each.
// February has 28 days in a common year, and 29 days in a leap year.
// All the other months have 31 days.
public static int nDaysInMonth(int month, int year) {
    int days = 0;
    switch (month) {
        case 1: days = 31;
```

```
                break;
        case 2: if (isLeapYear(year)) days = 29;
                        else days = 28;
                break;
        case 3: days = 31;
                break;
        case 4: days = 30;
                break;
        case 5: days = 31;
                break;
        case 6: days = 30;
                break;
        case 7: days = 31;
                break;
        case 8: days = 31;
                break;
        case 9: days = 30;
                break;
        case 10: days = 31;
                 break;
        case 11: days = 30;
                 break;
        case 12: days = 31;
                 break;
      }
      return days;

   }
}
```