/\*\*

\* 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) {

// Replace the following statement with your code

double g = loan/n;

iterationCounter=0;

while(endBalance(loan, rate, n, g) >= epsilon) {

g = g + epsilon;

iterationCounter++;

}

return g;

}

/\*\*

\* 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) {

// Replace the following statement with your code

double min = 0;

double max = loan;

double g = ((min + max) / 2);

iterationCounter=0;

while(max - min > epsilon){

if(endBalance(loan, rate, n, min) \* endBalance(loan, rate, n, g) < 0 ){

max = g;

g = (min + g) / 2;

}

else{

min = g;

g = (max + g) / 2;

}

iterationCounter++;

}

return g;

}

/\*\*

\* 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) {

// Replace the following statement with your code

double balance = loan;

for(int i = 0; i < n; i++){

balance = ((balance - payment) \* (1 + (rate / 100)));

}

return balance;

}

}

/\*\* 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) {

// Replace the following statement with your code

int length = s.length();

String newString ="";

for(int i = 0 ; i < length ; i++) {

char ch = s.charAt(i);

if (ch >= 'A' && ch <= 'Z'){

newString = newString + (char)(ch + 32);

}

else{

newString = newString + (char)(ch + 0);

}

}

return newString;

}

}

/\*\* 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) {

// Replace the following statement with your code

String newS = "";

int length = s.length();

for (int i = 0 ; i < length ; i++){

char ch = s.charAt(i);

if(newS.indexOf(ch) < 0 || ch == ' '){

newS = newS + ch;

}

}

return newS;

}

}

/\*

\* 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) {

// Replace this comment with your code

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) {

// Replace the following statement with your code

boolean leap = false;

if (year % 4 == 0 || (year % 100 == 0 && year % 400 == 0)){

leap = true;

}

return leap;

}

// 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) {

// Replace the following statement with your code

int days = 0;

switch (month) {

case 1:

days = 31;

break;

case 2:

if(isLeapYear(year) == true){

days = 29;

break;

}

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;

}

}

/\*\*

\* 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".

// The following variable, used for debugging purposes, counts how many days were advanced so far.

//// Write the necessary initialization code, and replace the condition

//// of the while loop with the necessary condition

while (year <= 1999 && month <= 12) {

//// Write the body of the while

advance();

break;

//// If you want to stop the loop after n days, replace the condition of the

//// if statement with the condition (debugDaysCounter == n)

}

//// Write the necessary ending code here

}

// 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() {

// Replace this comment with your code

int sundaycounter = 0;

for(int year = 1900 ; year <= 1999 ; year++){

for(int month = 1 ; month <= 12 ; month++){

nDaysInMonth = nDaysInMonth(month , year);

for(int i = 1; i <= nDaysInMonth ; i++){

if(dayOfWeek == 1){

System.out.println(i + "/" + month + "/" + year + " sunday");

if(i == 1){

sundaycounter++;

}

}

else{

System.out.println(i + "/" + month + "/" + year);

}

dayOfWeek++;

if(dayOfWeek > 7){

dayOfWeek = 1;

}

}

dayOfMonth = 1;

}

}

System.out.println("During the 20th century, " + sundaycounter + " Sundays fell on the first day of the month");

}

// Returns true if the given year is a leap year, false otherwise.

private static boolean isLeapYear(int year) {

// Replace the following statement with your code

boolean leap = false;

if (year % 4 == 0 && (year % 100 == 0 && year % 400 == 0)){

leap = true;

}

return leap;

}

// 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.

private static int nDaysInMonth(int month, int year) {

// Replace the following statement with your code

int days = 0;

switch (month) {

case 1:

days = 31;

break;

case 2:

if(isLeapYear(year) == true){

days = 29;

break;

}

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;

}

}

/\*\*

\* Prints the calendars of all the years in the 20th century.

\*/

public class Calendar {

// Starting the calendar on 1/1/1900

static int dayOfMonth = 1;

static int month = 1;

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".

// The following variable, used for debugging purposes, counts how many days were advanced so far.

//// Write the necessary initialization code, and replace the condition

//// of the while loop with the necessary condition

int year = Integer.parseInt(args[0]);

//// Write the body of the while

advance(year);

//// If you want to stop the loop after n days, replace the condition of the

//// if statement with the condition (debugDaysCounter == n)

}

//// Write the necessary ending code here

// 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(int year) {

// Replace this comment with your code

dayOfWeek = 2;

for(int y = 1900 ; y < year ; y++){

for(int month = 1 ; month <= 12 ; month++){

nDaysInMonth = nDaysInMonth(month , y);

for(int i = 1; i <= nDaysInMonth ; i++){

dayOfWeek++;

if(dayOfWeek > 7){

dayOfWeek = 1;

}

}

dayOfMonth = 1;

}

}

for(int month = 1 ; month <= 12 ; month++){

nDaysInMonth = nDaysInMonth(month , year);

for(int i = 1; i <= nDaysInMonth ; i++){

if(dayOfWeek == 1){

System.out.println(i + "/" + month + "/" + year + " Sunday");

}

else{

System.out.println(i + "/" + month + "/" + year);

}

dayOfWeek++;

if(dayOfWeek > 7){

dayOfWeek = 1;

}

}

dayOfMonth = 1;

}

}

// Returns true if the given year is a leap year, false otherwise.

private static boolean isLeapYear(int year) {

// Replace the following statement with your code

boolean leap = false;

if (year % 400 == 0){

leap = true;

}

if (leap == true || year % 4 == 0 && year % 100 != 0){

leap = true;

}

return leap;

}

// 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.

private static int nDaysInMonth(int month, int year) {

// Replace the following statement with your code

int days = 0;

switch (month) {

case 1:

days = 31;

break;

case 2:

if(isLeapYear(year) == true){

days = 29;

break;

}

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;

}

}