CSC 122 001 Computer Science II
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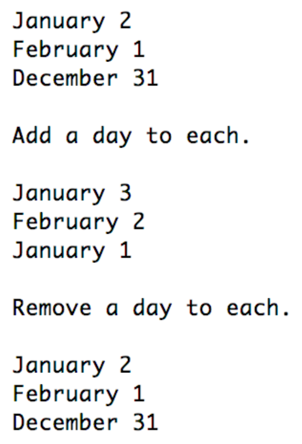
Chapter 11 Programming Challenge 3 Day of the Year Modification
Modify the *DayOfYear* class from the previous programming challenge and add a constructor that takes two parameters: a string representing a month and an integer in the range 0 through 31 representing the day of month. Also, add the prefix and postfix increment and decrement overloaded operators.

Screenshot of runtime.

```
January 2
February 1
December 31

Add a day to each.

January 3
February 2
January 1

Remove a day to each.

January 2
February 1
December 31
```

Files included: (1) main.cpp, (2) DayOfYear.h, (3) DayOfYear.cpp

main.cpp

```cpp
#include <iostream>
#include "DayOfYearMod.h"

int main() {

    int test[ ] = {2, 32, 0}; // Ignore last test case.
    const int SIZE = sizeof(test) / sizeof(test[0]);

    DayOfYearMod d[SIZE];

    // Assign test values.

    for (int i = 0; i < SIZE - 1; i++) {
        d[i].setDay(test[i]);
        std::cout << d[i] << " \n";
    }
    // Assign last test case with new constructor
    d[SIZE - 1] = DayOfYearMod("December", 31);
    std::cout << d[SIZE - 1] << "\n";

    std::cout << "\n";
    std::cout << "Add a day to each. \n";
    std::cout << "\n";

    for (int i = 0; i < SIZE; i++) {
        std::cout << ++d[i] << "\n";
    }

    std::cout << "\n";
    std::cout << "Remove a day to each. \n";
    std::cout << "\n";

    for (int i = 0; i < SIZE; i++) {
        std::cout << --d[i] << "\n";
    }

    return 0;
}
```

DayOfYear.h

```
#ifndef CH11_PR2_DAY_OF_THE_YEAR_DAYOFYEAR_H
#define CH11_PR2_DAY_OF_THE_YEAR_DAYOFYEAR_H

#include <string>
#include <iostream>

class DayOfYearMod {

public:
    static const int dayMax;
    static const int numMonths;
    static int daysPerMonth[ ]; // One-based indexing. 1 = January
    static std::string monthNames[ ];

private:
    int numDay; // -nth day of the year

    // Results
    int numMonth;
    std::string month;
    int dayOfMonth;

    void extractDetails();

public:

    DayOfYearMod();
    DayOfYearMod(int);
    DayOfYearMod(std::string, int);
    void setDay(const int);

    bool isInRange(int);
    void addToDay(int);
    void print();

    // Overloaded Operators
    DayOfYearMod operator++(int);
    DayOfYearMod& operator++();

    DayOfYearMod operator--(int);
    DayOfYearMod& operator--();

    friend std::ostream& operator<<(std::ostream&, const DayOfYearMod&);
};


#endif //CH11_PR2_DAY_OF_THE_YEAR_DAYOFYEAR_H
```

DayOfYear.cpp

```
//
// Created by TheLoneWoof on 2/6/18.
//

#include <algorithm> // For transform
#include "DayOfYearMod.h"

const int DayOfYearMod::dayMax = 365;
const int DayOfYearMod::numMonths = 12;

// One-based indexing. January = 1.
// Assuming no leap years.
int DayOfYearMod::daysPerMonth[DayOfYearMod::numMonths + 1] = {
        0,
        31, 28, 31, 30, 31, 30,
        31, 31, 30, 31, 30, 31
};

std::string DayOfYearMod::monthNames[DayOfYearMod::numMonths + 1] = {
        "",
        "January", "February", "March",
        "April", "May", "June",
        "July", "August", "September",
        "October", "November", "December"
};

// Constructors

DayOfYearMod::DayOfYearMod(int num) {
    numDay = 0;
    addToDay(num); // This function allows for out-of-range values.
}

// Constructor delegated
DayOfYearMod::DayOfYearMod() : DayOfYearMod(1) { }

DayOfYearMod::DayOfYearMod(std::string monthName, int day) {
    int nMonth = 0;

    // Clean-up monthName for searching.
    std::transform(monthName.begin(), monthName.end(), monthName.begin(), ::tolower);
    monthName[0] = toupper(monthName[0]);

    for (int i = 1; i <= numMonths; i++) {
        if (monthName == monthNames[i]) {
            nMonth = i;
            break;
        }
    }

    if (nMonth == 0) {
        std::cout << "Error: Month not found. ";
        exit(-404);
    }
    if (day <= 0 || day > daysPerMonth[nMonth]) {
        std::cout << "Error: Day out of range. ";
        exit(-403);
    }

    // If month and day are valid.
    numMonth = nMonth;
    month = monthNames[nMonth];
    dayOfMonth = day;

    numDay = day;
    for (int i = 1; i < numMonth; i++) {
        numDay += daysPerMonth[i];
    }
}

// PRIVATE METHODS

void DayOfYearMod::extractDetails() {
    int temp = numDay;
    for (int i = 1; i <= numMonths; i++) {
        temp = temp - daysPerMonth[i];
        if (temp <= 0) {
            numMonth = i;
            month = monthNames[i];
            dayOfMonth = temp + daysPerMonth[i];
            break;
        }
    }
}

void DayOfYearMod::addToDay(int plus) {
    this->numDay = (this->numDay + plus) % DayOfYearMod::dayMax;
    // If r == 0, then the day is the max day.
    if (this->numDay == 0) this->numDay = DayOfYearMod::dayMax;
    this->extractDetails();
}

// PUBLIC METHODS

bool DayOfYearMod::isInRange(int val) {
    if (val > 0 && val <= dayMax) {
        return true;
    } else return false;
}

void DayOfYearMod::setDay(const int val) {
    if (!isInRange(val)) {
        std::cout << "Day not in range.";
        exit(-1);
    }
    numDay = val;
    extractDetails();
}

void DayOfYearMod::print() {
    std::cout << month << " " << dayOfMonth;
}

// OVERLOADED OPERATORS

// Prefix Increment
DayOfYearMod& DayOfYearMod::operator++() {
    this->addToDay(1);
    return *this;
}

// Postfix Increment
// This postfix operator functions the same as the default
// postfix operator, meaning that a copy of the object is
// returned and the current object is incremented.
DayOfYearMod DayOfYearMod::operator++(int) {
    DayOfYearMod copy(*this);
    this->addToDay(1);
    return copy;
}

// Prefix Decrement
DayOfYearMod& DayOfYearMod::operator--() {
    this->addToDay(-1);
    return *this;
}

// Postfix Decrement
// See note on postfix increment.
DayOfYearMod DayOfYearMod::operator--(int) {
    DayOfYearMod copy(*this);
    this->addToDay(-1);
    return copy;
}

// Output stream operator
std::ostream& operator<<(std::ostream& out, const DayOfYearMod& d) {
    out << d.month << " " << d.dayOfMonth;
    return out;
}
```