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Jan 18, 11 14:33      C++_all_samples.cc      Page 1/8
//~kvollmay/classes.dir/capstone_s2011.dir/unix_C++_intro.dir/C++sample_inout.cc
//=====
// Sample Program For Input/Output
// with cout/cin name & birthdate are read in & sentence printed out
// handling files: from file "birthdays.data" four name&birthdays read
// sentence for each printed into file "birthdaysout"
//
#include <iostream> // for input/output via screen
using namespace std;
#include <fstream> // for input/output via files
#include <string> // to enable data-type string

int main(){
    int birthday, birthmonth, birthyear;
    string firstname, lastname;

// use screen for input and output:
//-----
    cout << "Please type your first name and your last name, "
    << " separated by a blank. ";
    cin >> firstname >> lastname;
    cout << "please type in your birthday (month, day, year) "
    << " in the form of three integers separated by blanks. ";
    cin >> birthmonth >> birthday >> birthyear;
    cout << "first name << " " << lastname << " is born on "
    << " birthmonth << "/" << birthday << "/" << birthyear << "."
    << endl;

// use files for input and output: (same as before but 4 times)
//-----
// before you run this program cp into your working directory
// ~kvollmay/classes.dir/capstone_s2011.dir/unix_C++_intro.dir/birthdays.data
ifstream infile ("birthdays.data", ios::in);
ofstream outfile ("birthdaysout.data", ios::out);
int i;

for (i=1; i <= 4; i++){
    infile >> firstname >> lastname;
    infile >> birthmonth >> birthday >> birthyear;
    outfile << "first name << " " << lastname << " is born on "
    << " birthmonth << "/" << birthday << "/" << birthyear << "."
    << endl;
}

return 0;
}

//~kvollmay/classes.dir/capstone_s2011.dir/unix_C++_intro.dir/C++sample_C++sampl
e_datatypes.cc
//=====
// Sample Program For Data Types
//
#include <iostream> // for cin and cout
using namespace std;
#include <string> // for string
#include <cmath> // for mathematical functions
#include <cstdlib> // -"-

int main(){
// integer variables:
//-----
    int i1,i2; //similarly short etc.

    i1 = 3;
    i2 = 4*i1;
    cout << "i1=3 and i2=4*i1= " << i2 << endl;

// real variables:
//-----

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Jan 18, 11 14:33      C++_all_samples.cc      Page 2/8

    double d1,d2,d3; //similarly float and long double

    d1 = 3.2;
    d2 = 2.1E-2;
    d3 = 1.5e+3;
    cout << "d1,d2,d3=" << d1 << " " << d2 << " " << d3 << endl;
    cout << "exp(3.1)= " << exp(3.1) << endl;

// character variables:
//-----

    char c1,c2,c3; // single characters
    string firstname,lastname,genericname; // string of characters

    c1 = 'h';
    cout << "the character c1=" << c1 << endl;
    cout << "please type in your first and last name " ;
    cin >> firstname >> lastname;
    cout << "Thank you " << firstname << " " << lastname << "!" << endl;
    genericname = "Otto Mueller";
    cout << genericname << endl;

// logical variable:
//-----

    bool b1,b2,b3;

    b1 = false;
    b2 = true;
    b3 = (d1 < d2);
    cout << "b1,b2,b3=" << b1 << " " << b2 << " " << b3 << endl;

    return 0;
}

//~kvollmay/classes.dir/capstone_s2011.dir/unix_C++_intro.dir/C++sample_C++sampl
e_repetitions.cc
//=====
// Sample Program For Repetitions
// example reads in integer N and calculates&prints 1+2+3+...+N
// using various repetition options and at end mathematical check
//
#include <iostream> // for cin and cout
using namespace std;
#include <cmath> // for mathematical functions
#include <cstdlib> // -"-

int main(){
    int i,N,sum,check;

// read in N (to be able each step of while loop, choose small N)
    cout << "Please type in an integer. For now smaller than 15.";
    cin >> N;

// calculate 1+2+3+...+N

// while

    sum = 0;
    i = 0;
    while (i <= N){
        cout << "i=" << i << endl; //this prints for i=1,2,...,N line
        sum = sum + i; //sum += i; would do the same
        i = i+1; // i++; would do the same;
    }
    cout << "With while: 1+2+...+N=" << sum << endl;

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Jan 18, 11 14:33

C++_all_samples.cc

Page 3/8

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// for
sum = 0;
for (i=0; i <= N; i++){
    sum += i;
}
cout << "With for: 1+2+...+N=" << sum << endl;

// do while
i = 0;
sum = 0;
do{
    sum += i;
    i++;
}
while (i <= N);
cout << "With do-while: 1+2+...+N=" << sum << endl;;

// check with N*(N+1)/2
check = (N*(N+1))/2;
cout << "N*(N+1)/2=" << check << endl;

return 0;
}

//~kvollmay/classes.dir/capstone_s2011.dir/unix_C++_intro.dir/C++sample_C++sampl
e_decisionsI.cc
//-----
// Sample Program For Decisions
// This program reads in two integers and prints out larger integer
//
#include <iostream> // for cin and cout
using namespace std;
#include <string> // for string

int main(){
    int i1,i2;

    cout << "Please type in the first integer ";//say what you need
    cin >> i1; //read in first integer
    cout << "Please type in the second integer ";//endl for new line
    cin >> i2; //read in first integer

// determine if i1 or i2 is larger, print larger one
//-----
    if(i1 > i2){
        cout << i1 << " is larger than " << i2 << endl;
    }
    else {
        cout << i2 << " is larger than " << i1 << endl;
    }

// for this task you could have used max:
//-----
    cout << "Or via max(i1,i2): " << max(i1,i2) << " is larger." << endl;

    return 0;
}
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Jan 18, 11 14:33

C++_all_samples.cc

Page 4/8

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//~kvollmay/classes.dir/capstone_s2011.dir/unix_C++_intro.dir/C++sample_C++sampl
e_decisionsII.cc
//-----
// Sample Program For Decisions (advanced)
// This program reads in two names and birth dates and
// prints out who the older person is.
//
#include <iostream> // for cin and cout
using namespace std;
#include <string> // for string

int main(){
// read in names and birth dates
//-----
    string name1,name2;
    int day1,month1,year1,day2,month2,year2;

    cout << "Please type in the first name ";
    cin >> name1;
    cout << "What is the birth date of " << name1 << "? "
        << " (month, day, year)" << endl
        << "3 integers separated by blanks ";
    cin >> month1 >> day1 >> year1;

    cout << "Please type in the second name ";
    cin >> name2;
    cout << "What is the birth date of " << name2 << "? "
        << " (month, day, year)" << endl
        << "3 integers separated by blanks ";
    cin >> month2 >> day2 >> year2;

// determine who the older person is (older = 1 or 2, 3 if same)
//-----

    int older;

    if(year1 != year2){
        if(year1 < year2)
            older = 1;
        else
            older = 2;
    }
    else if (month1 != month2){
        if(month1 < month2)
            older = 1;
        else
            older = 2;
    }
    else {
        if(day1 < day2)
            older = 1;
        else if (day1 > day2)
            older = 2;
        else
            older = 3;
    }

// print out the result
//-----
    switch (older){
    case 1 :
        cout << name1 << " is the older person." << endl;
        break;

    case 2 :
        cout << name2 << " is the older person." << endl;
        break;
    }
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Jan 18, 11 14:33

C++_all_samples.cc

Page 5/8

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    case 3 :
        cout << name1 << " and " << name2 << " are the same age." << endl;
        break;
    }

    return 0;
}

//~kvollmay/classes.dir/capstone_s2011.dir/unix_C++_intro.dir/C++sample_C++sampl
e_functionsI.cc
//-----
// Sample Program For Functions
// multiply number(s) times five
// (For this task you would usually not write a function, this is
// just an example to illustrate functions.)
#include <iostream> // for cin and cout
using namespace std;
#include <string> // for string
#include <cmath> // for mathematical functions
#include <cstdlib> // -"-

// "Prototype" (announces existence of functions and allows you
// to use functions anywhere in program)
double numbertimes5 (double); //multiply one number times five
void twonumberstimes5 (double&, double&); //multiply two numbers times five

int main(){
    double num1,num2,result1;

// Use numbertimes5 ("Call of Function")

    num1 = 3.1;
    result1 = numbertimes5(num1); //numbertimes5 returns double
    cout << "3.1*5= " << result1 << endl;
    cout << "1.5*5= " << numbertimes5(1.5) << endl;

// Use twonumberstimes5 ("Call of Function")
    num1 = 2.5;
    num2 = 4.1;
    cout << "num1,num2 before: " << num1 << " " << num2 << endl;
    twonumberstimes5 (num1,num2); //notice, result is given back via num1,num2
    // you can only "call function", not result1=...
    cout << "num1,num2 after: " << num1 << " " << num2 << endl;
} //end of main
//-----
// function to multiply single double variable times five
//-----
double numbertimes5 (double n1) { // "Definition of Function"

    double result;

    result = n1 * 5.0;
    return result; //This is "double" of "double nubertimes5 which is returned
}
//-----
// function multiplies two numbers times five
//-----
void twonumberstimes5 (double& n1, double& n2){ // "Definition of Function"

    n1 = n1*5.0;
    n2 = n2*5.0;
}

//~kvollmay/classes.dir/capstone_s2011.dir/unix_C++_intro.dir/C++sample_C++sampl
e_functionsII.cc

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Jan 18, 11 14:33

C++_all_samples.cc

Page 6/8

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//-----
// Sample Program For Functions (advanced)
//-----
#include <iostream> // for cin and cout
using namespace std;
#include <string> // for string
#include <cmath> // for mathematical functions
#include <cstdlib> // -"-

double feetinchtometer (int,double); //in:feet,inch out:meter
void metertofeetinch (double, int&, double&); //in:meter out:feet,inch

int main(){
    int feetval;
    double inchval,resultmeter,meterin;

// Use of feetinchtometer

    cout << "Give the length in feet and inches "
        << "(feet as integer, inch as double "
        << "separated by blank)" << endl;
    cin >> feetval >> inchval ;

    resultmeter = feetinchtometer(feetval,inchval);
    cout << feetval << " feet and " << inchval << " inch="
        << resultmeter << " m" << endl;

// Use of metertoinch

    cout << "Give the length in meter (one double)" << endl;
    cin >> meterin;
    metertofeetinch (meterin, feetval, inchval);
    cout << meterin << " m="
        << feetval << " feet and " << inchval << " inch" << endl;
    return 0;
}
//-----
// function converts feet + inch to meter
//-----
double feetinchtometer (int feet, double inch){

    double result;

    result = feet * 0.3048 + inch * 0.0254;
    return result;
}
//-----
// function converts meter to feet + inch
//-----
void metertofeetinch (double m, int& feet, double& inch){

    double remainingmeters;

    feet = int(m/0.3048);
    remainingmeters = fmod(m,0.3048);
    inch = remainingmeters/0.0254;
}

//~kvollmay/classes.dir/capstone_s2011.dir/unix_C++_intro.dir/C++sample_C++sampl
e_arraysI.cc
//-----
// Sample Program For Arrays
//-----
#include <iostream> // for cin and cout
using namespace std;
#include <string> // for string
#include <cmath> // for mathematical functions
#include <cstdlib> // -"-

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Jan 18, 11 14:33

C++_all_samples.cc

Page 7/8

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int main(){
    int A[3]; //defines A to be set of 3 integers (vector)
    double B[2][2]; //defines B to be a set of 2x2 real numbers (matrix)

// Vector A: assign values to three integers
//
    A[0] = 5; //note index starts with 0!
    A[1] = 2;
// You can use these variables like any other integers. For example:
    cout << "A[0]+A[1]=" << A[0]+A[1] << endl;

// Matrix B: assign values to all for double variables

    B[0][0]= 10;
    B[0][1]= 15;
    B[1][0]= 20;
    B[1][1]= 25;

// You can use these variables like any other real numbers. For example:
    cout << "B[0][0]*B[1][0]=" << B[0][0]*B[1][0] << endl;
// print matrix
    cout << endl;
    for (int i=0; i < 2; i++){
        for (int j=0; j < 2; j++){
            cout << B[i][j] << " ";
        }
        cout << endl;
    }

return 0;
}

//~kvollmayr/classes.dir/capstone_s2011.dir/unix_C++_intro.dir/C++sample_C++sampl
e_arraysII.cc
//=====
// Sample Program For Arrays and how to use in functions
//      A[]  B[][]      (advanced)
//
#include <iostream>      // for cin  and cout
using namespace std;
#include <string>        // for string
#include <cmath>         // for mathematical functions
#include <cstdlib>       //  "-"

const int ALENGTH = 5;
const int BLENGTH = 3;

void printvector (const int [], int); // prints vector
void printmatrix (const int [BLENGTH][BLENGTH]); //print BLENGTHxBLENGTH
void multiplyvectorbytwo (int [],int); // (modify vector)
void multiplymatrixbytwo (int [BLENGTH][BLENGTH]); // (modify matrix)

int main(){
    int A[ALENGTH];
    int B[BLENGTH][BLENGTH];
    int i,j,count;

// determine A and B
//
    for (i=0; i<= (ALENGTH-1); i++){
        A[i] = (i+1)*(i+1);
    }

    count = 0;
    for (i=0; i <= (BLENGTH-1); i++){
        for (j=0; j <= (BLENGTH-1); j++){
            B[i][j] = count;
            count++;

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Jan 18, 11 14:33

C++_all_samples.cc

Page 8/8

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    }
}

// print A
    cout << "A: ";
    printvector(A,ALENGTH); //call function to print A
    cout << endl;

// print B
    cout << "B: " << endl;
    printmatrix(B);

// multiply A by 2 and print again
    multiplyvectorbytwo(A,ALENGTH);
    cout << "A: ";
    printvector(A,ALENGTH); //call function to print A
    cout << endl;
// multiply B by 2 and print again
    multiplymatrixbytwo(B);
    cout << "B: " << endl;
    printmatrix(B);

return 0;
}

//-----
// function prints vector (example for 1-d array in, nothing out)
void printvector(const int vectorA[], int Asize){
// alternative void printvector(const int* vectorA, int Asize){
//-----
    for (int i=0; i<= (Asize-1); i++){
        cout << vectorA[i] << " ";
    }
    cout << endl;
}
//-----
// function prints matrix. notice that length needs to be specified
void printmatrix (const int matrix [BLENGTH][BLENGTH]){ //print matrix
//-----
    for (int i=0; i <= (BLENGTH-1); i++){
        for (int j=0; j <= (BLENGTH-1); j++){
            cout << matrix[i][j] << " ";
        }
        cout << endl;
    }
    cout << endl;
}
//-----
void multiplyvectorbytwo (int vector[], int size){
    for (int i=0; i<= (size-1); i++){
        vector[i] = vector[i]*2;
    }
}
//-----
void multiplymatrixbytwo (int matrix [BLENGTH][BLENGTH]){
    for (int i=0; i <= (BLENGTH-1); i++){
        for (int j=0; j <= (BLENGTH-1); j++){
            matrix[i][j] = matrix[i][j] * 2;
        }
    }
}
//-----
// Note for You: to print single source code (e.g. C++sample_inout.cc)
// type a2ps -2r C++sample_inout.cc
// Note for KVL: to make psfile name C++sample_all.cc (.cc for a2ps)
// a2ps -2r -o C++_all_samples.ps C++_all_samples.cc

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