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/*
 * Date written: August 15, 2002
 * Written by: Peraphon Sophatsathit
 *             Department of Mathematics, Faculty of Science
 *             Chulalongkorn University.
 *             email: peraphon.s@chula.ac.th
 *             http://pioneer.netserv.chula.ac.th/~sperapho
 * Classnote:  Sample #3 for 2301171 tutorial (Distant Learning Program)
 * Description: This program illustrates the use of various math and
 *             trigonometric functions in C.
 */

#include <stdio.h>
#include <math.h>

#define Oet 180.0 /* degree to radian conversion */

#define M_E 2.7182818284590452354 /* e */
#define M_PI 3.14159265358979323846 /* pi */
/*
 * function prototypes
 */
double sin(double);
double cos(double);
double tan(double);
double asin(double);
double acos(double);
double atan(double);

double log(double);
double log10(double);
double exp(double);
double floor(double);
double ceil(double);
double sqrt(double);
double pow(double, double);
double fabs(double);
int abs(int);
long int labs(long int);

int
main(void)
{
    int first = -34;
    long int second = -20L;
    double again = 7.5;
    double next = -4.2;
    double base = 2.0;
    double pw = 5.0;
    double lgv = M_E;

    double angle1 = 45.0;
    double angle2 = 30.0;
    double angle3 = 60.0;
    double tmp1, tmp2;

    /*
     * math functions
     */
    printf("\n");
    printf("absolute integer value of %d is:\t%7d\n", first, abs(first));
    printf("absolute long integer value of %ld is:\t%7ld\n", second, labs(second));
    printf("absolute floating value of %6.2f is:\t%7.2f\n", next, fabs(next));
    printf("floor of %6.2f is:\t\t\t%7.2f\n", again, floor(again));
    printf("ceiling of %6.2f is:\t\t\t%7.2f\n", again, ceil(again));
    printf("squared root of %6.2f is:\t\t\t%7.2f\n", again, sqrt(again));
    printf("power of %4.1f(to %4.1f) is:\t\t\t%7.2f\n", base, pw, pow(base, pw));
    printf("log(e) of %6.2f is:\t\t\t%7.2f\n", lgv, log(lgv));
    printf("log10 of %6.2f is:\t\t\t%7.2f\n", again, log10(again));

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printf("exponential of %6.2f is:\t\t%7.2f\n", M_E, exp(M_E));
printf("\n");

/*
 * trigonometric functions
 */
tmp1 = sin(angle1 * M_PI / Oet);
printf("sine of %6.2f degrees is:\t\t%7.2f\n", angle1, tmp1);
tmp2 = asin(tmp1) * Oet / M_PI;
printf("arc sine of %6.2f is:\t\t\t%7.2f\n", tmp1, tmp2);
tmp1 = cos(angle1 * M_PI / Oet);
printf("cosine of %6.2f degrees is:\t\t%7.2f\n", angle1, tmp1);
tmp2 = acos(tmp1) * Oet / M_PI;
printf("arc cosine of %6.2f is:\t\t%7.2f\n", tmp1, tmp2);
tmp1 = tan(angle1 * M_PI / Oet);
printf("tangent of %6.2f degrees is:\t\t%7.2f\n", angle1, tmp1);
tmp2 = atan(tmp1) * Oet / M_PI;
printf("arc tangent of %6.2f is:\t\t%7.2f\n", tmp1, tmp2);
printf("\n");
tmp1 = sin(angle2 * M_PI / Oet);
printf("sine of %6.2f degrees is:\t\t%7.2f\n", angle2, tmp1);
tmp2 = asin(tmp1) * Oet / M_PI;
printf("arc sine of %6.2f is:\t\t\t%7.2f\n", tmp1, tmp2);
tmp1 = cos(angle3 * M_PI / Oet);
printf("cosine of %6.2f degrees is:\t\t%7.2f\n", angle3, tmp1);
tmp2 = acos(tmp1) * Oet / M_PI;
printf("arc cosine of %6.2f is:\t\t%7.2f\n", tmp1, tmp2);

tmp1 = tan(angle2 * M_PI / Oet);
printf("tangent of %6.2f degrees is:\t\t%7.2f\n", angle2, tmp1);
tmp2 = atan(tmp1) * Oet / M_PI;
printf("arc tangent of %6.2f is:\t\t%7.2f\n", tmp1, tmp2);
tmp1 = tan(angle3 * M_PI / Oet);
printf("tangent of %6.2f degrees is:\t\t%7.2f\n", angle3, tmp1);
tmp2 = atan(tmp1) * Oet / M_PI;
printf("arc tangent of %6.2f is:\t\t%7.2f\n", tmp1, tmp2);
printf("\n");

return 0;
}

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