Задание 1

- **Увеличивает значение первой переменной на заданную величину**
- **Меняет знак переменной**
- **Уменьшает радиус окружности на заданную величину**
- **Транспонирует матрицу**

Программа

function.h:

```
#include <cmath>

struct circle
{
    float x;
    float y;
    float r;
    circle(float, float, float);
    circle();
};

struct matrix
{
    int elements[3][3];

    matrix(int[3][3]);
    matrix();
};

namespace ptr
{
    void sum(int*, const int*);
    void conversion(float*);
    void decrease_r(circle*, float);
    void transpose_matrix(matrix*);
}

namespace ref
{
    void sum(int&, const int&);
    void conversion(float&);
    void decrease_r(circle&, float);
    void transpose_matrix(matrix&);
}
```

Function.cpp

```
#include "functions.h"

////////////увеличение одной переменной на заданную переменную
```

```
void ptr::sum(int* a, const int* b ){

    *a = *a + *b;
}
void ref::sum(int& a, const int& b){
    a = a + b;
}
///////////////меняет знак переменной
void ptr::conversion(float* a){
    *a = 0 - *a;
}
void ref::conversion(float& a){
    a = 0 -a;
}
///////// уменьшает радиус окружности на заданное число
circle::circle(float new_x, float new_y, float new_r){
    x = new_x;// У центра
    y = new_y;// Х центра
    r = new_r; // радиус
}
circle::circle(){
}

void ptr::decrease_r(circle* circle, float d){
    circle->r -= d;
}
void ref::decrease_r(circle& circle, float d){
    circle.r -= d;
}
////////////////////////////////////////////////////////
matrix::matrix(int array[3][3]){
    for (int i = 0; i < 3; ++i){
        for (int j = 0; j < 3; ++j){
            elements[i][j] = array[i][j];
        }
    }
}
matrix::matrix(){
}
void swap(int& a, int& b){
    int t = a;
    a = b;
    b = t;
}
void ptr::transpose_matrix(matrix* m)
{
    for (int i = 0; i < 3; ++i)
    {
        for (int j = 0; j < i; ++j)
        {
            swap(m->elements[i][j], m->elements[j][i]);
        }
    }
}

void ref::transpose_matrix(matrix& m){
    for (int i = 0; i < 3; ++i){
        for (int j = 0; j < i; ++j){
            swap(m.elements[i][j], m.elements[j][i]);
        }
    }
}
```

Main.cpp

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

int main()
{
    std::cout << "sum" << std::endl;
    int t1_b = 7;
    int t1_a = 10;

    t1_a = 10;
    ptr::sum (&t1_a, &t1_b);
    std::cout << "pointer.sum 10 + 7 = " << t1_a << std::endl;

    t1_a = 11;
    t1_b = 8;
    ref::sum(t1_a, t1_b);
    std::cout << "reference.sum 11 + 8 = " << t1_a << std::endl << std::endl;
////////////////////////////////////////////////
    std::cout << "conversion" << std::endl;
    float t2_a;

    t2_a = 5.6;
    ptr::conversion(&t2_a);
    std::cout << "pointer conversion 5.6 to " << t2_a << std::endl;

    t2_a = 5.45;
    ref::conversion(t2_a);
    std::cout << "reference conversion 5.45 to " << t2_a << std::endl << std::endl;
    ////////////////////////////////
    std::cout << "radius" << std::endl;
    circle t3_c;
    float d;

    t3_c = circle(1.2, 2.3, 3.4);
    d = 0.56;
    ptr::decrease_r(&t3_c, d);
    std::cout << "Pointer(Circle(1.2, 2.3, 3.4), 0.56): " << t3_c.r  << std::endl;
/*float(3.4) - float(0.56)*/
    t3_c = circle(1.2, 2.3, 3.4);
    d = 0.56;
    ref::decrease_r(t3_c, d);
    std::cout << "Reference(Circle(1.2, 2.3, 3.4), 0.56): " << t3_c.r << std::endl <<
std::endl; /*float(3.4) - float(0.56)*/
    ////////////////////////
    std::cout << "Transpose matrix" << std::endl;
    matrix t4_m;
    int t4_a[3][3] = { 1, 2, 3, 4, 5, 6, 7, 8, 9 };
    bool t4_res = true;

    t4_m = matrix(t4_a);
    ptr::transpose_matrix(&t4_m);
    for (int i = 0; i < 3; ++i){
        for (int j = 0; j < 3; ++j){
            t4_res &= t4_m.elements[i][j] == t4_a[j][i];
        }
    }
    std::cout << "Pointer Matrix({ { 1, 2, 3 }, { 4, 5, 6 }, { 7, 8, 9 } }): " << (
t4_res ? "OK" : "WA")  << std::endl;
```

```
    t4_m = matrix(t4_a);
    ref::transpose_matrix(t4_m);
    for (int i = 0; i < 3; ++i){
        for (int j = 0; j < 3; ++j){
            t4_res &= t4_m.elements[i][j] == t4_a[j][i];
        }
    }
    std::cout << "Reference Matrix({ { 1, 2, 3 }, { 4, 5, 6 }, { 7, 8, 9 } }): " <<
(t4_res ? "OK" : "WA") << std::endl << std::endl;
```

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