

Quiz 1 CMPSC 16, PROBLEM SOLVING WITH COMPUTERS, SUMMER 2016

NAME:

DATE:

Problem 1.(10 points.) Why can a `short` only store values in the range $[-32768, 32767]$ while an `int` can store values in the range $[-2147483648, 2147483647]$? Additionally, how could we adjust these data types to store larger values?

A *short* is only 16 bits, while an *int* is 32 bits. We could use a *long*, which is 64 bits to store more information, or a *long long*, which is 128 bits.

Problem 2.(10 points.) What is a run-time error?

A run-time error is an error that arises during the execution of the program. For example, dividing by zero.

Problem 3.(10 points.) What does `#include <iostream>` do in C++?

This line is including the *iostream* library, which contains useful functions like *cin* and *cout*.

Problem 4.(10 points.) Why do most computers have two different types of memory? What is the difference between the two?

Typically we have persistent (secondary) memory, which is used for long-term storage, even when the power is disconnected, and volatile (main) memory, which is used for temporary storage during execution. Due to the available technologies, persistent memory tends to be cheaper, but significantly slower. Hence the two can both be utilized intelligently to provide an optimal experience.

Problem 5.(10 points.) What will this program output?

```
#include <iostream>

using namespace std;

int main() {

    int i = 3;
    double d = 2.0;

    // Divide i by d and store the result in i
    i /= d;

    cout << "The answer is:_" << i << endl;

    return 0;
}
```

Since we are trying to store a decimal value (double) in an int, the decimal will be truncated. Thus, the output will be:
The answer is: 1

Problem 6.(10 points.) What will this program output?

```
#include <iostream>

using namespace std;

int main() {

    int my_number;

    my_number += 5;

    cout << "My_number:_" << my_number << endl;

    return 0;
}
```

Since we never set an initial value for *my_number*, we have no clue what initial value will be in the variable, and thus have no clue which value it will contain after adding 5 to it.

Problem 7 [Syntax Error].(10 points.) What should this program do? What does it actually do? Fix it.

```
#include <iostream>
#include <string>

using namespace std;

int main() {
    string input = "";

    cout << "Please enter your password:";
    cin >> input;

    if (input == "s3cr3tPassword");
        cout << "The secret is: Hogwartz" << endl;
    else
        cout << "Sorry, wrong password!" << endl;

    return 0;
}
```

This program should output “The secret is: Hogwartz” whenever the password is entered. However, because of the ; after the if statement on line 13, this program will not even compile because this terminates the if, and leaves the else statement without an if.

Problem 8 [Comparators].(10 points.) What should this program do? What does it actually do? Fix it.

```
#include <iostream>

using namespace std;

int main() {

    int input = 0;

    cout << "Give me a number:";
    cin >> input;

    if ((input = 50) || (input > 100)) {
        cout << "The result is:_" << (input*100) << endl;
    } else {
        cout << "I don't like your number" << endl;
    }

    return 0;
}
```

This program should take the number that user inputs and multiply it by 100 if its 50 or greater than 100. However, because of the first clause in the if (*input = 50*), the input will actually always be set to 50, and the result will always be “The result is: 5000”. The correct expression is: (*input == 50*)

Problem 9.(10 points.) What will this program do?

```
#include <iostream>

using namespace std;

int main() {

    int input = 0;
    double sum = 0, count = 0;
    while (input != -1) {
        cout << "Give_me_a_number:";
        cin >> input;

        sum += input;
        count++;
    }

    cout << "The_result_is:" << (sum / count) << endl;

    return 0;
}
```

This program will continue to take input from the user until they input -1. At this point the program will output the average of all of the input values (including the -1, which was a bug on my part).

Problem 10.(10 points.) What inputs will output "You win!"?

```
#include <iostream>

using namespace std;

int main() {

    bool input1 = 0, input2 = 0, input3 = 0;

    cout << "Give_me_3_numbers:";
    cin >> input1 >> input2 >> input3;

    if ((input1 && input2) || input3) {
        cout << "You_win!" << endl;
    } else {
        cout << "You_lose!" << endl;
    }

    return 0;
}
```

The following inputs will result in a positive output: 001, 011, 101, 111, and 110.