You have 50 minutes. You may use one prepared 8.5 × 11 sheet of paper. All questions concern the C++ programming language. For the multiple choice questions, marked [MC], circle the letter of the best answer, even if no answer is ideal. For the other questions, write the answer after the question in a clear and readable way.

For the programming problems, do not use arrays or any similar data structure. Only use the library functions that are explicitly allowed. Check your answers.

1. [MC] What is the value of C++ expression 9 − 5 − 2 * 3?
   (a) −2
   (b) 0
   (c) 2
   (d) 6
   (e) 10

2. [MC] What is the value of C++ expression 19/5 + 3/5?
   (a) 3
   (b) 3.4
   (c) 4
   (d) 4.4
   (e) 5

3. [MC] What is the value of C++ expression (14 % 3 + 1)?
   (a) 2
   (b) 3
   (c) 3.6666 . . .
   (d) 4.66666 . . .
   (e) 5

4. [MC] What is the type of expression 2.0*3.0 + 1?
   (a) int
   (b) long
   (c) real
   (d) bool
   (e) double
5. [MC] When you create a variable $x$ using statement

```c
int x;
```

(a) $x$ has an initial value of 0.
(b) $x$ has no initial value, and using $x$ before you initialize $x$ will lead to a run-time error.
(c) $x$ has no initial value, and using $x$ before you initialize $x$ will lead to a compile error.
(d) $x$ will have an initial value, but you have no way of knowing what that value will be when the program runs.

6. [MC] What is the value of $b$ after statement

```c
bool b = 3 > 2 && 4 == 4;
```

is performed?

(a) false
(b) true
(c) $b$ does not have a value because that statement is not allowed.
(d) $b$ has a value, but you have no way of determining what that value is.

7. What is the value of variable $x$ after the following statements?

```c
int y = 10;
int x = y;
y = 50;
x++; y++;
```

Answer: _______________________

8. Function $f(n)$ is defined below in C++. What is the value of C++ expression $f(f(3))$?

```c
int f(const int n)
{
    int m = (n+1)*(n+1);
    return m + 1;
}
```

Answer: _______________________

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9. The distance between numbers \( x \) and \( y \) on a number line is \(|x - y|\).
Write a C++ definition of function distance\((x, y)\), which returns the
distance between numbers \( x \) and \( y \) on a number line. You can use
function abs from the library. Do not use sqrt. A heading is given.

```cpp
int distance(int x, int y)
```

10. Imagine that you start at one number \( w \) on a number line and walk
to another number \( x \). Then, from there, you walk to another number
\( y \), and then to another number \( z \). Write a C++ definition of function
totalDistance\((w, x, y, z)\), which returns the total distance traveled
walking from \( w \) to \( x \) to \( y \) to \( z \). You must use your function from the
preceding problem to determine the distance between two numbers.
Do not use any library functions in this function definition. A heading
is given.

```cpp
int totalDistance(int w, int x, int y, int z)
```
11. Write a C++ definition of function ascending \((x, y, z)\), which returns true if sequence \((x, y, z)\) is in strictly ascending order, and returns false if not. A heading is given.

\[
bool \ ascending(int \ x, \ int \ y, \ int \ z)
\]