PIC 10A
Introduction to Programming in C++

Fall 2025 Midterm I - Practice Exam

Instructions:

- You have **50 minutes** to complete this practice exam.
- There are **3** problems (1abcd, 2, 3ab) worth a total of 30 points.
- Try to complete it under timed, exam-like conditions.
- Write your solutions in the space **below**, **next to**, or **included with** the questions.
- After you finish, check your work against the provided answer key.

Name: _____
Student ID number: _____
Discussion: _____

Question	Points	Score
1	12	
2	6	
3	20	
Total:	38	

- All questions start with the **correct** header inclusions and `using namespace std`.

  These are never a reason for a build error.

- All questions use line numbers.

  These are not a part of the code and never a reason for a build error.

- Recall that `'␣'` is how the *space* `char` literal is indicated in the textbook and this exam. You do **not** need to write spaces this way.

Codepoint	char		Codepoint	char		Codepoint	char		Codepoint	char
0	'\0'		32	' '		64	'@'		96	'`'
			33	'!'		65	'A'		97	'a'
			34	'"'		66	'B'		98	'b'
			35	'#'		67	'C'		99	'c'
			36	'$'		68	'D'		100	'd'
			37	'%'		69	'E'		101	'e'
			38	'&'		70	'F'		102	'f'
			39	'\''		71	'G'		103	'g'
			40	'('		72	'H'		104	'h'
9	'\t'		41	')'		73	'I'		105	'i'
10	'\n'		42	'*'		74	'J'		106	'j'
			43	'+'		75	'K'		107	'k'
			44	','		76	'L'		108	'l'
13	'\r'		45	'-'		77	'M'		109	'm'
			46	'.'		78	'N'		110	'n'
			47	'/'		79	'O'		111	'o'
			48	'0'		80	'P'		112	'p'
			49	'1'		81	'Q'		113	'q'
			50	'2'		82	'R'		114	'r'
			51	'3'		83	'S'		115	's'
			52	'4'		84	'T'		116	't'
			53	'5'		85	'U'		117	'u'
			54	'6'		86	'V'		118	'v'
			55	'7'		87	'W'		119	'w'
			56	'8'		88	'X'		120	'x'
			57	'9'		89	'Y'		121	'y'
			58	':'		90	'Z'		122	'z'
			59	';'		91	'['		123	'{'
			60	'<'		92	'\\'		124	'|'
			61	'='		93	']'		125	'}'
			62	'>'		94	'^'		126	'~'
			63	'?'		95	'_'			

Problem 1. *12pts.*

In each of part (a), (b), (c), and (d),

- **either** explain **any** build errors, runtime errors, or undefined behavior,
- **or**, if none of these issues arise and the code builds and runs on every compiler to produce the same output, write down the output.

(a) (Explain any build errors, runtime errors, undefined behavior, **or** write the output.)

```
#include <iostream>
using namespace std;

int main() {
    int x = 5;
    int y = 2;
    double z = x / y;
    cout << z << endl;
    z = static_cast<double>(x) / y;
    cout << z << endl;
    cout << x % y + 3 << endl;
    return 0;
}
```

(b)
```cpp
#include <iostream>
using namespace std;

int main() {
    char c1 = 'x';
    char c2 = 'B';
    c1 = c1 - ('a' - 'A');
    c2++;
    cout << c1 << c2 << endl;
    return 0;
}
```

(c)

```cpp
#include <iostream>
#include <string>
using namespace std;

int main() {
    string s = "hello";
    for (int i = 0; i <= s.size(); ++i) {
        cout << s.at(i);
    }
    return 0;
}
```

(d) (Explain any build errors, runtime errors, undefined behavior, **or** write the output.)

```
#include <iostream>
using namespace std;

int main() {
    int count = 0;
    int sum = 0;
    while (count < 5) {
        sum += count;
        if (count==3)
        {
            continue;
        }
        count++;
    }
    cout << "Sum: " << sum << endl;
    cout << "Count: " << count << endl;

    for (int count = 10; count > 0; count /= 2) {
        cout << count << " ";
    }
    cout << endl;
    return 0;
}
```

(e) (Explain any build errors, runtime errors, undefined behavior, **or** write the output.)

```
#include <iostream>
using namespace std;

int main() {
    int count = 0;
    int sum = 0;
    while (count < 5) {
        count++;
        if (count==3)
        {
            continue;
        }
        sum += count;
    }
    cout << "Sum: " << sum << endl;
    cout << "Count: " << count << endl;

    for (int count = 10; count > 0; count /= 2) {
        cout << count << " ";
    }
    cout << endl;
    return 0;
}
```

(f) (Explain any build errors, runtime errors, undefined behavior, **or** write the output.)

```
#include <iostream>
using namespace std;

int main() {
    char c = 'C';
    int n = 10;

    if (c == 'C') {
        int n = 20;
        cout << n << endl;
    }
    cout << n << endl;

    c++;
    cout << c << endl;

    return 0;
}
```

Problem 2. *6pts.*

The code below builds on all compilers. A user executes the code and types the following line, hitting the ENTER key after it, and the code finishes successfully.

```
1234
```

Write down the output produced by the code.

```
#include <iostream>
using namespace std;
int main() {
    int number;
    cin >> number;
    int reversed_number = 0;
    for (int digit =1 ; number !=0 ; number /= 10)
    {
        reversed_number = reversed_number * 10 + digit;
        digit = number % 10;
    }

    cout << reversed_number << endl;
    return 0;
}
```

The program below compiles. Assume the user enters the following input and presses ENTER after each line:

```
15
```

What is the output?

```
#include <iostream>
using namespace std;

int main() {
    int n;
    cin >> n;
    int count = 0;
    while (n > 0) {
        if (n % 2 == 1)
            count++;
        n /= 2;
    }
    cout << "Number␣of␣1␣bits:␣" << count << endl;
    return 0;
}
```

Problem 3.

(a) [4pts.]

The following code builds and runs on every compiler to produce the same output. Write down the output in a box (to separate it from your scratch work).

```
#include <iostream>
using namespace std;

int main() {
    int i = 4321;
    while (i > 0) {
        cout << (i % 10) * 2 << "␣";
        i /= 100;
    }
    cout << endl;
}
```

(b) [8pts.]

The following code builds and runs on every compiler to produce the same output. Write down the output in a box (to separate it from your scratch work).

```
#include <iostream>
using namespace std;

int main() {
    int a = 5;
    int b = 3;

    for (int i = 0; i < 4; i++) {
        a -= b;
        b++;
        cout << "Loop " << i << ": a=" << a << ", b=" << b;
        if (a < 0) {
            cout << " (Breaking early)";
            break;
        }
        cout << endl;
    }

    cout << "\nFinal: a=" << a << ", b=" << b << endl;
    return 0;
}
```

(c) [8pts.] The following code builds and runs on every compiler to produce the same output.
Write down the output in a box (to separate it from your scratch work).

```
#include <iostream>
using namespace std;

int main() {
    int score = 80;
    if (score > 70) {
        int score = 10;
        cout << "Inner␣score:␣" << score << endl;
    }
    cout << "Outer␣score:␣" << score << endl;

    double val = -3.7;
    int rounded = val;
    cout << "Rounded␣value:␣" << rounded << endl;

    return 0;
}
```