Study Guide Project

Tong Yi

In this project, we display questions and answer them. If the answer is correct, we display true, otherwise, we display false. This project can serve as a study guide for our courses or Civics (History and Government) Questions for the Naturalization Test, as in `https://www.uscis.gov/sites/default/files/document/questions-and-answers/100q.pdf`.

Warning:

1. These are copyrighted materials and cannot be uploaded to the Internet.
2. Only ask help from teaching staff of this course.
3. Use solutions from ChatGPT or online tutoring websites like, but not limited to, chegg.com, violates academic integrity and is not allowed.

1 Task A

1.1 Requirements

In this task, we initialize two questions and their expected answers, then take answers from users. If a user-input answer matches exactly, **including spelling, spaces and cases**, to the provided expected answer, display true, otherwise, display false.

The first question is as follows.

```
What is -1 + 5 / 3 ?
```

The expected answer is 0. Explanation is as follows.

1. Division operator / has higher precedance than plus operator +, so 5 / 3 runs first. Since both numerator 5 and denominator 3 are integers, the division result should be an integer. It is like to divide 5 pens among three person, each person gets 1 pen. That is, 5 / 3 returns 1.
2. Add -1 and the result of 5 / 3, which is 1, the sum is 0.

The second question is

```
Assume that n is properly declared and initialized. Write a condition to represent that
    n does NOT satisify 0 < n < 100.
```

An expected answer is `(n <= 0 || n >= 100)`. That is, either n is less than or equal to 0 or n is larger than or equal to 100. Here is an explanation.

1. Pay attention to borderline case. For example, `n <= 0` cannot be replaced by `n < 0`. Reason: when n is 0, it does not satisfy `0 < n < 100`.

   Similarly, `n >= 100` cannot be replaced by `n > 100`.

2. A condition in C++ should be enclosed in a pair of parentheses.

3. Cannot write as `(n <= 0 && n >= 100)`, where && means and. Never can integer n satisfy `n <= 0` and `n >= 100`. That is, integer that is less than or equal to 0 and at the same time is larger than or equals to 100 does not exist.

1.2 Steps of Task A

1. Name the source code as `checkAnswer.cpp`.

2. Declare two string variables, one for question text, the other for expected answer.

   (a) Even though some answers are numbers, for example, the answer to question `What is -1 + 5 / 3 ?` is 0, we still need to save them as strings, to be consistent with all other problems whose answers are strings.

3. Initialize question text to be the question text of the first problem and expected answer to be the corresponding value.

4. Delcare a string variable to hold user answer.

5. Use getline function to input from console and put the value to user answer.

   (a) `cin >> variable;` takes input from console and stop at the first space character or new line character, whichever is encountered first. The variable can be of primitive type of int, double, string, and char. That is, >> (extraction or push from) operator reads a word from the keyboard buffer, then extract the value to the corresponding type of the variable as in `cin >> variable;`

   (b) `getline(cin, stringVariable);` takes a whole line from console and put the value to `stringVariable` The first parameter of `getline` is either the Standard input stream object like cin or an `ifstream` object, which reads input from a file. The second parameter must be a string variable. That is, `getline` can only save the input to a string.

6. If the input user answer match exactly to the expected answer, print true, otherwise, print false.

   (a) Hint: you may print a boolean (type `bool` in C++) value `cout << boolean_expression;`, where `boolean_expression` is obtained by comparing two variables. If the result is true, the print out is 1, otherwise, the print out is 0.

   However, we would like to see word "true" instead of 1 and "false" instead of 0. We can use `boolalpha` from standard name space, illustrated as follows. Then, if the boolean expression returns true, then the print is true, otherwise, the print is false.

```
1  cout <<  boolalpha << boolean_expression;
```

7. Work the second problem similarly.

A sample input is as follows.

```
What is -1 + 5 / 3 ?
Your Answer: 2
false

Assume that n is properly declared and initialized. Write a condition to represent that
    n does NOT satisify 0 < n < 100.
Your Answer: (n >= 0 && n <= 100)
false
```

Another sample run is as follows.

```
What is -1 + 5 / 3 ?
Your Answer: 0
true

Assume that n is properly declared and initialized. Write a condition to represent that
    n does NOT satisify 0 < n < 100.
Your Answer: (n <= 0 || n >= 100)
true
```

1.3 Resources

Please read class notes on January 30, 2025 and February 3, 2025 to learn input and output statements. You may also use branch statements.

Pay attention to the difference between `cin >> variable;` and `getline(cin, stringVariable);`.

2 Task B

2.1 Requirements

In this task, we do the following.

1. Define a source code called `checkAnswer_array.cpp`.
2. Declare and initialize two arrays of strings.
   (a) The first array stores question texts. Save the following questions in the given order.

```
1 Given char arr[] = {'A', 'B', 'C'}, what is arr[1]?
2
3 Given string arr[] = {"Hello", "Hi", "Hey"}, what is arr[2]?
4
5 Given two double variables a and b, find out the return of a^b, that is, a
     raised to the power of b. Hint: use pow function.
6
```

```
Suppose n is properly declared and initialized as an integer. Write a
   statement to throw away the least significant digit from n. For example, if
    n is 12, after the statement, n changes to be 1.

Assume that n is properly declared and initialized. Write a statement to
   declare lastDigit as an integer and initialize it to be the least
   significant digit of integer n. Suppose n is 123, after the statement,
   lastDigit is 3.

What is the output?
#include <iostream>
using namespace std;

int main() {
    int count = 0;
    for (int i = -6; i < 2; i += 3)
        count++;

    cout << count << endl;
    return 0;
}

Write a condition to represent that char variable ch is none of the following:
    'a', 'b', or 'c'.
```

Here are codes to declare and initialize the array called `texts`.

```
    string texts[] = {
    "Given char arr[] = {'A', 'B', 'C'}, what is arr[1]?",
    "Given string arr[] = {\"Hello\", \"Hi\", \"Hey\"}, what is arr[2]?",
    "Given two double variables a and b, find out the return of a^b, that is,
   a raised to the power of b. Hint: use pow function.",
    "Suppose n is properly declared and initialized as an integer. Write a
   statement to throw away the least significant digit from n. For example, if
    n is 12, after the statement, n changes to be 1.",
    "Assume that n is properly declared and initialized. Write a statement to
   declare lastDigit as an integer and initialize it to be the least
   significant digit of integer n. Suppose n is 123, after the statement,
   lastDigit is 3.",
    "What is the output?\n#include <iostream>\nusing namespace std;\n\nint
   main() {\n    int count = 0;\n    for (int i = -6; i < 2; i += 3)\n
   count++;\n\n    cout << count << endl;\n    return 0;\n}",
    "Write a condition to represent that char variable ch is none of the
   following: 'a', 'b', or 'c'."
    };
```

Here is some explanation.

i. To include double quotes symbols " inside a string, need to use escape sequence \", as shown in Line 3.
Without backslash \ immediately before double quotes ", double quotes " by itself is treated as beginning or end of a string literal, which results in compilation error.

ii. Similarly, \n is a newline character. That is, move to the next line. See Line 7.

```
1 "Given string arr[] = {\"Hello\", \"Hi\", \"Hey\"}, what is arr[2]?"
```

(b) The second array saves the expected answers for the above problems. The answers are as follows.
Warning: need to save each answer as a string and save in the second array in the same order.

```
1  'B'
2
3  "Hey"
4
5  pow(a, b)
6
7  n /= 10;
8
9  int lastDigit = n % 10;
10
11 3
12
13 (ch != 'a' && ch != 'b' && ch != 'c')
```

3. Display the above question texts, get answers from users. Compare answers with users. If the user answer matches the expected answer, display "true" (without quotes), otherwise, display "false".

4. Find out the number of correct answers and print out the value.

5. Calculate percentage of correct answers.

6. If percentage is at least 90%, print "excellent", otherwise, if percentage is at least 80%, print "good", otherwise, if percentage is at least 60%, print "pass", otherwise, print "please ask help ASAP".

2.2 A sample run when result is excellent

Highlight parts are user inputs.

```
1 Question 1: Given char arr[] = {'A', 'B', 'C'}, what is arr[1]?
2 Enter your answer: 'B'
3 true
4
5 Question 2: Given string arr[] = {"Hello", "Hi", "Hey"}, what is arr[2]?
6 Enter your answer: "Hey"
7 true
8
9 Question 3: Given two double variables a and b, find out the return of a^b, that is, a
     raised to the power of b. Hint: use pow function.
```

```
Enter your answer: pow(a, b)
true

Question 4: Suppose n is properly declared and initialized as an integer. Write a
   statement to throw away the least significant digit from n. For example, if n is 12,
    after the statement, n changes to be 1.
Enter your answer: n /= 10;
true

Question 5: Assume that n is properly declared and initialized. Write a statement to
   declare lastDigit as an integer and initialize it to be the least significant digit
   of integer n. Suppose n is 123, after the statement, lastDigit is 3.
Enter your answer: int lastDigit = n % 10;
true

Question 6: What is the output?
#include <iostream>
using namespace std;

int main() {
    int count = 0;
    for (int i = -6; i < 2; i += 3)
        count++;

    cout << count << endl;
    return 0;
}
Enter your answer: 3
true

Question 7: Write a condition to represent that char variable ch is none of the
   following: 'a', 'b', or 'c'.
Enter your answer: (ch != 'a' && ch != 'b' && ch != 'c')
true

number of correct problems: 7
percentage of correct: 100%
excellent
```

2.3 A sample run when result is good

Highlight parts are user inputs.

```
Question 1: Given char arr[] = {'A', 'B', 'C'}, what is arr[1]?
Enter your answer: 'B'
true
```

```
Question 2: Given string arr[] = {"Hello", "Hi", "Hey"}, what is arr[2]?
Enter your answer: "Hey"
true

Question 3: Given two double variables a and b, find out the return of a^b, that is, a
   raised to the power of b. Hint: use pow function.
Enter your answer: pow(a, b)
true

Question 4: Suppose n is properly declared and initialized as an integer. Write a
   statement to throw away the least significant digit from n. For example, if n is 12,
    after the statement, n changes to be 1.
Enter your answer: n /= 10;
true

Question 5: Assume that n is properly declared and initialized. Write a statement to
   declare lastDigit as an integer and initialize it to be the least significant digit
   of integer n. Suppose n is 123, after the statement, lastDigit is 3.
Enter your answer: int lastDigit = n % 10;
true

Question 6: What is the output?
#include <iostream>
using namespace std;

int main() {
    int count = 0;
    for (int i = -6; i < 2; i += 3)
        count++;

    cout << count << endl;
    return 0;
}
Enter your answer: 3
true

Question 7: Write a condition to represent that char variable ch is none of the
   following: 'a', 'b', or 'c'.
Enter your answer: (ch != 'a' || ch != 'b' || ch != 'c')
false

number of correct problems: 6
percentage of correct: 85.7143%
good
```

2.4 Resources

To finish Task B, you need to learn array and repetition statements. See notes on Feb 6 and Feb 10.