

Question 1. [2 points] Write a statement(s) to declare a variable named `num_students` that will be used to store the number of students and set the value of the variable to 10. Hint: Be sure to use an appropriate data type.

```
int num_students;  
num_students = 10;
```

Question 2. [2 points] Which of the following is a correct statement to obtain user *input*? (Assume that `fleems` is an `int` variable.)

A. `scanf("%i" & fleems);`

B. `scanf("%i", &fleems);`

C. `printf("%i", &fleems)`

D. `printf("%i", fleems);`

Question 3. [6 points] Circle and *briefly describe* the error(s) in the following code:

```
#include <stdio.h>
```

```
int main(void)
```

```
{
```

```
    int num;
```

```
    printf("Enter your favorite number: ", num);
```

```
    scanf("%i", &value);
```

```
    return 0;
```

```
}
```

no corresponding placeholder; num has not been initialized

variable has not been declared

Question 4. [5 points] Assume that `a` and `b` are integer variables. Show how to compute the formula $2a + b$, storing the result in a variable called `sum`. Be sure to properly declare `sum`.

```
int sum;
```

```
sum = (2 * a) + b;
```

Question 5. [4 points] What output is printed by the following code?

```
int x = 5, y = 2;
int result = x / y;
printf("The result is: %i\n", result);
```

The result is: 2

Question 6. [4 points] What output is printed by the following code?

result variable's type is int

```
int x = 5, y = 2;
int result = (float)x / (float)y;
printf("The result is: %f\n", (float)result);
```

The result is: 2.000000

Question 7. [4 points] What output is printed by the following code?

```
int a = 5, b = 2;
double c;
c = a / b;
printf("The result is: %.2lf\n", c);
```

integer division, result is truncated

The result is: 2.00

Question 8. [5 points] What output is printed by the following code? Write your answer in the space provided below.

```
#include <stdio.h>
int main(void) {
    int a=6, b=9;
    if (a <= b/2) {
        printf("If %i was %i, by Jimi\n", a, b);
    } else {
        printf("How about some Coldplay?\n");
    }
    return 0;
}
```

$b/2$ is 4, 6 is not less than or equal to 4

How about some Coldplay?

Question 9. [6 points] Consider the following code:

```
int points = 3;
int limit = 55;

int speed;
scanf("%i", &speed);
    3           75       65
if (points < 4 && speed > limit + 10) {
    printf("Fine is $200\n");
    points = points + 3; // points becomes 6
}
    6           75       70
if (points >= 4 && speed > limit + 15) {
    printf("Hand over your license!\n");
    points = 10000; // points becomes 10000
}

printf("You now have %i points on your license!\n", points);
```

What is the output of the above code if the user enters the value **75**?

Fine is \$200
Hand over your license!
You now have 10000 points on your license!

Question 10. [6 points] Consider the following code:

```
int n;
scanf("%i", &n);

if (n != 3) {
    printf("A\n");
} else if (n < 4) {
    printf("B\n");
} else {
    printf("C\n");
}
```

(a) Is it possible for the code above to print **only** the output B? (Yes or no.)

yes

(b) If you answered “Yes” to (a), state the value that the user would need to enter. If you answered “No” to (a), explain why the output B is not possible.

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Question 11. [6 points] Consider the following code:

```
int n;
scanf("%i", &n);

if (n != 3) {
    printf("A\n");
} else {
    printf("B\n");
}

if (n < 4) {
    printf("C\n");
}
```

(a) Is it possible for the code above to print **only** the output B? (Yes or no.)

NO

(b) If you answered "Yes" to (a), state the value that the user would need to enter. If you answered "No" to (a), explain why the output B is not possible.

B is only printed if n is equal to 3, in which case C is also printed because 3 is less than 4.

Programming Questions

Note: For all of the programming questions, you should use `scanf` to read the input value(s) required by the program.

Note: Make sure your programs produce the output in **exactly** the format described, including capitalization and punctuation. You may not receive credit for programs that produce incorrectly-formatted output.

Getting started: Start **Cygwin Terminal** and **Notepad++** and make sure ALL TABS are closed. (Note: do *not* open any other programs.) Your instructor will give you the name of a zip file. In your terminal, run the following commands:

```
cd h:
mkdir -p CS101
cd CS101
curl -O http://faculty.ycp.edu/~dbabcock/spring2016/cs101/zipfile
unzip zipfile
cd CS101_Exam1
```

Note that in the `curl` command, the `-O` has the letter ‘O’, not the digit ‘0’.

Substitute the name of the zip file for *zipfile*.

Editing code: Use your text editor to open the source file (e.g., `question13.cpp`) referred to in the question. Do not open any files other than the ones for the exam.

Compiling: To compile the program for Question 13, run the following command in the terminal:

```
make question13.exe
```

Change the number as appropriate for the other questions (e.g., `question14.exe`).

Running: To run the program for Question 13, run the following command in the terminal:

```
./question13.exe
```

Change the number as appropriate for the other questions (e.g., `question14.exe`).

To submit: In Cygwin Terminal, run the command

```
make submit
```

Enter your Marmoset username and password when prompted.

Good luck!

Question 12. [15 points] Complete the program in `question12.cpp` as follows. The program should prompt the user to enter two values: the height in meters of an object on earth, and the height in meters of an object on the moon. The program should then use the following formula to compute the velocity v of each object in m/s when it hits the ground:

$$v = a\sqrt{2h/a}$$

where h is the initial height in meters, and a is the acceleration due to gravity (in meters per second squared). On earth, $a \approx 9.81$. On the moon, $a \approx 1.62$.

The program should output using the format shown below. There should be separate lines indicating the initial height and impact velocity for the objects on the earth and moon, and whether the impact velocity was greater on the earth or moon. (You can ignore the possibility that the velocities will be equal.)

Make sure your output *exactly* matches the format shown below. Use `double` values for your calculations and display the results with **two** decimal points of precision.

Example run (user input in **bold**):

```
Input initial height on Earth: 50.0
Input initial height on the moon: 50.0
Object dropped from a height of 50.00 meters on Earth
Velocity at impact was 31.32 m/s on Earth
Object dropped from a height of 50.00 meters on the moon
Velocity at impact was 12.73 m/s on the moon
The velocity on Earth was greater than on the moon
```

Example run (user input in **bold**):

```
Input initial height on Earth: 2.3
Input initial height on the moon: 97.5
Object dropped from a height of 2.30 meters on Earth
Velocity at impact was 6.72 m/s on Earth
Object dropped from a height of 97.50 meters on the moon
Velocity at impact was 17.77 m/s on the moon
The velocity on the moon was greater than on Earth
```

Question 13. [15 points] Complete the program in `question13.cpp` so that it asks the user to enter the number of quarters he or she has. The program should then print out how many dollars and cents that number of quarters represents. The number of dollars and cents should be printed on separate lines formatted *exactly* as shown in the examples below.

Example run (user input in **bold**):

```
How many quarters? 5  
Dollars: 1  
Cents: 25
```

Example run (user input in **bold**):

```
How many quarters? 8  
Dollars: 2  
Cents: 0
```

Hint: Use `int` values and variables. Integer division and modulus will be useful.

Question 14. [20 points] Complete the program in `question14.cpp` so that it prompts the user for the (numeric) month and day of his or her birthday, then prompts the user for today's month and day. (Note: Assume the user will enter valid values for the months and days).

Based on these values, provide output that tells the user whether

- his/her birthday was in the past
- his/her birthday is in the future
- today is his/her birthday.

The output of the program should be one of the following lines of text:

```
Your birthday was in the past.  
Your birthday is in the future.  
Happy birthday, today is your birthday!
```

Example run (user input in **bold**):

```
Enter the month of your birthday (1-12): 2  
Enter the day of your birthday (1-31): 8  
Enter today's month: 2  
Enter today's day: 9
```

```
Your birthday was in the past.
```

Example run (user input in **bold**):

```
Enter the month of your birthday (1-12): 7  
Enter the day of your birthday (1-31): 10  
Enter today's month: 2  
Enter today's day: 9
```

```
Your birthday is in the future.
```

Example run (user input in **bold**):

```
Enter the month of your birthday (1-12): 6  
Enter the day of your birthday (1-31): 14  
Enter today's month: 6  
Enter today's day: 14
```

```
Happy birthday, today is your birthday!
```