CISS245: Advanced Programming
Quiz q3001

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Open `main.tex` and enter answers (look for `answercode`, `answerbox`, `answerlong`). Turn the page for detailed instructions. To rebuild and view pdf, in bash shell execute `make`. To build a gzip-tar file, in bash shell execute `make s` and you'll get `submit.tar.gz`.

Q1. Write a struct for `Martian` so that a `Martian` variable has

- `num_heads`: number of heads
- `num_arms`: number of arms
- `num_legs`: number of legs
- `gender`: gender (as a `char`)
- `max_speed`: maximum speed of travel (as a `double`)

and create struct variable `marvin` with 1 head, 2 arms, 3 legs, and gender of `'r'` using an initializer list.
Answer:

```
// create Martian struct here

// create marvin here
```

Q2. You are given

```
struct Position
{
    int x, y;
};
struct Alien
{
    Position p;
    int health;
};
```

Complete the following to create an array `x` of 100 `Aliens`, all at the given position `p` (see below) and all with `health` of 1000.
Answer:

```
Position p = {10, 20};

// create x here
```

Q3. An `Alien` struct value has a `health` member variable. Something is not quite right with the following. Fix it so that it works.
Answer:

```
Alien * alien = new Alien;
alien.health = 0;
```

Q4. Complete the following (see STEP 1 and STEP 2)) so that the program prints

```
<Weapon type:sword, name:guthwine>
<Person name:eomer, health:1000, weapon:<Weapon type:sword, name:guthwine>>
```

Answer:

```
#include <iostream>

struct Weapon
{
    char type[1024];
    char name[1024];
};

struct Person
{
    char name[1024];
    int health;
    Weapon * weapon;
};

void Weapon_print(Weapon & w)
{
    std::cout << "<Weapon type:" << w.type << ", name:" << w.name << '>';
}

void Weapon_println(Weapon & w)
{
    Weapon_print(w);
    std::cout << '\n';
}

void Person_println(Person & p)
{
    std::cout << "<Person name:" << p.name
              << ", health:" << p.health
              << ", weapon:";
    // STEP 2: Add a statement here to print the weapon of p
    std::cout << ">\n";
}

int main()
{
```

```
    Weapon w = {"sword", "guthwine"};
    Weapon_println(w); // prints <Weapon type:sword, name:guthwine>

    // STEP 1: Create variable p of type Person and with name of "eomer",
    // health of 1000, and has weapon w (from above).
    Person p = {?, ?, ?};

    // The following should print
    // <Person name:eomer, health:1000, weapon:<Weapon type:sword, name:guthwine>>
    Person_println(p);

    return 0;
}
```

Instructions

In `main.tex` change the email address in

```
\renewcommand\AUTHOR{jdoe5@cougars.ccis.edu}
```

to yours. In the bash shell, execute "`make`" to recompile `main.pdf`. Execute "`make v`" to view `main.pdf`. Execute "`make s`" to create `submit.tar.gz` for submission.

For each question, you'll see boxes for you to fill. You write your answers in `main.tex` file. For small boxes, if you see

```
1 + 1 = \answerbox{}.
```

you do this:

```
1 + 1 = \answerbox{2}.
```

`answerbox` will also appear in "true/false" and "multiple-choice" questions.

For longer answers that needs typewriter font, if you see

```
Write a C++ statement that declares an integer variable name x.
\begin{answercode}
\end{answercode}
```

you do this:

```
Write a C++ statement that declares an integer variable name x.
\begin{answercode}
int x;
\end{answercode}
```

`answercode` will appear in questions asking for code, algorithm, and program output. In this case, indentation and spacing is significant. For program output, I do look at spaces and newlines.

For long answers (not in typewriter font) if you see

```
What is the color of the sky?
\begin{answerlong}
\end{answerlong}
```

you can write

```
What is the color of the sky?
\begin{answerlong}
The color of the sky is blue.
\end{answerlong}
```

For students beyond 245: You can put LaTeX commands in `answerbox` and `answerlong`.

A question that begins with "T or F or M" requires you to identify whether it is true or false, or meaningless. "Meaningless" means something's wrong with the statement and it is not well-defined. Something like "$1+_2$" or "$\{2\}^{\{3\}}$" is not well-defined. Therefore a question such as "Is $42 = 1+_2$ true or false?" or "Is $42 = \{2\}^{\{3\}}$ true or false?" does not make sense. "Is $P(42) = \{42\}$ true or false?" is meaningless because $P(X)$ is only defined if X is a set. For "Is $1 + 2 + 3$ true or false?", "$1 + 2 + 3$" is well–defined but as a "numerical expression", not as a "proposition", i.e., it cannot be true or false. Therefore "Is $1 + 2 + 3$ true or false?" is also not a well-defined question.

When writing results of computations, make sure it's simplified. For instance write 2 instead of $1 + 1$. When you write down sets, if the answer is $\{1\}$, I do not want to see $\{1, 1\}$.

When writing a counterexample, always write the simplest.

Here are some examples (see `instructions.tex` for details):

1. T or F or M: $1 + 1 = 2$ ..... T
2. T or F or M: $1 + 1 = 3$ ..... F
3. T or F or M: $1+^2 =$ ..... M
4. $1 + 2 =$ 3
5. Write a C++ statement to declare an integer variable named `x`.

   ```
   int x;
   ```

6. Solve $x^2 - 1 = 0$.

   Since $x^2 - 1 = (x - 1)(x + 1)$, $x^2 - 1 = 0$ implies $(x - 1)(x + 1) = 0$. Therefore $x - 1 = 0$ or $x = -1$. Hence $x = 1$ or $x = -1$.

7. Which is true? C
   (A) $1 + 1 = 0$
   (B) $1 + 1 = 1$
   (C) $1 + 1 = 2$
   (D) $1 + 1 = 3$
   (E) $1 + 1 = 4$