3.1

Henry Hsu

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1 Specification

Write a program that reads a temperature value and the letter C for Celsius or F for Fahrenheit. Print whether water is liquid, solid, or gaseous at the given temperature at sea level.

2 Analysis/Design

obtain user input for temperature in celsius or farenheit
below 0 degrees Celsius or 32 degrees Fahrenheit, water changes into a solid
above 100 degrees Celsius or 212 degrees Fahrenheit, water changes its a gas
print state of water at input temperature to screen

- Get temperature from user at celsius or farenheit
- Determine physical state of water at given temperature
- Display result

3 Implementation

⟨ *get input* 1 ⟩ ≡

```
double temp;
cout << "Enter numerical value of temperature: ";
cin >> temp;

string scale;
cout << "Enter C for celsius or F for farenheit: ";
cin >> scale;
```

◇

Fragment referenced in 2c.

⟨ *determine state* 2a ⟩ ≡

```
string state;
if (scale == "c")
{
        if (temp < 0)
        {
                state = "Solid";
        }
        if ( 0 <= temp <= 100)
        {
                state = "liquid";
        }
        if {temp > 100)
        {
                state = "gas";
        }
}
else
string state;
{
        if (temp < 32)
        {
                state = "Solid";
        }
        if ( 0 <= temp <= 100)
        {
                state = "liquid";
        }
        if {temp > 212)
        {
                state = "gas";
        }
}
```

◇

Fragment referenced in 2c.

⟨ *display result* 2b ⟩ ≡

```
cout << "For the given temperature using given scale, water will be a " << state << endl
```

◇

Fragment referenced in 2c.

"p3_1.cpp" 2c≡

```
⟨ Include ? ⟩

⟨ Constants ? ⟩

int main()
{
        ⟨ get input 1 ⟩
        ⟨ determine state 2a ⟩
        ⟨ display result 2b ⟩
}
◇
```

These are the include files needed for library function calls

⟨ *Include* ? ⟩ ≡

```
#include <iostream>
#include <cmath>
#include <string>
using namespace std;
◇
```

Fragment referenced in 2c.

These are the values that will not change during program execution

⟨ *Constants* ? ⟩ ≡

```
◇
```

Fragment referenced in 2c.

4 Test

If specified temperature is between $0Cand100C*$ or $32For212F$ then water is in liquid phase. Temperatures below that result in water being in a solid phase, and above that it will be in a gaseous phase.