

# Experiment ‘P\_3\_10\_temperature\_altitude’ Results

December 18, 2025

**Experiment outcome:** SUCCESS

**Bad responses:** 0

**Responses containing assume :** 0

**Resolution attempts:** 1

**Hard fails (resolution):** 0

**Soft fails (resolution):** 0

**Verification attempts:** 1

## Problem Specification

**Problem name:** P\_3\_10\_temperature\_altitude

**Natural language statement:** Write a method that takes a temperature value and the altitude in meters. Return whether water is liquid, solid, or gaseous at the given temperature. The boiling point of water drops by about one degree centigrade for every 300 meters of altitude.

**Method signature:** P\_3\_10\_temperature\_altitude (t: real, a: nat) returns (s: string)

### Ensures

- if  $t < 0.0$  then  $s == \text{"solid"}$  else if  $t == 0.0$  then  $s == \text{"solid or liquid"}$  else if  $0.0 < t < 100.0 - (a \text{ as real} / 300.0)$  then  $s == \text{"liquid"}$  else if  $t == 100.0 - (a \text{ as real} / 300.0)$  then  $s == \text{"liquid or gaseous"}$  else  $s == \text{"gaseous"}$

### Requires

- $t \geq -273.15 \ \&& a \leq 10000$

## GenAI interactions

Below you will find all interactions between the ‘user’ (program) and the ‘assistant’ (OpenAI).

### Program → GenAI

You are given the following task to perform in Dafny:

Write a method that takes a temperature value and the altitude in meters. Return whether  
→ water is liquid, solid, or gaseous at the given temperature. The boiling point of  
→ water drops by about one degree centigrade for every 300 meters of altitude.

The signature should be:

```
method P_3_10_temperature_altitude (t: real, a: nat) returns (s: string)
```

The method should respect the following contract:

```
requires t >= -273.15 && a <= 10000, ensures if t < 0.0 then s == "solid" else if t ==  
→ 0.0 then s == "solid or liquid" else if 0.0 < t < 100.0 - (a as real / 300.0) then  
→ s == "liquid" else if t == 100.0 - (a as real / 300.0) then s == "liquid or  
→ gaseous" else s == "gaseous"
```

Produce and show only the Dafny body of this method, including the curly braces that  
→ surround it. Do not show the signature nor contract. You must not use 'assume'  
→ anywhere in your code.

### GenAI → Program

**System fingerprint:**

**ID:** chatmpl-Co4T5Xw9lMurLBMFh9X2Jy33Gp3bi

**Model:** gpt-5.1-chat-latest

**Created at:** 1766049611

**Finish reason:** stop

**Usage:** 542 tokens in, and 329 tokens out

```
{  
    var bp := 100.0 - (a as real / 300.0);  
    if t < 0.0 {  
        s := "solid";  
    } else if t == 0.0 {  
        s := "solid or liquid";  
    } else if t < bp {  
        s := "liquid";  
    } else if t == bp {  
        s := "liquid or gaseous";  
    } else {  
        s := "gaseous";  
    }  
}
```

## Final Program

```
method P_3_10_temperature_altitude (t: real, a: nat) returns (s: string)
    requires t >= -273.15 && a <= 10000
    ensures if t < 0.0 then s == "solid" else if t == 0.0 then s == "solid or liquid"
        ↪ else if 0.0 < t < 100.0 - (a as real / 300.0) then s == "liquid" else if t
        ↪ == 100.0 - (a as real / 300.0) then s == "liquid or gaseous" else s == "
        ↪ gaseous"
{
    var bp := 100.0 - (a as real / 300.0);
    if t < 0.0 {
        s := "solid";
    } else if t == 0.0 {
        s := "solid or liquid";
    } else if t < bp {
        s := "liquid";
    } else if t == bp {
        s := "liquid or gaseous";
    } else {
        s := "gaseous";
    }
}
```

## Total Token Usage

**Input tokens:** 542

**Output tokens:** 329

**Reasoning tokens:** 192

**Sum of ‘total tokens’:** 871

## Experiment Timings

**Overall Experiment** started at 1766049613031, ended at 1766049618118, lasting 5087ms (5.09 seconds)

**Iteration #1** started at 1766049613031, ended at 1766049618118, lasting 5087ms (5.09 seconds)