

# Experiment '2\_8\_rectangle\_properties' Results

December 18, 2025

**Experiment outcome:** FAILURE\_VERIFY

**Bad responses:** 0

**Responses containing assume :** 0

**Resolution attempts:** 8

**Hard fails (resolution):** 7

**Soft fails (resolution):** 0

**Verification attempts:** 1

## Problem Specification

**Problem name:** 2\_8\_rectangle\_properties

**Natural language statement:** Write a method that takes the lengths of the sides of a rectangle. Then return the area and perimeter of the rectangle and the length of the diagonal (use the Pythagorean theorem).

**Method signature:** rectangle\_properties(length: real, width: real) returns (area: real, perimeter: real, diagonal: real)

## Ensures

- `area == length * width`
- `perimeter == 2.0 * (length + width)`
- `diagonal * diagonal == length * length + width * width`

## 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 the lengths of the sides of a rectangle. Then return the area  
→ and perimeter of the rectangle and the length of the diagonal (use the Pythagorean  
→ theorem).

The signature should be:

```
method rectangle_properties(length: real, width: real) returns (area: real, perimeter:  
→ real, diagonal: real)
```

The method should respect the following contract:

```
ensures area == length * width, ensures perimeter == 2.0 * (length + width), ensures  
→ diagonal * diagonal == length * length + width * width
```

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:** chatcmpl-Co4Pd2JrQ0jX4NXyW62vLmR9l0L3h

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

**Created at:** 1766049397

**Finish reason:** stop

**Usage:** 362 tokens in, and 119 tokens out

```
{  
  area := length * width;  
  perimeter := 2.0 * (length + width);  
  diagonal := sqrt(length * length + width * width);  
}
```

### Program → GenAI

When using dafny resolve, the below error is emitted and resolve fails:

```
problem_data/2_8_rectangle_properties/program.dfy(8,14): Error: unresolved identifier:  
→ sqrt  
|  
8 | diagonal := sqrt(length * length + width * width);  
| ~~~~
```

```
1 resolution/type errors detected in program.dfy
```

Correct the error by altering only the method body. Produce and show only the Dafny body,  
→ 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:** chatcmpl-Co4Pg7fOZUsscsEr0zZ4O1KMtnENY

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

**Created at:** 1766049400

**Finish reason:** stop

**Usage:** 491 tokens in, and 379 tokens out

```
{  
  area := length * width;  
  perimeter := 2.0 * (length + width);  
  diagonal :| diagonal * diagonal == length * length + width * width;  
}
```

## Program → GenAI

When using dafny verify, the below error is emitted and verify fails:

```
problem_data/2_8_rectangle_properties/program.dfy(8,11): Error: cannot establish the  
→ existence of LHS values that satisfy the such-that predicate. Note, no trigger was  
→ found for the such-that predicate, which may be the reason the proof failed. To  
→ give a trigger explicitly, use the {trigger} attribute. For more information, see  
→ the section on quantifier instantiation rules in the reference manual.
```

```
|  
8 | diagonal :| diagonal * diagonal == length * length + width * width;  
| ^^
```

Dafny program verifier finished with 0 verified, 1 error

Correct the error by altering only the method body. Produce and show only the Dafny body,  
→ 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:** chatcmpl-Co4PneNWyV2XiBN4rnn7c0XBijJDR3

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

**Created at:** 1766049407

**Finish reason:** stop

**Usage:** 809 tokens in, and 257 tokens out

```
{
  area := length * width;
  perimeter := 2.0 * (length + width);
  diagonal :| {:trigger diagonal * diagonal} diagonal * diagonal == length * length +
    ↪ width * width;
}
```

## Program → GenAI

When using dafny resolve, the below error is emitted and resolve fails:

```
problem_data/2_8_rectangle_properties/program.dfy(8,14): Error: invalid UnaryExpression
|
8 | diagonal :| {:trigger diagonal * diagonal} diagonal * diagonal == length * length +
  ↪ width * width;
  | ^
```

1 parse errors detected in program.dfy

Correct the error by altering only the method body. Produce and show only the Dafny body,  
 ↪ 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:** chatcmpl-Co4PrUr0b2UFU1fWFD8rl76cnQcGH

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

**Created at:** 1766049411

**Finish reason:** stop

**Usage:** 937 tokens in, and 129 tokens out

```
{
  area := length * width;
  perimeter := 2.0 * (length + width);
  diagonal :| diagonal * diagonal == length * length + width * width {:trigger diagonal *
    ↪ diagonal};
}
```

## Program → GenAI

When using dafny resolve, the below error is emitted and resolve fails:

```
problem_data/2_8_rectangle_properties/program.dfy(8,69): Error: invalid AssignStatement
|
8 | diagonal :| diagonal * diagonal == length * length + width * width {:trigger diagonal
  ↪ * diagonal};
  | ^
```

```
1 parse errors detected in program.dfy
```

Correct the error by altering only the method body. Produce and show only the Dafny body,  
→ 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:** chatcmpl-Co4PtU41LLbNTp4Nt7eBBu9MBLDZ4

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

**Created at:** 1766049413

**Finish reason:** stop

**Usage:** 1126 tokens in, and 253 tokens out

```
{  
  area := length * width;  
  perimeter := 2.0 * (length + width);  
  diagonal := (length * length + width * width) ** 0.5;  
}
```

## Program → GenAI

When using dafny resolve, the below error is emitted and resolve fails:

```
problem_data/2_8_rectangle_properties/program.dfy(8,49): Error: invalid UnaryExpression  
|  
8 | diagonal := (length * length + width * width) ** 0.5;  
| ^
```

```
1 parse errors detected in program.dfy
```

Correct the error by altering only the method body. Produce and show only the Dafny body,  
→ 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:** chatcmpl-Co4Px5daXt15t5quBYsoUZICgLbMv

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

**Created at:** 1766049417

**Finish reason:** stop

**Usage:** 1306 tokens in, and 196 tokens out

```
{  
  area := length * width;  
  perimeter := 2.0 * (length + width);  
  diagonal :| (diagonal * diagonal == length * length + width * width) {:trigger diagonal  
    → * diagonal};  
}
```

## Program → GenAI

When using dafny resolve, the below error is emitted and resolve fails:

```
problem_data/2_8_rectangle_properties/program.dfy(8,71): Error: invalid AssignStatement
|
8 | diagonal :| (diagonal * diagonal == length * length + width * width) {:trigger
  ↪ diagonal * diagonal};
  | ^

1 parse errors detected in program.dfy
```

Correct the error by altering only the method body. Produce and show only the Dafny body,  
↪ 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:** chatcmpl-Co4Q1MG6RAG6jeWTf6vnZZ0VcdntC

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

**Created at:** 1766049421

**Finish reason:** stop

**Usage:** 1508 tokens in, and 133 tokens out

```
{
  area := length * width;
  perimeter := 2.0 * (length + width);
  diagonal :| {:trigger (diagonal * diagonal)} (diagonal * diagonal == length * length +
    ↪ width * width);
}
```

## Program → GenAI

When using dafny resolve, the below error is emitted and resolve fails:

```
problem_data/2_8_rectangle_properties/program.dfy(8,14): Error: invalid UnaryExpression
|
8 | diagonal :| {:trigger (diagonal * diagonal)} (diagonal * diagonal == length * length
  ↪ + width * width);
  | ^

1 parse errors detected in program.dfy
```

Correct the error by altering only the method body. Produce and show only the Dafny body,  
↪ 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:** chatcmpl-Co4Q3WKcrENnJIyBEhjRMT0wI7Z6w

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

**Created at:** 1766049423

**Finish reason:** stop

**Usage:** 1709 tokens in, and 257 tokens out

```
{
  area := length * width;
  perimeter := 2.0 * (length + width);
  diagonal {:trigger diagonal * diagonal} :| diagonal * diagonal == length * length +
    ↪ width * width;
}
```

## Final Program

```
method rectangle_properties(length: real, width: real) returns (area: real, perimeter:
  ↪ real, diagonal: real)
  ensures area == length * width
  ensures perimeter == 2.0 * (length + width)
  ensures diagonal * diagonal == length * length + width * width
{
  area := length * width;
  perimeter := 2.0 * (length + width);
  diagonal {:trigger diagonal * diagonal} :| diagonal * diagonal == length * length +
    ↪ width * width;
}
```

## Total Token Usage

**Input tokens:** 8248

**Output tokens:** 1723

**Reasoning tokens:** 1216

**Sum of 'total tokens':** 9971

## Experiment Timings

**Iteration #8** started at 1766049425635, ended at 1766049429361, lasting 3726ms (3.73 seconds)

**Overall Experiment** started at 1766049399676, ended at 1766049429361, lasting 29685ms (29.69 seconds)

**Iteration #4** started at 1766049412784, ended at 1766049415694, lasting 2910ms (2.91 seconds)

**Iteration #5** started at 1766049415694, ended at 1766049419728, lasting 4034ms (4.03 seconds)

**Iteration #6** started at 1766049419728, ended at 1766049423008, lasting 3280ms (3.28 seconds)

**Iteration #7** started at 1766049423008, ended at 1766049425635, lasting 2627ms (2.63 seconds)

**Iteration #1** started at 1766049399676, ended at 1766049402482, lasting 2806ms (2.81 seconds)

**Iteration #2** started at 1766049402482, ended at 1766049408686, lasting 6204ms (6.20 seconds)

**Iteration #3** started at 1766049408686, ended at 1766049412784, lasting 4098ms (4.10 seconds)