COMPUTING AND DIGITAL LITERACY

# Debugging

### Difficulty level: Intermediate

### Computing and Digital Literacy

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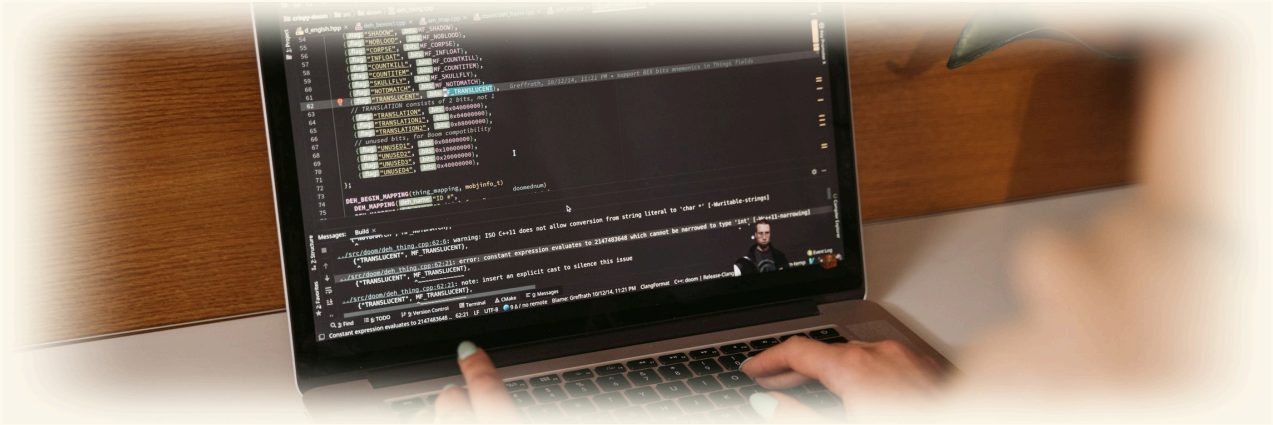
## *Overview of the concept*

This is how you find and fix what is wrong when a program or an app does not work. Instead of giving up and starting over, you track down the one thing that is off, the way you would find out why a bike will not shift gears instead of buying a new one. You test one part at a time until the fault shows itself. It is a patient skill, and it is the same skill you use to fix anything that stops working.



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## Worked examples

EXAMPLE 1

### Q Read the error message

**SOLUTION**

total = 0

for n in [1, 2, 3]:

total = total + n

print(totai) -> NameError: name 'totai' is not defined

Read the error: NameError says a name is not defined, and it names 'totai'.

Compare with your variables: you defined total, not totai, so it is a spelling mistake.

Fix the spelling to print(total) and run again; the output is 6.

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EXAMPLE 2

## Q Trace values by hand

### SOLUTION

x = 5

x = x + 1

print(x) -> Output: 6, but you expected 5.

Fix: you added 1, so 6 is correct; change the expectation, not the

code.

Write down each variable's value after each line: x starts at 5.

After x = x + 1, x holds 6.

Compare with what you expected: if the code did what you wrote, fix your expectation; if not, fix the line that went wrong.

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## Practice questions

**1** **This code gives NameError  name 'totl' is not defined. total = 0; for n in [1, 2, 3]: total = total + n; print(totl). What is wrong, and what is the fix?**

- **A** totl is a spelling mistake for total; change print(totl) to print(total).
- **B** total is a spelling mistake for totl; change total = 0 to totl = 0.
- **C** totl is not defined because the loop never runs; change [1, 2, 3] to [1, 2, 3, 4].
- **D** print(totl) is a syntax error; remove the print line.

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## This code gives TypeError: can only concatenate str (not 'int') to str. age = 25; print('Age: ' + age). What is wrong, and what is the fix?

A. age is a number, but + with a string needs text; change print('Age: ' + age) to print('Age: ' + str(age)).

B. age is a spelling mistake for ages; change age = 25 to ages = 25.

C. The error is on the wrong line; change age = 25 to age = 26.

D. print('Age: ' + age) is a syntax error; delete the print line.

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## This code runs but prints the wrong answer. total = 0; for n in [1, 2, 3]: total = total - n; print(total). It prints -6 but should print 6. What is wrong, and what is the fix?

A. The loop subtracts instead of adding; change total = total - n to total = total + n.

B. total starts at 0; change total = 0 to total = 6.

C. The list is wrong; change [1, 2, 3] to [1, 2, 3, 4].

D. print(total) is a syntax error; remove the print line.

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**4** Trace this code `x = 7; x = x + 3; print(x)`. What prints, and what is x after each line?

- **A** 10 prints. x is 7, then 10.
- **B** 7 prints. x is 7, then 7.
- **C** 3 prints. x is 7, then 3.
- **D** 10 prints. x is 10, then 10.

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**5** Trace this code `y = 3; y = y + 2; y = y + 4; print(y)`. What prints?

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**6** Trace this code `total = 0; for n in [2, 4, 6]: total = total + n; print(total)`. What prints?

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7 **Trace this code x = 5; y = x + 2; x = 9; print(y). What prints?**

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8 **An error message names a line number. Why read the error message first?**

A. Because it says what went wrong and where.

B. Because it runs the code again automatically.

C. Because it fixes the mistake for you.

D. Because it tells you the answer.

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## What is a syntax error?

A. Code that breaks the language's grammar rules, so it cannot run

B. Code that runs but gives the wrong answer

C. Code that runs too slowly to finish

D. Code with a spelling mistake in a variable name

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## What is a logic error?

A. Code that breaks the language's grammar rules, so it cannot run

B. Code that runs but gives the wrong answer

C. Code that crashes as soon as it starts

D. Code that never finishes running

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## ANSWER KEY

**1.** totl is a spelling mistake for total; change print(totl) to print(total).

**2.** age is a number, but + with a string needs text; change print('Age: ' + age) to print('Age: ' + str(age)).

**3.** The loop subtracts instead of adding; change total = total - n to total = total + n.

**4.** 10 prints. x is 7, then 10.

**5.** 9

**6.** 12

**7.** 7

**8.** Because it says what went wrong and where.

**9.** Code that breaks the language's grammar rules, so it cannot run

**10.** Code that runs but gives the wrong answer

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