

Coding with Python Review

Try each problem first. You don't need to finish everything.

Core path ~55 min · Full sheet ~1 h 45 min

Recommended: K1-K5, then one A and one T problem

K = Knowledge & Understanding · A = Application · T = Thinking · Boss = Challenge



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QUICK REFERENCE

Assignment: `x = x + 3` computes the right side first, then stores it in `x`. `=` stores a value; `==` tests whether two values are equal.

Input: `input()` always returns a `str`. Convert it with `int()` or `float()` before you calculate.

Show your work on separate paper.

Core Skills (K)

Variables · Operators · Data Types · Loops · Conditionals

K1 Trace the Variables

Determine what each program prints.

a) `a = 7`
`b = a`
`a = 2`
`print(a, b)`

b) `x = 4`
`x = x + 3`
`x = 2 * x`
`print(x)`

c) `p = 3`
`q = 8`
`p = q`
`q = p`
`print(p, q)`

K2 Python Operators

Evaluate each pair of expressions in Python.

a) `23 // 4` and `23 % 4`

b) `12 / 4` and `2 ** 5`

c) `1 / 2 * 8` and `1 / (2 * 8)`

K3 Numbers or Text?

Determine the value and the data type (`int`, `float` or `str`) of each result.

a) `"12" + "3"`

b) `int("12") + 3`

c) The user types 4 when this program runs.
`n = input("Enter a number: ")`
`print(n * 3)`

K4 Loops and range

Determine what each program prints.

Operators: `/` always gives a `float`, `//` gives the whole-number quotient, `%` the remainder, and `**` a power (not `^`).

Loops and branches: `range(a, b)` starts at `a` and stops **before** `b`. In an `if/elif/else` chain, only the first true branch runs.

a) `for i in range(4):`
`print(i * 2)`

b) `for i in range(3, 12, 4):`
`print(i)`

c) `total = 0`
`for k in range(1, 5):`
`total = total + k * k`
`print(total)`

K5 Branching

Determine what this program prints for each input.

```
t = float(input("Temperature: "))
if t > 25:
    print("hot")
elif t > 10:
    print("mild")
else:
    print("cold")
```

a) The user types 30.

b) The user types 25.

c) The user types 10.

Real World (A)

Math Library · While Loops · Branching in Context

A1 Ladder Check

A hardware store's app uses this program to find how high a ladder reaches up a wall.

```
import math
ladder = float(input("Ladder: "))
base = float(input("Base: "))
h = math.sqrt(ladder**2 - base**2)
print("Reaches", round(h, 2), "m")
```

a) A 5 m ladder stands with its base 1.4 m from a wall. Determine the output. How high up the wall does the ladder reach?

- b) A painter always sets the base one quarter of the ladder's length from the wall. Rewrite the **base** line so the program calculates it instead of asking. Then determine the output for a 6 m ladder.
- c) Someone types a ladder length of 3 and a base of 4. What happens when the program runs, and what does it mean for the ladder?

A2 Saving for a Bike

Maya has \$50 and saves \$35 every week for a \$480 bike. Her program counts the weeks.

```
savings = 50
weeks = 0
while savings < 480:
    savings = savings + 35
    weeks = weeks + 1
print(weeks, savings)
```

- a) Determine the output. What does it tell Maya?
- b) Maya already has \$500 when she starts, so the first line becomes `savings = 500`. Determine the output and what it means.
- c) A friend calculates $\frac{480 - 50}{35} \approx 12.29$ and says Maya needs 12.29 weeks. Who is right, Maya's program or her friend?

A3 Electricity Bill

An Ontario utility charges 10 cents per kWh for the first 600 kWh in a month, and 12 cents per kWh for each kWh above 600. This program prints the bill in dollars.

```
kwh = float(input("Energy used (kWh): "))
if kwh <= 600:
    cost = 0.10 * kwh
else:
    cost = 60 + 0.12 * (kwh - 600)
print(round(cost, 2))
```

- a) Determine the output for 450 kWh and for 900 kWh. What do the outputs mean?
- b) A family's bill was \$120. How much energy did they use?
- c) The meter reader types -50 by mistake. Determine the output. Does it make sense for the bill? Write an `if` condition that would catch this kind of mistake.

Think It Through (T)

Error Analysis · Building Code from a Graph

T1 Spot the Flaw

A student wants to add $1 + 2 + 3 + 4$:

```
for n in range(1, 5):
    total = 0
    total = total + n
```

```
print(total)
```

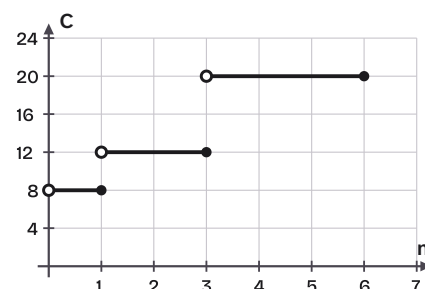
"My trace table shows that the total ends at 10, so the program prints 10."

n	1	2	3	4
total	1	3	6	10

- a) Determine what the program actually prints.
- b) Identify the line that causes the problem, explain why, and fix the program.
- c) To add the whole numbers from 1 to 100, the student starts the fixed loop with `for n in range(1, 100)`: instead. Determine what it prints, and correct the loop.

T2 Build It from the Graph

The graph shows the cost C , in dollars, to ship a parcel of mass m kilograms, for $0 < m \leq 6$.



- a) Write a program that reads m and prints C , using `if`, `elif` and `else`.
- b) Determine the cost of a 3 kg parcel and of a 3.2 kg parcel from the graph.
- c) A student's program uses `if m < 1:` as its first condition and `elif m <= 3:` after it. Find the mass for which it disagrees with the graph.

Boss Level

Optional challenge

Count Without Running

```
count = 0
for n in range(1, 1001):
    if n % 3 == 0 or n % 5 == 0:
        count = count + 1
print(count)
```

- a) Determine the output without running the program.
- b) The or is changed to and. Determine the new output.
- c) With or again, 1001 is replaced by a whole number N. Find the smallest N for which the program prints 100.

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