

Exercise walk-through

3.3

Mathematical Expressions

AP Computer Science Principles

Variables, expressions & strings

Variable

a named box;
assignment $\leftarrow$

Expressions

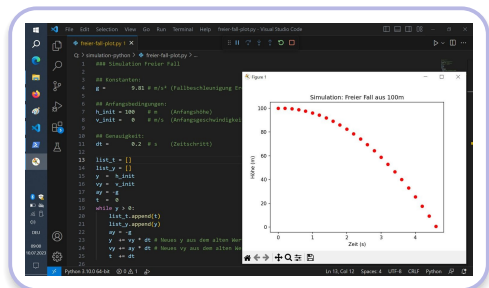
$\times \div$ before $+-$:
 $2+3\times 4 = 14$

Strings

ordered characters; index from 0

Data abstraction

groups many values under one name – a **list** –
so the same code works for any amount of data.



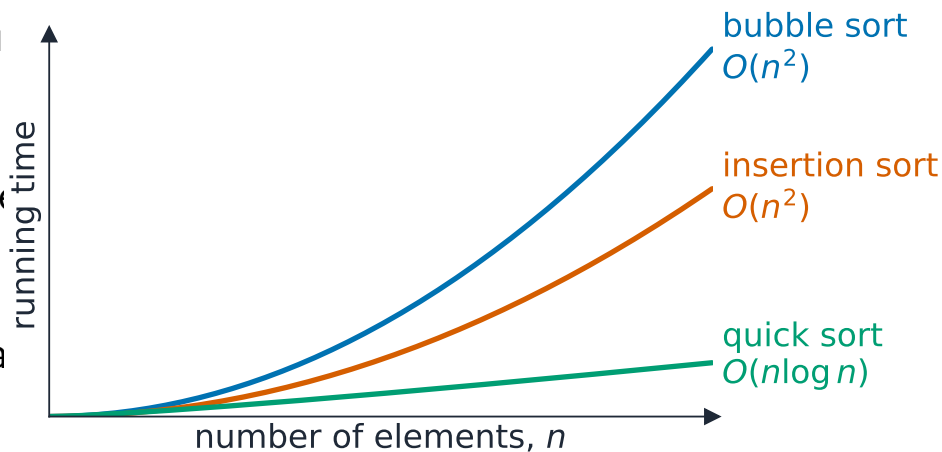
Programs use variables, expressions, and control flow

Exam tips

- Know a variable is a named store for a value and trace how **assignment** updates it step by step.
- Read the AP **pseudocode** carefully – `a <- expression` assigns, and lists are **1-indexed** on the exam reference sheet.
- Distinguish a variable from a **list** (a collection accessed by index) and use list operations correctly.
- Evaluate expressions with the right precedence and boolean logic (AND, OR, NOT).
- Pick clear, meaningful variable names – the written tasks reward readable code.

Check yourself

- 1 Binary search on 1,000 items: about many steps?
- 2 What must be true of the list before binary search works?
- 3 Name the three building blocks of an algorithm.
- 4 What makes a problem undecidable



for large n : $O(n \log n)$ (quick/merge) beats $O(n^2)$ (bubble/insertion)

Answers 1. about 10 ($\log_2 1000$) 2. it must be sorted 3. sequencing, selection, iteration 4. no algorithm can solve it for every input

Exercises 2.1-2.3

2.1 Evaluate $2 + 3 \times 4$.

[2]

2.2 Find $17 \bmod 5$.

[1]

2.3 State what the modulus operator returns.

[1]

Exercises 2.1-2.3

2.1 Evaluate $2 + 3 \times 4$.

[2]

2.1

- $\times$ first: $3 \times 4 = 12$, then $2 + 12 = 14$
-

2.2 Find $17 \bmod 5$.

[1]

2.2

- $17 \bmod 5 = 2$
-

2.3 State what the modulus operator returns.

[1]

2.3

- the remainder of an integer division

Exercises 3.1-3.2

3.1 The modulus operator returns the

[1]

☐

A quotient

B remainder

C sum

D product

☐

A 24

B 4

C 8

D 6

Exercises 3.1-3.2

3.1 The modulus operator returns the

[1]

☐

- A quotient
- B remainder
- C sum
- D product

3.1 B

- remainder.

3.2 Using the order of operations, $10 - 2 \times 3$ equals

[1]

☐

- A 24
- B 4
- C 8
- D 6

3.2 B

- $2 \times 3 = 6$, then $10 - 6 = 4$

Exercise 3.3 (a)

3.3 Evaluate the following.

(a) $(6 + 4) \div 2$.

[1]

Exercise 3.3 (a)

3.3 Evaluate the following.

(a) $(6 + 4) \div 2$.

[1]

(a)

- $10 \div 2 = 5$

Exercise 3.3 (b)

3.3 Evaluate the following.

(b) $20 \bmod 6$.

[1]

Exercise 3.3 (b)

3.3 Evaluate the following.

(b) $20 \bmod 6$.

[1]

(b)

- $20 \bmod 6 = 2$

Exercise 3.3 (c)

3.3 Evaluate the following.

(c) State whether $20 \bmod 6$ shows that 20 is a multiple of 6.

[1]

Exercise 3.3 (c)

3.3 Evaluate the following.

(c) State whether $20 \bmod 6$ shows that 20 is a multiple of 6.

[1]

(c)

- no – the remainder is 2, not 0, so 20 is not a multiple of 6