

KK13 — Types of errors

Programming · Comprehensive exam study guide

STUDY DESIGN — YOU MUST KNOW

- syntax
- logic
- runtime (overflow, index out of range, type mismatch, divide by zero)

You must classify errors and recognise the listed runtime errors. A typical question gives a symptom ('runs but wrong output') and asks for the error type and a fix.

The three error types

Type	When detected	Symptom	Example
Syntax	Before/at compile or interpret time	Code won't run at all.	Missing colon/bracket; misspelt keyword.
Logic	At run time (program runs)	Runs but produces wrong output.	Using + instead of ×; wrong condition.
Runtime	During execution	Program crashes/stops unexpectedly.	See runtime examples below.

Runtime errors to know

Runtime error	Cause
Overflow	A value too large for its data type/storage.
Index out of range	Accessing an array element that doesn't exist (e.g. index 5 in a 5-element array).
Type mismatch	Using a value of the wrong type (e.g. adding a string to a number).
Divide by zero	Attempting to divide a number by zero.

How to tell them apart

REMEMBER

Won't run → **syntax**. Runs but wrong → **logic**. Runs then crashes → **runtime**.

Key definitions to memorise

Syntax error	An error breaking the rules of the language so the code will not run.
Logic error	An error where code runs but produces incorrect results.
Runtime error	An error occurring during execution that causes the program to stop unexpectedly.

Exam technique

EXAM TIP

- Use the three-way test (won't run / wrong / crashes) to classify quickly.
- For a fix, name the cause precisely (e.g. add validation to prevent divide by zero).

COMMON MISTAKES

- Calling a wrong-output bug a syntax error — it's logic.
- Confusing 'index out of range' with 'type mismatch'.

Quick revision checklist

- I can classify an error from its symptom.
- I can name and explain the four runtime errors.

Exam practice — questions & model answers

Q1. A program runs but calculates an incorrect average. Name the error type and suggest a likely cause.

Name/Suggest · 2 marks

Model answer

- Logic error (1).
- Likely an incorrect formula, e.g. dividing by the wrong count or summing incorrectly (1).

Q2. State the runtime error each describes: (a) accessing element 10 of an 8-element array; (b) dividing total by a count that is 0.

State · 2 marks

Model answer

- (a) Index out of range (1).
- (b) Divide by zero (1).

Q3. Distinguish between a syntax error and a runtime error.

Distinguish · 2 marks

Model answer

- A syntax error breaks language rules so the code will not run at all (1);
- a runtime error occurs while the program is executing and causes it to stop unexpectedly (1).