Outputs and time delays

LEARNING INTENTION

We are learning to write flowcharts that switch outputs in order with time delays.

SUCCESS CRITERIA — I CAN

- ☐ switch outputs on and off using pin numbers
- ☐ add time delays with units
- ☐ convert between ms, s and minutes
- ☐ turn a written sequence into a flowchart

Writing outputs

Use the pin number from the table in the question. Write each output in an Input/Output symbol: **Switch on pin 7**, **Switch off pin 7**.

Writing delays

A delay is a process. Write the time and its unit: **Wait 5 s**. Common units: ms (milliseconds), s (seconds), min (minutes).

Unit	Example	In seconds
ms	500 ms	0.5 s
s	5 s	5 s
min	1 min	60 s

WORKED EXAMPLE Unit conversion for delays

1 GIVEN

```
program line: pause 2500
pause is in milliseconds (ms)
```

2 FIND

```
delay in seconds
```

3 FORMULA

```
1 s = 1000 ms
s = ms ÷ 1000
```

4 SUBSTITUTE

```
2500 ÷ 1000
```

5 ANSWER + UNIT

2.5 s

Always write the unit. '2.5' alone does not get the mark.

SHORT CIRCUIT

× WHAT EXAMINERS SAW

Delays written without a unit, or outputs written without a pin number, did not gain the mark.

✓ THE FIX

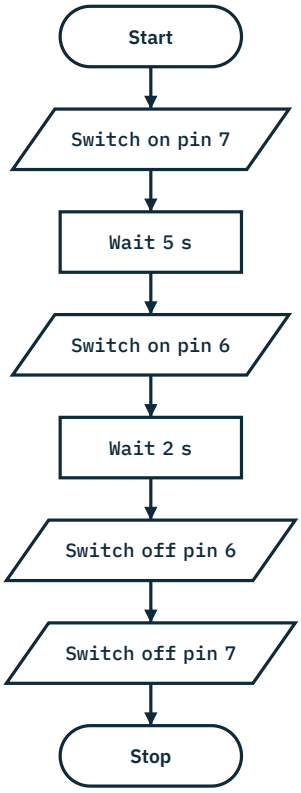
Every delay needs a number and a unit (ms, s or min). Every output needs its pin number: 'Switch on pin 7'.

Course report 2026, Question 12(a); MI 2025 Q9(a).

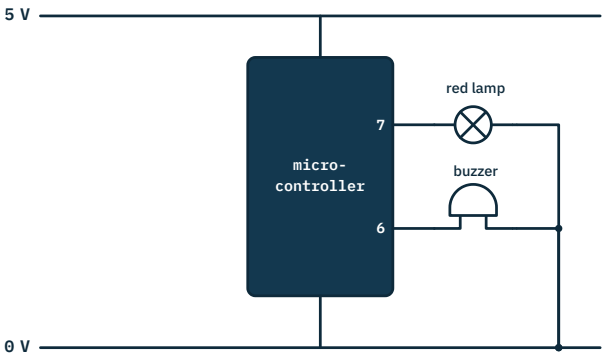
A sequence

Sequence: a red lamp (pin 7) comes on. After 5 s a buzzer (pin 6) sounds for 2 s. Then both turn off.

Outputs and time delays



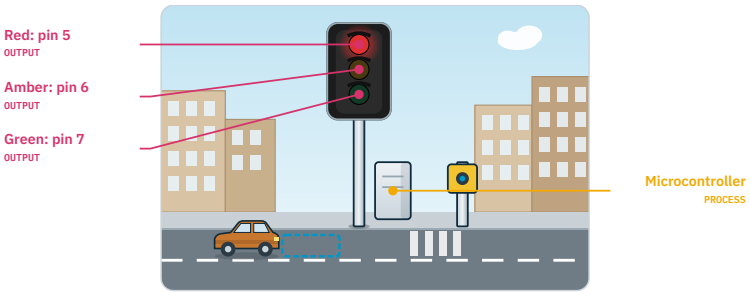
Red lamp and buzzer sequence

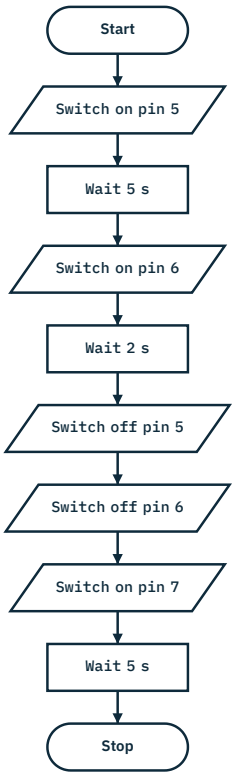


Output connections

Outputs and time delays

A traffic light sequence





One pass of the sequence

CONVERTING DELAY UNITS

1. `ms ÷ 1000 = s`

Milliseconds to seconds

2. `min × 60 = s`

Minutes to seconds

3. `250 ms = 0.25 s`

Example

4. `1.5 min = 90 s`

Example

Outputs and time delays



WORKED EXAMPLE Traffic light sequence

1 GIVEN	2 FIND	3 FORMULA	4 SUBSTITUTE	5 ANSWER + UNIT
red pin 5, amber pin 6, green pin 7 red 5 s, red+amber 2 s, green 5 s	flowchart steps	output, delay, output, delay	Switch on pin 5, Wait 5 s Switch on pin 6, Wait 2 s Switch off pins 5 and 6, switch on pin 7, Wait 5 s	**6+ steps**

WORKED EXAMPLE Total time of a sequence

1 GIVEN	2 FIND	3 FORMULA	4 SUBSTITUTE	5 ANSWER + UNIT
on 0.5 s, off 250 ms, on 2 s	total time	convert all to s	0.5 + 0.25 + 2	**2.75 s**

WRONG No unit: no mark.

```
Wait 5
```

RIGHT Delay with a unit.

```
Wait 5 s
```

Outputs and time delays

REAL ENGINEERING · ARDGOUR FERRY WARNING

Before the Ardgour (fictional) ferry ramp moves, a beacon flashes and a horn sounds for 3 s.

The sequence is set by delays in the program, so the timings are the same every time.

PROBE · QUICK CHECKS

1. 500 ms in seconds? _____
2. 2 min in seconds? _____
3. What two things must every delay have? _____

EXAM READY · 8 MARKS

1 **State** the delay 'pause 3000' in seconds. **[1]**

2 A sequence is: 1. LED on pin 2 turns on. 2. After 0.5 s, LED on pin 3 turns on. 3. After 1 min both turn off. **Complete** the flowchart. Include pin numbers and delay units. **[6]**

3 **Explain** why the unit must be shown for each delay. **[1]**