

Solutions

Each answer shows the steps, then the **result**.

2.1

- a **variable** can change while the program runs
- a **constant** is fixed

2.2

- MOD is the remainder after division
- $23 = 5 \times 4 + 3$, so **3**

2.3

- name: **DECLARE Name : STRING**
- tax rate: **CONSTANT TaxRate $\leftarrow$ 0.2**

2.4

- price: **REAL**
- box ticked: **BOOLEAN**
- grade letter: **CHAR**

2.5

- **WHILE** tests before the body, so the body may run **zero times**
- **REPEAT** tests after the body, so it **always runs at least once**

3.1 C

- a **REPEAT (post-condition)** loop always runs at least once
- A and B can run zero times; D is not a loop

3.2

(a)

- repeating a known number of times is **iteration** (a count-controlled / FOR loop)

(b)

- $\text{Total} \leftarrow 0$; FOR $I \leftarrow 1$ TO 10; input and add; output after

```
total  $\leftarrow$  0
FOR I  $\leftarrow$  1 TO 10
    INPUT mark
    total  $\leftarrow$  total + mark
NEXT I
OUTPUT total
```

3.3

- a **function** returns a value to where it was called

- a **procedure** does a task but returns no value

3.4

(a)

- **DECLARE Total : INTEGER**
- **DECLARE Time : INTEGER**
- **DECLARE Count : INTEGER**

(b)

- $\text{Total} \leftarrow 0$ before the loop; FOR Count $\leftarrow 1$ TO 20; INPUT Time; $\text{Total} \leftarrow \text{Total} + \text{Time}$; $\text{Average} \leftarrow \text{Total} / 20$; OUTPUT Average

```
Total  $\leftarrow$  0
FOR Count  $\leftarrow$  1 TO 20
    INPUT Time
    Total  $\leftarrow$  Total + Time
NEXT Count
Average  $\leftarrow$  Total / 20
OUTPUT Average
```

(c)

- set **Fastest** to the first time (or a very large value) before the loop
- compare each new time with **Fastest**
- if smaller, replace **Fastest**; output it after the loop

(d)

- $137 \text{ DIV } 60 = \mathbf{2}$ minutes
- $137 \text{ MOD } 60 = \mathbf{17}$ seconds
- displayed as **2 minutes 17 seconds**

(e)

- written once and called three times, so a correction is made in **one place**
- easier to read and test
- a **function returns a value**; a procedure does not