Student book answers

Chapter 6 Programming

Test your knowledge

THE OS (OPERATING SYSTEM)

1 An operating system provides an environment to run programs and processes. It negotiates with hardware for access to memory, storage space, software, communications and video display. It also coordinates background services such as virus scanning and software updates.

2 People provide data to the system and request information. They also maintain the system, provide electricity, updates, repairs and necessary hardware. Processes, such as backups and data entry, are organised procedures for maintaining the system and getting information from it. The digital system comprises – hardware, software and networks – comprises the electronics necessary to compute, store and communicate data and information, and the software to control the hardware.

HARDWARE

3 Primary storage, or RAM, is used during a program's execution and loses its contents when the power is turned off. Secondary storage is needed between runtimes. Secondary storage, such as a hard disk drive or solid state drive, is usually much larger in capacity but slower to access, and keeps its stored data when the power is turned off.

SOFTWARE

4 System software manages hardware and run the user's programs; for example, the operating system (OS), device drives and communication protocols. However, applications perform work or complete larger tasks. Popular examples of applications include Microsoft Word and Excel, Adobe Photoshop and Mozilla Firefox browser.

PROGRAMMING AND SCRIPTING LANGUAGES

5 While each language has its own individual rules for vocabulary and punctuation, they all use the same basic concepts, such as loops, arrays and logical operators.

SOFTWARE DEVELOPMENT TOOLS

6 A programmer creates source code, which a compiler converts to executable code.

STORAGE STRUCTURES

7 Any five of the following are acceptable.

- Text (string): Jacob Matthew Smith
- Integer: 5
- Floating point (real) numbers: decimal 5.520194
- Date/time (timestamp): 12 May 2016
- Boolean: Married? Yes/No.
- Character: Q
- Byte: 4
- Currency: 32.50

8 Lossy compression shrinks media by throwing away details. Lossy formats include JPEG, DivX, MKV, WMV and MP3. Lossless compression reduce media size as much as possible without losing data. They work by summarising data. For example, instead of recording 500 blue pixels individually, it says, ‘The next 500 pixels are blue’. Lossless formats include GIF, PNG, TIF and FLAC.

THE SOFTWARE DEVELOPMENT PROCESS

9 PSM’s analysis stage is important because it ensures the problem to be solved is properly understood, and the aims of the solution are clearly defined. It forces a project to focus on the reasons for creating software in the first place.

10 Pseudocode:

```
IF profit < 10% then display “This is not worth it”
```

Data dictionary:

Variable name	Data type	Length
TxtFirstName	Text	15
txtAge	Single precision	NA

IPO chart:

Input	Processing	Output
Date of birth Date now	(Date now – date of birth) / 365.25	Age

11 An algorithm is the strategy for a calculation. For example, the calculation you would use to determine if a particular year is a leap year. Pseudocode is a method of describing an algorithm.

12 Responses will vary, but the following answers are suggested, because they apply Hungarian notation and CamelCase.

- intMensAvShoeSize
- intMensAverageShoeSize

These use Hungarian Notation and CamelCase.

CREATING EFFECTIVE USER INTERFACES

13 Affordance is the concept that objects on an interface should immediately suggest what they do and how to use them. For example, a command button has shadows to suggest it is 3D, making it logical to click it.

Tolerance is the capacity of software and interfaces to compensate for a user’s errors and cope with people’s natural differences in how they carry out tasks. An interface that forces users to obey its rigid expectations and is unforgiving of individual variation will be unpleasant and difficult to use. For example, you could allow users to cancel or undo their actions and not lock them onto a path from which they have no escape, such as printing 300 pages with no option to cancel or stop the printing.

14 Any five of the following are acceptable; however, you should also accept any other reasonable answers.

- Be consistent. Use the same colour scheme, fonts and vocabulary throughout.
- Keep it simple.
- Make important things larger than less important things, such as headings.
- Group related items together, such as in menus.
- Use the best GUI control, such as a calendar control for entering dates.

- Give help, such as context-sensitive pop-up tips or text on forms.
- Use restrained colours.
- Make sure contrast between foreground text/background is optimal.

FUNDAMENTAL PROGRAMMING CONCEPTS

15 The following answers are examples only. Many other examples are possible and acceptable.

- Syntax error: Using the command `PRUNT` in source code instead of the correct command `PRINT`. The compiler would not recognise `PRUNT`.
- Logical error: Adding 10% tax to a cost with the logic:

  ```
  Cost ← Cost + 10%
  ```

  This would just add 0.10 to the cost, not 10% of the cost.
- Runtime error: Running out of hard disk space or RAM when running a program, causing it to crash

16 A compiled language converts source code to executable code just once. An interpreted language is converted to executable code every time it is run.

17 Internal documentation makes the purpose of code clear, explaining to other programmers why tasks were carried out in a certain way, what the version is, and so on.

18 Arrays consist of many storage locations addressable by their number. Loops easily iterate through many cycles. By using a counter in a loop, many array elements can be accessed with a simple loop.

19 Desk checking verifies that code is producing the expected results at all stages of the code. It is a manual form of stepping through code and inspecting calculated values.

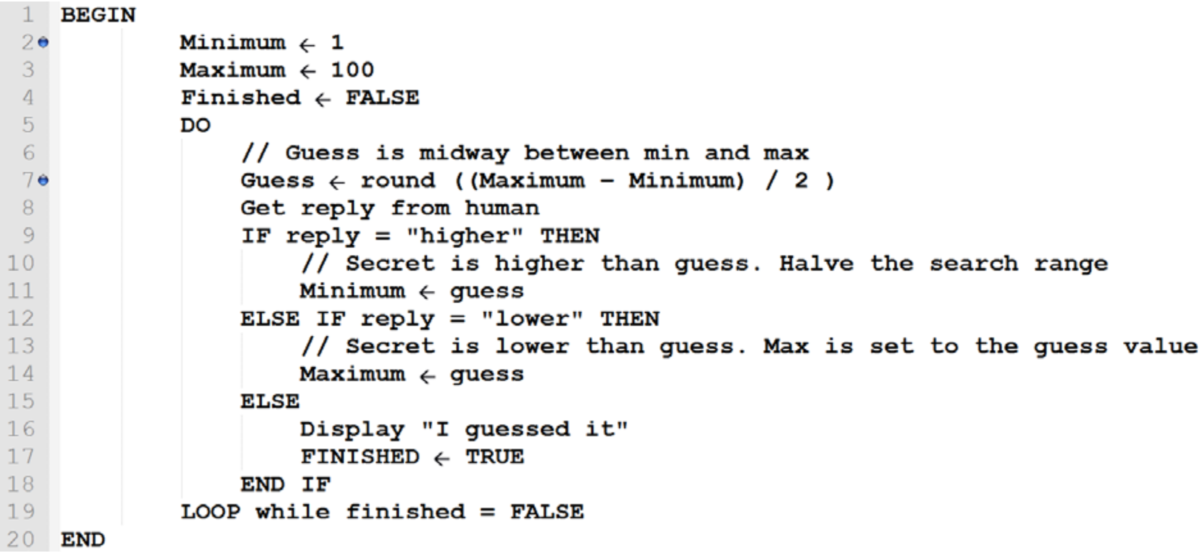
20 Many logical errors occur when the behaviour of code is supposed to change. Code may work well most of the time, but fail at these ‘tipping points’. For example, testing for an age over 18 can be very different to check for an age of 18 or more.

21 Use a random file when there is a lot of data that is of a consistent nature that needs to be accessed as quickly as possible.

Apply your knowledge

Tasks

1



```
BEGIN
        Minimum ← 1
        Maximum ← 100
        Finished ← FALSE
        DO
            // Guess is midway between min and max
            Guess ← round ((Maximum - Minimum) / 2 )
            Get reply from human
            IF reply = "higher" THEN
                // Secret is higher than guess. Halve the search range
                Minimum ← guess
            ELSE IF reply = "lower" THEN
                // Secret is lower than guess. Max is set to the guess value
                Maximum ← guess
            ELSE
                Display "I guessed it"
                FINISHED ← TRUE
            END IF
        LOOP while finished = FALSE
END
```

2

I	P	O
Maximum Minimum	(Maximum – minimum) / 2 (rounded to nearest integer)	Guess
Guess reply	Guess = reply	Finished

3 Responses will vary.

4 Secret number = 39

5

Min	Max	Guess	Player's reply
1	100	50	Too high
1	50	25	Too low
25	50	37	Too low
37	50	43	Too high
37	43	40	Too high
37	40	38	Too low
38	40	39	Correct

6 Responses will vary.

7 Responses will vary.

8 Responses will vary.