[Braille page 1] X816/75/01 PRINT COPY BRAILLE

N5

National Qualifications

2025

Computing Science

FRIDAY, 25 APRIL

Instructions to Candidates

Candidates should enter their surname, forename(s), date of birth, Scottish candidate number and the name and level of the subject at the top of their first answer sheet.

Total marks – 80 marks

Only Section 1 and Section 2 have been provided.

Attempt ALL questions

SECTION 1 — Software design and development, and Computer systems — 55 marks

SECTION 2 — Database design and development — 25 marks

You may use a calculator.

Show all workings.

An ow in the margin indicates a new question.

Questions marked with an asterisk differ in some respect from those in the printed paper.

You must clearly identify the question number you are attempting on your answer sheet.

Marks are shown in square brackets at the end of each question or part question.

[Braille page 2] Diagrams are supplied on separate sheets.

[Braille page 3] SECTION 1

SOFTWARE DESIGN AND DEVELOPMENT, AND COMPUTER

SYSTEMS — 55 marks

Attempt ALL questions

ow 1. A leaderboard shows teams and their scores.

[In the table below, Position is followed by: Team; Score.]

1: Harry Putter; 81.

2: Par Tee; 79.

3: Sandy; 77.

(a) A computer system stores the scores as binary numbers.

Convert the denary number 79 to an 8-bit binary number. [1 mark]

(b) A computer system stores the team names using extended ASCII code.

Calculate the number of bits required to store the team name:

Par Tee [1 mark]

ow 2. Describe a situation where an iterative approach is required during the software development process. (4 print lines) [1 mark]

[Braille page 4]

ow 3. Part of a program is shown below.

…

Line 34 RECEIVE xyz FROM (INTEGER) KEYBOARD

Line 35 SET abc TO xyz ^ 2

…

(a) State the value stored in abc when ‘3’ is entered by the user at Line 34. (1 print line) [1 mark]

(b) The programmer has not used internal commentary or white space in their code.

State one other way to improve the readability of this code. (1 print line) [1 mark]

ow 4. Identify the mantissa and exponent in the floating-point representation below. [2 marks]

0.127×10^2

Mantissa (1 print line)

Exponent (1 print line)

[Braille page 5]

ow 5. A photograph of a dog looking at the camera is stored in a computer system as an array of pixels.

State the graphic representation used to store this photograph. (1 print line) [1 mark]

[Braille page 6]

ow 6. The program below issues customers with a username.

…

Line 11 RECEIVE firstName FROM (STRING) KEYBOARD

Line 12 RECEIVE yearOfBirth FROM (STRING) KEYBOARD

Line 13 SET userName TO firstName & yearOfBirth

Line 14 SEND userName TO DISPLAY

Describe how the value assigned to the userName variable is created in Line 13. (2 lines) [1 mark]

ow * 7. A program is required for passengers to book a ticket on a bus.

(a) Passengers must enter their destination and their age when making a booking, as some will qualify for free travel.

(b) Complete the table below by writing the missing items labelled (i) and (ii) to state the most suitable data types that should be used. [2 marks]

[Braille page 7] [In the table below, Variable name is followed by: Sample data; Data type.]

passengerAge: 78; (i).

destination: Ullapool; (ii).

(c) Write a line of code that will randomly allocate a seat number and store this in the variable seatNum. There are 50 seats available. [2 marks]

ow * 8. Refer to the diagram for Question 8. A new supermarket self-service till is being designed for customers. Part of the program design is shown by the diagram.

Image of a self-service till to be used by customers replaced with description.

There is an empty conveyor belt on one side of the scanning machine and then a packing area on the other side.

(a) State the design technique shown. (1 print line) [1 mark]

(b) State which type of loop is used in this design. (1 print line) [1 mark]

(c) State the most suitable data type for the variable that will be used in the 'is conveyor belt empty?' step. (1 print line) [1 mark]

[Braille page 8]

ow 9. Refer to the diagram for Question 9(a). Luna Life is a company that creates animations.

(a) The company logo shown by the diagram is stored as a vector graphic.

Identify the object used to make this logo and one of its attributes. [2 marks]

Object (1 print line)

Attribute (1 print line)

(b) Luna Life uses a program to calculate the cost of creating an animation. Part of the program is shown below.

SET basicCost TO timeInSeconds * animatorCharge

After the basic cost has been calculated, the following discounts can be applied to animations depending on their use:

• education — deduct £20 from cost

• charity — deduct £30 from cost.

Using a programming language of your choice, write the code to ask for the purpose of the animation, calculate any **[Braille page 9]** discount, and display the final cost in the variable finalCost. [4 marks]

(d) State the part of the processor used, during the calculation of the discount, to:

(i) perform the calculation (1 print line) [1 mark]

(ii) temporarily store the values used in the calculation. (1 print line) [1 mark]

(e) Luna Life has 100 computers in its office. During the working day, staff use standby mode when their computers are not in use.

Describe why staff use standby mode. (2 print lines) [1 mark]

[Braille page 10]

ow * 10. A program is being written that will allow gamers to add money to their account using gift cards.

Image shows a gift card for £25 with a 16 digit number.

The program asks the user to enter their username, their five-character password and the gift card number. The updated balance in the user's account is then displayed.

(a) Identify three processes that will be carried out by the program.

Complete the table below by writing the missing items labelled (i), (ii) and (iii). [3 marks]

Input(s): Username, password, gift card number

Process: (i)

Process: (ii)

Process: (iii)

Output(s): Display new balance

(b) Using a programming language of your choice, write the input validation code to confirm that the password entered has five characters. [4 marks]

(c) Test data will be used to ensure this input validation works correctly.

Complete the test table below by writing the missing items labelled (i) and (ii). [2 marks]

[Braille page 11] [In the table below, Type of test is followed by: Input; Expected result.]

(i): As4G5; Program will continue.

Exceptional: (ii); Error message, ask to re-enter.

[Braille page 12]

ow 11. A gym wants to encourage members to burn more calories than their monthly target.

It uses a program to calculate additional calories burned over a 12-month period.

April	May	June
6821.34	5129.89	4997.67

The design below shows how a member's average additional calories burned is calculated and displayed.

1. Store each month's additional calories burned

2. Calculate the average additional calories burned

3. Display the average additional calories burned

The data structure calories is used to store additional calories burned each month. The variable avgCalories is used to store the user's average additional calories burned.

(a) Using a design technique of your choice, refine step 2. [4 marks]

(b) A member's average additional calories burned is displayed using the line of code below.

[Braille page 13]

SEND avgCalories TO DISPLAY

This code displays the value below to a member.

5123.879

Using a programming language of your choice, rewrite this code to display the average additional calories to one decimal place. [2 marks]

(c) If a member's average additional calories burned is over 6000 calories, and they have a personal trainer at the gym, they will be given a 15% discount on their next session.

The code to implement this is shown below.

…

```
Line 27 SET memberDiscount TO 0.00
Line 28 <repeat for every gym member>
```

[Braille page 14]

```
Line 29   IF avgCalories < 6000 AND trainer = TRUE
Line 30   SEND  “Congratulations on a 15% discount”
      TO DISPLAY
Line 31   SET memberDiscount TO      sessionCost * 0.15
Line 32  END IF
Line 33 <end repeat>
```

…

(i) Identify the logical operator in the above code. (1 print line) [1 mark]

(ii) It was identified that a member who burned 6578.1 average additional calories and who has a personal trainer did not receive the 15% discount.

State the type of error in the program and how the error can be corrected. [2 marks]

Type of error (1 print line)

Correction (1 print line)

(d) After final testing, the program is run without requiring any further translation.

[Braille page 15] State the type of translator that has been used. (1 print line) [1 mark]

(e) State the term used at the evaluation stage, to describe a program's capability to handle unexpected or incorrect data being entered without crashing. (1 print line) [1 mark]

(f) A member has written an e-mail to the gym manager.

State what can be done to ensure that, if intercepted, the e-mail cannot be read by others. (2 lines) [1 mark]

(g) The gym manager wants to set up tablet computers at the door to carry out a survey as people leave the gym.

The survey should ask if they are a member or a pay-as-you-go customer, and if they were attending the gym or a fitness class. The survey should also ask people to rate their visit, from 1 to 10, and have a space for any additional comments.

Describe a user interface for this survey. [4 marks]

[Braille page 16]

ow 12. In an archery game, players score points when they hit the target.

The points entered are whole numbers in the range 0 to 10.

The game has 10 rounds and each player shoots two arrows in each round.

The program below is written to record a player's score.

…

Line 24 SET totalScore TO 0.00

Line 25 SEND “round1” TO DISPLAY

Line 26 RECEIVE arrow1 FROM (REAL) KEYBOARD

Line 27 RECEIVE arrow2 FROM (REAL) KEYBOARD

Line 28 SET roundTotal1 TO arrow1 + arrow2

Line 29 SET totalScore TO totalScore + roundTotal1

…

Line 70 SEND “round10” TO DISPLAY

Line 71 RECEIVE arrow19 FROM (REAL) KEYBOARD

[Braille page 17]

Line 72 RECEIVE arrow20 FROM (REAL) KEYBOARD

Line 73 SET roundTotal10 TO arrow19 + arrow20

Line 74 SET totalScore TO totalScore + roundTotal10

Line 75 < display all ten round totals >

Line 76 SEND “TotalScore: “ & totalScore TO DISPLAY

(a) When this code is evaluated it is found to be inefficient.

Explain how to make this code more efficient. (6 print lines) [3 marks]

(b) A tester enquired why the total score was displayed as below:

Total score: 180.60

Explain the problem with the program that this output has highlighted. (2 print lines) [1 mark]

(c) The code below is written to store the names of a maximum of 40 competitors in an archery competition.

[Braille page 18]

…

```
Line 80  SET stop TO TRUE
Line 81  SET count TO 0
Line 82  WHILE NOT(stop) AND count <= 40 DO
Line 83   RECEIVE nextPerson FROM (STRING) KEYBOARD
Line 84   IF nextPerson = “NO” THEN
Line 85   SET stop TO FALSE
Line 86   ELSE
Line 87   <store name entered>
Line 88   SET count TO count + 1
Line 89   END IF
Line 90  END WHILE
Line 91  SEND “Total archers “  & count TO DISPLAY
```

…

[Braille page 19] Describe why this code will not function as expected. (2 print lines) [1 mark]

[END OF SECTION 1]

[Braille page 20] SECTION 2

DATABASE DESIGN AND

DEVELOPMENT — 25 marks

Attempt ALL questions

ow 13. A model collector keeps information about the items collected in a database. A query has been run and the output is shown below.

[In the table below, modelNumber is followed by: title; theme; pieceAmount; cost.]

1279: Space Base; Space; 1422; 125.

7525: Colour Fun; Classic; 1685; 90.

1457: Lady Liberty; Architect; 1500; 90.

5271: Command Rover; Space; 750; 70.

1280: Dino Compound; Adventure; 612; 60.

6598: Creative Box; Classic; 790; 45.

8182: Astronaut; Space; 647; 45.

3688: Century Hawk; Star Battles; 253; 30.

[Braille page 21]

1094: Tomb Treasure; Adventure; 161; 20.

2281: River Raft; Adventure; 18; 6.

Complete the SQL statement used to produce this sorted output. [2 marks]

SELECT modelNumber, title, theme, pieceAmount, cost

FROM Model

ORDER BY

(2 print lines)

[Braille page 22]

ow 14. A restaurant stores employee details in a database. Each employee is trained as either a chef, a server, a manager or a cleaner. Sample data from the database is shown below.

[In the Employee table below, empID is followed by: empName; jobTitle; startDate; fullTime; contactNum.]

117254: Alex Roberts; Manager; 21/10/24; ✓; 07701675815.

259631: Rayyan Patel; Chef; 05/09/23; ✓; 07778589526.

300193: Charlie King; Server; 10/03/25; ...; 07789900991.

220205: Sam Scott; Cleaner; 13/02/25; ...; 07811606115.

576482: Drew Moore; Cleaner; 30/12/24; ...; 07705900169.

365482: Carter Price; Server; 23/01/25; ...; 07716168759.

419372: Rowan Kelly; Chef; 07/07/24; ✓; 07700148652.

895714: Jun Baek; Server; 30/04/25; ...; 07812612568.

681354: Nikan Khan; Manager; 06/08/23; ✓; 07780254369.

...: ...; ...; ...; ...; ....

[Braille page 23] (a) Identify the missing attribute and attribute type in the table below by writing the missing items labelled (i) and (ii). [2 marks]

[In the table below, Attribute is followed by: Attribute type.]

contactNum: (i).

(ii): Boolean.

(b) Errors are made when data is entered for new employees.

State one attribute where restricted choice validation could be used to reduce errors. (1 print line) [1 mark]

[Braille page 24]

ow * 15. A band booking company has a range of bands that can be booked for various events. It wants a database to store information on bands and their bookings.

A band can play more than one event. An event can only have one band.

When a band is being booked for an event the form below is completed.

Each of the options (i) to (iv) represent the boxes for the customer to enter the event information.

Please use the form below to book your band of choice.

Event Name: (i)

Date: (ii)

Venue: (iii)

E-mail: (iv)

Band Ross Wonder ▼ [Drop down icon for selecting a band that opens ‘More Info’.]

More Info

• RW172 - Ross Wonder

• Genre is rock

• Price is £1500

• Has 2 members

Submit button

When the band has been booked, the following e-mail is sent to the organiser.

[Braille page 25]

Congratulations.

You are all booked. You have been given the exclusive event ID 1318.

Ross Wonder is looking forward to playing at your event.

Refer to the diagram for Question 15

(a) Using the entity relationship diagram by:

• identifying the key attributes

• state the relationship between the entities

• name the relationship. [3 marks]

The database has been created. Sample data from each table is shown below.

[In the Band table below, bandRef is followed by: bandName; cost; numMembers; genre.]

RW172: Ross Wonder; 1500; 2; Rock.

ML435: Of Men and Lions; 1250; 5; Country.

BP908: Brightplay; 2200; 6; Rock.

LP241: Les Pencils; 1800; 2; Pop.

BB456: The Bright Brothers; 1300; 3; Electronic.

ME243: Miceica; 2000; 4; Country.

[Braille page 26]

SI746: 20 Seconds to Irvine; 1100; 5; Folk.

...: ...; ...; ...; ....

[In the Event table below, eventID is followed by: eventName; date; bandRef; venue; bookingEmail.]

1215: Paterson Wedding; 10/04/2026; ML435; Lakeside Lodge; steph@zmail.com.

1318: Charity Ball; 25/09/2025; RW172; The Old Poet; jgritchie@cmail.com.

1154: Oscar's Luau; 11/08/2025; ME243; The Old Poet; YFang131@mail.com.

1089: Award Ceremony; 05/12/2025; SI746; Driftwater; JThom@zmail.com.

1706: Hogmanay Dance Off; 31/12/2025; BB456; The Unicorn; handD@mail.com.

2011: Afternoon Tea; 26/03/2026; BP908; The Old Poet; andyCliff@cmail.com.

...: ...; ...; ...; ...; ....

(b) Complete the SQL statement below that will display the name of any country band **[Braille page 27]** playing at ‘The Old Poet’ and the date of the event. [4 marks]

SELECT (1 print line)

FROM (1 print line)

WHERE (3 print lines)

(c) Customers' personal details have been stolen.

State one requirement of the UK General Data Protection Regulation (GDPR) that the company should have implemented to prevent this from happening. (1 print line) [1 mark]

[Braille page 28]

ow * 16. Caledonian Wheels organises a motorsport racing championship. A

database is used to store data on racing teams and their individual drivers. The data stored in the database is shown below.

[In the Team table below, teamID is followed by: teamName; titlesWon; location.]

RR32: Rapid Racers; 7; Italy.

SS21: Swift Streaks; 3; United Kingdom.

TT16: Turbo Titans; 2; Germany.

VR12: Velocity Vipers; 4; Italy.

ER54: Elite Racers; 1; United Kingdom.

PV81: Prime Speed; 5; Spain.

[In the Driver table below, driverNum is followed by: forename; surname; wins; points; teamID.]

1: Shannon; Kelly; 5; 125; ER54.

[Braille page 29]

3: Ezri; Wuzik; 2; 50; PV81.

4: Jackie; Price; 2; 50; RR32.

11: Kai; West; 4; 100; SS21.

14: Charlie; Wilkinson; 1; 25; TT16.

18: Moss; Gray; 0; 0; VR12.

22: Kris; Hunt; 1; 25; SS21.

31: Meenal; Ibrahim; 3; 75; VR12.

55: Ollie; Graham; 6; 150; TT16.

63: Gerry; Fox; 0; 0; PV81.

77: Jackie; West; 1; 25; ER54.

81: Akari; Ogawa; 0; 0; RR32.

(a) Caledonian Wheels want to share details about all the UK based drivers who have had a successful year so far.

(i) Design a query to search the database for a driver's full name, driver number and team name who have won more **[Braille page 30]** than three races and drive for a United Kingdom based team.

Identify the missing items labelled (i) to (iii) below; [4 marks]

Field(s): (i)

Table(s): (ii)

Search Criteria: (iii)

(ii) Describe how the SQL statement could be tested when the query is created. (2 print lines) [1 mark]

(b) The following SQL statement is implemented in the database.

SELECT teamID, teamName, titlesWon

FROM Team

WHERE (teamID = “PV81” OR location = “Italy”) AND titlesWon >=5

Write the expected output from this SQL statement. [2 marks]

(c) Jackie West won her 2nd race of the season increasing her points to 50.

Write the SQL statement to update Jackie's details. [4 marks]

(d) A new driver is to be added.

[Braille page 31]

INSERT INTO Driver (driverNum, forename, surname, wins, points, teamID)

VALUES (99, “Thomas”, “Webb”, 0, 0, “PC81”)

When this SQL statement is run, an error message is displayed stating that the record cannot be added.

Explain why an error message is displayed. (2 print lines) [1 mark]

[END OF SECTION 2]

[END OF QUESTION PAPER]