



Course Report 2016

Subject	Computing Science
Level	National 5

The statistics used in this report have been compiled before the completion of any Post Results Services.

This report provides information on the performance of candidates which it is hoped will be useful to teachers, lecturers and assessors in their preparation of candidates for future assessment. It is intended to be constructive and informative and to promote better understanding. It would be helpful to read this report in conjunction with the published assessment documents and marking instructions.

Section 1: Comments on the Assessment

Component 1: question paper

All comments raised on this paper were fully discussed at grade boundary.

Question 19(b) (ii) contained an error which did not allow this question to be answered as it was originally designed. During marking it was found that candidates answered the question by applying problem solving techniques and identified the problems with the reference language. The marks awarded for this question were addressed in the grade boundary meeting.

Candidates found questions, sampling content from the Course Assessment Specification, that had not previously been asked to be challenging. These were also discussed at grade boundary meeting.

SQA acknowledges that there were a number of typographical and coding errors within the 2016 question paper. These were fully discussed at the Grade Boundary meeting and where these were found to impact on candidate performance, grade boundary adjustments were made. This ensures that no candidates were advantaged/disadvantaged by such errors.

An amended version of the 2016 question paper and associated marking instructions can be obtained on the SQA website.

Component 2: assignment

The marks gained in the assignment were higher than would be expected when compared with the performance in the question paper but were similar to those of the predecessor Computing/ Information Systems courses.

Section 2: Comments on candidate performance

The comments below make reference to candidate performance, the position of the content within the course and also past instances where a similar question was asked or similar content sampled.

Areas in which candidates performed well

Component 1: question paper

Question 1: Candidates performed well in this question. Candidates have experienced similar questions in the SQP (q1), 2014 QP (q5) and 2015 QP (q1).

Software Design and Development

Low-level operations and computer architecture — Use of binary to represent and store: integers

Question 2: Candidates performed well in this question.

Software Design and Development

Testing and documenting solutions — readability of code

Question 3: Candidates performed well in this question.

Information System Design and Development

Technical implementation (hardware requirements) — ROM

Question 4: Candidates performed well in this question.

Information System Design and Development

Purpose, features, functionality, users — Description of purpose

Structures and links (database) — validation restricted choice

Question 5: Candidates performed well in this question, although a small proportion made no attempt at an answer. This term has not been assessed in previous examinations.

Software Design and Development

Low-level operations and computer architecture — Basic computer architecture: processor (registers)

Question 6: Candidates performed well in this question.

Information System Design and Development

Security precautions — use of security suites

Question 7: Candidates performed well in this question. Candidates have experienced similar questions in the 2015 QP (q13).

Information System Design and Development

Security risks — identity theft

Question 8: Candidates performed well in this question. Although a small proportion made no attempt at an answer.

Information System Design and Development

Purpose, features, functionality, users — Users: expert, novice

Question 9: Candidates performed well in this question. Candidates have experienced similar questions in the SQP (q16c) and the 2015 QP (q7).

Candidates demonstrated an ability to show an understanding of how a program works and were able to 'demonstrate application of knowledge and understanding to answer appropriately challenging context-based questions by drawing on and applying knowledge'.

Software Design and Development

Computational constructs — Exemplification and implementation of the following constructs

Question 10: Candidates performed well in this question, although a small proportion made no attempt at an answer.

Information System Design and Development

Structures and links (database) — database operations search

Question 11: Candidates performed well in this question, although a small proportion made no attempt at an answer.

Candidates have experienced similar questions in the 2014 QP (q18(e)) and the 2015 QP (q17(b)).

Software Design and Development

Low-level operations and computer architecture — Translation of high-level program code to binary (machine code): interpreters and compilers

Question 13: Candidates performed well in this question. Candidates have experienced similar questions in the 2014 QP (q21(c)) and the 2015 QP (q18(e)).

Information System Design and Development

Structures and links (web-based) — good design to aid navigation

User interface (also applies in software design and development) — User requirements (visual layout, navigation, selection, consistency, interactivity, readability)

Question 14: Candidates performed well in this question. Candidates have experienced similar questions in the 2014 QP (q11) and the 2015 QP (q11).

Information System Design and Development

Technical implementation (networking/connectivity) peer-to-peer

Question 15(a): Candidates performed well in this question. Candidates have experienced similar questions in the 2015 QP (q20(c)).

Information System Design and Development

Structures and links (database) — database structure: ... primary keys

Question 15(b): Candidates performed well in this question. Candidates have experienced similar questions in the 2014 QP (q(6)) and the 2015 QP (q20(b)).

Information System Design and Development

Structures and links (database) — database structure: flat file

Question 15(d): Candidates performed well in this question. Candidates have experienced similar questions in the 2014 QP (q21(b)) and the 2015 QP (q20(d)).

Information System Design and Development
Structures and links (database) — field types (text, ...)

Question 15(e)(i): Candidates performed well in this question. Candidates have experienced similar questions in the 2014 QP (q21(c)) and the 2015 QP (q20(a)).

Information System Design and Development
Structures and links (database) — validation (including ... restricted choice...)

Question 15(e)(ii): Candidates performed well in this question, applying their solution to the context of the question. Candidates applied their knowledge from software design and development to a database application 'applying computing science concepts and techniques to create solutions across a range of contexts'

Candidates have experienced similar questions in the 2014 QP (q21(c)) and the 2015 QP (q20(a)).

Software Design and Development
Testing and documenting solutions — normal, extreme and exceptional test data

Question 15(f):

Candidates performed well in this question. Candidates have experienced similar questions in the 2014 QP (q16(c)(ii)) and the 2015 QP (q5).

Information System Design and Development
Structures and links (database) database operations, sort (on multiple fields)

Question 16(c): Candidates demonstrated an ability to show an understanding of how a program works.

Candidates showed that they could 'demonstrate application of knowledge and understanding to answer appropriately challenging context-based questions by drawing on and applying knowledge'.

Software Design and Development
Computational constructs — Exemplification and implementation of the following constructs

Question 16(e): The candidates that gave a response showed a good understanding of loops. A proportion made no attempt at an answer.

Software Design and Development
Computational constructs — iteration and repetition using fixed and conditional loops ...

Question 17(c): Candidates performed well in this question. Candidates have experienced similar questions in the 2014 QP (q1).

Information System Design and Development
Structures and links (web-based) — hyperlinks

Question 17(d)(i): Candidates performed well in this question. Candidates have experienced similar questions in the 2015 QP (q18(d)).

Information System Design and Development
Media types — video: avi

Question 17(d)(ii): Candidates found this question challenging. Candidates were stronger with their knowledge of absolute addressing in the 2015 QP (q16(c)(ii)).

Information System Design and Development
Structures and links (web-based) -, relative addressing

Question 17(e)(i): Candidates performed well in this question. Candidates have experienced similar questions in the 2014 QP (q1).

Information System Design and Development
Structures and links (web-based) — hyperlinks (... external)

Question 17(e)(ii): Candidates either knew what URL stood for or they did not. Candidates have experienced similar questions in past papers where they have had to apply knowledge of the URL in the 2015 QP (q18(b)) and the 2014 QP (q15(a)).

Information System Design and Development
Structures and links (web-based) — URL

Question 17(e)(iii): Candidates have grown in confidence in calculation questions and performed well. Candidates have experienced similar questions in the SQP, 2014 QP (q(3)) and the 2015 QP (q15(a)).

Information System Design and Development
Media types — Calculation of file size for colour bitmap.

Question 18(a(i)): Candidates performed well in this question.

Information System Design and Development
Media types — Factors affecting file size and quality ... sampling rate.

Question 18(a(ii)): Candidates performed well in this question.

Information System Design and Development
Media types — audio: mp3

Question 18(b(i)): Candidates either knew the Computer Misuse Act or they did not.

Information System Design and Development

Legal implications — Basic descriptions and implications of: Computer Misuse Act

‘Question paper will give candidates an opportunity to demonstrate the following skills, knowledge and understanding: understanding of the legal implications and environmental impact of contemporary information system technologies’

Question 18(b(ii)): Candidates either knew the Computer Misuse Act or they did not.

Information System Design and Development

Legal implications — Basic descriptions and implications of: Computer Misuse Act

‘Question paper will give candidates an opportunity to demonstrate the following skills, knowledge and understanding: understanding of the legal implications and environmental impact of contemporary information system technologies’.

Question 18(c): Candidates either knew the Communications Act or they did not.

The 2015 QP (q12) also had a question on the Communications Act linking to mobile technologies.

Information System Design and Development

Legal implications — Basic descriptions and implications of: Communication Acts

‘Question paper will give candidates an opportunity to demonstrate the following skills, knowledge and understanding: understanding of the legal implications and environmental impact of contemporary information system technologies

Question 18(d)(i): Candidates performed well in this question. Candidates are familiar with this Act. Candidates have experienced similar questions in the 2014 QP (q19(b)(iii)).

Information System Design and Development

Legal implications — Basic descriptions and implications of: Copyright, Designs and Patents Act (plagiarism)

‘Question paper will give candidates an opportunity to demonstrate the following skills, knowledge and understanding: understanding of the legal implications and environmental impact of contemporary information system technologies

Question 18(d)(ii): Candidates performed well in this question.

Software Design and Development

Computational constructs — use of selection constructs including simple and complex conditional statements and logical operators

Computational constructs — expressions to return values using arithmetic operations +

Question 18(e): Candidates performed well in this question. Candidates are familiar with this Act. Candidates have experienced similar questions in the SQP and the 2015 QP (q18(e)).

Information System Design and Development

Legal implications — Basic descriptions and implications of: Data Protection Act

‘Question paper will give candidates an opportunity to demonstrate the following skills, knowledge and understanding: understanding of the legal implications and environmental impact of contemporary information system technologies

Question 19: This question contained several typos:

Line 2 – spaces should have been between the commas and the values

Line 3 – FOR EACH cost FROM all costs DO

These edits would still generate a problem with 19b(iii). Candidates answered 19b(iii) using true problem solving skills.

The original question was:

```
SET total = 0
```

```
SET counter = 0
```

```
DECLARE cost INITIALLY[35.00, 36.00, 40.00, 35.00, 42.50]
```

```
REPEAT
```

```
    SET total = total + cost(counter)
```

```
    SET counter = counter + 1
```

```
UNTIL counter = 4
```

```
SEND ‘The total cost = £’&total TO DISPLAY
```

Question 19(a): Candidates are becoming more confident in the identification of arrays, but they still have to develop knowledge of the data type.

This question was similar to one in the 2015 QP (q19(c(i))) and the SQP (q7).

Software Design and Development

Data types and structures — 1-D arrays

Data types and structures — numeric (... real) variables

Question 19(b(i)): Candidates are becoming more confident in reading code. It is evident that they are explaining what code does, with or without line numbers to assist them. Candidates have experienced similar questions in different contexts in the SQP, 2014 and 2015 QPs.

Software Design and Development

Computational constructs

Exemplification and implementation of the following constructs:

- ◆ expressions to assign values to variables
- ◆ expressions to return values using arithmetic operations (+, -, *, /, ^, mod)
- ◆ iteration and repetition using fixed and conditional loops

Question 19(b)(iii): This question was covered in the introduction to this section. Please read the marking instructions for the 2016 paper for further information.

Question 20:

Information System Design and Development

Technical implementation (hardware requirements) -

input and output devices ,processor type and speed (Hz),memory (RAM, ROM)
device type (including supercomputer, desktop, portable devices (including laptop, tablet, smartphone)

Technical implementation (software requirements)

operating systems

Technical implementation (storage)

capacity (in appropriate units) rewritable, read-only interface type data transfer speed
storage devices: built-in, external, portable magnetic, optical solid state

Question 20(a): Candidates performed well in this question.

Information System Design and Development

Security precautions – firewalls

Question 20(b): Candidates are becoming clear in their understanding of encryption and how it applies to keeping data safe. A similar question was in the 2014 QP (q17(b)).

Information System Design and Development

Security precautions — ... encryption

Question 20(c): The weight in the specification should have been 0.65kg, however this did not affect candidate performance.

Inconsistences in units in the diagrams.

Question 20(c(i)): Candidates performed well in this question. They are confident in the input and output devices.

Information System Design and Development

Technical implementation (hardware requirements) — input and output devices

Question 20(c)(iv): Candidates were very confident in this area, clearly identifying reasons.

Information System Design and Development

Technical implementation (software requirements) operating systems

Technical implementation (storage)

capacity

Question 20(d): Candidates were very confident in this area, clearly identifying reasons.

Candidates have experienced similar questions in the 2014 QP (q17(a) and (c)).

Information System Design and Development

Purpose, features, functionality, users — Description of purpose

User interface (also applies in software design and development) — User requirements (visual layout, navigation, selection, consistency, interactivity, readability)

Information System Design and Development

Structures and links (web-based) — good design to aid navigation

Question 21(b): Candidates answered well in this question. Candidates have experienced similar questions in the 2015 QP (q3).

Software Design and Development

Computational constructs — use of selection constructs including simple and complex conditional statements and logical operators

Question 21(c)(i): Candidates answered well in this question. Candidates have experienced similar questions in the 2015 QP (q5) and the 2014 QP (q13).

Software Design and Development

Testing and documenting solutions — normal, extreme and exceptional test data

Question 21(d): Candidates answered well in this question. Candidates have experienced similar questions in the 2014 QP (q20(b)) and the 2015 QP (q9).

Software Design and Development

Testing and documenting solutions

Readability of code (internal commentary, meaningful identifiers, indentation)

Component 2: assignment

The assignments were well attempted by most candidates. The majority of candidates showed that they had good programming skills and were able to build suitable information systems to complete the assignments

Areas which candidates found demanding

Component 1: question paper

Question 12: Candidates have difficulty in this style of question. Deliverers and candidates should further familiarise themselves with this area of content and this style of question.

Candidates have experienced similar questions in the SQP (q22(a)), the 2014 QP (q16(b)) and the 2015 QP (q21(b)).

Software Design and Development

Computational constructs — expressions to assign values to variables, iteration and repetition using fixed and conditional loops

Question 15(c): Candidates who answered the question performed well. However, a proportion made no attempt at an answer. Candidates have experienced similar questions in the SQP (q20(a)).

Information System Design and Development

Structures and links (database) — database structure: linked tables

Question 16: This question contained a typo at line 5, instead of RECEIVE the question paper stated GET.

Question 16(a): A small proportion of candidates made no attempt at an answer. A similar proportion achieved full marks. Candidates were asked to ‘represent this input validation’. Candidates have had experience of input validation in their unit assessment and course assignment. Deliverers should work with candidates to ensure they have an understanding of this standard algorithm.

Candidates found this style of question challenging. Deliverers and candidates should further familiarise themselves with this area of content and this style of question.

Candidates have experienced similar questions in the 2014 (q16(b)) and the 2015 QP (q21(a)).

Question 16(d): A small proportion of candidates made no attempt at an answer, and of those that did only a few achieved full marks.

Pre-defined functions have been used in past question papers, unit assessments and course assignments. Although the pre 2016–17 Course Assessment Specification does not identify a range of pre-defined functions, candidates should be able to apply their knowledge of pre-defined functions to the question context.

Candidates have experienced similar questions in the 2014 QP (q20(c)) and the 2015 QP (q21(c)). (The 2015 Course Report commented: ‘In part (c) candidates were asked to describe how a pre-defined function could be used to solve a problem. This required them to apply their knowledge of pre-defined functions and apply problem solving techniques — the question was ‘describe’ not ‘state’ the pre-defined function to be used.’)

Software Design and Development

Computational constructs — pre-defined functions (with parameters)

Question 16(b): Candidates either knew the answer or they did not. Deliverers and candidates should ensure they are confident in the use of data types within software development. Candidates have experienced similar questions in the 2015 QP (q2 and q10).

Software Design and Development

Data types and structures — String, character

Question 17(a): Candidates had difficulty in this style of question. Similar style questions have been in the SQP (q18(c)), the 2014 QP (q19(a(i))), unit assessments and course assignments. Candidates had difficulty in applying knowledge gained in practical work to assessed questions.

Structures and links (web-based) — navigation

Design notations (also applies in information system design and development)

Question 17(b): Candidates had difficulty in this question. Candidates had difficulty in applying knowledge gained in practical work to this type of question. Candidates have experienced similar questions in the SQP (q18(c)) and the 2014 QP (19(a(i))).

Software Design and Development

Design notations (also applies in information system design and development)

Information System Design and Development

User interface (also applies in software design and development) User requirements (visual layout, navigation, selection, consistency, interactivity, readability)

Question 19: This question contained several typos:

Line 2 – spaces should have been between the commas and the values

Line 3 – FOR EACH cost FROM all costs DO

These edits would still generate a problem with 19b(iii). Candidates answered 19b(iii) using true problem solving skills.

The original question was:

SET total = 0

SET counter = 0

DECLARE cost INITIALLY[35.00, 36.00, 40.00, 35.00, 42.50]

REPEAT

 SET total = total + cost(counter)

SET counter = counter + 1

UNTIL counter = 4

SEND 'The total cost = £' & total TO DISPLAY

Question 19(b)(ii): Candidates either knew how real numbers were stored or they did not. Candidates have experienced similar questions in the SQP (q16(c)) and the 2015 QP (q17(a)).

Software Design and Development

Low-level operations and computer architecture — Use of binary to represent and store: real numbers

Question 19(c): Candidates either knew the term 'concatenation' or they did not. This was the first time this question had been asked in a paper. The candidates that did answer the question answered it well.

Software Design and Development

Computational constructs expressions to concatenate strings and arrays using the & operator

Question 20(ii): Candidates either knew interfaces or they did not. Several candidates gave the display as the interface. Candidates are still confusing Human Computer Interfaces with Interfaces.

Technical implementation (storage)
interface type

Software Design and Development

Low-level operations and computer architecture — Basic computer architecture: interfaces

Question 20(c)(iii): Candidates either knew interfaces or they did not. Several candidates are still confusing Interfaces with Human Computer Interfaces

Similar questions have appeared in the 2014 QP (q18(f)) and the 2015 QP (q17(e)).

Software Design and Development

Low-level operations and computer architecture — Basic computer architecture: interfaces

Question 21(a)(i): Candidates could either see an advantage in this design or they could not. Several candidates could describe the visual impact.

This style of question was also in the SQP (q17(a)) and the 2014 QP (q18(d) and (20(f))).

Software Design and Development

Design notations (also applies in information system design and development) — other contemporary design notations

Question 21(a)(ii): Candidates are still unclear on standard algorithms. The question asked the candidate to name the algorithm. Candidates either knew the algorithm or they did not.

Software Design and Development

Algorithm specification — Exemplification and implementation of algorithms, including: input validation

Question 21(c)(ii): The majority of candidates were not confident in answering this question.

Software Design and Development

Testing and documenting solutions

... execution errors

Component 2: assignment

Candidates found the analysis and reporting stage of the task difficult and were often unable to provide all the points asked for. Many candidates found the design stage of the program difficult to complete, even though they seemed to be able to easily solve the task in code.

The design stage of the database cannot be a screenshot of the implementation.

Section 3: Advice for the preparation of future candidates

Component 1: question paper

In preparing candidates for future examination please refer to the Computing Science Course Assessment Specification session 2016–17.

Candidates are becoming more confident in reading code, but are still experiencing difficulties with problem solving questions where they are required to write code or pseudocode to demonstrate their solution. It should be noted here that solutions do not need to be written in SQA reference language; any form of pseudocode/programming language that candidates have been using in their learning environment can be used as solutions to these type of questions. 'Where candidates are required to answer by writing code, answers may be expressed using any form of pseudocode, any other design notation or any programming language; marks will be awarded for demonstrating understanding, not for correctness of syntax.'

'Design notations (also applies in information system design and development)'. Candidates should be able to apply knowledge from learning and practical work. Knowledge of various design notations should be applied within both units.

Candidates are demonstrating difficulty with the 'Input validation algorithm'. Candidates should be able to apply knowledge from learning and practical work.

Candidates are confident in contexts that they have seen before, but they struggle to achieve success when the context is unfamiliar: 'challenging context-based questions by drawing on and applying knowledge from the table provided in the 'Further mandatory information on Course coverage'

Candidates will have used linked tables within learning environments and when completing unit assessment. Deliverers should work with the candidates to further develop an understanding between the practical implementation within databases and the content of Computing Science Course Assessment Specification.

In preparing candidates for the question paper it should be remembered that:

'This question paper will give candidates an opportunity to demonstrate the following skills, knowledge and understanding:

- ◆ applying aspects of computational thinking across a range of contexts
- ◆ analysing problems within computing science across a range of contemporary contexts
- ◆ the ability to communicate how a program works
- ◆ communicating understanding of key concepts related to software design and development, and information system design and development, clearly and concisely using appropriate terminology
- ◆ understanding of the legal implications and environmental impact of contemporary information system technologies
- ◆ applying computing science concepts and techniques to create solutions across a range of contexts

It is always recommended that candidates and deliverers read the marking instructions to become familiar with the responses expected to examination questions.

Component 2: assignment

It should be noted that program designs cannot be written in SQA reference language as this is not a contemporary design notation but a language that is used in the exam paper to test understanding of coding. Candidates can use any appropriate design notation that shows how they are going to solve the problem. This is an area where candidates did not do as well and where some additional practice would be beneficial.

It is important that candidates are able to evidence each part of the assignment. Deliverers should support their candidates by ensuring that they use the checklists within the assignments.

Centres should ensure that they are using the most up-to-date version of the assignment.

Grade Boundary and Statistical information:

Statistical information: update on Courses

Number of resulted entries in 2015	7663
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Number of resulted entries in 2016	7927
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Statistical information: Performance of candidates

Distribution of Course awards including grade boundaries

Distribution of Course awards	%	Cum. %	Number of candidates	Lowest mark
Maximum Mark —				
A	32.8%	32.8%	2600	107
B	26.7%	59.5%	2114	90
C	22.9%	82.4%	1819	73
D	7.8%	90.2%	616	64
No award	9.8%	-	778	-

Decision Making Record Statement:

The combination of changes in demand had a different effect on the grade boundaries.

General commentary on grade boundaries

- ◆ While SQA aims to set examinations and create marking instructions which will allow a competent candidate to score a minimum of 50% of the available marks (the notional C boundary) and a well prepared, very competent candidate to score at least 70% of the available marks (the notional A boundary), it is very challenging to get the standard on target every year, in every subject at every level.
- ◆ Each year, SQA therefore holds a grade boundary meeting for each subject at each level where it brings together all the information available (statistical and judgemental). The Principal Assessor and SQA Qualifications Manager meet with the relevant SQA Business Manager and Statistician to discuss the evidence and make decisions. The meetings are chaired by members of the management team at SQA.
- ◆ The grade boundaries can be adjusted downwards if there is evidence that the exam is more challenging than usual, allowing the pass rate to be unaffected by this circumstance.
- ◆ The grade boundaries can be adjusted upwards if there is evidence that the exam is less challenging than usual, allowing the pass rate to be unaffected by this circumstance.
- ◆ Where standards are comparable to previous years, similar grade boundaries are maintained.
- ◆ An exam paper at a particular level in a subject in one year tends to have a marginally different set of grade boundaries from exam papers in that subject at that level in other years. This is because the particular questions, and the mix of questions, are different. This is also the case for exams set in centres. If SQA has already altered a boundary in a particular year in, say, Higher Chemistry, this does not mean that centres should necessarily alter boundaries in their prelim exam in Higher Chemistry. The two are not that closely related, as they do not contain identical questions.
- ◆ SQA's main aim is to be fair to candidates across all subjects and all levels and maintain comparable standards across the years, even as arrangements evolve and change.