e-Quals Unit Syllabus

Level 3 Develop software using Java

7266/7267-305

www.cityandguilds.com/e-quals07
August 2008
Version 2.0

About City & Guilds

City & Guilds is the UK's leading provider of vocational qualifications, offering over 500 awards across a wide range of industries, and progressing from entry level to the highest levels of professional achievement. With over 8500 centres in 100 countries, City & Guilds is recognised by employers worldwide for providing qualifications that offer proof of the skills they need to get the job done.

City & Guilds Group

The City & Guilds Group includes City & Guilds, ILM (the Institute of Leadership & Management) which provides management qualifications, learning materials and membership services, NPTC which offers land-based qualifications and membership services, and HAB (the Hospitality Awarding Body). City & Guilds also manages the Engineering Council Examinations on behalf of the Engineering Council.

Equal opportunities

City & Guilds fully supports the principle of equal opportunities and we are committed to satisfying this principle in all our activities and published material. A copy of our equal opportunities policy statement *Access to assessment and qualifications* is available on the City & Guilds website.

Copyright

The content of this document is, unless otherwise indicated, © The City and Guilds of London Institute 2007 and may not be copied, reproduced or distributed without prior written consent.

However, approved City & Guilds centres and learners studying for City & Guilds qualifications may photocopy this document free of charge and/or include a locked PDF version of it on centre intranets on the following conditions:

- centre staff may copy the material only for the purpose of teaching learners working towards a City & Guilds qualification, or for internal administration purposes
- learners may copy the material only for their own use when working towards a City & Guilds qualification
- the *Standard Copying Conditions* on the City & Guilds website.

Please note: National Occupational Standards are not © The City and Guilds of London Institute. Please check the conditions upon which they may be copied with the relevant Sector Skills Council.

Publications

City & Guilds publications are available on the City & Guilds website or from our Publications Sales department at the address below or by telephoning +44 (0)20 7294 2850 or faxing +44 (0)20 7294 3387.

Every effort has been made to ensure that the information contained in this publication is true and correct at the time of going to press. However, City & Guilds' products and services are subject to continuous development and improvement and the right is reserved to change products and services from time to time. City & Guilds cannot accept liability for loss or damage arising from the use of information in this publication.

City & Guilds
1 Giltspur Street
London EC1A 9DD
T +44 (0)20 7294 2787
F +44 (0)20 7294 2413
www.cityandguilds.com
centresupport@cityandguilds.com

Contents

Unit 305	**Develop software using Java**	
Outcome 1	Interpret program specifications to develop software	3
Outcome 2	Create classes	4
Outcome 3	Develop code for implementation	5
Outcome 4	Test software using change control	7
Outcome 5	Produce documentation	8
Unit record sheet		9

Unit 305 Develop software using Java

Rationale

The aim of this unit is to enable candidates to understand the principles required to develop software using the Java programming language. Candidates will develop the skills required to design, create and test software to solve a given problem.

Learning outcomes

There are **five** outcomes to this unit. The candidate will be able to:

Interpret program specifications to develop software
Create classes
Develop code for implementation
Test software using change control
Produce documentation

Guided learning hours

It is recommended that 90 hours should be allocated for this unit. This may be on a full time or part time basis.

Connections with other qualifications

This unit contributes towards the knowledge and understanding required for the following qualifications:

Outcome	This award contributes to the knowledge and understanding of the following Areas of Occupational Competence in the City & Guilds NVQ for IT Professionals (4324)
1,2,3,4,5	311 Software development – component creation 3

Key Skills

This unit contributes towards the Key Skills in the following areas:

Communication	C1.3, C3.2
Application of Number	N1.1
Information technology	None
Working with others	None
Improving own learning	LP3.1, LP3.2, LP3.3
Problem solving	PS3.1, PS3.2, PS3.3

Assessment and grading

Assessment will be by means of a **set assignment** covering practical activities, and a **multiple choice test** covering underpinning knowledge.

Unit 305 Develop software using Java

Outcome 1 Interpret program specifications to develop software

Practical skills

The candidate will be able to:

1 design a solution to meet a given specification

2 identify and document input screens and output layouts

3 select the most appropriate classes to fulfil the specification

4 identify the methods and attributes for each class

5 identify the type of access required for attributes and members: **public, private**

6 use meaningful names for classes, methods and attributes

7 identify the links between classes

8 use a suitable method to document the code required for each method (eg pseudocode, flowchart or structured English)

9 provide a solution which is structured, easily maintained and fulfils the specification.

Underpinning knowledge

The candidate will be able to:

1 describe the key features of object oriented programming:

   a **encapsulation**

   b **polymorphism**

2 identify the elements of a class

3 describe the relationship between an instance of a class and of two or more instances of a class

4 describe how a method contains a sequence of computing actions and variables that are used to store values needed and produced during computation

5 explain the need for consistency in using meaningful names.

Unit 305 Develop software using Java
Outcome 2 Create classes

Practical skills

The candidate will be able to:

1 use the **import** statement to access predefined classes from packages

2 create user defined classes

3 declare the attributes of a class using the basic data types

4 create methods for a class

5 use methods to perform operations on instances of a defined class

6 use **public** and **private** to allow access to data and methods of a user defined class

7 declare and use instances of a defined class

8 create a constructor to initialise new instances of a class

9 write simple error-handling routines eg: **try**, **catch**, **finally.**

Underpinning knowledge

The candidate will be able to:

1 describe the effect of making data or methods public, private, protected, static or final

2 explain when a constructor is called

3 state that a constructor has the same name as the class, can have parameters but has no return value

4 describe the syntax for a method declaration, the number and type of arguments that must be supplied to a method and how arguments are passed by value

5 describe Java inheritance for a class and the use of **this** and **extends**

6 explain what causes a Java method to throw an exception

7 describe the purpose and use of overloading methods

8 describe how to call a method that is part of the current class.

Unit 305 Develop software using Java
Outcome 3 Develop code for implementation

Practical skills

The candidate will be able to:

1 declare and use data types:
   - a **byte**
   - b **int**
   - c **long**
   - d **char**
   - e **float**
   - f **double**
   - g **boolean**

2 declare and use constants and built-in predefined constants as appropriate

3 use single dimension arrays of type:
   - a **byte**
   - b **int**
   - c **char**
   - d **float**
   - e **double**

4 use **String** and **StringBuffer** classes to manipulate strings

5 use operators
   - a assignment operators: **=, +=, -=, *=, /=,** %**=**
   - b relational operators: **==, <, >, !=, <=, >=**
   - c arithmetic operators: **+, -, *, /,** %, **++, --**
   - d logical operators: **&&** (AND), **||** (OR), **!** (NOT)

6 use program constructs for iteration:
   - a **for**
   - b **while**
   - c **do…while**

7 use program constructs for selection:
   - a **if**
   - b **if…else**
   - c **switch**

8 use the **break** statement

9 use **System.out.print**() and **System.out.println**() to output data

10 use **System.in.read**() to input data.

Underpinning knowledge

The candidate will be able to:

1 describe the syntax for classes

2 describe the logical operators

3 describe the relational operators

4 describe the precedence rules for arithmetic and the effects of parenthesis

5 state limitations on the use of Java reserved words

6 explain the operation of repetition program constructs: **for, while, do…while**

7 explain the operation of selection program constructs: **if, if…else, switch**

8 explain the use of packages and the purpose of the **import** statement

9 state the difference between **prefix** and **postfix** mode for the increment (++) and decrement (--) operators

10 state the purpose of the **.** (dot) selection operator when calling a method

11 describe the three stream objects **System.in**, **System.out** and **System.err** and how they are produced.

Unit 305 Develop software using Java

Outcome 4 Test software using change control

Practical skills

The candidate will be able to:

1 determine the expected results from a given set of test data

2 test the software according to a prepared test plan

3 compare the expected to the actual results and correct any errors

4 keep a log of the results for each test, clearly identifying:

  a discrepancies between the expected and actual results

  b amendments made to correct errors

5 resolve logical and run-time errors found during testing using appropriate methods

6 verify that the program conforms to the design specification.

Underpinning knowledge

The candidate will be able to:

1 explain the reasons for testing a program prior to implementation

2 describe the meaning of a dry run

3 describe the meaning of a compilation error

4 describe the meaning of a run-time error

5 describe the purpose of test data

6 explain the need to test software in the target environment

7 state the difference between interfacing and integration

8 explain the need for overall control when developing software projects

9 identify the benefits of teamwork to avoid duplication of effort, when working on a large project

10 describe the need for control and documentation of any changes to programs.

Unit 305 Develop software using Java

Outcome 5 Produce documentation

Practical skills

The candidate will be able to:

1 produce end user instructions that are clear and unambiguous

2 produce technical documentation (to include class interface) to describe the purpose of the program and its operation

3 print listing of code.

Underpinning knowledge

The candidate will be able to:

1 identify the need for end user instructions

2 describe the need for technical documentation to aid future maintenance and reusability.

Unit record sheet

Use this form to track your progress through this unit.

Tick the boxes when you have covered each outcome. When they are all ticked, you are ready to be assessed.

Outcome	✓	Date
1 **Interpret program specifications to develop software**	☐	
2 **Create classes**	☐	
3 **Develop code for implementation**	☐	
4 **Test software using change control**	☐	
5 **Produce documentation**	☐	

Candidate Signature ..... **Date** .....

City & Guilds Registration Number ....

Centre Name ..... **Centre Number** .....

Published by City & Guilds
1 Giltspur Street
London
EC1A 9DD
T +44 (0)20 7294 2468
F +44 (0)20 7294 2400
www.cityandguilds.com
www.cityandguilds.com/e-quals07

City & Guilds is a registered charity established to promote education and training