Key Skills and GCE Mathematics

This document is to be used in conjunction with the OCR GCE Mathematics specification (7890-2) and offers detailed guidance on the Key Skills evidence that a candidate might produce during their programme of study. It focuses on the evidence required to meet the criteria for the internally assessed Key Skills portfolio. For example, in producing work for assessment of C3.2 (Read and synthesise information from two extended documents about a complex subject. One of these documents should include at least one image.) A candidate is required to:

- select and read material that contains the information you need;
- identify accurately, and compare, the lines of reasoning and main points from texts and images;
- synthesise the key information in a form that is relevant to your purpose.

The Key Skills and Evidence Requirements below are quoted from Part B of the QCA Key Skills specifications and, as such, are addressed to the candidate. The text below the Evidence Requirements is guidance for teachers about how the specifications might be used to provide teaching and learning opportunities and/or assessment opportunities for the Key Skill.

For further information, teachers should refer to QCA's Key Skills specifications (for use in programmes starting from September 2000).

For further information about the assessment and certification of Key Skills, teachers should contact OCR.

C3 COMMUNICATION (LEVEL 3)

C3.1a Contribute to a group discussion about a complex subject

Evidence requirements

- Make clear and relevant contributions in a way that suits your purpose and situation.
- Listen and respond appropriately to others, and develop points and ideas.
- Create opportunities for others to contribute when appropriate.

Possible opportunities

The extent to which the work produced by candidates can provide evidence for C3.1a depends upon the individual approach to teaching and learning. In each of the module specifications there is very little which addresses C3.1a directly. However, some parts of the specifications, particularly in the application areas, lend themselves to an investigative approach which could generate evidence.

Module M1: For example, in 5.8.2 (Equilibrium of a particle), candidates could use a mechanics kit to explore friction. This work could be organised to produce evidence from discussions between groups of candidates.

Module S1: Similarly, in 5.12.1 (Representation of data) or 5.12.4 (Bivariate data), candidates who had collected their own data as part of the learning process could discuss with each other and with other members of a class details of the methodology and any problems that they had encountered.

C3.1b Make a presentation about a complex subject, using at least one image to illustrate complex points

Evidence requirements

- Speak clearly and adapt your style of presentation to suit your purpose, audience and situation.
- Structure what you say so that the sequence of information and ideas may be easily followed.
- Use a range of techniques to engage the audience, including effective use of images.

Possible opportunities

Module M1: A candidate who had carried out experimental work to investigate the modelling of friction in the course of studying the material of 5.8.2 (Equilibrium of a particle) could present the conclusions to other members of a class.

Module S1: In studying 5.12.1 (Representation of data), a candidate could analyse a set of raw data and present his or her conclusions to other members of a class.

C3.2 Read and synthesise information from two extended documents that deal with a complex subject. One of these documents should include at least one image

Evidence requirements

- Select and read material that contains the information you need.
- Identify accurately, and compare, the lines of reasoning and main points from texts and images.
- Synthesise the key information in a form that is relevant to your purpose.

Possible opportunities

It is expected that all candidates will be able to demonstrate some competence in this area. All candidates could use text-books to obtain information and will practise the skill of extracting relevant information from various sources to provide data for calculations. Such sources could be in a variety of forms including tables, charts, diagrams and graphs, and could include redundant information, requiring a selection to be made.

Module S1: For example, in 5.12.1 (Representation of data), a candidate is required to be able to extract important features from a table or statistical diagram and to summarise his or her conclusions in words.

C3.3 Write two different types of documents about complex subjects. One piece of writing should be an extended document and include at least one image

Evidence requirements

- Select and use a form and style of writing that is appropriate to your purpose and complex subject matter.
- Organise relevant information clearly and coherently, using specialist vocabulary when appropriate.
- Ensure your text is legible and your spelling, grammar and punctuation are accurate so your meaning is clear.

Possible opportunities

It is expected that a candidate is able to use mathematical expressions, graphs, sketches and diagrams with accuracy and skill and to use mathematical language correctly to proceed logically through extended arguments. These skills will enable the candidate to demonstrate evidence of an appropriate form of written presentation and appropriate use of specialist vocabulary. The extent to which this evidence can contribute towards meeting the requirements of C3.3 depends upon the individual approach to teaching and learning. There are opportunities throughout the specifications to organise work on particular topics so that evidence could be generated.

Modules C3, FP2: In studying approximate numerical methods for solution of equations in 5.3.4 (Numerical methods in module C3) or 5.6.5 (Numerical methods in module FP2), a candidate could compare different methods for a variety of equations, including cases where a method failed, and then present the findings as an extended document.

Modules M1, M2, M3: A number of Mechanics topics might lend themselves to experimental work, e.g. using a mechanics kit, leading to a written report in which conclusions are presented, and in which appropriate images and diagrams will naturally occur. Examples are Friction (5.8.2 in module M1), Centre of mass and Moments (5.9.1 and 5.9.2 in module M2), and Elasticity (5.10.2 in module M3).

Module S1: Data collected and/or analysed by a candidate in the course of studying 5.12.1 (Representation of data) or 5.12.4 (Bivariate data) might form the basis of a written report which would include relevant graphs and diagrams.

N3 APPLICATION OF NUMBER (LEVEL 3)

You must:

Plan and carry through at least **one** substantial and complex activity that includes tasks for N3.1, N3.2 and N3.3

Note: There are many opportunities within all branches of mathematics for providing evidence for some aspects of this Key Skill, but references to 'working with a large data set' and 'handling statistics' indicate that a task that is largely statistics-based is most likely to be satisfactory.

N3.1 Plan, and interpret information from two different types of sources, including a large data set

Evidence requirements

- Plan how to obtain and use the information required to meet the purpose of your activity.
- Obtain the relevant information.
- Choose appropriate methods for obtaining the results you need and justify your choice.

Possible opportunities

Some aspects of the statistics covered in the specifications lend themselves to the possibility of investigative work, in which the use of a large data set could play a part.

Module S1: In 5.12.1 (Representation of data) an investigative task that involved the collection of a substantial amount of data, and its analysis and subsequent presentation in readily comprehensible form, could be capable of providing evidence relating to N3.1.

N3.2 Carry out multi-stage calculations to do with amounts and sizes; scales and proportion; handling statistics; rearranging and using formulae

You should work with a large data set on at least **one** occasion.

Evidence requirements

- Carry out calculations to appropriate levels of accuracy, clearly showing your methods.
- Check methods and results to help ensure errors are found and corrected.

Possible opportunities

Any substantial task of a statistical nature should provide many opportunities for carrying out and checking calculations, so a task chosen to satisfy the requirement of N3.1 should also enable evidence for N3.2 to be generated.

Module S1: In 5.12.1 (Representation of data) an investigative task that involved the collection of a substantial amount of data, and its analysis and subsequent presentation in readily comprehensible form, could be capable of providing evidence relating to N3.2.

N3.3 Interpret results of your calculations, present your findings and justify your methods. You must use at least one graph, one chart and one diagram

Evidence requirements

- Select appropriate methods of presentation and justify your choice.
- Present your findings effectively.
- Explain how the results of your calculations relate to the purpose of your activity.

Possible opportunities

Any substantial task of a statistical nature should provide many opportunities for presentations involving graphs, charts and diagrams, and matters of interpretation and methodology will usually arise also. Thus a task chosen to satisfy the requirement of N3.1 and N3.2 above should also enable evidence for N3.3 to be generated.

Module S1: In 5.12.1 (Representation of data) an investigative task that involved the collection of a substantial amount of data, and its analysis and subsequent presentation in readily comprehensible form, could be capable of providing evidence relating to N3.3.

IT3 IT (LEVEL 3)

You must:

Plan and carry through at least **one** substantial activity that includes tasks for IT3.1, IT3.2 and IT3.3.

IT3.1 Plan, and use different sources to search for, and select, information required for two different purposes

Evidence requirements

- Plan how to obtain and use the information required to meet the purpose of your activity.
- Choose appropriate sources and techniques for finding information and carry out effective searches.
- Make selections based on judgements of relevance and quality.

Possible opportunities

Although the specifications provide many opportunities for the use of different aspects of IT, the particular requirements concerning searching and selecting information are of very limited relevance in most of the areas of mathematics than candidates will be studying, and opportunities for producing evidence are correspondingly unlikely to arise naturally.

Module S2: In the course of studying 5.13.4 (Sampling and hypothesis tests) candidates might carry out practical work involving selecting samples from a database.

IT3.2 Explore, develop, and exchange information and derive new information to meet two different purposes

Evidence requirements

- Enter and bring together information in a consistent form, using automated routines where appropriate.
- Create and use appropriate structures and procedures to explore and develop information and derive new information.
- Use effective methods of exchanging information to support your purpose.

Possible opportunities

The most relevant areas of mathematics for the use of IT in a way relevant to generating evidence for IT3.2 are likely to be those in which numerical processes dominate (e.g. approximate solution of equations) or in which graphical output is useful. There may be some additional opportunities in the teaching and learning of statistical topics in which simulation is used, and in those parts of decision mathematics involving algorithms, e.g. the Simplex method.

Module C3: A candidate could choose to use a graph-plotting package to locate approximately the roots of an equation and then progress to use a spreadsheet to locate each root to a prescribed degree of accuracy.

IT3.3 Present information from different sources for two different purposes and audiences. Your work must include at least one example of text, one example of images and one example of numbers

Evidence requirements

- Develop the structure and content of your presentation using the views of others, where appropriate, to guide refinements.
- Present information effectively, using a format and style that suits your purpose and audience.
- Ensure your work is accurate and makes sense.

Possible opportunities

Candidates can be encouraged, in many areas of the specifications, to make use of available technology to present mathematical information effectively. Where candidates produce written reports they can be encouraged to do so via software that allows them to combine text, graphics and numerical information in one document, for example by importing numerical work and graphics into a word-processed text. It is probable that candidates will be able to show proficiency in using word-processing packages to produce correctly formatted mathematical expressions.

Modules C2, C3 and FP2: In 5.2.2 (Sequences and series in module C2), a candidate could use a spreadsheet to investigate the behaviour of a sequence and then embed a scatter-graph on the spreadsheet to show the behaviour visually. Similarly, in the sections on Numerical methods (5.3.5 in module C3 and 5.6.5 in module FP2) a candidate who has carried out computer-based investigative work on approximate solutions of equations would have the material available to prepare a report which would naturally include text, numbers and graphics.

Module S1: Any investigation involving the content of this module that a candidate had carried out (e.g. in accordance with the possibilities noted above under C3) should be suitable for presenting as a document including text and images.

WO3 WORKING WITH OTHERS (LEVEL 3)

You must:

Provide at least **one** substantial example of meeting the standard for WO3.1, WO3.2 and WO3.3 (you must show you can work in both one-to-one and group situations).

WO3.1 Plan the activity with others, agreeing objectives, responsibilities and working arrangements

Evidence requirements

- Agree realistic objectives for working together and what needs to be done to achieve them.
- Exchange information, based on appropriate evidence, to help agree responsibilities.
- Agree suitable working arrangements with those involved.

Possible opportunities

Opportunities within the specifications for generating evidence relevant to WO3.1 are extremely limited. There may be a few instances where investigative work on a topic within one of the modules can be adapted to involve a collaborative approach by a number of candidates, but such tasks are not likely to be sufficiently extensive to be capable of generating useful evidence for WO3.1.

Module S1: There may be some limited opportunity to organise investigative work on 5.12.1 (Representation of data) on a group basis, so that different members of a group work on different aspects of data collection or analysis.

WO3.2 Seek to establish and maintain co-operative working relationships over an extended period of time, agreeing changes to achieve agreed objectives

Evidence requirements

- Organise and carry out tasks so that you can be effective and efficient in meeting your responsibilities and produce the quality of work required.
- Seek to establish and maintain co-operative working relationships, agreeing ways to overcome any difficulties.
- Exchange accurate information on progress of work, agreeing changes where necessary to achieve objectives.

Possible opportunities

Opportunities within the specifications for generating evidence relevant to WO3.2 are extremely limited. There may be a few instances where investigative work on a topic within one of the modules can be adapted to involve a collaborative approach by a number of candidates, but such tasks are not likely to be sufficiently extensive to be capable of generating useful evidence for WO3.2.

WO3.3 Review work with others and agree ways of improving collaborative work in the future

Evidence requirements

- Agree the extent to which work with others has been successful and the objectives have been met.
- Identify factors that have influenced the outcome.
- Agree ways of improving work with others in the future.

Possible opportunities

Not applicable to the specifications.

LP3 IMPROVING OWN LEARNING AND PERFORMANCE (LEVEL 3)

You must:

Provide at least **one** substantial example of meeting the standard for LP3.1, LP3.2 and LP3.3.

LP3.1 Agree targets and plan how these will be met over an extended period of time, using support from appropriate people

Evidence requirements

- Seek information on ways to achieve what you want to do, including factors that might affect your plans.
- Use this information to agree realistic targets with appropriate people.
- Plan how you will effectively manage your time and use of support to meet targets, including alternative action for overcoming possible difficulties.

Possible opportunities

All modules in the specifications give some opportunities for generating evidence for aspects of LP3, particularly study-based learning, but the subject matter of individual modules is not of particular relevance.

LP3.2 Take responsibility for your learning by using your plan, and seeking feedback and support from relevant sources to help meet targets

Improve your performance by:

- studying a complex subject;
- learning through a complex practical activity;
- further study or practical activity that involves independent learning.

Evidence requirements

- Manage your time effectively to complete tasks, revising your plan as necessary.
- Seek and actively use feedback and support from relevant sources to help you meet your targets.
- Select and use different ways of learning to improve your performance, adapting approaches to meet new demands.

Possible opportunities

All modules in the specifications give some opportunities for generating evidence for aspects of LP3, particularly study-based learning, but the subject matter of individual modules is not of particular relevance.

LP3.3 Review progress on two occasions and establish evidence of achievements, including how you have used learning from other tasks to meet new demands.

Evidence requirements

- Provide information on the quality of your learning and performance, including factors that have affected the outcome.
- Identify targets you have met, seeking information from relevant sources to establish evidence of your achievements.
- Exchange views with appropriate people to agree ways to further improve your performance.

Possible opportunities

All modules in the specifications give some opportunities for generating evidence for aspects of LP3, particularly study-based learning, but the subject matter of individual modules is not of particular relevance.

PS3 Problem Solving (Level 3)

You must:

Provide at least **one** substantial example of meeting the standard for PS3.1, PS3.2 and PS3.3.

PS3.1 Explore a complex problem, come up with three options for solving it and justify the option for taking further

Evidence requirements

- Explore the problem, accurately analysing its features, and agree with others on how to show success in solving it.
- Select and use a variety of methods to come up with different ways of tackling the problem.
- Compare the main features of each possible option, including risk factors. and justify the option you select to take forward.

Possible opportunities

Not applicable to the specifications.

PS3.2 Plan and implement at least one option for solving the problem, review progress and revise your approach as necessary

Evidence requirements

- Plan how to carry out your chosen option and obtain agreement to go ahead from an appropriate person.
- Implement your plan effectively, using support and feedback from others.
- Review progress towards solving the problem and revise your approach as necessary.

Possible opportunities

Not applicable to the specifications.

PS3.3 Apply agreed methods to check if the problem has been solved, describe the results and review your approach to problem solving

Evidence requirements

- Agree, with an appropriate person, methods to check if the problem has been solved.
- Apply these methods accurately, draw conclusions and fully describe the results.
- Review your approach to problem solving, including whether alternative methods and options might have proved more effective.

Possible opportunities

Not applicable to the specifications.