Version 2.0

AQA Qualifications

LEVEL 3 Certificate

Mathematical Studies (1350)

Teachers' Guide

November 2015 v2.0

Further copies of this Teachers' Guide are available from aqa.org.uk

Changes from version 1.0 are side-barred.

Contents

Introduction

Introduction

This Teachers' Guide has been provided to assist teachers in their preparation and delivery of Level 3 Certificate Mathematical Studies (Level 3 Core Maths). This guide should be read in conjunction with the specification and specimen assessment material which are available on our website at www.aqa.org.uk/1350 .

What is Mathematical Studies & its background

Level 3 Certificate Mathematical Studies is AQA's level 3 core maths qualification. In 2011, Michael Gove MP stated that the Government wanted to see the majority of post-16 students continuing with a level 3 maths qualification. In order to facilitate this, Elizabeth Truss MP launched the 'Core Maths' qualification in January 2014. The specification was available for Early Adopters to start teaching Mathematical Studies in September 2014, with Early Developers and national teaching available from September 2015.

Assumed knowledge

The assumed knowledge for this qualification is the new GCSE Mathematics foundation tier content (in standard type) in the DfE criteria for GCSE Mathematics. Students are expected to have achieved at least a grade C (on the A*-G GCSE) or a grade 5 (on the 9-1 GCSE) prior to commencing study of this qualification. Please see this video for guidance on the new grade range.

A guide showing the assumed knowledge can be found on our website. The assumed knowledge also includes any formulae that are required to be known for the new GCSE.

Entering the qualification

When you enter an entry code (see section 5.1 of the specification) for a student, this will invoke all the materials you need for both papers (ie. question papers, preliminary materials, formula sheet and, if applicable, statistical tables).

Exam structure/re-sits/preliminary material/formula sheet/statistical tables/ exam dates

Students sit two papers. Paper 1 is compulsory for all students. Students then sit one of three paper 2's: 2A – Statistical Techniques, 2B – Critical Path and Risk Analysis or 2C – Graphical Techniques. The teacher may decide which option is provided for students (eg in instances where only one class can be run/to suit teacher expertise) or the students may pick the option (eg to continue to study branches of mathematics that interest them/study appropriate mathematics to support their other studies).

In any one exam series, students may only take paper 1 and one of the three paper 2's.

As this is a linear qualification, if a student re-sits the qualification both papers must be taken in the same exam series. Students cannot mix and match a paper 1 from one exam series with a paper 2 from a different series. The best overall (series) result will be the one that is counted; however, only the first result will count in the performance measures.

If a student re-sits the qualification, they may sit a different paper 2 to the one that was sat originally. Again, the best result will count.

Preliminary material is issued for paper 1. This may apply to any question on the paper. Preliminary material is also issued for the common section of the paper 2's. This comprises the first 20 marks of each paper 2 – the section that examines section 3.4 of the specification. All preliminary material for the summer series will be available on e-AQA from 1 March that year.

During examinations the official formula sheet should be made available to students. Similarly, there are statistical tables which should be made available to students sitting paper 2A only. If teachers wish to refer to these documents prior to the exams, they can be found as appendices in the specification.

Exam dates can be found on the A-level timetable.

Grading/UCAS points/Performance measures/Technical Baccalaureate

Grades will be reported on a scale of A – E. Grade U (unclassified) will be issued to students who do not meet the minimum standard required for grade E.

UCAS points are available for this qualification. UCAS are changing their tariff from 2017. The points for the 2016 exam and the 2017 series onwards are shown for each grade:

Grade	2016 tariff	2017 (onwards) tariff
A	60	20
B	50	16
C	40	12
D	30	10
E	20	6
U	0	0

Performance measures are also available for the Key Stage 5 performance measure tables. This qualification counts as the enhanced KS5 maths measure.

The Technical Baccalaureate (Tech Bacc) is a wrapper qualification that can be obtained by passing an approved vocational qualification, an approved level 3 maths qualification (Mathematical Studies is one of these qualifications) and the Extended Project Qualification. Details of the Tech Bacc can be found on the DfE website https://www.gov.uk/government/publications/technical-baccalaureate-measure-for-16-to-19-year-olds .

Use of ICT/calculators

The use of ICT and calculators is encouraged throughout the course. In examinations, students may use scientific or graphic calculators, provided they comply with the JCQ conditions, which can be found in their *Instructions for Conducting Examinations* document - http://www.jcq.org.uk/exams-office/ice---instructions-for-conducting-examinations .

Reporting results

Results will be issued on the same date as A-level results following each summer exam series.

Resources

In addition to the resources on our main website, there are additional resources on AQA All About Maths. This can be found by visiting http://aqamaths.aqa.org.uk/coremaths. There are further resources in production and these will be placed on our website/AQA All About Maths. There are other useful resource sites where you may find suitable resources for use with your students. These are:

The Nuffield Foundation
The Core Maths Support Programme

Furthermore, textbooks are being produced with the earliest publication date being Quarter 4 2015 / Quarter 1 2016

If you subscribe to our mailing list (see below), we can keep you up-to-date with information regarding resource production and textbook publication when we receive it from the publishers.

Updates and contacts

This is a living document and more advice will be added as it becomes available. Please re-visit regularly to ensure that you have the most up-to-date version of this document.

You may contact the AQA Maths subject team via 0161 957 3852 or maths@aqa.org.uk with any queries or comments that you may have. Alternatively, please visit the website for this qualification at www.aqa.org.uk/1350 .

To subscribe to our mailing list for this qualification, please email your name, centre number and email address to maths@aqa.org.uk stating in the email that you wish to join the Mathematical Studies email list.

Specification limits/exemplification

Q: Is a formal definition of outliers required, in terms of IQR, or standard deviation, or both?

A: Although outliers are not mentioned in the specification for paper 1, they could be included in section 3.1, under D3.2, but not in section 3.5. When using quartiles an outlier is defined as being more than 1.5 IQR below the lower quartile or above the upper quartile. Although students are not expected to use a standard measure for the definition of an outlier using the normal distribution, such a definition may be made within a question – and the definition may change depending on context. For example, when making bolts for aircraft an outlier may be 2 standard deviations (or less) away from the mean, but for scores in a quiz it may be 3. In such a case, the term 'outlier' may or may not be used – for example, in the aircraft example we may just say that bolts more than 2 sd from the mean are discarded.

Q: For standard deviation on a calculator, should students use sigma n, or sigma $n - 1$? In the specimen papers, Question 6 on paper 2A gives both possibilities in the answer. But is there a preferred one to teach the students and to use in this specification?

A: $n - 1$ is recommended, but we will accept, and have mark schemes for, both 'n' and '$n - 1$' in any question where the standard deviation has to be calculated.

Q: When finding upper and lower quartiles, will students be expected to use linear interpolation to find, say the 3.75th value as the lower quartile of a set of 14 values? Or will all upper and lower quartile positions $\frac{n+1}{4}$ and $\frac{3(n+1)}{4}$ be either whole or 'half' values, eg 3.5, 10.5?

A: A set of discrete values (less than or equal to 20 values) will be treated as such: find the middle value of the original set of data and then treat the values either side of the median as a separate data set. For example, with 15 pieces of data the 8th is the median; this leaves 7 either side, of which the 4th is the median, therefore the 4th and 12th are the quartiles. With 14 pieces of data the median is between the 7th and 8th. This leaves 7 pieces of data either side, of which the 4th is the median, so the quartiles are at 4 and 11. With 16 pieces of data the median is between the 8th and 9th. This leaves 8 pieces of data either side, of which the median is between the 4th and 5th, so the quartiles are between 4 and 5 and 12 and 13.

For larger data sets we recommend simply using $n/4$, $n/2$ and $3n/4$ – and generally (though not necessarily always) we would use a data set with n being a multiple of 4. This means that in terms of quartiles we would expect the students **not** to use '$n + 1$', although we would accept its correct use and mention this in each mark scheme if appropriate.

Q: Please can you provide guidance on section F1.3 of the specification?

A: We would usually test F1.3 in one of two scenarios:

Example 1

When financial institutions calculate amounts they have to round or truncate to the nearest penny. This could have a small effect on individual customers and a large effect on a financial institution over a period of time. For example, if a bank truncates every calculation, paying 2.25% interest on £12 500 over a six-month period could be affected as:

One calculation at the end of 6 months: $12\,500 \times 1.0225^6 = 14\,285.31$

Monthly calculations:
12 500 x 1.0225 = 12 781.25
12 781.25 x 1.0225 = 13 068.82
13 068.82 x 1.0225 = 13 362.86
13 362.86 x 1.0225 = 13 663.52
13 663.52 x 1.0225 = 13 970.94
13 970.94 x 1.0225 = 14 285.28

This means that the customer would receive 3p less over the 6 months. A question could follow from this that if the bank has 76 000 customers and decides to change from 6-monthly to monthly calculations, how much could they expect to save in a year?
Answer: 76 000 x 0.03 x 2 = £4560

Example 2

When projections are made, exact values may not be known, and therefore minimum and maximum expected amounts could be calculated based on the given accuracy of the values used in the projection. For example, if the value of a house, currently worth £180 000, is projected to increase by 3% per annum, to 1sf, for 5 years:

the minimum projected value of the house after 5 years is $180\,000 \times 1.025^5$, which is £203 653.48
the maximum projected value is 180 000 x 1.0355, which is £213 783.54

Therefore, there is a difference of over £10 000 in the projections.

Q: What financial terms should candidates know?

A: Candidates should

- Understand the terms gross wage/salary and net wage/salary and taxable income and that wages and salaries are subject to tax and National Insurance.
- Understand that overtime is often paid at a higher rate and should understand terms such as 'time and a half' and carry out related calculations.
- Understand the term 'Retail Price Index' (RPI) and be able to do related calculations.
- Understand the term 'Consumer Price Index' (CPI) and be able to do related calculations.

Questions may be asked where the Price Index of a product is defined as 100 at some base date and the change in this index is given over time. Candidates should understand how the change in the Index number relates to the index at the base date.

Q: Will all units be written in words, eg metres per second? Or will either m/s or ms^{-1} be used? For acceleration, m/s/s or ms^{-2} ? Will the abbreviations mph or mpg be used, or will these be written out in full?

A: Units: in some contexts we might give the units in words; for example, 'miles per hour' or 'metres per second'. In any question, we might give an abbreviation in brackets after the first use of the unit and then use the abbreviation only for the rest of the question; eg 'miles per hour (mph)' or 'metres per second (m/s)'. For speed or velocity we might give the units in words or in 'dash' form or in index form. For acceleration, we will always give the units in index form; eg 'ms^{-2}'. We will not give the units for acceleration in words or with two dashes such as m/s/s.

Q: Is skew included in the specification?

A: Skewness is not included in the specification, and we would not ask a question where the expected answer required identification or interpretation of skew. When testing the Normal distribution we will always assume skewness of 0, so mentioning skew when answering paper 2A would be inappropriate, and would not be likely to garner any marks. However, in paper 1, when comparing distributions represented by, for example, stem and leaf diagrams, box and whisker diagrams or histograms, students may be able to gain credit for making a valid comment about the comparative skew of the distributions. In most cases, we will be asking more specific questions than just asking for any comparison, and in those cases it may be that comparing skew would not be helpful in answering the question, but that would be judged on an individual basis. For the specimen and practice papers we will not be including skew in the mark schemes, but when the specification is first tested in 2016, and thereafter, we will look at student responses and, if we feel it is appropriate, will add any acceptable comments about skew as alternative answers in the mark scheme. You may choose to teach skewness in order to complete students' knowledge.

Q: When estimating rates of change from a graph, the specification does not list calculating gradients from a chord. Rates of changes are to be estimated from graphs by drawing the tangent. The only relevant specimen question can be answered by drawing and that is given as a possibility in the marking scheme. However, the first method given in the marking scheme is numerical. Can you confirm that the questions will always be such that a numerical method will **not** be expected?

A: There may be occasions where we ask for or accept the gradient of a chord as an approximation of a rate of change – this is covered in G3.3 (estimating rates of change for functions from their graphs). We will not ask a question where a numerical method is expected, but will accept such a method if appropriate. It would have been preferable to have reversed the order of alt 1 and alt 2 in Q8 of paper 2C, and we will give the methods in that reversed order in future schemes.

Q: Time series graphs are not mentioned in the specification but crop up a lot in real statistical data. Will students be expected to draw and interpret time series graphs?

A: Time series graphs are not mentioned in the specification and are unlikely to be tested in our papers. If we were to use them in a real-life context, we would explain their use within the context in such a way that the candidate could answer the questions without prior knowledge or understanding. An exception to this is graphs relating to Index Prices (see page 9). Financial or statistical data could be given in the form of a time series graph as part of a question or in the preliminary material for paper 1 or for the critical analysis common questions on paper 2. However, we would not ask students to draw a time series graph.

Q: For logarithms, is only familiarity with logs to base e expected, as used in the solutions to the specimen paper? Or should they use logs to base 10 too? For logs to base e, will 'ln' notation be used, or something else?

A: Only familiarity with logs to the base e will be expected, although the appropriate use of logs to base 10 as a response to any question will be accepted. We will always use the 'ln' notation.

Q: Will students be expected to:

- work with imperial units as well as metric units
- convert between metric and imperial units (where the conversion factor is given)
- know the conversion factors between metric and imperial units (and if so, which ones?)

A: As we will use real data there is every chance that some contexts will be framed in imperial units. For example, if an article was discussing fuel consumption in cars it is likely that in this country the units used would be miles per gallon. We would expect a student to be able to work with this unit if it was used consistently in the article and the questions. If we did want the student to convert from imperial to metric or vice versa we would give them the required conversion factor in the pre-release material or question. To use the same example, if we asked for a comparison with fuel consumption of a French car, given in km per litre, we would either give them a single conversion factor or the conversion factors for miles to kilometres and gallons to litres.

Q: Will students be expected to convert between nominal interest rates and AER or will all calculations involve AER only?

A: Conversion may be needed; eg if we gave one bank's AER and another bank's basic rate and the students had to compare the accounts by working out the second bank's AER.

Q: Will students be expected to evaluate probabilities associated with the normal distribution? Specifically:

a) $X < r$, where $r >$ mean

b) $X > r$, where $r >$ mean

c) $X < r$, where $r <$ mean

d) $X > r$, where $r <$ mean

e) $r < X < s$, where $r < s$ and $r, s >$ mean

f) $r < X < s$, where $r < s$ and $r, s <$ mean

g) $r < X < s$, where $r < s$, $r <$ mean and $s >$ mean

A: All of a-g could be tested.

Q: With the Normal distribution, given mean, sd and probabilities, e.g. 0.95, will students be expected to find values?

A: Students are expected to be able to use table 1 to work backwards from given probabilities to find X.

Q: The use of notation 'mean' and 'sd' is mentioned in the specification, but what about Z and phi?

A: Z and phi are expected to be used in the teaching of this topic and should be encouraged. Z and z are mentioned in the Statistical tables issued to students, so they should certainly be familiar with them. Although phi is not mentioned, teachers may well introduce it to students. We would never withhold a mark due to the lack of either z or phi if the outcome, or associated working, was correct.

Q: Does paper 2A include finding an unknown mean and/or sd from a Normal distribution function (table 1) (table 2 percentage points excluded in specification)?

A: The spec S3.1 states that the finding of an unknown mean and/or standard deviation by percentage points tables will not be required. We would not ask students to find the mean or sd using Table 1 in reverse either as this is not particularly functional.

Q: Will students be expected to be able to calculate outliers for the purposes of plotting Box Plots?

A: The spec does not include outliers in the list of statistical measures in D3.1 so we could not ask them to calculate outliers in paper 1. The only place we would expect them to identify and calculate them would be on Paper 2A (S7.3).

The only time a student would have to decide on inclusion/exclusion of outliers would be when drawing a line of best fit, which (presumably) would be when calculating the mean point. We could, however, ask for identification and discussion of outliers in other situations. For example, in a question on salaries in a company, the CEO's salary may be many times anyone else's, so is it fair to include it when calculating the company's 'average' salary? Including it may allow the company to look more generous to its employees than it actually is, but is excluding it statistically justifiable?

Q: The specification for probabilities and estimation uses the words "understanding", "developing ideas" and "appreciating" but does not seem to require any calculations. Is this correct or will students be asked to calculate, for example, confidence intervals? A list of items students are expected to calculate would be really helpful.

A: S4.1: no calculations expected

S4.2: only simple fractional or percentage calculations required (eg, describe a method of randomly sampling 1% of a population of 3000)

S5.1: use a sample of raw data to calculate a point estimate of the population mean (work out the mean of raw data)
use the total of fx and sample size to calculate a point estimate of the population mean (work out the mean of a sample),
given the means and frequencies of a number of samples for the same experiment, find total and total frequency and use them to calculate a more accurate point estimate.

S6.1: use a sample of raw data and given variance to calculate symmetrical confidence intervals (levels given) for the mean of the population
use the total of fx, given sample size of a sample and given variance to calculate symmetrical confidence intervals (levels given) for the mean of the population

Students should be able to calculate a stratified sample but this may be more likely on Paper 1 under spec ref D2.2.

Q: When calculating the pmcc will the students be expected just to use raw values - will any coding be required?

A: Coding will not be used or tested.

Q: How should I display critical path analysis work?

A: Please see the appendix to this Teachers' Guide.

Q: How should/will Gantt charts and Cascade diagrams be displayed?

A: When constructing diagrams, we will ask for a Gantt chart to be drawn. This would imply that all activities should be on a separate line, but we will accept the critical path activities being drawn together on one line. When we present a diagram, if the activities are on separate lines we will call it a Gantt chart and if the critical path activities are together on one line we will call it a cascade diagram.

Q: Will the students be provided with the formula for a and b when calculating the linear regression line in the form $y = a + bx$ (nothing listed on the formula sheet)? Please confirm $b = Sxy/Sxx$ and $a =$ mean of $y - b$ (mean of x).

A: It is expected that students will use their calculator to get the equation of a regression line, so no formulae will be given. The definitions of a and b are as above.

Q: In section 3.11 knowledge of the shape of exponential graphs is required. More specific knowledge of exponential functions is included in section 3.13. Detailed knowledge is also required about gradients so that curve sketching can occur, the specifics of which are included in the spec for 3.12. Is this the only use of gradients?

A: The use of gradients, as detailed in 3.12, will concentrate much more on their practical applications than on curve sketching (although the maximum and minimum points could obviously be used for that purpose).

Understanding of the link between the gradient and y-value of exponential curves (G7.1) is likely to be tested by giving one and asking for the other or giving enough information to calculate one and asking for the other.

Note also in this section that exponential equations of the form $y = A + Be^{kx}$ may be used, which would require manipulation in order to find a solution.

Q: Is there a qualification wide level of accuracy expectation, eg should all answers be given to 2dp?

A: Students should be encouraged to give their answers to a degree of accuracy appropriate for the context. Unless stated in the question we would not withhold marks for unrounded answers, but we may withhold marks for rounded answers without appropriate working seem. For example, if the exact answer to a 'mean' question was 999.12 then 999.12 or 999.1 or 999 without working would be accepted and 1000 with working would also be accepted.

Q: What formulae are required to be learnt for this specification?

A: The formulae required to be learnt for the new GCSE are required knowledge for this course (as GCSE Maths is assumed knowledge).

In questions where a formula outside the new GCSE specification is required to be used or is the only means of answering a question, if it is not printed on the formula sheet it will be printed either within the question or the Preliminary Material.

The use of technology is emphasised throughout the specification. As such, for topics such as pmcc and regression lines, students are expected to be able to use their calculators in exam conditions (or other technology in classroom situations) to perform these calculations.

However, students may use a formula where one is not printed. You may choose to teach formulae in order to complete students' knowledge, but there is no requirement for their use in the examination. If students were to write down the formula and use it, they would not be penalised for doing so.

Addendum to the specification

In section D2.2 and S4.2, students should understand the definition of, purpose of and how to collect from stratified sampling, cluster sampling, quota sampling and random sampling. In S4.2 only, the above also applies to systematic sampling.

In section G2.1, students should be able to find coefficients of variables in equations of the graphs mentioned in section G1.1.

Command words and language accessibility

The command words that will be used in Mathematical Studies are listed in the tables on the next pages.

We aim to use simplified language as much as possible to make papers accessible to all students. However, students are expected to be familiar with mathematical terms. As Mathematical Studies uses real-life contexts, we will endeavour to introduce unfamiliar contexts on the Preliminary Material so that students are familiar with the contexts prior to the examination. However, this may not always be possible depending on the nature of the context or the content of the question.

Command words	
Show that **Prove that** **Verify that**	Construct a logical argument that shows that the given information leads to the printed result. 'Prove that' often indicates that the result is either a standard result for the specification or that a formal use of the methods of mathematical argument is being assessed, eg 'Prove by contradiction that…'. Verify that indicates that students should provide evidence that a given result or statement is correct.
Deduce that	Like 'Show that' except that it specifically indicates that a previous result (or results) in the question is relevant.
Work out **Calculate**	A calculation or calculations are required. The calculation which leads to the result obtained should be shown in the working.
Write down **State** **Give**	Intermediate working out will not be expected and should not be necessary.
Explain	A written explanation is required, although this can include, or be substantially, arithmetic, algebraic, diagrammatic or graphical work as appropriate.
Express	Give an answer in the form described in the question.
Simplify	Cancel down fractions and ratios (possibly algebraic), collect like terms and use standard simplifying results from within the specification (eg $\ln e = 1$).
Solve	Find all the values that satisfy the given equation or inequality.
Describe **Give a full description of** **Write a report**	Give full details of …
Sketch	A sketch need not be a completely accurate drawing, but should illustrate all the significant features of the graph/shape.
Draw	Draw neatly and accurately.
Plot	Accurately place points on a graph.
Name	Give the technical term for …

Command words (continued)	
Construct	Formulate
Estimate	Perform a calculation leading to an approximate answer.
Forecast	Assuming the current trend continues, find …
Investigate **Conduct** **Test** **Carry out (a test)**	Perform a hypothesis test leading to a conclusion relating to the context of the question.
Interpret **Analyse**	Determine what the results mean in the context of the question.
Critically analyse	Look for and identify errors, suggest improvements and evaluate whether a claim is justified
Statistically analyse	Use statistical techniques to determine what the results mean in the context of the question
Justify	Give working or reasons to support your answers.
Comment on	Describe one or more notable feature(s) of the situation in the question.
Compare	Describe the significant similarities or differences between
Advise **Suggest**	What does the person in the question need to know? What would you tell them if you were able?
Predict	Use mathematics to give a reasoned estimation of a future or conditional result

Other words or expressions	
Hence	Use results found or given earlier in the question.
Hence, or otherwise	Any correct method is acceptable, but results found or given earlier in the question could be useful.
Exact value	The answer should be simplified as far as possible but should not be rounded.
Consider **Conclude**	Draw a conclusion from given information
List	Write down the required information (in order, where appropriate)

Advice words	
You **must** show your working (to justify your answer)	Answers without shown calculations may receive zero credit (even if correct)
(Give a reason to/for…) justify your answer/comments/recommendations	Answers without required explanation/evaluation receive zero credit (even if correct)
State any assumptions that you have made (show details of your assumptions/calculations	Assumptions need to be stated for marks to be awarded
(You may) use the grid/table…	Use the grid means that it is expected to be used for full marks. You may use the grid suggests this is one of a range of acceptable answers.

Glossary for Mark Schemes

Principal Examiners prepare the mark schemes, using appropriate mark types from the list below. Examinations are marked in such a way as to award positive achievement wherever possible. Thus, for mathematics papers, marks are awarded under various categories. Other useful abbreviations are also included to facilitate marking.

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners seek advice from their senior examiner if in any doubt.

Mark schemes are not finalised until the end of standardising to ensure that all credit-worthy responses are given credit.

M	mark is for method
dM	mark is dependent on one or more M marks and is for method
A	mark is dependent on M or m marks and is for accuracy
B	mark is independent of M or m marks and is for method and accuracy
E	mark is for explanation
ft	follow through from previous incorrect result
CAO	correct answer only
CSO	correct solution only
AWFW	anything which falls within
AWRT	anything which rounds to
ACF	any correct form
AG	answer given
SC	special case
OE	or equivalent
A2,1	2 or 1 (or 0) accuracy marks
PI	possibly implied
SCA	substantially correct approach
c	candidate
sf	significant figure(s)
dp	decimal place(s)

Frequently Asked Questions

Q: How many Guided Learning Hours (GLH) is the course?

A: The course is designed as 180 GLH.

Q: Can the course be studied in one year?

A: The course is designed as a two-year course; however, there is nothing to prevent students from entering for the exams after only one year of study.

Q: What progression is there from this qualification?

A: Students may progress from this qualification to AS/A-level Maths or the Extended Project Qualification.

Q: Can a student take more than one paper 2?

A: In one series, a student may take only paper 1 and one of the three paper 2's. If a student re-sits the qualification, they may take a different paper 2 when they re-sit.

Q: Can a student only re-sit one of the two papers?

A: No. This is a linear qualification, so a student must re-sit all papers in the same summer series. The carrying forward of the mark of one paper or the mixing and matching of results from different series is not permitted.

Q: Which result will count if a student is re-sitting the exams?

A: The best result will count for the student; however, only the first attempt will be recorded in the performance tables.

Q: Does the qualification have UCAS points?

A: Yes, the qualification has the same UCAS tariff points as an AS-level.

Q: Does the qualification have performance table points?

A: Yes, it will be included in schools and college performance tables from 2017 and will count as the 16-19 enhanced level 3 maths measure.

Q: Does the qualification count as the maths element of the Tech Bacc?

A: Yes, Mathematical Studies is an approved level 3 maths qualification which can be counted as the maths element of the Tech Bacc.

Appendix

An example of how an activity network for Critical Path Analysis is expected to be displayed by candidates (sometimes the diagram will be given and at other times the diagram will need to be constructed).

1 **Figure 1** below shows an activity diagram for a project. The duration required for each activity is given in hours. The project is to be completed in the minimum time.

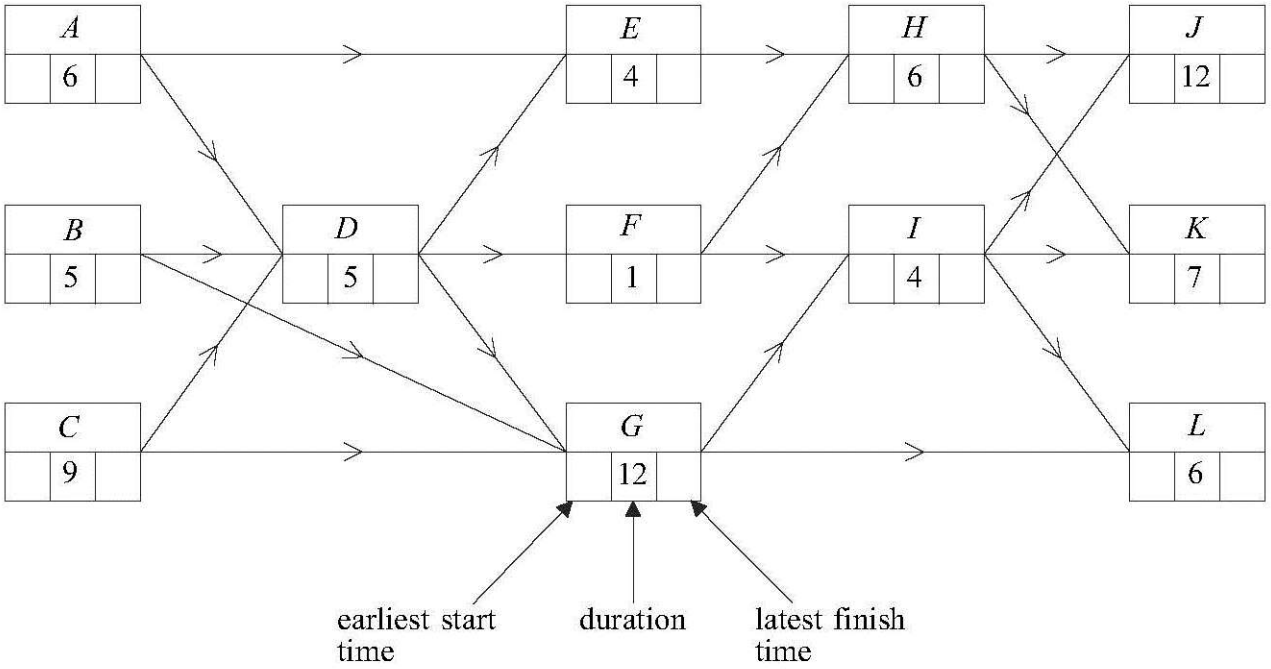
(a) Find the earliest start time and the latest finish time for each activity and insert their values on **Figure 1**. *(4 marks)*

(b) Find the critical path. *(1 mark)*

(c) Find the float time of activity E. *(1 mark)*

(d) Given that activities H and K will both overrun by 10 hours, find the new minimum completion time for the project. *(3 marks)*

Figure 1



If 2-box activity on node notation or activity on arc notation is used, and errors are made when doing so, answers to subsequent parts of the question may 'follow through', so that students are not penalised more than once for the same error.' (NB this penalty when constructing the activity network may, however, be more than one mark).