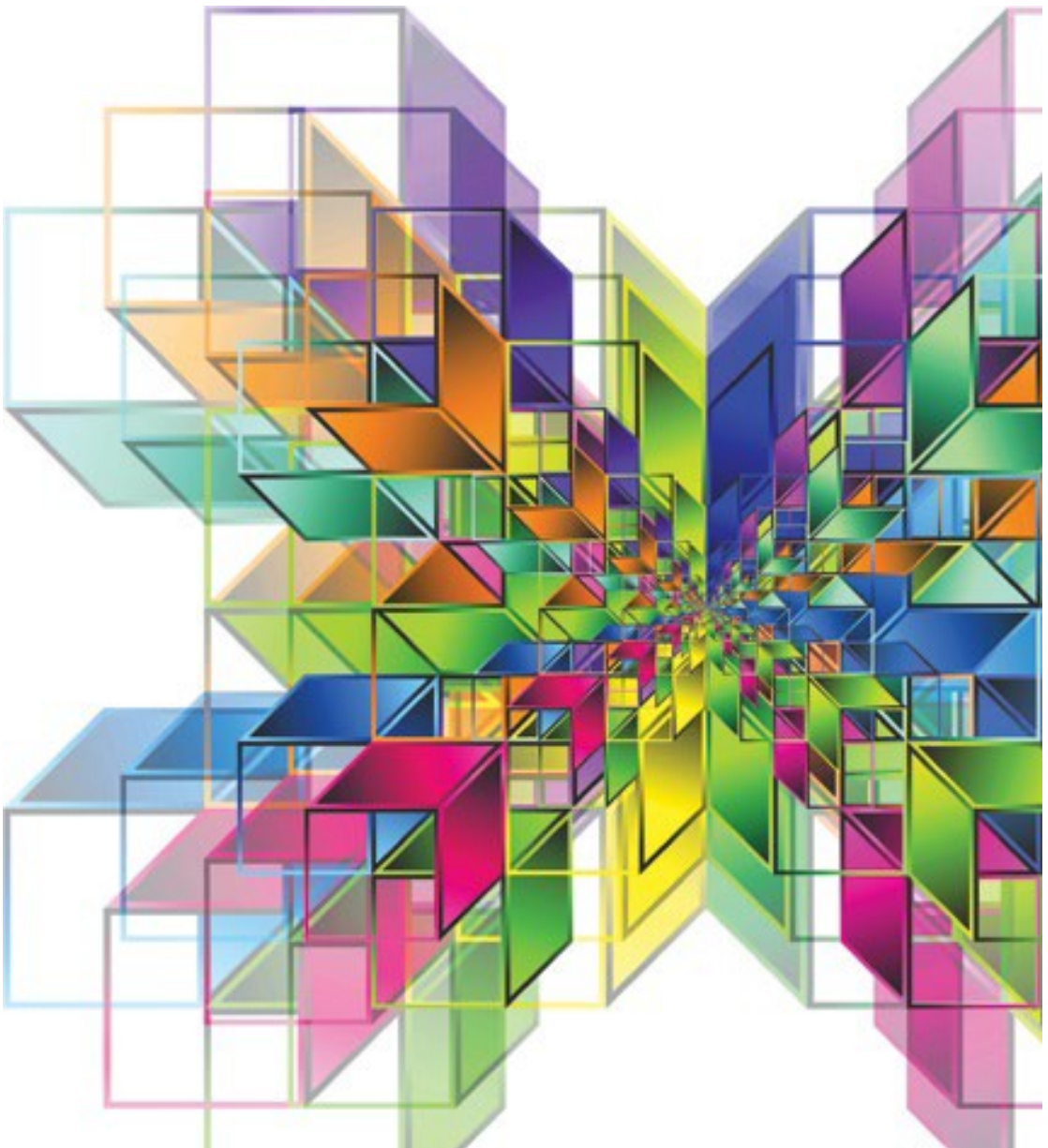
AQA Guidance

GCSE MATHEMATICS

Assessment Objective Guidance



Version 1.0

AO1 (Foundation 50%, Higher 40%)

AO1.1

Accurately recalling facts, terminology and definitions. Only 4 marks on average per paper on Foundation and 3 marks on average per paper on Higher. This is recall only so no application should be necessary.

Examples

Identifying special triangles / quadrilaterals / parts of a circle

Selecting multiples / factors / primes

Knowing conditions for congruence

Recalling required formulae

Identifying trigonometric graphs

AO1.2

Using and interpreting notation. Only 4 marks on average per paper on Foundation and 3 marks on average per paper on Higher. This is use and interpretation so some application may be necessary. If it is simply recall of a fact then it is AO1.1

Examples

Simplifying algebraic expressions

Converting to or from standard form

Writing a translation as a vector

Using inequality notation

Identifying the gradient or intercept of a line given its equation in a rearranged form

In the new specification marks can be split between assessment objectives. Some AO2 or AO3 questions could have one (or more) of their marks assigned as AO1.1 or AO1.2, although AO1.3 is used more often.

AO1.3a

Routine procedures where it is clear from the question what mathematics is required. The procedure must be familiar (or directly from the specification) and not have too much context. Multi-step solutions are tested under AO1.3b. Foundation will have more marks at AO1.3a than AO1.3b. The reverse is true for Higher papers.

In the new specification, marks can be split between assessment objectives. Some AO2 or AO3 questions will have one (or more) of their marks assigned as AO1.3a.

For example, it may be that one of the marks is simply for calculating the answer once the problem-solving part of the question has been addressed

or

perhaps an early mark is for using a straightforward procedure and can be gained without the student accessing the AO2 or AO3 part of the question.

AO1.3b

Multi-step routine procedures. Mostly it is clear when something is truly multi-step. However, there is sometimes debate about whether something counts as AO1.3a or AO1.3b. If a student has to rearrange the equation $y = mx + c$ is that one procedure or is it multi-step (subtract c, divide by m)?

Similarly, where a student expands a bracket there can be discussion. There is no hard and fast rule and flexibility can be applied depending on the demand of the question and the tier of paper.

In the new specification, marks can be split between assessment objectives. Some AO2 or AO3 questions will have one (or more) of their marks assigned as AO1.3b.

Note that if a question is ‘multi multi-step’ or has a number of modifiers of difficulty, then it is likely to become a problem to solve and AO3.

For example,

Buy some items, sell some at one price, give a fraction away, what price are the remainder sold at to make a profit of 30%? AO3.1d

Given the surface area of a sphere, work out the volume of the cube containing it. AO3.1b

AO2 (Foundation 25%, Higher 30%)

AO2.1a

Using reasoning to make deductions. This AO element is commonly used for any question that is not a routine procedure (so not AO1) but involves some reasoning. For it to be a deduction it must be a definitive solution. Note that under the old specification, some questions that we would have labelled problem-solving, could now be seen as using reasoning.

AO2.1b

Using reasoning to make inferences. For it to be an inference, the solution must be likely but not definitive. This is often used in statistical questions, for example looking at a chart of monthly sales for the past year and drawing conclusions for future years, working out an estimate of the mean of grouped data, using relative frequencies to estimate probabilities.

AO2.2

Using a chain of reasoning to achieve a given result. If the result is given, this will probably be a question of the form 'Show that...' Questions often require multi-step algebraic or geometric reasoning to reach the given result. Sometimes the result is not given but a student needs to use reasoning to give an answer in a specified form. (See also AO2.4a)

AO2.3a

Interpreting given information in a way that extends beyond what is explicitly shown. This can mean interpreting from graphs or charts, interpreting information given in two-way or other tables or understanding Venn diagrams.

AO2.3b

Communicating information which may involve taking something and representing it differently. This is often used for representing data in graphs, charts or other diagrams. However, it can also be used for taking a number machine and representing it as an equation or taking results from an experiment and using summary statistics or percentages to represent them in an alternative way.

AO2.4a

Presenting an argument, defined as a formal, comprehensive and logical account with a degree of relativity. This will be less formal than a proof (particularly on Foundation), for instance justifying a conclusion or showing whether two lines are parallel with reasons. As with AO2.2, this can be used for 'Show that...' questions but also for questions that ask a student to tick a box and give a reason or explanation. It tends to require more sophistication than AO2.1 and AO2.2

AO2.4b

Only assessed on Higher. Presenting a proof, defined as a formal, comprehensive and logical account with a degree of absoluteness. Usually used for algebraic and geometric proofs.

AO2.5a

Assessing the validity of a given argument. Often the student will be given a statement with a (usually but not always) flawed reason:

John thinks ... because ...

Is he correct?

Give a reason for your answer.

So if John's argument was flawed, it would be a common misconception that can easily be explained with a counter example or other simple reasoning.

Note that there has to be a statement with a reason given in the argument for the student to assess, not just a statement. If it were just a statement to verify then it is likely that AO2.1, AO2.2 or AO2.4a would be assigned depending on the complexity of the argument required.

AO2.5b

Critically evaluating a given way of presenting information. This is likely to be an incorrectly drawn graph or chart or statistical diagram which the student has to evaluate and list errors. However, it could be used, for instance, to analyse a marketing claim on a new size of cereal box or a newspaper article presenting percentage changes based on some given data. It is possible that the information may be presented appropriately and that the student will need to say that the claim or article is fair.

AO3 (Foundation 25%, Higher 30%)

Multi-strand

At least one third of AO3 marks within an assessment series (20 marks across the Foundation suite of three papers and 24 marks across the Higher suite of three papers) should be allocated to tasks which target two or more strands (eg AO3.1, AO3.4 etc) of AO3.

Within these multi-strand tasks, all strands of AO3 should be addressed in each assessment series.

A ‘task’ is a question with parts a, b, c etc focussing on one problem ie they must be linked.

AO3.1

Translating problems into a process or processes.

Elements 1(b) and 1(d) require a series of processes (ie are multi-step) and there will be far more of these in each paper, while 1a and 1c require translation into a single process.

Elements 1(c) and 1(d) are for non-mathematical contexts, while 1(a) and 1(b) are for mathematical contexts.

The procedures needed should not be clear from the question and, as long as this is the case, questions that we may have thought of as AO1 in the past may be classified (or part-classified) as AO3 here. Strand 1 is very commonly used at AO3 and can sometimes be combined with other AO3 strands to create multi-strand questions. Often one or more marks will also be claimed at AO1.3a or b. Sometimes a multi-step question becomes all or part AO3 because of the added context.

AO3.2

Making and using connections between different parts of mathematics. The student has to make the link so, for example, the question cannot say ‘Set up and solve’ as that would tell the student to link to algebra. Note that this is usually claimed in a multi-step, multi-strand AO3 question that also claims AO3.1b or AO3.1d. As it often appears in multi-step questions it seems slightly more common at Higher than Foundation but still relatively rare.

Examples of connections used have been ratio and algebra; circumference and speed; percentage and similarity; Pythagoras and simultaneous equations.

AO3.3

Interpreting results in the context of the given problem. This can be used in questions where the student has to decide whether to round up or truncate to give an integer answer that is appropriate for that particular problem. It can also be used where the student obtains one or more numerical answers and then has to decide which is cheaper / faster or who won a race. Some questions have an extra step, for example to interpret an amount of money as the number of extra weeks of saving required and this would fit this strand. This will frequently appear in multi-strand questions with AO3.1

AO3.4a

Evaluating methods used. There must be a method shown in order to evaluate it. It could be a stated method that contains a misconception that the student has to highlight and explain. It could also be used in questions where the student is asked to suggest a way to improve a given method, for example improving an estimate from relative frequency by increasing sample size. In theory, it could also apply to a case where the student is asked to evaluate their own methods but this may be hard to test in practice.

Note the difference between evaluating a **method** and assessing the validity of an argument (just a statement with a reason) which is AO2.5a and evaluating the presentation of information (usually a diagram) which is AO2.5b

AO3.4b

Evaluating results obtained. This can be tested implicitly in a question where one of the results is impossible within the given constraints or context and needs to be ruled out – this particular result may not be seen but the fact that it is not given as an answer implies the evaluation has taken place. However, usually a result will need to be seen (perhaps in a previous part) for the student to evaluate it. For example it can be used when deciding whether a previously estimated answer is too high, too low or appropriate. It could also be used in a situation where the student is given a problem and the result and asked whether the result is sensible. Note the subtle difference between asking the student to evaluate their result or their method.

AO3.5

Evaluating solutions to identify how they may have been affected by assumptions made. The assumptions may have been given in the question. It is often useful to give the assumptions in an earlier part that has some problem-solving (often AO3.1) so that a multi-strand task can be claimed. The assumptions used tend to be estimates (weeks worked, weeks in a month/year) or constant speed/rate or straight line/circular travel. The assumption may be generated by the student but this is harder to test in practice.