CAMBRIDGE
International Examinations

Cambridge International AS & A Level

SYLLABUS

Cambridge International AS and A Level Thinking Skills

9694

For examination in June and November 2017

Cambridge Advanced

Version 1

Changes to syllabus for 2017

This syllabus has been updated, but there are no significant changes.

You are advised to read the whole syllabus before planning your teaching programme.

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Contents

1. Introduction 2
   - 1.1 Why choose Cambridge?
   - 1.2 Why choose Cambridge International AS and A Level?
   - 1.3 Why choose Cambridge International AS and A Level Thinking Skills?
   - 1.4 Cambridge AICE (Advanced International Certificate of Education) Diploma
   - 1.5 How can I find out more?

2. Teacher support 5
   - 2.1 Support materials
   - 2.2 Endorsed resources
   - 2.3 Training

3. Assessment at a glance 6

4. Syllabus aims and assessment objectives 7
   - 4.1 Syllabus aims
   - 4.2 Assessment objectives
   - 4.3 Description of components

5. Syllabus content 11
   - 5.1 Paper 1: Problem Solving
   - 5.2 Paper 2: Critical Thinking
   - 5.3 Paper 3: Problem Analysis and Solution
   - 5.4 Paper 4: Applied Reasoning

6. Grade descriptions 24

7. Appendix A: Sample Paper 1 questions 25

8. Appendix B: Resource list 35

9. Other information 40

1. Introduction

1.1 Why choose Cambridge?

Cambridge International Examinations is part of the University of Cambridge. We prepare school students for life, helping them develop an informed curiosity and a lasting passion for learning. Our international qualifications are recognised by the world's best universities and employers, giving students a wide range of options in their education and career. As a not-for-profit organisation, we devote our resources to delivering high-quality educational programmes that can unlock learners' potential.

Our programmes set the global standard for international education. They are created by subject experts, are rooted in academic rigour, and provide a strong platform for progression. Over 10 000 schools in 160 countries work with us to prepare nearly a million learners for their future with an international education from Cambridge.

Cambridge learners

Cambridge programmes and qualifications develop not only subject knowledge but also skills. We encourage Cambridge learners to be:

- **confident** in working with information and ideas – their own and those of others
- **responsible** for themselves, responsive to and respectful of others
- **reflective** as learners, developing their ability to learn
- **innovative** and equipped for new and future challenges
- **engaged** intellectually and socially, ready to make a difference.

Recognition

Cambridge International AS and A Levels are recognised around the world by schools, universities and employers. The qualifications are accepted as proof of academic ability for entry to universities worldwide, although some courses do require specific subjects.

Cambridge AS and A Levels are accepted in all UK universities. University course credit and advanced standing is often available for Cambridge International AS and A Levels in countries such as the USA and Canada.

Learn more at **www.cie.org.uk/recognition**

1.2 Why choose Cambridge International AS and A Level?

Cambridge International AS and A Levels are international in outlook, but retain a local relevance. The syllabuses provide opportunities for contextualised learning and the content has been created to suit a wide variety of schools, avoid cultural bias and develop essential lifelong skills, including creative thinking and problem-solving.

Our aim is to balance knowledge, understanding and skills in our programmes and qualifications to enable students to become effective learners and to provide a solid foundation for their continuing educational journey. Cambridge International AS and A Levels give learners building blocks for an individualised curriculum that develops their knowledge, understanding and skills.

Schools can offer almost any combination of 60 subjects and learners can specialise or study a range of subjects, ensuring a breadth of knowledge. Giving learners the power to choose helps motivate them throughout their studies.

Cambridge International A Levels typically take two years to complete and offer a flexible course of study that gives learners the freedom to select subjects that are right for them.

Cambridge International AS Levels often represent the first half of an A Level course but may also be taken as a freestanding qualification. The content and difficulty of a Cambridge International AS Level examination is equivalent to the first half of a corresponding Cambridge International A Level.

Through our professional development courses and our support materials for Cambridge International AS and A Levels, we provide the tools to enable teachers to prepare learners to the best of their ability and work with us in the pursuit of excellence in education.

Cambridge International AS and A Levels have a proven reputation for preparing learners well for university, employment and life. They help develop the in-depth subject knowledge and understanding which are so important to universities and employers.

Learners studying Cambridge International AS and A Levels have opportunities to:

- acquire an in-depth subject knowledge
- develop independent thinking skills
- apply knowledge and understanding to new as well as familiar situations
- handle and evaluate different types of information sources
- think logically and present ordered and coherent arguments
- make judgements, recommendations and decisions
- present reasoned explanations, understand implications and communicate them clearly and logically
- work and communicate in English.

Guided learning hours

Cambridge International A Level syllabuses are designed on the assumption that learners have about 360 guided learning hours per subject over the duration of the course. Cambridge International AS Level syllabuses are designed on the assumption that learners have about 180 guided learning hours per subject over the duration of the course. This is for guidance only and the number of hours required to gain the qualification may vary according to local curricular practice and the learners' prior experience of the subject.

1.3 Why choose Cambridge International AS and A Level Thinking Skills?

Thinking Skills develops a specific set of intellectual skills, independent of subject content. It reflects the need voiced by universities and employers for more mature and sophisticated ways of thinking. The Thinking Skills syllabus also enables students to approach their other subjects with an improved ability to understand, analyse and resolve problems. As a result, students find the course of great benefit when preparing for higher education and for a wide range of careers, including law, scientific research, social science, journalism, medicine, business, accounting and engineering. As a curriculum subject, Thinking Skills offers students an excellent opportunity to express themselves freely and openly. The Thinking Skills syllabus encourages free and open debate, critical and investigative thinking, and informed and disciplined reasoning.

Prior learning

Candidates beginning this course are not expected to have studied Thinking Skills previously.

Progression

Cambridge International A Level Thinking Skills provides a suitable foundation for a variety of courses in higher education.

Cambridge International AS Level Thinking Skills constitutes the first half of the Cambridge International A Level course in Thinking Skills and therefore provides a suitable foundation for the study of Thinking Skills at Cambridge International A Level and thence for related courses in higher education. Depending on local university entrance requirements, it may permit or assist progression directly to university courses in a variety of subjects.

1.4 Cambridge AICE (Advanced International Certificate of Education) Diploma

Cambridge AICE Diploma is the group award of the Cambridge International AS and A Level. It gives schools the opportunity to benefit from offering a broad and balanced curriculum by recognising the achievements of candidates who pass examinations in different curriculum groups.

Learn more about the Cambridge AICE Diploma at **www.cie.org.uk/aice**

1.5 How can I find out more?

If you are already a Cambridge school

You can make entries for this qualification through your usual channels. If you have any questions, please contact us at **info@cie.org.uk**

If you are not yet a Cambridge school

Learn about the benefits of becoming a Cambridge school at **www.cie.org.uk/startcambridge**. Email us at **info@cie.org.uk** to find out how your organisation can register to become a Cambridge school.

2. Teacher support

2.1 Support materials

We send Cambridge syllabuses, past question papers and examiner reports to cover the last examination series to all Cambridge schools.

You can also go to our public website at **www.cie.org.uk/alevel** to download current and future syllabuses together with specimen papers or past question papers and examiner reports from one series.

For teachers at registered Cambridge schools a range of additional support materials for specific syllabuses is available from Teacher Support, our secure online support for Cambridge teachers. Go to **http://teachers.cie.org.uk** (username and password required).

2.2 Endorsed resources

We work with publishers providing a range of resources for our syllabuses including print and digital materials. Resources endorsed by Cambridge go through a detailed quality assurance process to ensure they provide a high level of support for teachers and learners.

We have resource lists which can be filtered to show all resources, or just those which are endorsed by Cambridge. The resource lists include further suggestions for resources to support teaching.

2.3 Training

We offer a range of support activities for teachers to ensure they have the relevant knowledge and skills to deliver our qualifications. See **www.cie.org.uk/events** for further information.

3. Assessment at a glance

To achieve a Cambridge International AS Level in Thinking Skills, each candidate must successfully complete Papers 1 and 2.

Advanced Subsidiary qualification	
Paper 1 1¾ hours 'Problem Solving' 30 multiple choice questions Maximum mark 30 Weighted at 50% of total.	**Paper 2** 1¾ hours 'Critical Thinking' 3 structured answer questions Maximum mark 45 Weighted at 50% of total.

To achieve a Cambridge International A Level in Thinking Skills, each candidate must successfully complete Papers 1, 2, 3 and 4.

Advanced Level qualification	
Paper 1 1¾ hours 'Problem Solving' 30 multiple choice questions Maximum mark 30 Weighted at 25% of total.	**Paper 2** 1¾ hours 'Critical Thinking' 3 structured answer questions Maximum mark 45 Weighted at 25% of total.
Paper 3 2 hours 'Problem Analysis and Solution' 4 structured answer questions Maximum mark 50 Weighted at 25% of total.	**Paper 4** 1½ hours 'Applied Reasoning' 4 questions, one requiring an extended response Maximum mark 50 Weighted at 25% of total.

Availability

This syllabus is examined in the June and November examination series.

This syllabus is available to private candidates.

Detailed timetables are available from **www.cie.org.uk/examsofficers**

Combining this with other syllabuses

Candidates can combine this syllabus in an examination series with any other Cambridge syllabus, except:

- syllabuses with the same title at the same level

4. Syllabus aims and assessment objectives

4.1 Syllabus aims

The aims of the Thinking Skills syllabus are:

- To give candidates a specific and transferable set of skills for solving problems, critical thinking and reasoning.
- To encourage candidates to apply these skills to realistic scenarios.
- To develop candidates' abilities to understand and engage confidently in argument and reasoning.

4.2 Assessment objectives

The Thinking Skills syllabus has two aspects: Problem Solving and Critical Thinking. Each of these is made up of a set of sub-skills. Candidates should be skilled in the following areas:

	Critical Thinking	Problem Solving
Core	• Recognising reasoned arguments (skill CT1) • Identifying conclusions (CT2) • Drawing conclusions (CT3) • Recognising implicit assumptions (CT4) • Assessing the impact of further evidence (CT5) • Recognising flaws in reasoning (CT6) • Selecting believable explanations (CT7) • Recognising the logical functions of key elements of an argument (CT8) • Understanding and clarifying key terms and expressions (CT9) • Being able to infer and deduce (CT10) • Analysing and evaluating evidence and argument (CT11) • Further argument (CT12)	• Extracting relevant data (skill PS1) • Processing data (PS2) • Finding procedures for solving problems (PS3) • Searching for solutions (PS4) • Identifying similar data (PS5) • Suggesting hypotheses for variations (PS6) • Using spatial reasoning (PS7) • Identifying necessary and sufficient data (PS8) • Working with models (PS9) • Making choices and decisions (PS10) [Mathematics ability assumed: Junior School]
Extension	• Constructing a reasoned case, including selecting and combining information (CT13) • Interpretation of statistics (CT14)	• Developing a model (PS11) • Analysing complex data and drawing conclusions (PS12) [Mathematics ability assumed: IGCSE/O Level]

Advanced Subsidiary Syllabus = Core
Advanced Level Syllabus = Core + Extension

Problem Solving and Critical Thinking are explained in more detail below:

Problem Solving

- The Problem Solving components assess a candidate's ability to analyse numerical and graphical information, which is based in real life situations, and apply the right numerical techniques to find new information or derive solutions.
- Problem Solving uses a range of skills such as data handling, reading, modelling, logic and reasoning. In the Cambridge syllabus, candidates are assessed on these various sub-skills, which are the building blocks to successfully solving wider and more complex problems.
- Candidates need to apply simple mathematics to new situations to show they can manipulate numerical and graphical data. They need to extract and use relevant data, and find ways of drawing conclusions from information. Candidates need to be able to present that same data in different forms. They are expected to think critically about information, find possible reasons for unexpected variations and be able to use information for informed decision-making.
- For the Thinking Skills AS papers, candidates need to be familiar with basic techniques of mathematical manipulation to junior school level.
- For the Thinking Skills A Level papers, candidates need to be familiar with basic techniques of mathematical manipulation to IGCSE/O level standard.
- Thinking Skills is not a test of candidates' mathematical abilities. The Problem Solving element of this subject is about using logical methods of handling numerical, graphical and pictorial data. Problem solving skills are not only desirable but essential to lawyers, sociologists, geographers, historians and those in other professions. They have to understand and use numerical information, to analyse it and to draw conclusions from it. For example, a lawyer may need to know about and understand the probabilities of a DNA test being conclusive. Sociologists frequently employ statistics and demographic data.

Critical Thinking

- Critical Thinking is the analytical thinking which underlies all rational discourse and enquiry. It is characterised by a meticulous and rigorous approach. As an academic discipline, it is unique in that it explicitly focuses on the processes involved in being rational. These processes include:
  - analysing arguments;
  - judging the relevance and significance of information;
  - evaluating claims, inferences, arguments and explanations;
  - constructing clear and coherent arguments;
  - forming well-reasoned judgements and decisions.

  Being rational also requires an open-minded yet critical approach to one's own thinking as well as that of others.
- Critical Thinking is based around the concept of *argument*. Candidates learn to recognise when someone is engaged in reasoned argument, as distinct from quarrelling, disputing, reporting or explaining. Different examples of reasoning and argument are explored to understand their common characteristics, and most importantly the use of reasons (or premises) to support conclusions.
- Candidates learn a basic language of reasoning: everyday words such as 'therefore', 'because', 'if… then', which are used *in* arguments; and semi-technical terms such as 'conclusion', 'assumption', 'flaw', 'sufficient', which are used to talk *about* argument.
- The main activities of Critical Thinking are *analysis*, *evaluation* and *construction of argument*. By analysing arguments, candidates learn to identify the key parts of a reasoned case, and to understand how they work.
- To evaluate a piece of reasoning, candidates need to make informed judgements about how sound, strong or weak it is. This often includes assessing the impact of responses to an argument: challenges, supporting evidence, counter-examples, etc. Candidates undertake their own reasoning, based on stimulus material.

4.3 Description of components

Paper 1: Problem Solving

- 30 multiple choice questions, each made up of a stimulus, a question and 4 options – only one of which is the correct answer.
- Paper 1 tests skills PS1–PS10.
- Calculators are allowed.

Paper 2: Critical Thinking

- Three structured answer questions.
- For question 1, the candidate evaluates evidence.
- For question 2, the candidate uses reasoning in a scientific context.
- Question 3 requires the candidate to evaluate and present an argument.
- Paper 2 focuses on skills CT1–CT12.

Paper 3: Problem Analysis and Solution

- Four structured answer questions.
- Questions 1 and 2 require candidates to apply skills PS1–PS10 to complex problems.
- Question 3 requires the candidate to develop a model and explore possible solutions (PS11).
- For question 4, candidates must analyse given complex data and draw conclusions (PS12).
- Paper 3 tests skills PS1–PS12.
- The use of an electronic calculator is expected, where appropriate.

Paper 4: Applied Reasoning

- One question requires the candidate to evaluate and/or infer conclusions from given statistics.
- Three other questions are based on one subject. The candidate is provided with source material made up of three or more documents. The candidate must select from the given information, opinion and/or argument and use this to build a reasoned case.
- Paper 4 tests skills CT1–CT14 with emphasis on CT13 and CT14.

5. Syllabus content

5.1 Paper 1: Problem Solving

The questions examine the candidate's abilities to use the following skills.

PS1: Extract relevant data
PS2: Process data
PS3: Find procedures for solving problems
PS4: Search for solutions
PS5: Identify similar data
PS6: Suggest hypotheses for variations
PS7: Use spatial reasoning
PS8: Identify necessary and sufficient data
PS9: Work with appropriate models
PS10: Make choices and decisions

The questions are multiple choice with a short stimulus passage. The candidates select the most appropriate response from four options A to D.

Information may be presented in five categories: tables, graphs, words, pictures, diagrams.

The stimulus may include information in more than one category. The stimulus material is based on a realistic scenario. In general, candidates should be able to answer the question from the stimulus, rather than having to work backwards from the list of possible answers. However, there will be some questions where the options in effect form part of the stimulus. Candidates do not have to have knowledge specific to any subject, for example knowledge of physics or statistics; they do have to have knowledge of the basic mathematics required.

Each of the 10 sub-skill categories for Problem Solving is explained below. An example of a question that tests the sub-skill is also provided in Appendix A.

PS1 Data Extraction

- Questions may give information in words, tables or graphs. Most is quantitative but some qualitative elements may be included (e.g. colour or shape).
- Candidates are given criteria for choosing one item or a range of items from the data presented. The skill is to select the correct item or range of items from a set which includes some unnecessary data.
- This type of question may also include a small amount of simple processing, e.g. to find a journey time from a timetable giving departure and arrival criteria: the correct departure and arrival time should be found from the timetable and the journey time found by subtraction.

PS2 Data Processing

- Candidates are given information in words, tables or graphs.
- This data must be used to answer a question.
- One or more items from the data should be used correctly to give an answer. The method of using the data will be clear and will not need to be clarified. The skill is to choose and use the data correctly.
- This category of question may rely on some data extraction as well as processing, but this will not be the main emphasis of the question.

PS3 Finding a Procedure

- Questions may give information in words, tables, graphs, pictures or diagrams.
- Candidates are given a problem to solve (this will in most cases have a numerical solution but it may also be in other forms, e.g. a spatial manipulation).
- The method of solution is not immediately obvious and the candidate has to choose a suitable method of using the data to come up with the answer. The skill is to work out how to use the data in a suitable way to solve the problem, and then produce a solution.

PS4 Searching

- Questions may give information in words, tables, graphs, pictures or diagrams.
- Candidates have to solve a problem by searching for a solution.
- Searching can be in two forms. It may be necessary to search the data given to find the correct pieces of information to use. In general, it will also be necessary to consider several possible scenarios which may solve the problem, then to decide which, for example, is the best according to a given factor.
- The required skills are to identify a suitable method of searching and to carry it out correctly.

PS5 Identifying Similarity

- Candidates will be asked to match information in one form to the same information in another form (e.g. table to graph), or in a different representation of the same form (e.g. matching a time-distance graph with the same data presented as a time-velocity graph).
- The information given and derived may be in words, tables, graphs, pictures or diagrams.
- The skill required from the candidate is to recognise the correct data item or data set from several others which are presented.

PS6 Suggesting Hypotheses

- Candidates are given information, usually as graphs or tables. This will typically illustrate how one variable changes as a function of another or with time.
- Candidates select, from a list, a statement or an additional piece of data which would explain the nature of variation in the data.
- The skill is to make a reasoned choice of a possible cause of variation.

PS7 Spatial Reasoning

- Candidates are given information, usually as pictures (although other forms such as a written description may be used).
- They have to identify the result of a spatial operation such as deformation, reflection or rotation or, for example, to identify a view from a different direction.
- The skill is in being able to visualise shapes and views, and how they may change, in two or three dimensions.

PS8 Data Necessity and Sufficiency

- Candidates must decide what data is either necessary to contribute to the solution of a problem or sufficient, along with other data, to solve the problem. For example, a question could be of the form 'Which of the following additional pieces of data would be sufficient to answer this question?'.
- The candidate is not usually asked to solve the problem.

PS9 Working with Models

- A model of a set of data may be in the form of a graph, a diagram or a written description.
- Candidates are given a scenario which includes information on the way in which a parameter or a process varies.
- They are then asked to choose a representation of this variation in another form which models the data presented.
- A more difficult question might expect the candidate either to derive a mathematical model and use it, or to use a given model to produce an answer.
- The skill is to recognise how one set of information may model either another set or a real situation.

PS10 Choices and Decisions

- Questions give data in words, tables, graphs, pictures or diagrams and a set of criteria.
- Candidates choose from a set of options based on the given data and criteria. This involves a search of some sort.
- In the simplest sense, this would be just extracting an item from the data set (and would be equivalent to type PS1) or the search may involve an amount of data handling. The skill is to be able to make an informed decision by combining a set of information and given criteria for selection.

5.2 Paper 2: Critical Thinking

The main skills examined in Paper 2 are inference and deduction (CT10), analysis and evaluation (CT11) and constructing argument (CT12). However, these skills need to be built on the more fundamental skills of CT1–CT9 (see Table in section 3). Skills CT1–CT9 may also be tested directly on Paper 2.

CT1 Recognising Reasoned Arguments

- Candidates need to be able to tell the difference between short arguments (of various kinds) and non-arguments.

CT2 Identifying Conclusions

- The most basic skill of argument analysis is identifying the *main* conclusion and distinguishing it from the reasons (premises) that support it.
- Given arguments of different kinds, candidates need to be able to select a sentence which is the stated conclusion, or a close paraphrase of the main conclusion.
- In some arguments the conclusion is not contained in one distinct statement. For such arguments candidates need to be able to identify the best expression of the overall conclusion of the passage.

CT3 Drawing Conclusions

- When given information or evidence, it is important to be able to determine what you can and cannot rightly conclude from it.
- Candidates need to be able to select a conclusion, inference or hypothesis which is supported by given content.

CT4 Recognising Implicit Assumptions

- In many, if not most, everyday arguments, certain ideas are left out, perhaps because they 'go without saying', or because it suits the author to omit them. In Critical Thinking they are termed *assumptions* (or *implicit* assumptions or *underlying* assumptions) as opposed to stated reasons.
- Recognising such assumptions is an essential skill in analysing and evaluating argument because if the assumptions are false or questionable, the argument is undermined.
- Candidates need to be able to identify whether a given statement, not explicit in the text, is necessary to ensure the soundness of the argument.

CT5 Assessing the Impact of Further Evidence or Information

- Someone may respond to a particular argument by presenting additional evidence or information. So it is important to be able to assess the impact of such information on the argument.
- Candidates need to be able to decide whether a claim or item of evidence would, if true, either strengthen or weaken the argument.
- Candidates need to be able to assess the impact of a given response to a given argument.

CT6 Recognising Flaws in Reasoning

- Candidates need to be able to identify various faults or errors in arguments where the reasons – even if true – do not adequately support the conclusion.

CT7 Recognising Plausible Explanations

- Reasons do not always function as claims made in support of a conclusion; sometimes reasons function as *explanations* for a fact or observation.
- Explanations are particularly relevant where circumstances are puzzling, unusual, etc. Candidates need to be able to recognise a statement which offers a credible explanation for a fact or set of data.

CT8 Recognising the Logical Functions of Key Elements

- Texts which present arguments have certain key elements, most obviously reasons (premises) and conclusions, including intermediate conclusions.
- There are also more special functions such as: example, counter-example, analogy, alternative explanation, general principle, etc.
- Candidates need to be able to identify or assess the part certain words, phrases or sentences play in a reasoned argument.
- Candidates should be able to supply a key element which is required to complete a particular piece of reasoning.

CT9 Understanding and Clarifying Key Terms and Expressions

- Often, assessing an argument depends on how certain key terms or expressions are understood.
- This can be especially so when the expressions in question are either vague or ambiguous.
- Sometimes the authors of arguments 'help themselves to definitions' and it is important to recognise this.
- Candidates need to be able to clarify the meanings of key words, phrases or sentences.
- It is also important to understand the nature and the effect of claims made in an argument: for example, whether they are factual or judgemental, general or particular, strong or weak, significant or irrelevant, conditional or unconditional.
- Candidates need to be able to show that they can recognise some of these differences.

CT10 Inference and Deduction

- Candidates should be able to recognise what conclusions follow from evidence or information and, equally, what conclusions do *not*. This is an important skill to develop, for example when drawing conclusions about causal explanations, blame or responsibility.
- Candidates should also be aware of the *degree* of support their conclusions receive from the evidence or information given. They should understand the difference between knowledge and belief, and be able to express conclusions appropriately in terms of certainty, likelihood, possibility/impossibility.

CT11 Analysis and Evaluation

- In critical thinking, analysis means identifying the key elements of a reasoned case; most importantly its premises (reasons), and its main and intermediate conclusions.
- Detailed analysis may also reveal features such as assumptions (missing premises), counter-arguments, background information outside the main argument, and so on.
- Evaluation involves judging claims or arguments against certain relevant criteria. For example, it may mean asking yourself how reliable is that piece of evidence, or how sound and effective is that line of reasoning?
- Evaluation can involve looking beyond the argument, for example when candidates use a counter-example, alternative explanation, analogy, etc. to show a weakness. (In this respect there is some overlap between evaluation and further argument.)

CT12 Further argument

- As well as analysing and evaluating arguments, candidates are encouraged to present their own, relevant arguments, whether in opposition to, or in support of, the original case.
- Further argument can arise out of evaluation, for example by giving an additional example to support a step in the reasoning or it may be a different line of reasoning altogether.
- The skill of further argument is the ability to add something new, but at the same time remain within the scope of the original argument.

Question 1: Evaluating Evidence

The concept of 'evidence' has a special role in a wide range of reasoning activities. The typical example is in the application of the law, where there are strict rules determining what counts as evidence, and what can or cannot be concluded from it. But in all kinds of contexts, from scientific investigation to historical research to everyday decision making, the evaluation and 'weighing' of evidence plays a crucial part.

Candidates are given a scenario in which several items of evidence, of different kinds, are presented. The tasks are to assess these and/or their sources, and to come to reasoned judgements on the basis of them.

The kind of criteria candidates are expected to consider include:

- the *nature* of the evidence – fact, opinion, eyewitness account, 'hearsay', circumstantial evidence, conclusive evidence ('smoking gun'), etc.
- where relevant, the *reputation*, *authority* or *expertise* of a witness
- the *ability* of a witness to observe the details alleged in the evidence
- the degree of *independence* of a source, e.g. from bias or vested interest
- whether there is *corroboration* (proof) of a claim from independent sources, or from known facts
- the *plausibility* (believability) of a claim, or whether the source can provide credible reasons for the claim.

The candidates' ability to approach the evidence fairly and objectively will be assessed through their answers to **three** questions requiring short written answers and on **one** question which asks them to draw a general conclusion, or reach a decision, based on their evaluation of the evidence.

Question 2: Reasoning in a Scientific Context

Candidates are given argument, evidence, or information in the form of numbers, graphs or pictures, with or without an accompanying text. Whilst being broadly scientific in content and treatment, the material does not require specialist scientific knowledge or understanding.

Candidates are asked **four** questions, which require short written answers testing, for example, their ability to assess hypotheses, draw conclusions and suggest credible explanations.

Question 3: Evaluating and Presenting Argument

Candidates are given an argument of around 350 words. They are given several critical thinking tasks which they must complete. They must show that they understand argument structure; that they can comment critically on how sound and effective the reasoning is; and that they can extend the reasoning using ideas of their own.

5.3 Paper 3: Problem Analysis and Solution

This paper tests the same sorts of skills identified in Paper 1, i.e. PS1–PS10. It also requires the additional skills of (a) developing a model (PS11) and (b) analysing complex data and drawing conclusions (PS12).

The mathematical content for Paper 3 requires, in addition to junior/elementary school mathematics, some knowledge of:

- numerical probability (e.g. the throws of a die), including the combination of independent and non-independent events
- expressing problems as linear algebraic equations and the solution of these equations
- expressing problems as a pair of simultaneous equations with integral coefficients and the solution of these equations
- use and manipulation of integer powers (e.g. knowing that $3^3 \times 3^2 = 3^5$) and square roots
- the use of tree and decision diagrams
- the calculation and use of mode, mean and median of sets of data
- the use of Venn and Carroll diagrams for solution of categorisation problems.

PS11 Developing a model

Modelling requires the candidate to develop a set of equations, a table or some other set of data which represents the mathematics of a real situation. As a very simple example, a telephone bill which consists of a standing charge plus a fixed rate per time of calls could be modelled as: $b = s + at$, where b is the bill, s is the standing charge, a the cost per minute and t the minutes used.

The candidate might be required to take a real physical situation and extend the data and parameters given to draw conclusions about other related and possibly more complex situations.

PS12 Analysing complex data and drawing conclusions

Analysis requires candidates to combine raw data in appropriate ways so they are able to draw conclusions. The data may be presented as words, tables and/or graphs. The candidates are expected to:

- select the pieces of data which are relevant to the questions asked
- look for patterns in the data
- analyse the data mathematically to lead to the conclusions required.

Question 1: Solving Complex Problems

The question will have some stimulus source material based around a single topic. Information may be presented in five categories: tables, graphs, words, pictures, diagrams. The stimulus will probably include more than one of these categories. The stimulus will be based on a realistic scenario.

The question will require the candidate to demonstrate several of the skills PS1–PS10. The complexity of the problem will be greater than on Paper 1, requiring candidates to demonstrate a more sophisticated level of application of skills PS1–PS10. To answer some parts of the question, candidates may need to select and apply more than one of these problem solving skills.

The question will have several parts. Candidates will need to give a written response to each part.

Question 2: Solving Complex Problems

This question will have an equivalent format to question 1.

Question 3: Developing a model

A realistic 'task' is described to the candidate. This task might be of a physical nature (e.g. the amount of netting needed to cover the sides of a birdcage) or non-physical (e.g. a business challenge such as maximising profit). Some tasks may include a mixture of physical and non-physical aspects – such as maximizing sound output from a speaker system while working within a financial budget.

The task description might include:

- an overall project 'aim'
- one or more essential objectives (requirements)
- one or more additional objectives that are desirable but non-essential
- some constraints which the solution must satisfy.

The candidate will need to use the information given in the task to develop a simple mathematical model and/or explore the application of this model.

For example, the application of the model might be used to identify the range of solutions that are possible within the constraints, or the most desirable outcome that can be achieved, or which constraint would need to be relaxed in order to obtain a better outcome.

The question will consist of several parts.

Question 4: Analysing Complex Data and Drawing Conclusions

Candidates are presented with various data that relate to a single problem. The data may be spread across more than one table and/or graph. Data may also be included in the introductory description of the problem. Some of the data may be irrelevant to the problem to be solved.

Faced with relatively complex data in disparate forms, the candidate will need to recognise how the data can be used to solve the problem posed.

This might include identifying what is the relevant data and/or combining data from different sources to generate a solution or intermediate solution.

The question will make clear what form of solution is required. But the form of what is required will vary between questions. For instance, the candidate might be asked to:

- identify the relevant datum
- find an optimal solution (maximum/minimum) or an extreme case
- verify a 'claim' that has been stated (is it true or false?)
- identify an assumption that must be made to reach a solution with a particular attribute
- rank the given options according to some criteria
- select from a number of options
- make a recommendation
- reach some other form of conclusion from the data given.

The question will consist of several parts.

5.4 Paper 4: Applied Reasoning

The aim of this paper is to assess the candidate's ability to apply critical thinking skills to real life situations which may be encountered in higher education, in employment or in intellectual debate.

For example, at university a student may be introduced to the view or belief of a respected academic or thinker. For instance, this might be Noam Chomsky's criticism of US foreign policy or Ghandi's belief that violence can never be justified or Chinua Achebe's claim that Conrad's novel 'Heart of Darkness' is racist. Within each academic discipline there are radical and opposing viewpoints. The university student may be asked to research and reflect, and write an essay supporting or opposing the given view or belief, submitting the essay to the professor within a short time. Paper 4 is largely concerned with simulating a task such as this. The candidate for Paper 4 does not need to find the relevant documents (these are given); however, the candidate does need to analyse and evaluate the evidence provided, then go on to construct their own argument either for or against a given view. They need to be able to present their own argument which is clear, robust and convincing. They also *need to work efficiently*, so that they produce a high quality answer in a short time.

Applied reasoning is also a necessary skill in most jobs. This includes occupations in science, medicine, law and management. For instance, a business manager working at company X might be asked by the Board of Directors to evaluate the Chief Executive's proposal that the business should buy company Y. The manager would need to analyse and evaluate this proposal by studying multiple sources of information such as the financial statements of the companies, marketing analyses, competitor data and economist reports. The manager would then need to construct his own argument either in favour of or against the take-over. Again, there would be a deadline and the manager would need to work efficiently to produce a sound case in a short timeframe.

A common characteristic, both at university and in a professional job, is the ability to understand and consider a stated view, analyse and evaluate it, then either support or reject it (in a substantive way). The ability to do this is a precursor to effective decision-making and action.

The paper may test (directly or indirectly) any of the skills CT1–CT14. However, there will be an emphasis on assessing the candidate's ability to apply critical thinking skills in a holistic way. In particular, there will be an emphasis on the skills of analysis, evaluation and construction of argument.

CT13 Construction of a Reasoned Case

This is a multi-faceted skill which enables the candidate to go beyond the skills of analysis and evaluation of argument. CT13 may be regarded as a deepening and formalizing of the skill of further argument (CT12). The skill of constructing a reasoned case consists of the following sub-skills.

- *Selecting relevant material* from a range of documents. The usefulness, relevance and reliability of the information and arguments in the evidence (documents) will vary.
- *Combining information or opinion* from different kinds of sources through critical evaluation, comparison and inference.
- *Proposing a clear conclusion* or recommendation. This involves coming to a definite 'view', and not being inconclusive ('sitting on the fence'). The candidate might do this, *depending on what a question requires*, by accepting a given statement (or the opposite conclusion), or by choosing between two or more alternative conclusions that appear in different documents, or by proposing an altogether different conclusion (which might be based on counter-arguments contained in the documents and/or the candidate's own knowledge).
- *Justifying the conclusion* or recommendation with sound reasoning. Each critically selected or synthesised strand of reasoning should relevantly support the preferred argument or the proposed main conclusion or recommendation.
- *Identifying and responding effectively to counter-positions* (objections to own argument).

CT14 Interpretation of Statistics

- Statistics can be used to add weight to a claim. But candidates need to develop a sceptical approach because authors can make intentional (or unintentional) errors when using statistics to support their arguments. Candidates should be able to analyse and evaluate the use of statistics in supporting a particular claim.
- A candidate might wish to use statistics to support a given argument. Thus, it is important that candidates understand what they might reasonably infer from a given set of statistics.
- Candidates should be familiar with the meaning of the following terms which may be used in conjunction with statistics: correlation, causation, likely, unlikely, inference, prediction, error, uncertainty, risk, sample, population, distribution, outlier. Candidates should be familiar with graph shapes (e.g. graphs of exponential growth/decay and the bell curve) and how a visual representation may be misleading yet technically accurate (e.g. truncated scales or logarithmic scales). Candidates are not required to understand the meaning of 'statistical significance' nor are they required to have any knowledge of statistics formulae.
- This skill may be regarded as extension of skills CT11 (analysing and evaluating evidence and argument) and CT10 (engaging in inference and deduction).

Question 1: Interpretation of Statistics

This question might be considered as having some similarity to the 'Reasoning in a Scientific Context' question on Paper 2. However, there are some important differences. On the Applied Reasoning paper the statistics may be more complex, they may have a non-scientific context, and the candidate will be expected to be adept at using a broader range of concepts and terms. [Note: It should not be assumed from these comments that the 'Reasoning in a Scientific Context' question on Paper 2 will always include statistics.]

The candidate will be presented with some information, which will include statistics and often also a related claim. The candidate will be asked to undertake one or more tasks relating to the interpretation of the statistics provided, such as to:

- make criticisms of the statistics themselves, or the way that they have been used or presented
- assess the validity of an inference drawn from the statistics (i.e. a claim being made)
- identify inferences that can be drawn from the data presented.

For example, a candidate may need to consider: Is the sample reasonable? Are any of the statistics unclear, imprecise or ambiguous? Is the data representation misleading? Are the data relevant to the claim being made? Does correlation imply causation?

Question 2: Analysis of Given Argument

Arguments and information relating to a single topic are given in a number of documents. Questions 2, 3 and 4 are all based on this single topic.

Question 2 will require candidates to analyse the argument presented in one of these documents. It can be expected that this argument will be more complex, and its structure less transparent, than arguments presented in Paper 2.

Candidates should show their ability, at this level, to pinpoint and apply their knowledge of the underpinning structure of arguments (e.g. identifying reasons, counter-arguments, intermediate conclusions, etc., as appropriate to the particular argument being analysed).

Question 3: Evaluation of Given Argument

Candidates should be able to demonstrate their critical evaluation skills (e.g. by identifying assumptions, flaws and strengths/weaknesses) in a given stem document containing an argument. The coherence, clarity and precision of the candidate's evaluation will be considered in the assessment.

Question 4: Construction of a Reasoned Case

Having completed some analysis and evaluation of some of the source material, candidates are required to construct a reasoned case by selecting relevant material from the full range of documents, combining information or opinion from these documents, proposing a clear conclusion or recommendation, justifying this conclusion or recommendation, and responding effectively to counter-positions. *Candidates are expected to know that they must demonstrate these sub-skills if they are asked to construct a reasoned argument – candidates should not expect the question to prompt them to demonstrate these sub-skills.*

Candidates should be able to skim-read while not glossing, having a keen perceptive eye to find reasons and examples that bolster their position in the argument. They should also find points of counter-arguments which they can critically neutralise or knock down using valid critical tools such as credibility criteria. They should be able to evaluate the significance, relevance and typicality of evidence in the context of the argument they construct. They should draw upon their own ideas and knowledge, not just to construct a further argument but to build a coherent reasoned case in the context of the wider and more complex perspectives presented in the source documents.

Candidates should aim to present an argument that is convincing to an educated reader.

Although candidates are encouraged to be succinct in the expression of their arguments, candidates should be clear in their minds that an extended piece of writing is required to answer question 4 and that more than half of the marks on the Applied Reasoning paper may be available for this question. Candidates should manage their time in answering questions 1–3 so that they have sufficient time to construct a reasoned case in answering question 4.

6. Grade descriptions

A **Grade A** candidate:

- shows clear understanding of both simple and complex arguments in terms of their structure and techniques
- shows consistent success at solving (often complex) problems requiring initiative, precision and attention to detail
- shows the ability to make perceptive critical evaluations of arguments in terms of their strengths, weaknesses, flaws, implicit assumptions, persuasive devices, etc.
- demonstrates consistent ability to make sound inferences (e.g. from evidence); and to critically assess the reliability of claims and their sources
- presents convincing, relevant and well-developed arguments in response to stimulus materials and questions
- structures work so that the process of thought is made clear
- shows understanding of the conventions of language; and uses the vocabulary of reasoning appropriately.

A **Grade B** candidate:

- shows understanding of the broad structure of arguments, some of them complex
- is successful in solving a number of problems requiring initiative and attention to detail
- is able to evaluate arguments in terms of their soundness or effectiveness, making some reference to flaws, assumptions, etc.
- is able to make generally sound inferences, and an awareness of the criteria needed to assess the reliability of claims and their sources
- presents some sound, relevant arguments in response to stimulus materials and questions
- generally makes his or her thinking clear
- shows some understanding of the conventions of language; and on occasions uses the vocabulary of reasoning in a way that shows he/she understands its correct usage.

A **Grade E** candidate:

- is able to recognise some of the characteristic features of reasoning
- shows some success in solving problems
- offers some evaluation of arguments in terms of their effectiveness
- shows some ability to draw conclusions from texts and other sources
- gives some further arguments in response to stimulus materials and questions
- constructs responses with sufficient clarity for meaning to be clear.

7. Appendix A: Sample Paper 1 questions

PS1 Sample question (Data Extraction)

The cost of sending letters from the United Kingdom to continental Europe is shown below.

Not over	£ p	Not over	£ p	Not over	£ p
20 g	0.22	250 g	1.06	500 g	2.02
60 g	0.37	300 g	1.25	750 g	2.77
100 g	0.53	350 g	1.44	1000 g	3.52
150 g	0.70	400 g	1.64	1250 g	4.07
200 g	0.88	450 g	1.83	1500 g	4.62

A firm in London wishes to send two letters to separate clients in continental Europe. The letters weigh 75 g and 215 g.

What is the total cost of sending the two letters?

A £1.25
B £1.41
C £1.43
D £1.59

Key D

Stimulus Type Table
Justification
The 75 g letter will cost 53p to post (over 60 g but under 100 g) and the 215 g letter will cost £1.06p (over 200 g but under 250 g). The total cost is 53p + £1.06p = £1.59p.

Candidates are expected to select the two correct values from the table, given the weights of the parcels, and add these together. The primary skill is extraction with a small amount of processing.

PS2 Sample question (Data Processing)

We had 76 people wanting coffee at a conference. The caterers provided enough coffee for each of 80 people to have an 8 fluid ounce cup three-quarters full. We carefully filled each cup to exactly three-quarters full as we handed them out, but failed to notice that they had given us 10 fluid ounce cups.

How many people went without?

A 0
B 4
C 8
D 12

Key D

Stimulus Type Words
Justification
The amount of coffee provided by the caterers was 80 (people) × 8 (fluid ounce cups) × $^3/_4$ (full) = 480 fl oz.
The amount of coffee in one of the larger cups is 10 (fluid ounces) × $^3/_4$ (full) = 7.5 fl oz.

The number of people that can be catered for is 480 (the amount of coffee provided) / 7.5 (in each cup) = 64.
There are 76 people so 76 – 64 = 12 people will go without.

The candidate must use the data correctly (all the data is relevant so the only extraction skill is to use the correct numbers at the correct time). The skill is processing. Finding a method is a minor part of the answer, as the method of solution is straightforward.

PS3 Sample question (Finding a Procedure)

Each of two identical cars can carry enough fuel to travel 100 miles only. To make a longer journey over a deserted area, they set out together and then at some stage the first car transfers fuel to the other and returns home. The second car travels on.

What, approximately, is the furthest distance from home that the second car can travel?

A 125 miles

B 133 miles

C 150 miles

D 167 miles

Key B

Stimulus Type Words

Justification

A method must be developed to solve this problem – it cannot be done just using extraction or processing.

One way is by trial and error. For example, if the two cars travel 50 miles together, it would be possible to transfer 50 miles worth of fuel from one to another but then the car donating the fuel would be empty so this is clearly too far. Similarly, at 25 miles only 25 miles worth could be transferred so the donor car would have 25 miles left when it reaches home.

It becomes clear that the donor car must divide its fuel into 3 – $^1/_3$ for the outward journey, $^1/_3$ to transfer to the other car, and $^1/_3$ to return. At 33 miles the car which is continuing is completely refilled and would have enough for another 100 miles, making 133 miles in total.

PS4 Sample question (Searching)

A private mail delivery company makes the following charges for delivering letters and packages:

Weight up to 60 g	25 pence
Each extra 10 g or part thereof	5 pence

A woman wishes to use this company to send a manuscript either as a single package of weight 138 g or two or more packages with a total weight of 138 g.

What is the lowest cost of postage with this company?

A 59 pence
B 60 pence
C 64 pence
D 65 pence

Key B

Stimulus Type Words/Table
Justification
The skill is in performing a search of the options on splitting up the package to find how many pieces, and of what weights, is most effective.

As a single package it would cost 25p for the first 60 g and 8 × 5p for the remaining 78 g, or 65p in total.

If sent as two packages, it is most economical to have both at 60 g or more, as the first 60 g is pro-rata cheaper than the remaining weight. Thus 60 g + 78 g is as effective as any other split: this costs 25p + (25p + 2 × 5p) = 60p.

If sent as three packages, once again it is best to keep as many as possible at 60 g or more. They would then divide as 60 g + 60 g + 18 g at 3 × 25p = 75p.

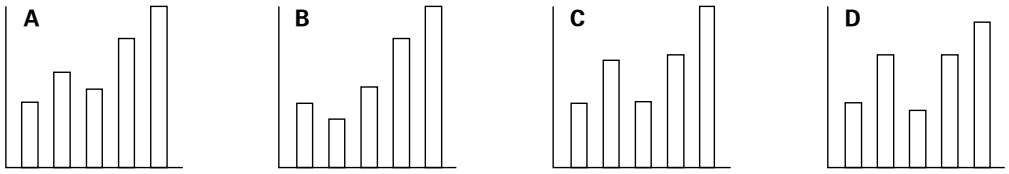
The two package option is the best at 60p.

PS5 Sample question (Identifying Similarity)

The table shows the age distribution of the inhabitants of a small town:

Age group	0–15	16–25	26–45	46–64	65 +
Number of inhabitants	2997	4432	3761	5980	7440

Which of the following charts, if suitably labelled, could represent the data above?



Key A

Stimulus Type Table
Justification
The second bar should be approximately 1.5 × the height of the first, the third should be in between the first and second, the fourth approximately twice the height of the first and the fifth the largest.

Only chart A shows this.

PS6 Sample question (Suggesting Hypotheses)

Tina is a part-time teacher. She teaches her lessons during the day and, when she has finished her last lesson, she leaves the school and goes to the bus stop to get a bus home. All lessons start on the hour, or at quarter past, half past or quarter to the hour and each lasts 45 minutes. It takes her 15 minutes from the end of a lesson to reach the bus stop. She doesn't know what the bus timetable is, but she notices that she always has to wait either 5 minutes or 20 minutes for a bus.

Which of the following explains the times she has to wait?

A The buses run every 15 minutes at 5, 20, 35 and 50 minutes past the hour
B The buses run every half hour at 5 and 35 minutes past the hour
C The buses run every 20 minutes at 0, 20 and 40 minutes past the hour
D In the morning the buses run every hour at 5 minutes past the hour; in the afternoon they run every hour at 20 minutes past the hour

Key B

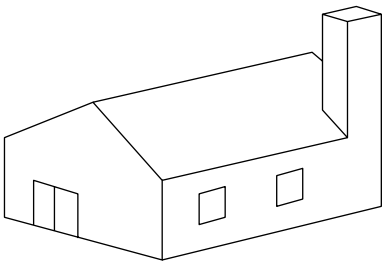
Stimulus Type Words
Justification
She always arrives at the bus stop on an exact quarter hour – on the hour or quarter past, half past or quarter to the hour (the lessons start on a quarter hour, take ¾ hour and she takes 15 min to get to the bus stop).

If she arrives at the bus stop at the hour or half past, she waits five minutes. If she arrives at quarter past or quarter to, she waits 20 minutes. The buses are at 5 and 35 minutes past the hour. B explains this.

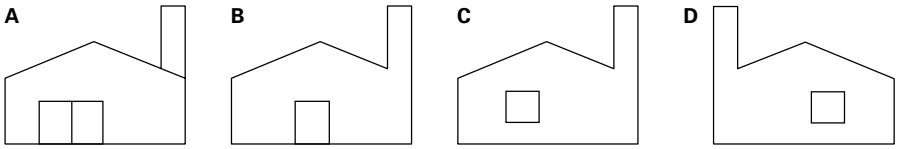
The skill is in matching the verbal stimulus to one of the verbal explanations.

PS7 Sample question (Spatial Reasoning)

The diagram shows a factory. There is a square chimney in the south-eastern corner of the factory. There is an entrance in the western end which can be seen in the diagram. There are two windows in the southern wall. There is also a door in the northern wall of the factory and a window in the eastern wall of the factory, which are hidden in the diagram.



Which of these is a possible view of the eastern end of the factory?



Key D

Stimulus Type Picture and Words

Justification

The view from the eastern end of the factory should show the chimney on the left and a window in the wall. The roofline should appear behind the chimney. Only figure D shows this.

PS8 Sample question (Data Necessity and Sufficiency)

Bill and Colin are twin brothers. They plan to meet at a hotel between their houses to exchange birthday presents. Bill's journey is on motorways and he travels at an average 120 km/hr. Colin's journey is on minor roads and he travels at 80 km/hr. Bill leaves at 10 am. They expect to arrive at the hotel at the same time.

Which one of the following further pieces of information would be sufficient to determine at what time they will meet?

A Colin's journey time
B Colin's travel distance
C Colin's departure time
D Bill's travel distance

Key D

Stimulus Type Verbal
Justification
In order to find the meeting time, from information on either journey, the following calculation has to be carried out:

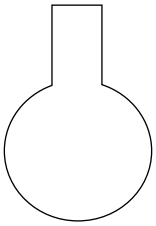
Meeting time = departure time + travel distance / average speed.

For Bill, we have two of the values on the right hand side (departure time and average speed), for Colin we have only one (average speed). Thus, the only single piece of information which would allow us to calculate the meeting time, would be Bill's travel distance, so D is correct.

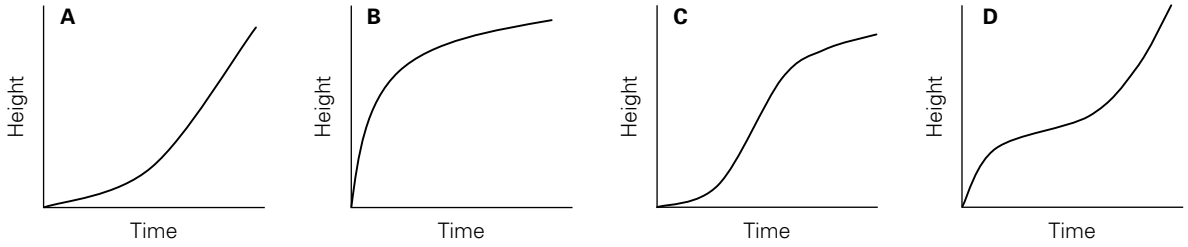
PS9 Sample question (Working with Models)

The drawing shows a cross section of a bottle used in a laboratory. In order to determine the volume of liquid in the bottle for various heights, water is allowed to flow into the bottle at a constant rate.

An observer makes frequent notes of the height the water has reached and of the time. He draws a graph to illustrate his observations.



Which of the following graphs could be the one drawn by the observer?



Key D

Stimulus Type Words and Picture

Justification

The height will rise quickly at first (as the vessel is narrow at the bottom), it will then rise more slowly as the level reaches the wider section and more quickly again at the narrower section towards the top. All these segments will show curves as the area changes continuously. The rate of rise will then become constant in the cylindrical section at the top, giving a straight line segment. D is the only graph to show this.

PS10 Sample question (Choices and Decisions)

I have none of my nephew's favourite biscuits left. My nephew visits me, without fail, at least 3 times a week, though never more than five times. On each visit I know he will eat at least 6 biscuits but I won't let him have more than 8. Packets of biscuits can contain as few as 10 biscuits, or as many as 12.

How many packets of biscuits must I buy to make sure I do not run out within the next two weeks?

A 4
B 5
C 6
D 8

Key D

Stimulus Type Verbal
Justification
A decision on how many to buy is made by dividing my nephew's maximum requirement by the minimum number of biscuits in a pack. This is the only way of ensuring there are enough.

The most biscuits my nephew will eat in two weeks is 2 (weeks) × 5 (maximum visits per week) × 8 (maximum number of biscuits per visit) = 80. The minimum number of biscuits in a pack is 10, so 8 packets will be required. D is correct.

8. Appendix B: Resource list

Endorsed textbook for the Cambridge syllabus

Butterworth J and Thwaites G — *Thinking Skills* (2nd edition), Cambridge University Press, 2013, ISBN: 978-1107606302

Although not endorsed texts, Anne Thomson's *Critical Reasoning: A Practical Introduction* (3rd Edition, 2009), and George Polya's *How to Solve It* (1990) are also highly recommended for the critical thinking and problem solving parts of this syllabus.

Other Textbooks (These books look only at Critical Thinking and are not aimed at the Cambridge syllabus):

Author	Title	Date	Publisher	ISBN
Hart C, Lally J and McCabe T	A2 Critical Thinking for OCR, Student Book, 2nd edition	2009	Heinemann	0435235901
Lally J, Matthews R, Rowe A, Thwaites J and McCabe T	AS Critical Thinking for OCR, Student Book, 2nd edition	2008	Heinemann	0435235893
Haralambos M and Jones R	Critical Thinking for OCR	2006	Causeway Press	1405847719
Van den Brink-Budgen R	Critical Thinking for Cambridge International AS Level	2005	How To Books	1845280857
Van den Brink-Budgen R	Critical Thinking for A2	2006	How To Books	1845280954

Critical Thinking

Author	Title	Date	Publisher	ISBN
Black B (ed.)	An A to Z of Critical Thinking	2011	Continuum	978-1441117977
Blastland M and Dilnot A	The Tiger That Isn't: Seeing Through a World of Numbers	2008	Profile Books	1846681111
Boswell T and Kemp G	Critical Thinking: A Concise Guide, 2nd edition	2005	Routledge	0415343135
Copi I M and Burgess-Jackson K	Informal Logic, 3rd edition	1995	Prentice Hall	0132290480
Elder L and Paul R	Critical Thinking: Tools for Taking Charge of Your Learning and Your Life, 2nd edition	2005	Prentice Hall	0131149628
Ennis R H	Critical Thinking	1995	Prentice Hall	0133747115
Fisher A	Critical Thinking: An Introduction	2001	Cambridge University Press	0521009847
Fisher A	The Logic of Real Arguments	2004	Cambridge University Press	0521654815
Govier T	A Practical Study of Argument	2004	Wadsworth	0534605257
Hitchens C	Letters to a Young Contrarian	2002	Basic Books	0465030335
Huff D	How to Lie with Statistics	1991	Penguin	0140136290
Phelan P and Reynolds P	Argument and Evidence: Critical Analysis for the Social Sciences	1995	Routledge	0415113733
Rudinow J and Barry V E	Invitation to Critical Thinking, 6th edition	2007	Wadsworth	0495103713
Schick T and Vaughn L	How to Think about Weird Things: Critical Thinking for a New Age	2004	McGraw-Hill	007287953X
Shand J	Arguing Well	2000	Routledge	0415166861
Thomson A	Critical Reasoning in Ethics	1998	Routledge	0415171849
Thomson A	Critical Reasoning: A practical Introduction, 3rd edition	2009	Routledge	0415445876
Van den Brink-Budgen	Critical Thinking for Students: Learn the Skills of Critical Assessment and Effective Argument	2000	How To Books	1857036344
Warburton N	Thinking from A to Z, 3rd edition	2007	Routledge	0415433711
Weston A	A Rulebook for Arguments	2001	Hackett Publishing	0872205525

Problem Solving

Author	Title	Date	Publisher	ISBN
Polya G	How to Solve It	1990	Penguin	0140124993
Butterworth J and Thwaites G	Preparing for the BMAT: The Official Guide to the Biomedical Admissions Test	2005	Heinemann	0435280139
Eastaway R	Why Do Buses Come in Threes? (The Hidden Mathematics of Everyday Life)	2005	Robson Books	1861058624
Eastaway R and Wyndham	How Long is a Piece of String? (More Hidden Mathematics of Everyday Life)	2003	Robson Books	1861056257
Forte I, Schurr S and Quinn A	180 Icebreakers to Strengthen Critical Thinking and Problem-Solving Skills	1996	Incentive Publications	0865303452
Posamentier A and Krulik S	Problem-Solving Strategies for Efficient and Elegant Solutions, Grades 6–12	2008	Corwin Press	1412959705

Internet Resources for Critical Thinking and Problem Solving Skills

Organisation name	Web address	Details
The Foundation for Critical Thinking	**www.criticalthinking.org**	Includes details of the Thinker's Guide series of booklets.
Open CourseWare on Critical Thinking	**www.philosophy.hku.hk/think/**	Includes a Mini Guide to Critical Thinking and Class Exercises.
Critical Thinking on the Web	**www.austhink.org/critical/**	A directory of online resources.
The Argument Clinic	**www.unco.edu/philosophy/clinic.html**	Analysis of submitted arguments. Note: the .html is needed.
The Fallacy Files	**www.fallacyfiles.org/**	Examples of fallacies.
Mind Games	**www.bbc.co.uk**	Try searching on 'mind games' within the BBC website.
More or Less	**www.bbc.co.uk/news/magazine-17707410**	Excellent magazine and radio programme for interpretation of statistics.
Snopes	**www.snopes.com**	Analysis of urban legends.

Sources of Topics

The following do not deal directly with Thinking Skills but could be used by the teacher for developing topics (where appropriate) for discussion and analysis in the classroom.

Author	Title	Date	Publisher	ISBN
Fernandez-Armesto F	Ideas that Changed the World	2004	Dorling Kindersley	1405305932
Various	Very Short Introductions*	Various	Oxford University Press	Various

* OUP has published over a hundred of these small paperbacks (see **www.oup.co.uk**). There is a wide range of topics including: Indian Philosophy, International Migration, Socrates, Logic, Gandhi, Drugs, Animal Rights, Ethics, Globalisation, Postcolonialism, Evolution, Free Will, Medical Ethics, Anarchism, Global Warming, Dreaming, Buddhist Ethics, Nationalism, World Trade Organisation, Feminism, Global Catastrophes, International Relations, Racism, African History, Chaos, Citizenship, Mandela.

DVD: An Inconvenient Truth – The Planetary Emergence of Global Warming and What We Can Do About It Today. Director: Davis Guggenheim. Presented by Al Gore.

Internet Resources for Sources of Topics

Local and national newspapers can be a rich source of material for analysing arguments. The Internet provides a way to analyse opinion and the reporting of news from countries other than one's own. All of the following are English language websites.

Organisation name	Web address	Details
BBC	**www.bbcworld.com** **www.bbc.co.uk/worldservice**	International websites from the London based BBC.
Aljazeera	**www.aljazeera.com**	Qatar based international news and current affairs channel.
New York Times	**www.nytimes.com**	News and opinion from serious US publication.
Time	**www.time.com/time**	US current affairs magazine.
The Times	**www.timesonline.co.uk**	Serious UK newspaper. The Guardian and Independent sometimes give alternative views.
Daily Mail	**www.dailymail.co.uk**	Can be a very good source for analysing argument in class.
Mail and Guardian	**www.mg.co.za**	South African news and opinion.
New Zealand Herald	**www.nzherald.co.nz**	New Zealand perspective on news.
Straits Times	**www.straitstimes.com**	From Singapore.
Jakarta Post	**www.thejakartapost.com**	Asian view from Indonesia.
Bangkok Post	**www.bangkokpost.com/news**	From Thailand.

New Straits Times	**www.nst.com.my**	Malaysian source.
Pakistan Dawn	**www.dawn.com**	View from Pakistan.
The News	**www.jang.com.pk**	From Pakistan.
Asia Times	**www.atimes.com**	Hong Kong based.
New Scientist	**www.newscientist.com**	Good source for 'reasoning in a scientific context' (paper 2).
Friction TV	**www.friction.tv**	Online platform for user generated news and opinion.
The Times of India	**www.timesofindia.indiatimes.com**	Major Indian newspaper.

Resources are also listed on Cambridge's public website at **www.cie.org.uk**. Please visit this site on a regular basis as the Resource lists are updated through the year.

Access to teachers' email discussion groups, suggested schemes of work and regularly updated resource lists may be found on the Cambridge Teacher Support website at **http://teachers.cie.org.uk**. This website is available to teachers at registered Cambridge Centres.

9. Other information

Equality and inclusion

Cambridge International Examinations has taken great care in the preparation of this syllabus and assessment materials to avoid bias of any kind. To comply with the UK Equality Act (2010), Cambridge has designed this qualification with the aim of avoiding direct and indirect discrimination.

The standard assessment arrangements may present unnecessary barriers for candidates with disabilities or learning difficulties. Arrangements can be put in place for these candidates to enable them to access the assessments and receive recognition of their attainment. Access arrangements will not be agreed if they give candidates an unfair advantage over others or if they compromise the standards being assessed.

Candidates who are unable to access the assessment of any component may be eligible to receive an award based on the parts of the assessment they have taken.

Information on access arrangements is found in the *Cambridge Handbook* which can be downloaded from the website **www.cie.org.uk/examsofficers**

Language

This syllabus and the associated assessment materials are available in English only.

Grading and reporting

Cambridge International A Level results are shown by one of the grades A*, A, B, C, D or E, indicating the standard achieved, A* being the highest and E the lowest. 'Ungraded' indicates that the candidate's performance fell short of the standard required for grade E. 'Ungraded' will be reported on the statement of results but not on the certificate. The letters Q (result pending), X (no results) and Y (to be issued) may also appear on the statement of results but not on the certificate.

Cambridge International AS Level results are shown by one of the grades a, b, c, d or e, indicating the standard achieved, 'a' being the highest and 'e' the lowest. 'Ungraded' indicates that the candidate's performance fell short of the standard required for grade 'e'. 'Ungraded' will be reported on the statement of results but not on the certificate. The letters Q (result pending), X (no results) and Y (to be issued) may also appear on the statement of results but not on the certificate.

If a candidate takes a Cambridge International A Level and fails to achieve grade E or higher, a Cambridge International AS Level grade will be awarded if both of the following apply:

- the components taken for the Cambridge International A Level by the candidate in that series included all the components making up a Cambridge International AS Level
- the candidate's performance on these components was sufficient to merit the award of a Cambridge International AS Level grade.

For languages other than English, Cambridge also reports separate speaking endorsement grades (Distinction, Merit and Pass), for candidates who satisfy the conditions stated in the syllabus.

Entry codes

To maintain the security of our examinations, we produce question papers for different areas of the world, known as 'administrative zones'. Where the component entry code has two digits, the first digit is the component number given in the syllabus. The second digit is the location code, specific to an administrative zone. Information about entry codes for your administrative zone can be found in the *Cambridge Guide to Making Entries*.

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