**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**GCE Advanced Level**

# MARK SCHEME for the October/November 2012 series

## 9694 THINKING SKILLS

**9694/43** Paper 4 (Applied Reasoning), maximum raw mark 50

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2012 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

**1 Do you think that the local government's decision to close Sinar's Leisure Learning Centre can be justified on the basis of the statistics and information provided? Justify your answer.**

There are many reasons why the information provided may be insufficient to justify the decision. Credit 1 mark for identification and 2 marks for development (e.g. reference to why a certain factor is significant to the council's decision) – *max 5 marks*

Example answer:

- Relative local populations not given **[1]**; Sinar's having the highest total expenditure may be justified by it being the largest town in the region **[1]**.

Other areas around which points can be developed include:

- No information on demographics for the 8 areas which could provide many reasons for different patterns of expenditure.
- 2011-2012 may have been an atypical year.
- Figure for staff employed per local population head may be misleading if say Sinar, being a historic town, has high rates of tourists.
- Ranked values not very informative about actual differences between values.
- Absolute values compared with values per population head – unreasonable.
- Selective sample of library records from June 2012.
- Book-borrowing only a limited representation of services provided by centre.
- High expenditure may have been due to some kind of investment, e.g. purchasing IT resources.

**2 Briefly analyse the argument in Document 1: *Electronic Brain*, by identifying its main conclusion and main reasons and/or intermediate conclusions and counter-arguments. [6]**

**CA** – Some think it is not possible…
**MC** – It would be worthwhile and beneficial for the human race to create artificial intelligence.

**CA** – What we have developed in the area of computers is still not as interesting, powerful, and creative as the human brain.
R – There is nothing we can do to stop computers evolving into superstructures.
**IC** – It is inevitable that AI will come into being.

R – …they will not have our negative human qualities…
**IC** – A world where robots interact with human beings will be a more peaceful world.

R – It will work on a similar frame of creative capabilities as human brains.
**IC** – An AI computer brain will be para-human.

R – There will be many ways in which a computer brain can outperform the human brain.
**CA** – There are certain dimensions of human experience that may not be accessible to a computer brain.
**IC** – Such a computer brain is far superior to the human brain.
**IC** – Such a computer brain…will enhance human lives.
*(NB if these two written in one sentence only credit 1)*

**Marks**
1 mark for each emboldened element (maximum 4 if MC not identified).
Max 2 available for identification of CAs.

**3 Critically evaluate Tan's argument in Document 1: *Electronic Brain*, by identifying and explaining strengths, weaknesses, implicit assumptions and flaws.**

***Weakness***

**Para 1**

***Ad hominem***: "…such people must be driven by fear of being challenged by a greater intelligence..."

**Para 2**

***Assumes*** Moore's Law to be truth; however, this is not a physical law but a hypothesis / futurist prediction / extrapolates from trends.

***Conflation*** of processing speed with human intelligence / intellectual prowess. Mere processing speed will not make the computer brain as "interesting, powerful and creative" as the human brain.

***Assumption*** that current rates of progress will continue (i.e. that Moore's Law is correct).

***Assumption*** that there are no other factors/variables which may impede advance, e.g. wars, problems of funding.

***Restricting the options*** – there maybe other ways to manage exponential growth than to simply stop manufacturing computers.

***Circularity / begging the question:*** "inevitable that AI will come into being" – only repeats earlier assertion that computers will continue to evolve.

***Irrelevance:*** "…a $1000 computer will reach speeds surpassing the entire human species" does not have any meaning and therefore has no relevance.

***Assumption*** that we will not stop making computers.

***Assumption*** that humans will not continue to have conflicts with each other and prevent peace.

**Para 3**

***Contradiction***: The author argues that AI will have feelings, but then goes on to exclude feelings such as greed.

***Assumption*** that competitiveness is generally a bad thing.

**Para 4**

***Necessary / sufficient*** – capability for face and voice recognition may be necessary but are not sufficient for breaking down cultural barriers, such as ingrained hostilities and stereotypes.

**Para 5**

***Non-sequitor:*** that superior brains will enhance human lives – does not follow without further explanation as to how.

***Contradiction***: It is claimed that computer brains will not have access to emotional experiences, but Para 3 states that they will have feelings.

***Assumption*** that emotional experiences in social contexts is not needed for survival in the modern world.

***Assumption*** that capability of computer brains will not negatively affect the quality of human lives e.g. many jobs may be lost if machines replace human skills / that computers may not be used to carry out negative and destructive purposes.

***Equivocation:*** shift of meaning from superiority in terms of technical excellence, which is measurable, to superiority in terms of greatness, which is subjective and cannot be measured in the same way.

***Strength***

Tan does respond to relevant counter-argument/s in attempt to build up his case e.g. "what we have developed in the area of computers is still not as interesting, powerful and creative as the human brain" although he relies mostly on extrapolation and hypothesis.

**Overall Evaluation**
A weak argument. Tan argues that the creation of AI is inevitable, but it does not therefore follow that it would be worthwhile and beneficial, in other words desirable. He emphasises functional superiority as the appeal factor but this is not sufficient to support why computer brain should be built. He has not argued convincingly for why it would be *desirable*.

**Marks**
For each sound evaluative point 1 mark and 2 marks for a developed point, to a maximum of 8 marks.
Up to 2 marks for an overall judgment on the argument. (Maximum 9 marks.)

**4 'A computer brain will be as good as, if not better than, a human brain.'**

**Construct a well-reasoned argument either for or against this statement, commenting critically on some or all of Documents 1 to 5, and introducing ideas of your own. [30]**

| Band | Overall | Within | Score |
|---|---|---|---|
| Band IV | Considers counter-positions to own argument and reflects on implications in arriving at conclusion. | Developed consideration of counter-positions. Knows precisely what complexities face own argument. | 27–30 |
| | | Limited development of 1 or 2 counter-positions to own argument. | |
| Band III | Well-reasoned, coherent argument, which should include evaluation of sources, integration of viewpoints, further argument and simple consideration of counter-arguments (or conflicting sources). Must reference 3+ documents. | Introduces further relevant lines of argument building their own position, with supporting examples. Outlines some complexities. Combines different viewpoints, or synthesizes arguments from different documents, using own ideas or critical comments or fresh perspectives. | 22–26 |
| | | Forges a chain of reasoning through examining multiple sources. Compares and contrasts documents relevantly. Good interpretation of sources. Applies precise critical comments/evaluation to a source. | 17–21 |
| Band II | A reasoned stance: a clear conclusion, supported by reasons clearly expressed but uncritically selected from the sources. Implicit or explicit reference to document/s. | Some independent reasoning / implicit critical comments. Clear statement of 3 or 4 reasons in support. | 12–16 |
| | | Reasons indiscriminately selected. Little clear independent or no independent reasoning. Some irrelevance / deviation from the question. May be multiple conclusions with little support for each one. Too brief a response, even if accurate. | 7–11 |
| Band I | 'Pub rhetoric': unclear or no conclusion; reasoning that goes off question target at a tangent; substantial irrelevant material. Completely misunderstands or no understanding of question. | Reproduced reasoning from Q2 and Q3. Disorganised. Unconvincing attempts to construct reasoning. | 2–6 |
| | | Stream of consciousness. Wholly irrelevant/deviant/incoherent material. No attempt. | 0–1 |

**Indicative content**

**Credit will be given for the judicious use of resources in the documents and c... referencing material relevantly**. Candidates need to judiciously select and use material with... stimulus documents, commenting, comparing and contrasting relevant material to support or challenge their case e.g. supporting the claim in document 1 that a computer can out-perform the human brain by functioning thousands of times, better and without fatigue, must also take into consideration the claim in document 2 that the thinking process differs fundamentally from functional / computational processes. Document 3's conclusion that humans are facing the threat of a robot takeover can be used against document 1's claim of the benefits of creating AI.

**Credit will be given for critical evaluation of stimulus sources, critical interpretation of evidence and inferences, and forging critical reasoning** e.g. document 3 discusses the likelihood of robots displacing human resources but this is only in terms of manpower, i.e. that it cannot be concluded that human creativeness would be replaced, if we consider document 4's claim that the human mind is not the same as the brain. Marshall Brain projects that robots will compete with and overtake human beings in the future, leaving the latter destitute. In critically evaluating if this claim is credible or too far-fetched / sensationalist (since he admits Moore's law has limitations), reference can be made to the blogger view that Brain could be a dreamer with vested interest; or that processor speed alone does not define intelligence. Documents 1 and 3 corroborate in their predictions of artificial intelligence (AI) and calls for examining if it may be possible or even inevitable that AI may eventually surpass the human brain, or whether human intelligence would also be progressing as time passes to keep ahead of electronic intelligence. Critical reasoning should focus the terms 'good' and 'better' in terms of the desirability of AI.

**Credit will be given for the synthesis of arguments from different sources, awareness of complexities, proposing further arguments, and consideration of counter-arguments to own position** e.g. A conclusion that a computer brain is as good as, if not better than, a human brain, should crucially have considered the question of how beneficial and worthwhile this development can be. Candidates may bring other examples and observations comparing the human brain with AI. They may explore the moral implications if any of letting robots control human destiny, and the question of desirability of such. They may argue that the AI and human brain arrive at similar outcomes only through different paths and consider if AI can satisfactorily replace the human brain, given the complexities.

To obtain higher bands, candidates should consider counter-arguments and objections to their own position, and some response to these. Anecdotes from personal experience should not dominate the discussion to the exclusion of other considerations raised by the stimulus sources; they should be weighed in the balance properly.

No marks are reserved for the quality of written English or specialist knowledge of the subject matter/s in the stimulus material. It is the quality of critical thinking and reasoning alone which is under assessment.