UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

THINKING SKILLS   **9694/04**

Paper 4 Applied Reasoning   **For Examination from 2009**

SPECIMEN MARK SCHEME

                                                                1 hour and 30 minutes

MAXIMUM MARK: 50

This document consists of **9** printed pages and **1** blank page.

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1 **Question 1 assesses the candidate's ability to develop a model or carry out an investigation.**

(a) If a person eats 250 g of meat and 500 g cabbage in a day, how much potato bread is required to make up the 3000 kcal energy requirement? **[1]**

- 0.875 kg (or 875 g) – award 1 mark.
- 250 g meat gives 1000 kcal. 500 g cabbage gives 250 kcal. A further 1750 kcal is required: this needs 0.875 kg of potato bread.
- Skill: Data extraction and processing.

(b) Is it possible to meet all the energy requirements with a diet of just potato bread and meat giving the required 3000 kcal per day? If so, give an example of a diet which would work. If not, explain how it would be inadequate. **[2]**

- Determining that the diet cannot be adequate – with a correct method of determining this – award 1 mark.
- Correct explanation – award 1 mark.
- Skill: Carry out an investigation and draw conclusions.

The answer is that this combination cannot give an adequate diet because either the protein will be too low or the fat too high.

Consider 3 extremes: all potato, half and half, and all meat. Diets giving 3000 kcal are as follows:

Diet	Energy kcal	Protein g	Fat g	Vit C mg
1.5 kg potato bread	3000	30	15	75
0.75 kg potato bread, .375 kg meat	3000	60	120	37.5
.75 kg meat	3000	90	225	0

The bottom two diets have too much fat whilst the top one has insufficient protein. We need a diet with more potato bread than the central one. The bottom two have insufficient Vitamin C.

Looking at the middle option, if we increase the proportion of potato bread, the protein will fall and be too low. If we increase the proportion of meat, the fat will remain too high. This combination cannot give an adequate diet.

(c) Suppose a person eats equal weights of all three foodstuffs to make up the 3000 kcal energy requirement. For each of the other three dietary requirements, will the requirement be met or not? Show how you reach your conclusions. **[3]**

- The answer is that this diet contains enough protein, too much fat and enough vitamin C.
- 1 mark for stating whether each of the three nutrients is or is not adequate, with the method of working shown. No mark for the correct answer unless working is shown, as it could be a guess.
- Skill: Carry out an investigation and draw conclusions.

1 kg potato bread gives 2000 kcal. 1 kg meat gives 4000 kcal. 1 kg of vegetables gives 500 kcal. The total would be 6500 kcal, so one actually needs 3000/6500 kg (.46 kg) of each foodstuff. This amount gives the following amounts of each of the other nutrients:

	Energy kcal	Protein g	Fat g	Vit C mg
.46 kg potato	920	9	5	23
.46 kg meat	1840	55	138	0
.46 kg cabbage	230	5	0	45
Total	2990	69	143	68

This diet contains enough protein, too much fat and enough Vitamin C.

(d) Starting with a daily diet having a fat content at the 100 g maximum, investigate possible diets with the 3000 kcal daily energy requirement.

  (i) What combinations will have adequate Vitamin C and how do these diets perform in terms of protein requirement? **[2]**

  (ii) Give an example of a diet which satisfies all the dietary requirements. **[2]**

- Determining the Vitamin C and protein values of various combinations (tabulation or algebra) – award 1 mark.
- Showing a systematic method of searching for suitable combination of Vitamin C, protein and fat – award 1 mark.
- Establishing a diet which fulfils all requirements and showing that this is so – award 2 marks.
- Skill: Develop a model and draw conclusions.

We know that a diet having less than 100 g fat must contain less than 0.33 kg meat a day. This means that less than 1333 kcal will come from meat – the remaining 1667 kcal must be from potato bread and vegetables. Furthermore, only 40 g of protein will come from meat, so at least 20 g must come from elsewhere.

There are various ways to proceed: tabulating several possible contents of each foodstuff, setting up algebraic equations for the necessary amounts, or trial and improvement.

For example: if p is the weight of potato bread, m the weight of meat and v the weight of vegetables:

1. Energy = $2000p + 4000m + 500v = 3000$
2. Fat = $10p + 300m < 100$
3. Protein = $20p + 120m + 10v > 60$
4. Vitamin C = $50p + 100v > 60$

We can use the second equation to investigate possible intakes of potato bread and meat which do not exceed the fat recommendation:

m (kg)	.35	.3	.25	.2
max p (kg)	-ve	1	2.5	4
energy (kcal)		3200	7000	etc.

Thus we know the meat must lie between 0.2 and 0.25 kg per day and the potato bread between 0 and 1 kg per day. If we look at 0.3 kg per day meat, the potato bread will be less than .9 kg or the energy content would be too high. Protein will then be 36 + 18 g from meat and potato bread – a total of 54 g which is a little less than adequate. The Vitamin C from potato bread (none from meat) will be less than 45 mg, so we need at least .15 kg of vegetables to make up the rest.

An approximation will be 0.3 kg meat, 0.8 kg potato and 0.5 kg vegetables. This gives:

Energy: 2400 + 1600 + 250 = 3250 kcal
Protein: 36 + 16 + 5 = 57 g
Fat: 90 + 8 = 98 mg
Vitamin C: 40 + 50 = 90 mg

We need a little less calories and a little more protein, so need to increase the vegetables at the expense of the potato bread (we cannot increase the meat or the fat will go too high). We can tabulate a few values:

Pot bread	Meat	Veg	Energy	Protein	Fat	Vit C
0.6	0.3	1	2900	58	96	130
0.7	0.3	1	3500	72	127	135
0.6	0.3	1.2	3000	60	96	150

The first one had too little calories and protein. The second had too many calories. The third meets the dietary requirements in terms of all nutrients.

2 **Question 2 assesses the candidate's ability to analyse complex data and draw conclusions.**

(a) What percentage of the blade market was held by companies other than the three market leaders? **[1]**

- 29.2% – award 1 mark.
- This is 100 minus the sum of the three numbers in the 'blades' column.
- Skill: Data extraction and processing.

(b) What were Maxglide's sales of disposables in the last financial year? Express your answer in $ million. **[2]**

- $40 million or '40 million' – award 2 marks.
- If working is shown and method is generally correct but answer is numerically wrong – award 1 mark.
- Wrong answer and incorrect (or no working) – no marks.
- Lucis had 35% and this was worth $70 million. Maxglide had 20%, so this must have been worth $40 million (20/35 x 70).
- Skill: Data analysis.

(c) Which <u>market segment</u> accounted for the largest value of sales in the last financial year? **[2]**

- Disposables or 'disposable razors' – award 2 marks.
- If working is shown and method is generally correct but answer is numerically wrong – award 1 mark.
- Wrong answer and incorrect (or no working) – no marks.
- Lucis's $10 million razors accounted for 12.5% of the market, so the total market for razors is $80 million. Similarly, the size of each market may be calculated:
  - o Razors: 100/12.5 x 10 million = $80 million
  - o Blades: 100/25 x 30 million = $120 million
  - o Disposables: 100/35 x 70 million = $200 million
  - o Shave gel: 100/10 x 10 million = $100 million
- Skill: Analyse complex data and draw conclusions.

(d) Rank the three dominant companies in order of their sales in the shaving market (largest to smallest). **[3]**

- The correct order is Lucis, Maxglide, Nisgon – award 3 marks for correct order and correct method of working.
- If the method of calculation is correct but the ranking is wrong due to errors – award 2 marks.
- If a partially correct method of working is evident – award 1 mark.
- Skill: Analyse complex data and draw conclusions.

Lucis' 12.5% of the razor market corresponds to sales of $10 million, so Maxglide's 25% must represent sales of $20 million. In this way, we can calculate each company's sales in each segment, building the table below:

Company sales ($ million) in each market segment (shaving market)					
Company	Razors	Blades	Disposables	Shave gel	Total
Lucis	10	30	70	10	120
Maxglide	20	40	40	15	115
Nisgon	30	15	30	30	105

(e) A new company will enter the shaving market at the beginning of the next financial year. Lucis have employed a marketing consultancy to estimate the effect this will have on their total sales of shaving products. This estimate is based on two assumptions. First, they assume that the new company will take a fixed percentage (say 10%) of each segment. What other assumption must they make? Show how the data in your answer would be used. **[2]**

- The assumption which needs to be made is the penetration of each company's market (in particular that of Lucis) by the new company in each segment.
- For example, if the new company takes 10% of the razor market, this corresponds to $8 million. 1/3 of this could be taken from each company's market or a fixed percentage of each company's market could be lost. The form of this assumption will control the estimate of Lucis's market loss.
- Candidate shows that he understands that the predicted sale in each market segment must be known and gives an illustration of how the calculation would be carried out – award 2 marks.
- Candidate demonstrates that he understand the need for knowing the degree of penetration of each segment by the new company but does not show how this information will be used – award 1 mark.
- Skill: Data necessity and sufficiency.

3 **Question 3 assesses the candidate's ability to construct a reasoned case.**

(a) **Provide a brief analysis of the argument presented by Gary Clabaugh (GC) in Document 5.** **[4]**

The overall conclusion is that affirmative action is wrong – 'unjust and ineffective'. The reasoning can be condensed as follows:
(1) Affirmative action (AA) is positive discrimination (PD) by another name, and PD seems like a self-contradiction.
(2) The bases for discrimination can be divided into 'given' characteristics (race etc.) and 'achieved' (those requiring individual effort). Because people are not responsible for given characteristics it is wrong to discriminate on the basis of them.
(3) PD *does* discriminate on the basis of given characteristics: it uses racism to combat racism etc.
(4) BUT: the individuals who benefited from past discrimination often do not pay the costs of compensating; AND those who suffered often do not gain. We 'just as easily' end up with two wrongs that don't make a right. THEREFORE: (it is simple minded to believe) past remedies are undone by present remedies (intermediate conclusion – IC)
The main thrust of the argument comes from (4). To illustrate it two hypothetical examples are also given:
(i) of an undeserving beneficiary of PD;
(ii) of a victim who deserved more.
The implication is that under PD (on the basis of race and sex) a privileged Hispanic female would be selected over an *under*privileged white male.

Marks awarded in keeping with the relevant Grade Descriptors (cf. Syllabus).

3–4 marks for:
• showing clear understanding of the author's argument in terms of structure and technique.

2 marks for:
• showing understanding of the main points of the argument.

1 mark for:
• showing recognition of the general direction of the argument and some of its features.

(b) **Give a critical evaluation of Clabaugh's reasoning, commenting on its strengths and/or weaknesses, and on any assumptions it makes.** **[6]**

The argument's main strength is in the claims that PD is itself a form of discrimination based on given characteristics, and is therefore as unjust as the negative discrimination that it is intended to redress.
The supporting argument (4) is less effective. We are told that 'often' the wrong people suffer or benefit and that we 'can just as easily' get two wrongs, not a right. However, these are vague claims and it does not follow from them that some past injustices cannot be undone by present remedies, and certainly not that it is simple-minded to believe they can.
The two examples are very unconvincing. The main problem with the two examples is that they *are* hypothetical, not actual; and they deliberately distort the purpose and spirit of PD. The whole point of PD is to compensate underprivileged people for the difficulties they face by making concessions to them. It is implausible that any PD policy would be so inflexible as to overlook the anomalous circumstances surrounding the two applicants. If PD were applied in the spirit in which it is intended, then it would not favour Juanita, but Sam.

Another way to put this would be to say that the author makes the implicit but unwarranted assumption that PD will always be implemented inflexibly, and/or cannot be applied sensitively. It could thus be described as a 'straw man' fallacy (or flaw): i.e. caricaturing the case *for* PD by untypical examples.

It could also be observed that two examples are, anyway, not grounds for a *general* objection to PD. Even if they were factual examples they would at best be weak anecdotal evidence.

A number of assumptions are made in the argument, not all of them warranted. One of the most telling assumptions is that discrimination on the basis of achievement *is* just and/or effective. It is a problematic assumption because it is difficult to separate achievement from inherited abilities or talents, which could easily be seen as given. The author implies that the determining factor is effort: but effort alone does not bring achievement.

Another assumption is that the individual is what matters most, rather than society as a whole. An ethnic mix, for example, may be sufficiently desirable to justify quotas etc. The author does not give any reasons to support the view that rewarding the individual for achievement is the *only* just criterion for selection.

It would be a fair general evaluation to say that this argument succeeds in showing that PD/AA runs the risk of replacing one injustice with another, but that it is not a convincing case for rejecting the policy entirely, and certainly not for dismissing it as simple minded. The conclusions are too strong and/or the reasons are too weak.

Other evaluation points may be made: these are examples and are not intended to be exhaustive.

Marks awarded in keeping with the relevant Grade Descriptors (cf. Syllabus).

5–6 marks for
- perceptive critical evaluation in terms of strengths, weaknesses, and assumptions (including some of the above points).

3–4 marks for:
- generally sound evaluative comments about some aspects of the argument.

1–2 marks for
- some discussion of the quality of the reasoning.

(c) Commenting critically on some or all of the Documents (1–5), and introducing ideas and arguments of your own, construct a well-reasoned case either for or against a policy of positive discrimination. [20]

Candidates will be marked on the following three components of their response:
selection and synthesis:
- choosing relevant and *useful* material – evidence, opinion, argument etc. – from the documents;

critical reasoning:
- assessing the strength of available evidence;
- evaluating claims and arguments in the selected material;
- challenging or supporting claims made in the documents with ideas and arguments of their own;
- drawing and justifying their own inferences;

synthesis:
- integrating the material in the documents with their own ideas and arguments to produce a coherent case.

Credit will be given for judicious use of the resources in the documents. This does not mean referring to every item, but selecting for consideration those items which support or challenge their own arguments. For instance, a claim that PD is itself unjust for some individuals should not overlook the landmark Bakke case reported in Doc. 2. A point made about PD for women in business should mention the data on women in government in Doc. 4.

Credit will be given for the assessment and interpretation of evidence. For instance, it might be pointed out that many countries around the world adopt PD, but that many others do not, so that there is clearly little international agreement as to the effectiveness of the policy, or the rights and wrongs of it. It might also be observed that in America, which does apply affirmative action (PD), opinion has swung over the years.

Credit will also be given for the critical analysis and evaluation that candidates apply to the sources. For instance, if referring to the J.C. Dass argument in Doc. 3 candidates might point out that it is simplistic and/or that it overlooks consequences such as those experienced by Allan Bakke. Alternatively or as well Doc. 3 could be contrasted with the opposing argument by Clabaugh in Doc 5, and a judgement made on which of the two is the more convincing – and why.

Credit will be given for the inferences candidates draw from the sources and from other examples or observations they bring to the debate. There is no right or wrong answer here, but what is rated as a good response will be one which is consistent with the candidate's selection and treatment of the sources, and which is supported by the reasons and arguments they give. Accordingly the conclusion should not be too simplistic or sweeping, since there are clearly two sides to the argument, and the difficulties of deciding a fair policy should not be dismissed. The examiner's key question will be: 'How reliably / convincingly do the candidate's conclusions follow from his or her reasoning?' rather than, 'Is that the right solution to the problem?'

To obtain the higher mark bands, a candidate should consider counter-arguments and objections to their own position, and offer some response to these. For example, it could be acknowledged that PD is a genuine attempt to make society more egalitarian, but that it infringes too many human rights at an individual level and therefore does as much harm as it may do good. A perceptive candidate will also observe that much of the debate is about principles, including ethical principles. They may choose to consider principles such as maximising the good of the majority (utilitarianism), or never justifying means by ends.

Some responses may draw on personal experience, or local factors, such as the situation in their own country or school/college. However, these should not dominate the discussion to the exclusion of other considerations: they should be weighed in the balance appropriately.

No marks are reserved for the quality of the written English. It is the quality of the critical thinking and reasoning alone which is under assessment, and provided the candidate has made his or her thought processes sufficiently clear to be understood, full credit will be given.

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