



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education  
Advanced Level and Advanced Subsidiary Level

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**THINKING SKILLS**

**9694/04**

Paper 4: Applied Reasoning

**November 2007**

**1 hour and 30 minutes**

Additional Materials: Answer Booklet/Paper

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**READ THESE INSTRUCTIONS FIRST**

If you have been given an Answer Booklet, follow the instructions on the front cover of the booklet.

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

Do not use staples, paper clips, highlighters, glue and correction fluid.

**DO NOT WRITE ON ANY BARCODES**

Electronic Calculators should be used.

Answer **all** the questions.

Start each question on a new answer sheet.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [ ] at the end of each question.

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This document consists of **10** printed pages and **2** blank pages.



1 Study the following evidence and answer the questions which follow. Show your working.

Angus is a researcher for a new TV station. He has been given the task of selecting a sample of 1000 people to be surveyed regarding their viewing habits. He knows that the results of the survey will be used to attract advertisers and that the marketing manager is hoping for the results shown in Table 1.

| Desired Result | Average amount watched per week          |
|----------------|--|
| R1             | Sport: at least 8 hours                  |
| R2             | Drama: not more than the amount of sport |
| R3             | News: less than 3 hours                  |

**Table 1: Desired Results**

Angus also has the results from an old survey, which reveal the following viewing habits for different age groups (see Table 2). Although this survey is out of date, Angus believes that viewing habits are unlikely to have changed. He intends to use it to decide how many people he should ask from different age groups, in order to meet the desired results.

| Age Group | Average number of hours viewing per week |        |      |       |
|-----------|--|--------|------|-------|
|           | Sport                                    | Comedy | News | Drama |
| Under 25  | 13                                       | 3      | 4    | 3     |
| 25-54     | 11                                       | 12     | 4    | 3     |
| 55+       | 4  | 4      | 2    | 13    |

**Table 2: Results from Old Survey**

In addition to the desired results, Angus feels that the absence of one of the age groups may look suspicious, so he decided that he must select at least 10% of his sample from each age group.

If Angus were to select 200 people from the Under 25 age group and 800 from the 25-54 group he could expect the following results:

$$\begin{array}{l}
 \text{Sport: } (0.2 \times 13) + (0.8 \times 11) = 11.4 \\
 \text{Comedy: } (0.2 \times 3) + (0.8 \times 12) = 10.2 \\
 \text{News: } (0.2 \times 4) + (0.8 \times 4) = 4 \\
 \text{Drama: } (0.2 \times 3) + (0.8 \times 3) = 3
 \end{array}
 \left. \vphantom{\begin{array}{l} \text{Sport:} \\ \text{Comedy:} \\ \text{News:} \\ \text{Drama:} \end{array}} \right\} \text{ hours per week}$$

This selection would produce desired results R1 and R2, but not R3. It would also fail to include the required 10% minimum from each age group.

**Example: Choosing a Sample to Manipulate the Results**

- (a) Suppose Angus selects exactly 100 from the 25-54 group, 100 from the 55+ group and the rest of the sample from the Under 25's. Which of the desired results can he expect? [1]
- (b) Give an example of a selection of age groups for Angus's sample which can be expected to produce desired result R3 (irrespective of whether it produces either of the other two results). [2]
- (c) (i) Find a selection of age groups for Angus's sample which can be expected to produce results in which all three age groups watch the same amount of comedy per week. [2]
- (ii) Which of the manager's desired results can be expected from this selection? [1]
- (d) (i) Starting with a selection of age groups that can be expected to produce R3 (your answer to (b)), investigate possible distributions that can be expected also to produce R2. [2]
- (ii) Find a sample distribution that can be expected to produce all three of the manager's desired results. [2]

2 Study the following evidence and answer the questions which follow. Show your working.

Chumtech is a small firm that manufactures Chumbals. It can produce up to 1200 Chumbals per day; but as the rate of production is increased, the percentage of imperfect specimens also increases, as shown in Figure 1.

There is a guaranteed market for Chumbals, both perfect and imperfect. Chumtech sells perfect Chumbals to retailers for \$12 each, whilst 'imperfects' sell for \$6 each.

The firm's fixed costs are \$2450 per day. In addition, Chumbals cost \$2 each to manufacture. Profit is the money they make after they have paid all their costs and sold all their Chumbals.

(a) On a day when 600 Chumbals are manufactured:

(i) how many perfect Chumbals will be produced? [1]

(ii) how much profit will Chumtech make? [2]

(b) Considering the manufacture of whole number multiples of 100 only, what quantity manufactured per day will generate:

(i) the greatest number of perfect Chumbals? [2]

(ii) the greatest profit for Chumtech? [2]

(c) A client requires 5000 **perfect** Chumbals within 10 working days.

The production rate can be altered from day-to-day, and imperfect Chumbals (and leftover perfects) can be sold elsewhere.

Show how it is possible to produce 5000 perfect Chumbals in 10 days and make a total profit of more than \$38 500.

(Again, consider the manufacture of whole number multiples of 100 only.)

[3]

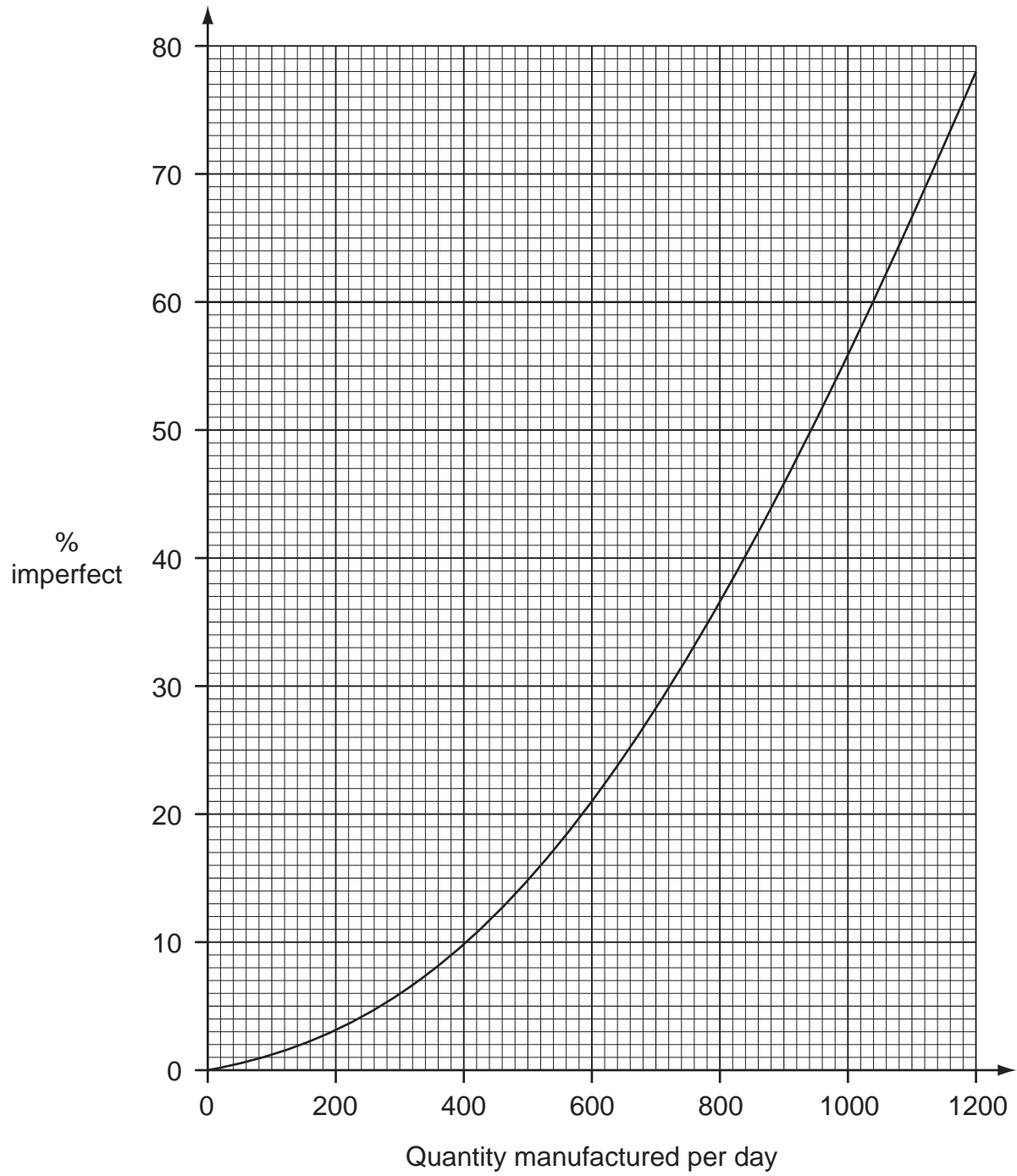


Figure 1

3 Study the following evidence and answer the questions below.

(a) Give a brief analysis of the argument by McCarthy and others in Document 2 *Revealed: The Real Cost of Air Travel*.

[6]


(b) Critically evaluate Jacey Dayer's counter-argument (Document 5), commenting on its strengths and weaknesses and any unstated assumptions.

[8]

(c) With the help of some or all of the documents, suggest what should be done about the threat that air travel poses to the future of the planet. Construct a well-reasoned argument supporting your conclusion.

[16]

## DOCUMENT 1

|   |  |
|---|--|
|  | <p><b>LOW COST AIR</b></p> <p>Flights: Choose a cheap flight with the World's leading low cost airline<br/>258 routes across 68 key airports</p> |
|---|--|

## DOCUMENT 2

**Revealed: The Real Cost of Air Travel**

By McCarthy, Woolf and Harrison.

It might be cheap, but it's going to cost the earth. The cut-price airline ticket is fuelling a boom that will make countering global warming impossible. Unless the boom in cheap flights is halted, say the environmentalists, many of the richer countries will simply not be able to meet targets for cutting back on the emissions of carbon dioxide (CO<sub>2</sub>) that are causing the atmosphere to warm, with potentially disastrous consequences.

For many people – and for many politicians – it is an uncomfortable truth, but as a spokesman for the environmental group Friends of the Earth put it: "The clash of interests cannot be ignored any more. The convenience we enjoy in covering huge distances in a short time is one of the fast-growing threats to life on earth."

In Britain alone, emissions of CO<sub>2</sub> from aircraft, expressed in millions of tons of carbon, shot up from 4.6 million tons in 1990 to 8.8 million tons in 2000. But based on predicted air passenger transport growth figures - from 180 million passengers per year today to 476 million passengers per year by 2030 - they are expected to rise to 17.7 million tons in 2030.

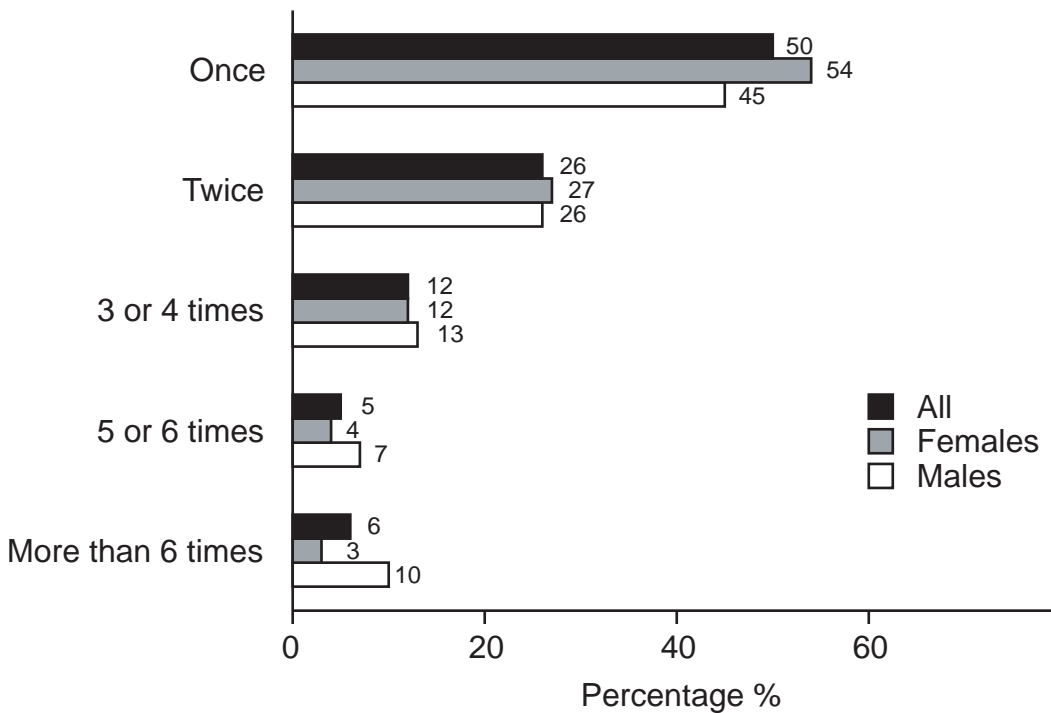
Aircraft emissions that go directly into the stratosphere have more than twice the global warming effect of emissions from cars and power stations at ground level and, based on the Government's own calculations, the effect of the 2030 emissions will be equivalent to 44.3 million tons of carbon. Planes pump out eight times more carbon dioxide per passenger mile than a train. One return flight from Europe to Australia will release as much carbon dioxide as all the heating, light and cooking for a house for a year.

What we have to do is reduce our flying. The only answer is to cut back on demand by forcing prices up, especially as commercial aviation has long benefited from a very easy tax regime. In other words, people will have to be "priced off planes" and the cheap flights bonanza will have to end.

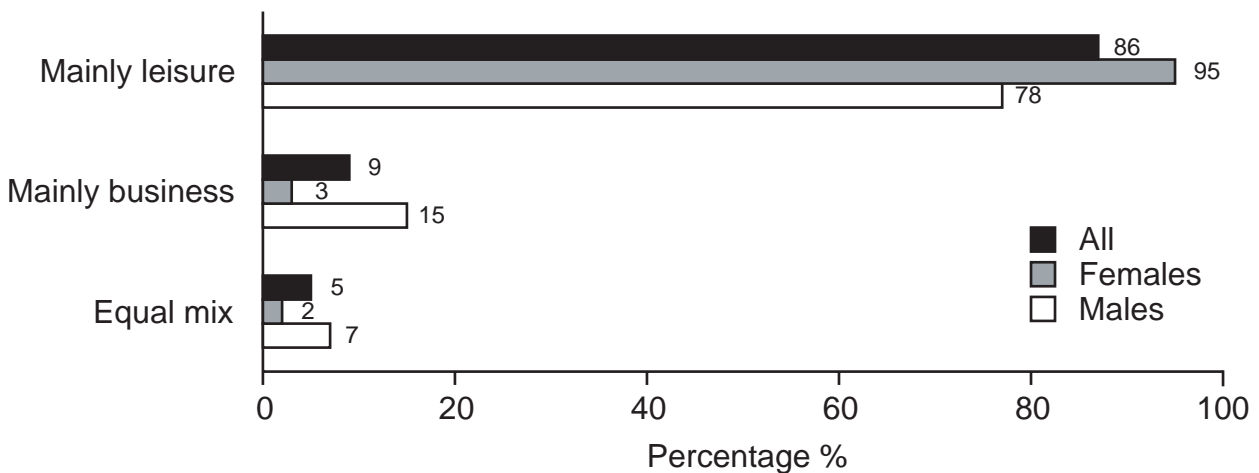
## DOCUMENT 3

## Survey of European airline passengers

Flights made, per person, in the last year:



Purpose of flights made in the last year:



Amongst 25-44 year olds surveyed, 15% did so mainly for business purposes, 79% mainly for leisure purposes and 6% an equal mix. This contrasts with those aged 16-24, of whom 1% did so mainly for business purposes, 97% mainly for leisure purposes and 2% an equal mix.



**DOCUMENT 4**

While most people are not likely to stop flying, many in the environmental movement and even the travel industry question our over-reliance on airplanes for trips that might more sensibly be made by other means of transportation. Mark Ellingham, founder of the popular Rough Guide travel handbooks, advocates that travellers "fly less often and stay longer". In the U.S., for instance, surveys show that people now take many long-weekend trips by air rather than going on one- or two-week holidays. That obviously creates far more greenhouse gases.

Ellingham advocates a Slow Travel movement, along the lines of the Slow Food movement, in which people savour their vacation experiences. "Travelling slower gives you a sense of place," he told *Sierra* magazine. "Trains give you the chance to talk to people, to see a landscape unfold."

The growing network of high-speed trains across Europe, Japan, Korea and Taiwan offers a vision of the future in which planes are used mainly for overseas and long-distance journeys, not short hops from Amsterdam to Paris, or Toronto to Montreal, or Kuala Lumpur to Singapore. The world's high-speed rail leaders, France and Japan, are developing trains that travel 350 kilometres an hour. China has unveiled a maglev (magnetic levitation) train that reaches 500 kilometres an hour, whisking passengers between central Shanghai and PuDong airport 30 kilometres away. Construction is expected to begin soon on a 250 kilometre maglev line between Shanghai and Hangzhou. Inspired by the success of the European and Asian trains, many other nations across the world, including Mexico, Brazil and Israel, are planning their own high-speed rail networks.

Even the most time-pressed business travellers are finding that air travel is not so speedy these days when you figure in congested roads on the way to the airport and long lines at security gates. Flying has become increasingly inconvenient and uncomfortable in recent years so that now trains and buses, once regarded as old-fashioned and low class, seem luxurious in comparison. Airport inconvenience has led to a new generation of comfortable, non-stop, intercity bus services such as Megabus and Lux Bus America - a development no one saw coming a few years ago.

Jay Walljasper.

**DOCUMENT 5****Changing Ways**

Pricing people out of the skies is not the way to reduce pollution or save the planet. For a start it is political suicide for any elected government. Air travel has become so popular that any attempt to tax it out of the reach of the ordinary traveller will be met with mass resentment and lost votes. And rightly so, for it would be both unjust and undemocratic to return to the days when flying was just for the rich and privileged elite.

Besides, some of the most persistent air-travellers are politicians and environmentalists themselves. They are forever off to a conference here or a summit meeting there, no doubt to tell the world how hard we should all be trying to reduce CO<sub>2</sub> emissions and save on fuel. And because they are busy and important people, how do they travel? By plane, of course, because it's the quickest and easiest way to get to their urgent meetings and back to their waiting desks. The trouble is, it's not the best way to convince the rest of us - who also have busy lives, places to see, families to visit - that air travel is something we should all be turning away from.

Fortunately there is a better and fairer solution, and that is to give people choice. Harsh taxes, dire warnings, negative campaigns and hypocritical behaviour are not the answer. They must see the benefits for themselves, not be bullied or blackmailed. If they discover that there are pleasures and advantages to travelling more slowly or going shorter distances, they will soon begin to change their ways. They managed until 80 or so years ago to take holidays, travel the world and conduct their business. And, with the arrival of modern communication systems, it is surely less necessary to travel physically from place to place, not more necessary.

Jacey Dayer



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