# THINKING SKILLS

**Paper 9694/22**
**Critical Thinking**

## Key messages

- Some candidates identify the content of the source(s) that allows an inference to be made (which is often the answer to a question) but simply repeat it without making the inference. The effect of this is that they tend to repeat what the source says leaving the significance still implicit and therefore fail to answer the question effectively. This was particularly in evidence on **Questions 1(a)** and **(b)**.

- Some candidates are looking for answers from information in the sources where the question requires the application of their own thinking, for example **Question 2(c)**.

## General comments

There was a broad range of performance, although only a minority of candidates achieved a mark over 30. At the other end of the mark range there was, as usual, quite a long 'tail' of candidates who were poorly prepared for the paper and who struggled, and frequently failed, to reach a mark in double-figures. Well-prepared candidates seemed to respond well to the issues raised by the questions and were able to tackle them effectively.

## Comments on specific questions

### Question 1

Fictional scenarios like this will not appear in the new format of the exam, from June 2020 onwards, but the types of question which have occurred on this occasion and previously as **Questions 1(a)**, **1(b)** and **1(c)** will feature in the new **Question 1**. The equivalent of the current **Question 1(d)** will not occur in the new exam.

**(a) (i)** This question was not done well with many candidates simply repeating points already made relating to general disorganisation. They key emphasis in the question was on the numbers and the correct answer should have made the point that the screening authorities should have known the numbers expected as an aircraft has a specific number of passengers on take-off.

**(a) (ii)** This was answered more successfully, although a number of candidates simply quoted the point that the enquiry found the airport was 'busy, disorganised and chaotic'. This is simply a re-statement of the claim that is stated at the start of the question and could not be treated as evidence for that claim.

**(b)** A reasonable number of candidates saw that the significance was that the screening authorities would have a motive to find a scapegoat for the failure of the screening process.

**(c)** This question was done quite well with a reasonable number of candidates seeing the significance of the information as regards implicating Patel in the subverting of the screening process. Some candidates spent too long on the credibility of the witness with speculative comments on bias (or lack of it) and inability to hear, which could not be allowed because they were speculative. The only thing we are told is that this is what the witness heard, which does allow one to make the simple point that credibility is increased by being an eye-witness with ability to see/hear.

**(d)** Candidates were fairly evenly split between those who saw Patel to blame for the failure and those who did not. Some candidates tried to sit on the fence and say it was a mixture of both but it is important in this question to come to a definite judgement, ideally rejecting the alternative. A complicating factor was the fact that the misconduct enquiry was against the colleague who took Patel's temperature, not Patel, and some candidates got rather 'bogged down' in this issue. The key question (that has no definite answer) is, 'would a medical professional returning from an area where she had been treating victims with a deadly virus ignore symptoms consistent with having contracted that virus?'

**Question 2**

***Section A*** of the new exam will approximately resemble this question, although the new **Question 1** will have slightly more parts than the current **Questions 2(a)**, **2(b)** and **2(c)**. The new **Question 2** will resemble the current **Question 2(d)**, but with more marks attached to it.

**(a)** This question was done well with many candidates identifying at least two reasons. The best answers were brief, making the most obvious points about expense and many people being outside when the earthquake occurred.

**(b)** This was also done quite well though most candidates tended to confine themselves to the first point about concrete with steel bars seeming to be acceptable, as the evidence was about older buildings without this feature. Only a minority of candidates made the point that the evidence was only relevant to areas of the world that suffered from earthquakes.

**(c)** Most candidates tackled this question effectively, with increased population or frequency of earthquakes being popular answers. As mentioned in the key comments, some candidates tried to use the material in the other sources (e.g. about 'base isolation devices') and this was not usually successful.

**(d)** Most candidates agreed with the proposition but only a minority showed good critical thinking skills by questioning the generalisation to the whole of nature. A significant number of candidates disagreed with the proposition on the grounds that nature could not be tamed, presumably on the grounds that one cannot fail if the task one is asked to accomplish is impossible. Whilst an interesting philosophical point, a more straightforward position is to see earthquakes as a key example of the inability of humans to tame nature, supporting the proposition in the question. Many candidates were able to make good use of the sources to show that technologies mitigating the effects of earthquakes had been developed but this hardly amounted to 'taming the forces of nature'.

**Question 3**

***Section B*** of the new exam will approximately resemble this question, although the new **Question 3** will normally ask about more argument elements than just main and intermediate conclusions and the new **Question 4** will be significantly different in format from the current **3(c)**. The new **Question 5** will closely resemble the current **3(d)**, but more marks will be allocated to it.

**(a)** A sizeable minority correctly identified the main conclusion. The intermediate conclusion 'dogs are an essential part of the cultural development of human society' was equally popular.

**(b)** Many candidates identified at least one intermediate conclusion, and failure to identify the main conclusion does not seem to have hampered candidates in answering this part of **Question 3**.

**(c)** Very few candidates identified a sufficient number of assumptions or flaws to gain five marks. Those who did usually identified the appeal to history in paragraph 1 and/or the contradiction about small/large dogs and old people in paragraphs 4 and 5. A number of candidates got bogged down in the points in paragraph 2, either challenging what was said or wrongly identifying assumptions. Easier evaluation points could be made about the other paragraphs. The nature of the topic seemed to encourage a great deal of counter-argument, which is not what is being looked for in answering this question.

**(d)** There was a reasonably even split between those arguing for and against the proposition. Arguments against frequently cited over or in-breeding, with pugs often being mentioned as an example of the resulting deformities. Arguments for tended to dwell on the constant supply of food

and warm bedding that dogs enjoy as opposed to them surviving in the wild. It is important that candidates pursue a consistent line of argument in answering this question, either for or against the proposition, with any points raised against the line of argument firmly countered. Some candidates reviewed points for and against the proposition and this more 'essay-style' of approach is not appropriate. A minority of candidates argued why humans had benefited from their association with dogs and such answers could not receive credit.

# THINKING SKILLS

**Paper 9694/32**
**Problem Analysis and Solution**

## Key messages

**Questions 1**, **2** and **4** attracted gratifying amounts of supporting working, which allowed many candidates to gain partial credit for their attempts even if the final answer was incorrect. Candidates' efforts to present answers to **Question 3** were often too sparsely presented or disorganised to gain marks for method – this may have been partly due to the fact that it was less obvious how to refer to the different journey distances, times and directions required, and so many of the worked solutions were unaccompanied by the brief commentary that would enable a marker to establish what process the candidate was using.

## General comments

All of the scenarios offered here required candidates to initially take in a logical structure and a collection of numerical details: the correct assimilation of these parts, and in particular the logical relations between the parts, was vital for an attempt at the questions to be fruitful. The number of candidate solutions which depended upon hasty simplifications of what was given on the Question Paper showed how easy it is to omit or misread what is given. Examples in this exam paper included: assuming that the pieces of ribbon used in **Question 1** started at the beginning of a new coloured section each time; assuming that one country could trust another's policies whether they were secret or not in **Question 2**; forgetting that everyone else walking on the path knew how far away the hostels were in **Question 3**; appreciating that the times it took the ferries to travel were not the same as the times in between departures in **Question 4**. Misjudging any of these logical insights derailed candidate approaches to much of the question. Candidates must be encouraged to be alert to such nuances and details, and to highlight/underline all key information.

As always, a number of questions required explanations as well as numerical answers, and candidates should consider what level of detail is needed to show that they have understood the essential logic. Sometimes a single, carefully chosen calculation can demonstrate understanding (as in **1(a)**); sometimes it is required to make precise claims about the problem's mechanism not given in the question, in order to demonstrate understanding (as in **1(c)(ii)**).

## Comments on specific questions

### Question 1

This question involved a procession of related problems, stemming from a simple repeating pattern applied to a simple three-dimensional problem. The problem solving elements arose from the fact that the decision points of the problem were sufficiently deep into the pattern to require short-cuts, changes of focus and generalisations to answer correctly under time pressure.

**(a)** This question allowed candidates to check that they understood the basic wrapping process – by confirming that the length of string was 124 cm. Fairly low expectations were set as to what was expected for the demonstration: any sum that included the appropriate multiples of 20s, 10s and 12s was awarded a mark.

**(b) (i)** Focusing on the critical values at which the red sections began (0, 30, 60, 90, 120) allowed candidates to deduce that 44 cm were needed. The most common wrong answer here was 40 cm, but there was normally very little working shown.

**(ii)** Candidates needed to track the critical values for the red sections and the critical values for each new ribbon (0, 124, 248, 372, …) in order to answer this. As with **(a)(i)** there was often little working shown on the answer sheet, and less than half the candidates offered a correct answer to this.

**(iii)** This required candidates to continue the process initiated in **(i)** and **(ii)**, and track their answers. There was no need to look for deeper patterns, and any detailed organised approach was likely to yield the correct answer. It is likely that the size of the investigation may have put off some candidates who then hypothesised patterns and predictions from the answers to **(i)** and **(ii)**, often wrongly.

**(c) (i)** This question returned to the analysis of the wrapping process, and how that would be affected by a change of design. No diagram was offered, and so candidates needed to find a way of modelling the effect of the change – with a sketch or a list of the component pieces – and then for comparing the two total lengths. Many candidates took hasty short-cuts here (such as multiplying all three dimensions by 3, or forgetting about the bow), and a substantial minority offered an answer for how much ribbon would be used to wrap a stack (but forgetting to compare with the amount needed to wrap all three separately).

**(ii)** The standard of explanation required here was higher than that for **part (a)**: the candidate had to demonstrate that they were not just 'working backwards from the answer'. As an example, an answer which said, *'The height affects both the wrapping methods in the same way, so the difference would be the same'* is an answer which is not wrong, but which could have been offered as a deduction based on what was said in the question, rather than by consideration of the problem itself. So it would have scored no marks. When candidates are considering whether they have given enough information they need to consider whether they have offered detail which could only be delivered by someone who understands the mechanics of the problem.

**Question 2**

This question involved the analysis of trust networks: a simple extension of a network diagram, about which candidates were not expected to have any prior knowledge.

**(a) (i)** The correct answer involved a loop of arrows that ensures that A can trust B, who can trust C, who can trust D, who can trust A. Hence 4 policies are all that are needed.

**(ii)** Most candidates drew a diagram here, and established that each of the 4 countries needed 3 policies, if they could not depend on knowing the published policies of others. The key information needed to deduce this was contained in the sentences directly above **(a)(i)** describing the associativity of the relation, 'so long as A knows about each policy'. Many candidates did not appreciate the significance of this restriction and offered the same answer for **(ii)** as for **(i)**.

**(b)** Many candidates were able to offer a diagram in which all the five countries were able to trust each other – but a diagram showing the minimum number of connections was needed to score 2 marks ('How many more … would be <u>needed</u> so that ...').

**(c) (i)** This question required confidence to explore how such a federation could be constructed. It was not immediately clear how to arrange things so that a 2 step minimum was achieved, and there were pages of experimental diagrams accompanying the varied answers that candidates offered. A few looked at the problem applied to smaller networks, and then extrapolated. Many appreciated that the solution was likely to be symmetrical. There were a number of ways of representing the correct network, but the most common involved a single 'node' surrounded by six others regularly spaced around it, with a double arrow out from the centre to each of the six.

**(ii)** A number of candidates offered answers to **(c)(ii)** unsupported by comprehensible answers to **(c)(i)**, but were still able to gain credit.

**(d)** This problem did not depend on the structural insights of **2(c)**, but many candidates did not attempt it, perhaps chastened by their struggles with the previous question. There was only one mark available here, so those who showed that they understood what the longest chain would now be '5', but failed to address the difference, were awarded no marks.

**(e)** This question required candidates to identify the significant difference between the two networks (the fact that one of the nodes required 3 steps in Skip 1, and 2 steps in Skip 2) and articulate this clearly. The appropriate measure (the number of steps to each other node) was not immediately obvious, and there was a wide variety of descriptive answers. No marks were awarded for the answer 'Skip 2' without a comprehensible explanation.

**Question 3**

This question involved times and distances travelled in two directions along a path, and what could be deduced from them. As a result, the inferences and optimisations that were at the heart of the problem were obscured by their representation (both involving a compound measure, speed, and an unwieldy unit, time). Most candidates attempted the questions, although some clearly struggled with the inferences.

**(a)** There was a fair amount of information to ingest at the start of this question, and a number of candidates offered the answer '36 km' or '12 km'. The correct answer involved appreciating that the other walker could only have walked for 5 hours at 3 km/h, and Peregrine had already walked 12 km.

**(b)** Most of those who answered **(a)** correctly also managed to answer this correctly. Some became entangled in distance/speed/time calculations, which could be avoided (given that both walkers were going at the same speed).

**(c)** The most common answer for this was 13:30, which is the latest time Peregrine can turn around if he is make if back to his starting point before dark (4.5 hours out and 4.5 hours back). But this was not what the question wanted. If he encountered anyone up to 12:00, they would be evidence that he would make it to his destination in time (for instance, someone encountered at 11:30 was evidence that the next hostel was no more than $5.5 \times 3 = 17.5$ km away, a distance Peregrine could walk before dusk). But no walkers after 12:00 could offer this guarantee: so he could never know how far it was, and could only walk forlornly on until 13:30 and then turn round. This last section would be pointless: he should turn around at 12:00.
Very few candidates managed to answer this correctly.

**(d)** The answer to this question did not depend on the subtleties of **(c)**, and many candidates answered it correctly. The walker who would be furthest away must have started at 06:00, and turned around at midday. At this point they were 9 km apart, and would meet 1.5 hours later (at 13:30). Many candidates showed little working for this, and so were awarded 2 marks or nothing.

**(e)** The demands of this problem did encourage many candidates to offer substantial working, and this enabled many to gain partial credit even if they could not offer a correct final answer. In particular, many candidates appreciated that the picnickers would stop 8 km away from Peregrine's starting point. An additional piece of analysis was needed to ascertain when Peregrine would meet them.

**(f) (i)** Many candidates were tempted to give the answer 4 hours (the maximum time that would enable Peregrine to reach the hostel by nightfall). But the fact that the family were sure that they would reach it by nightfall implies that it was a maximum of 8 km away. There was only one mark available here, so the correct deduction (of (8 ÷ 3) hours) was necessary to gain credit.

**(ii)** Once again, it is tempting to say 17:59 or 18:00, but such a family would had walked $12 \times 2 = 24$ km starting at 06:00, and Peregrine would have passed them at 15:00 if he started at 09:00. This is the latest time he could pass a family, and there were a number of ways to deducing this. Most candidates found the tracking of the two 'parties' (Peregine and a family), travelling at different speeds (3 km/h and 2 km/h) starting at different times (09:00 and 06:00) too hard to model.

**(g)** This question required a similar approach to **(f)(ii)**, and caused similar difficulties. In this case we can assume that the runner passed Peregrine at the very end of his walk (at 18:00) and work back from there. A number of candidates appreciated that the runner had taken (21 ÷ 5) hours, but only a few correctly put the two pieces of information together and concluded 12:45 pm.

**Question 4**

This question involved the tracking of ferries (and people) whose behaviour was summarised in a schematised map and timetable (combined with a fairly simple tariff). The tracking was made harder by the need to cope with the arrival times as distinct from the departure times, the roll-over nature of the timetables, and the difficulties that candidates have manipulating times (when they are under time pressure themselves).

**(a)** This tested candidates appreciation of how the timetable worked (CDMDC ...) and how the times on the map must fit with the timetable (31 minutes from C to D, leaving at 8:00, must imply a 6 minute wait in D before setting off to M at 08:37). These two insights were easy to lose amongst the mass of information, and most candidates managed to offer an answer that depended on one misinterpretation. These tended to be awarded one mark out of two.

**(b)** Although this required a comparison of the two routes, and their timings (dependent on the same subtleties as **(a)**), many candidates found this easier than **(a)** – partly because errors involving the travel times 'cancelled each other out'.

**(c)** This free-standing problem, independent of the timings and cycles of the ferry timetables, was accomplished well. A number of candidates offered a table showing the number of visitors on the island after each ferry. Partial credit was given to those who appreciated this logic, but gave the number on the island at an 'adjacent' time.

**(d)** This question was also independent of the timetables, and was tackled fairly well by most candidates. Most candidates did break their working down (offering the price of the Day Roamer tickets and the price to Ockelman Island and back), and so gained partial credit.

**(e)** This question did not involve the timetables; it did present a potentially daunting search (finding multiples of $15 and $9 which added to $1059) towards the end of the paper. The question could be dealt with by parsing it algebraically and solving the linear equations that emerged, but there were few examples of candidates using this technique. Most chose to combine some 15s and 9s, find their sum, and then adapt their numbers accordingly.

**(f)** Nearly half the candidates sitting the paper omitted this question altogether – which may have been due to time mismanagement, or due to perceived difficulties in answering the question. I suspect for many it was the former, since it was fairly easy to begin a solution (by listing the times of ferries that Susie might take, starting at Carleton). Partial credit was awarded for any solution that correctly showed the arrival times in Munro via the two routes.

# THINKING SKILLS

**Paper 9694/42**
**Applied Reasoning**

## Key messages

- Most candidates gained very few marks in **Question 1**.
- In **Question 2** many candidates knew exactly what to do and gained most or all of the available marks.
- In **Question 3** most candidates did as they were asked and attempted to evaluate the reasoning but few achieved very many marks.
- In **Question 4** many candidates created their own argument structure, ignoring the sequence in which the documents are presented, but few engaged *critically* with the documents provided.

## General comments

Most candidates appeared to have enough time to finish the paper – only very few appeared to have run out of time. Often, those who did not have time to complete **Question 4** had spent a disproportionately long time on previous questions, although such responses were in the minority.

The standard of candidates varied greatly but there was evidence that many candidates had been prepared with regard to answering **Questions 2**, **3** and **4**.

## Comments on specific questions

### Question 1

**(a)** Candidates were presented with some statistical evidence and asked to make some criticisms of the evidence presented. The full range of scores, from 0 to 3, was seen, although the vast majority of responses were awarded no marks. Most commonly, candidates gained marks for reference to one of the examples, Lemmy from Motörhead, being from the wrong year. Other points that regularly gained credit were criticisms of the unreliability of memory, the conflation of 'famous people' with 'people with whom the author is familiar' and questions about the annual variation and pre-2012 figures. Other marking points were rarely, if ever, seen. Some candidates alluded to creditworthy points but responses were insufficiently well expressed; a response that states 'we do not know the figures for any other years' is not as good as one that states' the pre-2012 average might have been higher'. Some candidates criticised the credibility of the evidence provided and received no credit.

**(b)** Remarkably few candidates were able to offer a plausible alternative explanation for a perceived increase in celebrity deaths in 2016. Some merely confirmed that there had been such an increase or suggested a reason for an increase in celebrity deaths.

### Question 2

This question rewarded the well-prepared candidate. Those who knew what was expected and attempted an analysis of the argument usually gained five marks easily and many gained all 6. Although there were fewer elements to identify, candidates were generally able to identify the ones that were there. Very few candidates provided a non-creditworthy summary or gist. As ever, some candidates, particularly those sitting Paper 41, are still unaware that quoting from the text is an appropriate, indeed a required, way to answer this question.

**Question 3**

Most candidates were aware of the nature of the task and attempted to evaluate the passage. However, most found the passage quite challenging and only a minority of candidates were able to gain marks. Historically, very few candidates have been able to identify assumptions, indeed many appear not to have learned that an assumption must not be stated in the text. However, on this occasion assumption marks were regularly credited. Points that were awarded marks were as follows: the assumption that the natural state is desirable; the straw man in paragraph 2; the assumption that increased spread of information results in people being well-informed; the confusion of social media posts with social network users; the assumption that not being in paid employment makes it more likely that you will post on social media; the relevance of the statistic about women who are not in paid employment to increasing the number of women senior business executives; the assumption that social networks can provide the same sort of career benefits as 'social clubs and other organisations'; the inconsistency between women taking over the majority of senior business roles and the aim of gender equality; the assumption that rapid political change is a good thing, and, once, the assumption that 'fun' is 'good'.

**Question 4**

Candidates were required to use the documents and their own ideas to construct a reasoned case to support or challenge the conclusion that online social networking is good for society. Many found they could engage with this topic and many candidates seemed ready and able to offer appropriate counterarguments to points brought up in the documents. More marks than has been the case in previous series were awarded for the 'treatment of counter-positions' skill. It was noted in the November 2018 series that many candidates were presenting their answers as a series of analyses of each document in turn. In the current series this was rarely seen and most candidates attempted to construct their own arguments; the more successful of these were able to arrange their ideas into strands of reasoning that supported intermediate conclusions. Hence, marks for the structure and quality skills often exceeded Level 2. Few candidates were using the documents with a critical eye, which meant their marks for 'use of documents' was restricted to Level 2. It is worth reminding Centres that what is likely to get high marks is a persuasive argument with a clear structure that is supported by thoughtful, particularly critical, use of the documents and that thoughtfully considers relevant alternative viewpoints.