BIOMEDICAL ADMISSIONS TEST

BMAT 2014

Section 1 explained answers
The first thing to notice is that the columns are 2008 and 2007, whereas the question asks for the increases from 2007 to 2008. So you need to be careful when reading the question and the date. You then need to compare the two right-hand columns (for 2007) with the left-hand columns (for 2008), taking care to identify where there is an increase in both ‘audience numbers’ and ‘time per visit’. A sensible strategy is to check row by row and tick each row where there is an increase in both figures.

<table>
<thead>
<tr>
<th>Site</th>
<th>Audience (000's)</th>
<th>Time per visit (hrs:min:sec)</th>
<th>Audience (000's)</th>
<th>Time per visit (hrs:min:sec)</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>myspace.com</td>
<td>55,419</td>
<td>2:12:19</td>
<td>53,362</td>
<td>2:00:24</td>
<td>Y</td>
</tr>
<tr>
<td>Facebook</td>
<td>20,043</td>
<td>1:06:43</td>
<td>9,923</td>
<td>1:04:54</td>
<td>Y</td>
</tr>
<tr>
<td>LinkedIn</td>
<td>7,392</td>
<td>0:10:31</td>
<td>1,990</td>
<td>0:05:10</td>
<td>Y</td>
</tr>
<tr>
<td>Flixster</td>
<td>2,619</td>
<td>0:07:38</td>
<td>1,591</td>
<td>0:12:28</td>
<td>N</td>
</tr>
<tr>
<td>Reunion.com</td>
<td>4,323</td>
<td>0:04:34</td>
<td>4,348</td>
<td>0:04:49</td>
<td>N</td>
</tr>
<tr>
<td>Meetup.com</td>
<td>1,940</td>
<td>0:12:16</td>
<td>1,215</td>
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<td>Y</td>
</tr>
<tr>
<td>Last.fm</td>
<td>1,938</td>
<td>0:06:43</td>
<td>1,508</td>
<td>0:02:24</td>
<td>Y</td>
</tr>
<tr>
<td>myYearbook</td>
<td>1,738</td>
<td>0:07:02</td>
<td>2,368</td>
<td>0:09:04</td>
<td>N</td>
</tr>
</tbody>
</table>

So 5 sites had an increase in both ‘audience numbers’ and ‘time per visit’ from 2007 to 2008. The answer is D.
This kind of question asks you to pick out the main conclusion, or main point, of an argument. In short arguments like this, there are only a few places a conclusion can go. Somewhere in the passage, there ought to be a fairly strong assertion that needs, and receives, some support. This is likely to be the main conclusion and is often highlighted by words such as ‘however’. (Words like ‘however,’ ‘so’, ‘therefore’, ‘hence’ or ‘consequently’ and phrases such as ‘as a result of this’ often indicate that a conclusion is being drawn.)

If another conclusion is drawn, you need to decide whether this further conclusion is the main conclusion or an intermediate conclusion. (An intermediate conclusion is a conclusion that is drawn along the way to the main conclusion.) So, you need to decide if this further conclusion is an intermediate one that also supports the claim after the ‘however’ or whether it actually follows from, or is a logical consequence of, the claim after the ‘however’. If it follows from the claim that comes after ‘however,’ this later conclusion will be the main one.

If you are not sure which of two conclusions is the main one, say them together, and insert the words ‘therefore’ or ‘because’ between them. If they make more sense with the word ‘therefore’ between them, then the claim after the ‘therefore’ will be the (main) conclusion and the claim before it either a reason or an intermediate conclusion. The reverse is true if the word ‘because’ fits better between them.

Here the argument begins by asserting a viewpoint that is commonly held (‘There is a tendency to think that carnivores … are the most at risk from extinction’). This is followed by ‘Yet’ (a ‘however’ synonym) and the claim that this viewpoint ought to be revised – in fact, ‘the opposite has been the case’. Making such a statement in this context is equivalent to asserting that ‘herbivores are most at risk of extinction’. So the second sentence is likely to be a conclusion.

As you read on, you find that reasons are given for why the claim that carnivores are the most at risk from extinction ought to be rejected, so the second sentence is definitely a conclusion. Now, in this case, a further conclusion does occur, that carnivores are ‘less vulnerable to changes in environment’. However, this does not follow from the previous conclusion that herbivores are perhaps more at risk of extinction. Instead it supports it. What comes next in the passage gives further support for this second conclusion: ‘After all, meat remains meat through even the most dramatic of environmental upheavals; whereas grassland might be converted to forest – with serious consequences for the herbivores that are grazing specialists’. This would make the initial conclusion, the second claim of the passage, the main conclusion.

If you were not sure, here are the two possible conclusions, applying the ‘therefore’ test:

Herbivores are more vulnerable to changes in environment

Therefore:
It is likely that herbivores are more at risk of extinction

or:
It is likely that herbivores are more at risk of extinction

*Therefore:*

Herbivores are more vulnerable to changes in environment

Hopefully, you can see that the first is more logical. Apart from anything else, it goes from a definite claim, ‘Herbivores are more vulnerable …’, to a less definite claim, ‘It is likely that …’. It doesn’t make sense to argue from a less definite claim to a more definite one; it makes more sense to argue from something more certain (the *reason*) to something less certain. The *reason* in an argument is usually presented as more or less *known*; the conclusion as *inferred*.

Since C most closely paraphrases the claim after the ‘Yet’ and is supported by another conclusion, it most closely paraphrases the main conclusion of the argument. Therefore, C is the right answer.

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3 A password to open the safe in a hotel room uses an array of five names in a particular order selected from the names of the members of the owner’s family. They are:

Rick, Betty, Oscar, Gavin, Yasmin, Graham and Bertha.

In any password a name can only be used once and no two names with the same starting letter are allowed.

Jeremy is trying to remember the password he set and tries:

Betty Rick Oscar Gavin Yasmin

The safe doesn’t open because whilst the second, fourth and fifth names are correct, the first and third names are wrong.

Which of these could be the correct combination to open the safe?

A   Bertha Rick Oscar Gavin Yasmin
B   Bertha Rick Graham Gavin Yasmin
C   Betty Rick Bertha Gavin Yasmin
D   Oscar Rick Graham Gavin Yasmin
E   Oscar Rick Bertha Gavin Yasmin

Since the second, fourth and fifth names are correct, it is only the possible names for the first and third positions that need to be worked out. Since names cannot be repeated and no two names can have the same first letter, the only options left are Bertha, Betty and Oscar.

Since the two names cannot be both Bertha and Betty, one of the names must be Oscar, and this must be in the first position since we know that Oscar was wrong in the third position. This leaves only two possibilities for the code:

Oscar Rick Bertha Gavin Yasmin
Oscar Rick Betty Gavin Yasmin

Betty is not given as an option in the answer options. E is therefore the correct answer.

Alternatively, a quick strategy to answer this question is to eliminate the options. We know that the password cannot have more than one name with the same starting letter, so B (Graham and Gavin), C (Betty and Bertha) and D (Graham and Gavin) can be eliminated. We also know that Betty in first place and Oscar in third place are incorrect, so we can eliminate A (which has Oscar in third place) and C again (which has Betty in first place). So the only possible combination is E.
Here we have a passage where we are given nothing but a series of claims that are largely factual. None of them are claims that sound like judgments that demand further support – and in fact we are not given any. This kind of passage is likely to be used for a ‘drawing a conclusion’ question, since no actual conclusion, and therefore no argument, has been presented. (The author has not used any of the pieces of information to make a point; they are just presenting us with the information.) The task in ‘drawing a conclusion’ questions is to infer or deduce what can logically follow from the information provided.

In these questions, the key to getting the right answer is being careful. In particular, you must ensure that you do not conclude more than the passage allows. You also need to make sure that the conclusion you draw is consistent with, and supported by, the passage as a whole – not just a particular claim it makes.

Here, the information tells us: (1) that wolves are making a return to a region of France; (2) that farmers are rewarded compensation for sheep attacked by wolves; (3) that this is considerable; (4) that it is very difficult to distinguish between wolf and dog attacks; and (5) that there are many more wild dogs than wolves.

Putting these points together makes a case for thinking that farmers have a clear motive to make bogus claims about wolf attacks. After all, they are likely to be rewarded for such fake claims and are unlikely to get found out as being dishonest. Indeed, because there is such a greater number of wild dogs and it is difficult to distinguish between wolf and dog attacks, there is a strong likelihood that sheep losses attributed to wolves – purposely misleadingly or otherwise – are in fact caused by dogs.

From this line of reasoning it follows that any claim that a sheep has been attacked by a wolf in the Haute-France region should be treated with caution. Therefore, B is a conclusion that can be drawn from the passage. The other three options (A, C, D) go beyond what is supported by the information presented.
5. This is part of a tiled floor in my house, surrounding a space where I have removed a broken tile.

Each tile has a pattern of sixteen smaller squares, three of which are black. On each tile, one of the black squares is a corner square, one is an edge square and one is an inner square. No two black squares touch, either edge to edge or corner to corner.

Although I laid the tiles to produce an apparently random pattern, I made sure that no two black squares touched anywhere, either edge to edge or corner to corner.

Which one of the eight different tiles that are available must I use to replace the broken one? (Tiles may be rotated.)

With this type of question, there is normally a small number of necessary criteria that one must meet. Here, as no black squares can be touching (edge to edge or corner to corner) and we are placing the central tile, it is only the squares immediately surrounding the middle square that will determine which tile could be placed in the middle.
The squares shaded in yellow cannot be the ones that should be black as they would share an edge or corner with another black square. This means that the two squares shaded in blue must be ones that should be black. Once this is determined, it is possible to eliminate the squares that are green, as they touch the blue squares, so there is only one possible tile that fits the criteria.

To match it to the options, it is easiest to start with one square as a reference – for example, the ‘edge square’ is on the side clockwise round from the ‘corner square’ and in the nearer position of the two to the ‘corner square’. Once those two squares are checked, there is only one position for the final square that fits the requirements.

G is therefore the correct answer.

Structurally, this is a very straightforward argument. It only contains three claims, and the second one, clearly signalled with ‘So’, is evidently a conclusion. (As previously stated, words like ‘however,’ ‘so’, ‘therefore’, ‘hence’ or ‘consequently’ and phrases such as ‘as a result of this’ often indicate that a conclusion is being drawn.)

Hopefully, you should be able to recognise that the conclusion comes as a bit of a ‘jump’ from the first point – just because only people who are taught music before they are 6 develop perfect pitch doesn’t mean we should make teaching music to children under the age of 6 a priority in primary schools. We would have to assume that having perfect pitch is an important thing for people to acquire; there may be other things that are more important to spend time on in school than acquiring perfect pitch.

If it is clearly possible for the reason(s) in an argument to be true and the conclusion still false, this is a sign that an argument might be flawed. This flaw is likely to be present if there is too big a ‘jump’ from the reasons to the conclusion, or in other words, the reasons do not really give enough grounds from which to infer the conclusion.

The argument also displays another common type of flaw, or reasoning/logical fallacy. While it might be true that perfect pitch only manifests itself in people who have training at an early age, this only establishes that, if anything, it is a necessary condition to have musical training at an early age, not a sufficient one. In other words, it might be the case that if you don’t have musical training at an early age, you will never acquire perfect pitch; however, this does not mean that if you do have the training, you will definitely or most likely acquire it. It might be that as well as having early training, you also need some sort of innate ability/some natural disposition – which, while it only fully blossoms if early teaching is provided, nevertheless still needs to be there. (In reasoning terminology, this fallacy is known as ‘treating a necessary condition as if it were a sufficient condition’.)

So we have identified two different flaws in the argument: one to do with the inference to the main conclusion (that musical training for children under 6 should be prioritised in primary schools) and one to do with the inference to the intermediate conclusion (that being taught music before the age of 6 is sufficient for developing perfect pitch). Looking at the options available, B clearly captures the second flaw, which undermines the inference to the intermediate conclusion on which the main conclusion partly rests.
This question requires the calculations to be made in the appropriate order. Start with calculating the amount in each jar. The 25% extra means that the large jar will contain $400 \times 1.25 = 500$ g of coffee.

Similarly, the small jar will contain $100 \times 1.25 = 125$ g of coffee.

Buying a large jar of coffee (500 g) also gets a small jar for free (125 g).

So, in total the customer will get 625 g. If the special offers had not been in place, purchasing a large jar of coffee would get a customer 400 g. Thus, customers obtain an additional $500 + 125 - 400 = 225$ g of coffee.

A customer will therefore get $(225 / 400) \times 100\% = 56\frac{1}{4}\%$ more coffee.

E is the correct answer.
Questions 8 – 11 refer to the following information:

A new research study shows that general anaesthesia increases the risk of developing dementia in later life by 35%, regardless of lifestyle. Research from France being presented at a conference of anaesthetists identifies postoperative cognitive dysfunction (POCD), a common delirium-like complication of major surgery in older people, as a likely cause of dementia that develops some years later.

The study examined the health of 9,294 people aged 65 or over in three French cities from 1999 in order to assess the risk of dementia and decline in cognitive function linked to vascular risk factors. Participants were checked two, four, seven and 10 years later. Each time the 7,008 patients originally without dementia were asked if they had had either a general or local anaesthetic since the last check-up. After two years, 2,309 (33%) had undergone one in that time, of which 1,333 (19%) were general and 946 (14%) local. In total 632 participants developed dementia over the eight-year follow-up period.

The statistical model used in the study suggests that if a smoker has undergone general anaesthesia then they have a 27% likelihood of developing dementia in later life, compared to a 19% likelihood for a non-smoker. These results further support previous research findings about the effects of smoking on health.

A summary of the findings, which are being unveiled at the annual meeting of the European Society of Anaesthesiology, states: "After adjustment, participants with at least one general anaesthesia over the follow-up had a 35% increased risk of developing a dementia compared with participants without anaesthesia." That risk is for general anaesthesia, not all anaesthesia, they stressed.

Dr Sztark, one of the authors of the study, said that "[t]hese results are in favour of an increased risk for dementia several years after general anaesthesia." Health professionals should, he said, be aware of the possibility of POCD when deciding how to manage elderly patients who are being fully anaesthetised.

Dementia organisations responded cautiously. Dr Eric Karran, director of research at Alzheimer's Research UK, said: "This is early data and given the complexity of the findings we need to await the full peer-reviewed publication before fully interpreting the results. Research into the impact of anaesthetics on dementia is challenging because it can be very difficult to tease out cause and effect. Dementia is caused by several brain diseases, many of which arise from a complex mix of genetic and environmental factors."

Dr Doug Brown, director of research at the Alzheimer's Society, said: "The early results from this study support the view that anaesthesia may increase risk of developing dementia but questions still remain about why this is the case and whether other factors could also have a role to play."

Adapted from an article by Denis Campbell, The Guardian, Friday 31 May 2013
8. If the cohort is typical of the population aged 65 or over, what are the chances of someone without dementia developing it during the eight-year follow-up period?

A. 7%
B. 9%
C. 11%
D. 19%
E. 35%

For data analysis and inference questions, the accompanying text and data need to be carefully read. The relevant information to answer this question can be found in paragraph 2:

Each time the 7,008 patients originally without dementia were asked if they had had either a general or local anaesthetic since the last check-up. After two years, 2,309 (33%) had undergone one in that time, of which 1,333 (19%) were general and 948 (14%) local. In total 632 participants developed dementia over the eight-year follow-up period.

So, of 7,008 patients, 632 developed dementia during the next 8 years. 632 out of 7,008 is approximately 9%.

B is therefore the correct answer.

9. In the second to last paragraph Dr Karran says it can be "very difficult to tease out cause and effect".

Which one of the following could be an alternative explanation of the finding that anaesthesia increases the risk of dementia?

A. More patients in the study were free from dementia than had dementia.
B. The study cohort had a higher proportion of dementia patients than the population as a whole.
C. Other conditions or lifestyles which lead to the need for anaesthesia could also increase the risk of dementia.
D. Postoperative cognitive dysfunction does not always lead to the development of dementia.

In the passage it is stated that those who had at least one general anaesthetic over the follow-up had an increased risk of dementia. However, the evidence does not show that the general anaesthesia causes the increased risk of dementia, so an alternative explanation for the relationship is needed. It is possible that there is some third factor which causes both the need for general anaesthesia and the increased risk of dementia. So rather than one causing the other, undergoing general anaesthesia and an increased risk of dementia may be linked by a shared connection to other conditions or lifestyles. The correct answer is C.
10 Which one of the following additional pieces of information, if true, strengthens the case for general anaesthesia increasing the risk of dementia?

A. For those who had had a local anaesthetic, there was no statistical evidence for an increased risk of dementia.

B. Those who had had a general anaesthetic for a mechanical problem (e.g. hip replacement) showed a lower rate of dementia than those who had had anaesthesia for medical conditions (e.g. cancer).

C. Having a general anaesthetic has also been shown to weaken the immune system.

D. The cohort studied was carefully selected to represent a typical demographic group with an average range of pre-existing medical conditions.

The case for general anaesthesia would be weakened by any evidence that suggests that a different factor might be responsible for the link observed in the study. Therefore, if it is true that the cohort were selected to be a representative sample, then this would reduce the risk that the results were due to a different factor. So the additional piece of information about the representative study cohort strengthens the argument, and the correct answer is D.

11 If a smoker who is typical of the cohort in this study does not undergo general anaesthetic, what is the probability that they will develop dementia in later life?

A. 9%

B. 12%

C. 14%

D. 18%

E. 20%

The important information in the passage is:

General anaesthesia increases the risk of developing dementia in later life by 35%, regardless of lifestyle. (paragraph 1)

If a smoker has undergone general anaesthesia, then they have a 27% likelihood of developing dementia in later life. (paragraph 3)

Therefore, the 27% likelihood that a smoker who has undergone general anaesthesia has of developing dementia in later life is a 35% increase on the likelihood that a smoker who has not undergone general anaesthesia has (or 135% of the probability that a smoker who does not undergo a general anaesthetic will develop dementia – which is 1.35 times the probability we are looking for). Therefore, this likelihood is 27% + 1.35 = 20%. The answer is E.

[We can quickly check this by doing the calculation in reverse. If a smoker who does not undergo general anaesthetic has a 20% chance of developing dementia, and undergoing a general anaesthetic increases the chance of developing dementia by 35%, then if a smoker has undergone general anaesthesia they will have a (35% of 20 =7 so 20+7) 27% likelihood of developing dementia in later life.]
Looking at the two closest answers, we can see that they are 125 and 140. We can reason that the actual result must be somewhere in the middle of these two. 140-125 is 15, so the mid-point would be 125 + 7.5. And as there are only whole jelly beans, this must be either 125+7 or 125+8. 125+7 (132) is closer to 125 than 140. The second placed guess shows that the maximum number of jelly beans in the jar must be 132 (since 133 is closer to 140 than 125).

Similarly, the fact that a guess of 142 was better than 121 shows that the minimum number of jelly beans must be 132 (since 131 is closer to 121 than 142). Therefore, the only possibility is that the number of jelly beans is 132. The correct answer is D.
As with question 4, this question focuses on what can be concluded from the passage. What this question is asking you to do is assuming that the information here is true, what else would it be reasonable to conclude as being true?

Although it might appear more complicated than question 4 in that the passage presents a greater amount of information, the text boils down to two points. The first five sentences expand on and substantiate the initial claim that recorded crime figures are not a good way to identify crime trends. The last sentence tells us that the Crime Survey of England and Wales is ‘a much more reliable measure of crime’. If it is true that recorded crime figures are not a good way to determine crime levels (which we are told in the first five sentences); and if it is also true that the survey gives us a much more reliable measure of crime (last sentence); then it would be reasonable to conclude that if we wanted to find out whether crime levels are increasing, it would make more sense to survey people’s experience of crime (rather than look at the recorded crime figures).

E is therefore a conclusion that can be drawn.

Remember, whether or not it’s actually the case, the passage has told us that this method is more reliable, and for the purposes of this question, we can assume that what we have been told is true.
The drawing below shows a pictorial view of a model for a house.

Which two of the drawings below show possible side views of the model?

A 1 and 2  
B 2 and 3  
C 3 and 4  
D 4 and 5  
E 5 and 6  
F 6 and 1

[In the following explanation, the two sides of the model that are visible in the given pictorial view are referred to as the ‘front left’ (with the door and two windows) and the ‘front right’ (with the three windows). The two sides of the model that are not visible in the given pictorial view are called the ‘back left’ (sharing a corner with the ‘front left’) and the ‘back right’ (sharing a corner with the ‘front right’).

Going through each of the drawings in turn, we can see that the outline of diagram 1 matches what we would see if we were able to rotate the model to examine it from the now-hidden ‘back right’. Since the outlines for the roofs are consistent, this must be a possible view as no other detail is visible in the original diagram.

Looking at the outline of diagram 2, we can see that it is similar to that of diagram 6. On closer examination, however, we can see that there is a difference in the roof proportions depicted in the two drawings. Both diagrams might be a view from the now-hidden ‘back left’, but the height of the roof in diagram 6 is a better match to that of the visible structure of the original drawing. Since the outlines for the roofs are consistent, drawing 6 must be a possible view as no other detail is visible in the original diagram.

Moving on to diagrams 3 and 4, we can see that they might match the view from the ‘front right.’ But while the roof sections are correct in diagram 3, the windows do not match what is in the ‘front right’ in the original drawing. In the case of diagram 4, neither the roof pattern nor the windows match what is in the ‘front right’ in the original drawing.
Finally, the outline of diagram 5 might match the view from the ‘front left’ of the initial picture except that it is not a correct representation of the details that are visible from that side. (Some visible roof angles plus the door and two windows of the ‘front left’ are not shown correctly in diagram 5.) This process leaves us with only diagrams 1 and 6 as possible side views of the model. The correct answer is therefore F.
This kind of question asks you to identify an assumption, or unstated belief or idea, on which the argument depends. In other words, the task is to recognise the step that is missing within an argument. The missing step may be a reason or an intermediate conclusion, but whichever, it will be necessary to – not just helpful for – the given argument.

In order to identify this assumption, or missing step, you need to outline the structure of the argument. Put very simply, the structure of the argument in this question is as follows:

**Conclusion**  
People are wrong to oppose the sharing of medical records.

Because:

**Reason 1**  
It is in their interests to maintain privacy.

**Reason 2**  
But it is also in their interests for medical science to arrive at new treatments.

This line of reasoning means that the conclusion is the result of a balancing of interests – of weighing one thing against the other.

Since we have been given a reason for thinking it is not in people’s interests to support sharing the information, and a reason for thinking it is, and then used this to draw the conclusion that it is, the argument must be assuming that the reasons for thinking it is are more important/outweigh the reasons for thinking it isn’t.

Without assuming A, the argument would not work; the conclusion would not follow. A is therefore an assumption that the argument is making.
Ben designs booklets for companies to use for their marketing. The price that he charges is based on the number of pages in the booklet and whether the booklets are black and white or colour. His prices are summarised in the following table:

<table>
<thead>
<tr>
<th>Number of pages</th>
<th>Black and White</th>
<th>Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>$50</td>
<td>$80</td>
</tr>
<tr>
<td>8</td>
<td>$90</td>
<td>$150</td>
</tr>
<tr>
<td>16</td>
<td>$160</td>
<td>$250</td>
</tr>
</tbody>
</table>

Ben also offers a printing service. Printing 100 booklets in black and white costs $20 and printing 100 booklets in colour costs $30.

An 8-page booklet is required. How much more would it cost for the booklet to be designed and 500 copies made if it is in colour rather than black and white?

A $50
B $60
C $80
D $110
E $140

There is no need to calculate the actual costs for the two options, as it is just the increase that is needed. Looking at the 8-page booklet row, the design price is $60 more for colour than for black and white. It will then cost an additional $10 for the printing for every 100 booklets. The total additional cost is therefore $60 + (5 × $10) = $110. The correct answer is D.
This is a passage that begins by setting up a commonly held viewpoint – that we need to train more people in STEM – before then countering this with a ‘But’ claim: ‘But STEM training is not the only answer: anecdotal evidence shows that the STEM employees who do best are those most skilled in thinking and communicating’. However, this claim is not supported; it is therefore not a conclusion. Instead, it is used to draw the subsequent conclusion that: ‘Instead of looking to produce scientists or engineers, we should focus on turning out agile minds.’

A ‘focus on turning out agile minds’ is the position for which the passage is arguing. It bases this position on the previous claim (the anecdotal evidence reporting a correlation between the STEM employees who do best and those most skilled in thinking and communicating) and the claim which follows – that ‘The ability to process, synthesise and communicate information efficiently is the premium skill of the future.’ We want to identify why these two claims, even if what they report is true, do not allow us to infer the conclusion that: ‘Instead of looking to produce scientists or engineers, we should focus on turning out agile minds.’

In short, we need to ask why it is that it might be true that:
- STEM employees who do best are those most skilled in thinking and communicating

and also true that:
- the ability to process, synthesise and communicate information efficiently is the premium skill of the future

and yet it might not also be true that:
- Instead of looking to produce scientists or engineers, we should focus on turning out agile minds.

Hopefully, you might be able to think of several possible reasons, such as:

(i) It’s not possible to make someone’s mind more agile (this is something that depends on their character/natural abilities)
(ii) If we focus on training people to have agile minds at the expense of training them in STEM, we may lose the STEM capabilities/potential (although someone trained in STEM who also has an agile mind is more valuable than someone simply trained in STEM, it’s still better to be trained in STEM than not because it’s no use having loads of people with agile minds if none of them are STEM trained/end up as scientists or engineers!)
(iii) It may be that training in STEM is what fosters an ‘agile mind’ and/or
(iv) The two are not mutually exclusive: it’s possible to train people in both (and, if so, that’s better!)

Note that these are only possibilities. But if any of them were true, the argument would fail. They are all possible flaws because the argument has not proved any of them to be false.
Looking at the options available, it should be fairly clear that D is close to our second reason for thinking the argument flawed. The argument is assuming that since STEM-trained people who also have agile minds are the most successful, we ought to focus not on them being STEM trained but on them having agile minds. But simply having an agile mind alone is not necessarily that beneficial. While you might want an engineer with an agile mind working on an engineering problem rather than one without, you would probably prefer an engineer without an agile mind to a non-engineer who nevertheless could think and communicate well! The engineer needs the subject knowledge for his or her agile mind to be useful.

It is necessary to construct the order in which the balls were drawn from the bag. Because of the number of teams in the draw plus the draw criteria given (i.e. alternating between even and odd numbers and always keeping a difference of at least three), most of the numbers can only occur next to two others. Therefore, there are very few options to consider.

We are told that the first number drawn was 6, and since the 3 can only be next to 6 and 8, the sequence must start as 6, 3, 8. The next number must be 1 as we are told that the 5 appears at the end. Continuing in this way, the full sequence must be:

6 3 8 1 4 7 2 5

So the Quavers will play the Flats and the Minims will play the Crotchets. The correct answer is C.
Questions 19 – 21 refer to the following information:

The information below relates to offences dealt with by courts in England and Wales during 2010.

### Table 1: Sentencing rates by region (2010)

<table>
<thead>
<tr>
<th>Geographic region</th>
<th>Actual population of region (millions)</th>
<th>Percentage of the population sentenced</th>
</tr>
</thead>
<tbody>
<tr>
<td>North East</td>
<td>2.6</td>
<td>0.86%</td>
</tr>
<tr>
<td>Yorkshire</td>
<td>5.0</td>
<td>0.84%</td>
</tr>
<tr>
<td>North West</td>
<td>6.6</td>
<td>0.62%</td>
</tr>
<tr>
<td>West Midlands</td>
<td>5.3</td>
<td>0.57%</td>
</tr>
<tr>
<td>London</td>
<td>7.4</td>
<td>0.66%</td>
</tr>
<tr>
<td>Wales</td>
<td>3.0</td>
<td>0.5%</td>
</tr>
<tr>
<td>South West</td>
<td>5.0</td>
<td>0.5%</td>
</tr>
<tr>
<td>South East</td>
<td>8.1</td>
<td>0.47%</td>
</tr>
</tbody>
</table>

### Table 2: Occurrence of offences by type (2010)

<table>
<thead>
<tr>
<th>Offence type</th>
<th>Percentage of total recorded offences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arson</td>
<td>0.4%</td>
</tr>
<tr>
<td>Breach of Bail</td>
<td>1.9%</td>
</tr>
<tr>
<td>Breach of Conditional Discharge</td>
<td>0.6%</td>
</tr>
<tr>
<td>Breach of Statutory Order</td>
<td>6.0%</td>
</tr>
<tr>
<td>Criminal Damage</td>
<td>13.9%</td>
</tr>
<tr>
<td>Death or Injury by Reckless Driving</td>
<td>0.04%</td>
</tr>
<tr>
<td>Domestic Burglary</td>
<td>2.4%</td>
</tr>
<tr>
<td>Drugs Offences</td>
<td>4.8%</td>
</tr>
<tr>
<td>Fraud and Forgery</td>
<td>0.8%</td>
</tr>
<tr>
<td>Motorway Offences</td>
<td>9.4%</td>
</tr>
<tr>
<td>Non Domestic Burglary</td>
<td>1.6%</td>
</tr>
<tr>
<td>Other</td>
<td>2.7%</td>
</tr>
<tr>
<td>Public Order</td>
<td>8.6%</td>
</tr>
<tr>
<td>Racially Aggravated Offences</td>
<td>1.0%</td>
</tr>
<tr>
<td>Robbery</td>
<td>2.4%</td>
</tr>
<tr>
<td>Sexual Offences</td>
<td>0.6%</td>
</tr>
<tr>
<td>Theft and Handling</td>
<td>19.7%</td>
</tr>
<tr>
<td>Vehicle Theft</td>
<td>3.0%</td>
</tr>
<tr>
<td>Violence against a Person</td>
<td>19.4%</td>
</tr>
</tbody>
</table>
It is not possible to infer statement 1 as the information is about sentencing rates rather than actual crime rates.

The relevant values for statement 2 can be calculated:

- Yorkshire – 0.64% of 5 million is 32,000.
- Wales – 0.50% of 3 million is 15,000.

So it is possible to infer statement 2.

For the North West, 0.62% (which is more than 6 in every 1,000) have been sentenced, and it is safe to say that more individuals will have committed crimes than have been given sentences. It is possible to infer statement 3.

The correct answer is F.

From the table, we can see that 0.55% of the population have been sentenced. This means that the ratio of sentences to population is 0.55 : 100 or 1 : 181.8.

The correct answer is C.
The calculation that there were 100 arson sentences is made by multiplying the 25,000 by 0.4%. This requires an assumption that the proportion of sentences that were given for arson in the South West was the same as the proportion nationally (so assumption 1 is required).

Since the two tables show different information (the first table relates to sentences, whereas the second table refers to recorded offences), it needs to be assumed that these are the same as each other (so assumption 2 is required).

The correct answer is C.

We are told that 1 day (24 hours) is 10 decidays.

As 24 hours is \((24 \times 60) = 1,440\) minutes, we know that 1 deciday is 144 minutes.

For the new clock, midday (which is 12:00 on the old clock) is 0:00. So 1:75 will be 1.75 decidays after midday.

1.75 decidays = 1.75 \times 144\) minutes, which is 252 minutes past 12:00.

252 minutes is 4 hours 12 minutes.

4 hours 12 minutes after midday (12:00) is 16:12, so the correct answer is C.
This kind of question is similar to a ‘drawing a conclusion’ question in that it requires you to work out what the information does or does not allow you legitimately to assert. The difference is that the passage will actually contain the conclusion somewhere; either in the claim it is asking you to complete or in a claim that is probably a reason for the conclusion or in an intermediate conclusion itself. This is what will enable you to fill in the missing section, as hopefully you will see what conclusion can be drawn – or what reasons are needed to draw the conclusion. It is about being precise: exactly what conclusion (no more, no less) can be drawn?

Here it is all about getting the expression of the conclusion right. There is a clue that it is a conclusion/inference we are looking for in that the final sentence begins ‘Given that ...’. If someone says, ‘Given that X is the case, Y is the case’, then we know that X is being presented as a reason for Y or that Y is being presented as a conclusion/inference from X.

The first half of the passage gives us reasons to suggest that dementia is no longer an inevitable consequence of getting old and instead something that could be cured or prevented. It presents evidence of dementia being on the decline and then asks why this should be the case. The reasons offered link the fall in dementia cases to improvements in the health of blood vessels in the elderly; it then supplements this by pointing out that brain function requires the supply of oxygen to the brain from blood vessels. We then need to decide what we can conclude from this information.

What we have is a correlation between two things – the decrease in dementia and the improvements in blood vessels in the elderly – and then a reason for thinking these two things could be connected. It would be too hasty to conclude on the basis of this that one of these things is the (sole) cause of the other. There may be other explanations or factors at play. Therefore, A can be ruled out. However, we do have a reason for thinking they could be causally connected; therefore, B can be ruled out (since B has assumed they are not causally connected). C is better than A because it says ‘likely to be’ rather than ‘must be’; however, it still fails to admit the possibility of other factors at play (by talking of ‘the cause’). Only D presents the right degree of caution in terms of what we can/cannot legitimately conclude from the information given. This makes D the most logical completion of the sentence and therefore the correct answer.
The double room is £15 cheaper than two single rooms, so even the 10% discount does not make the single rooms cheaper than doubles. The only comparison that needs to be made is, therefore, the price of two double rooms compared with the price for a single room and a family room.

If they did not have the voucher, then the price would be £130 for both options, so two double rooms must be the cheapest option if the voucher is used as well. The correct answer is B.
In this kind of question, the task is to recognise the difference that additional information makes in terms of strengthening or weakening a given argument.

As always, when presented with an argument, try to work out which claims the argument is trying to justify and which ones are being used to justify them. (Alternatively, think: which ones are being supported and which ones are the support?)

The argument is that we should ‘think twice’ about taking painkillers when we have flu for the reason that doing so ‘could do more harm than good by increasing the transmission of flu’.

Clearly, if true, this gives us quite a good reason to ‘think twice’ – even if, strictly speaking, it does require us to make further assumptions about the relative importance of reducing our suffering against causing possible suffering for others!

However, notice that the reason only says it ‘could’ do more harm than good. Moreover, as it goes on to say how and why it could, we get evidence that itself is not especially strong: ‘Fever is thought to be an antiviral weapon’, ‘Some studies have shown that lowering fever can prolong viral infections.’

So what we have is an argument with a good reason for accepting the conclusion, but the reason itself could do with more support.

Option A might be thought to give some further support to the conclusion, but a careful reading reveals that this support would be very minimal, if non-existent. The fact that an overuse of painkillers can reduce their effectiveness in curing headaches does not really give a clear reason for not using them at all when suffering from flu.

B, however, gives further – and more clear and direct – support to the reason on which the conclusion depends. It would strengthen the grounds for thinking that taking painkillers when you have flu ‘could do more harm than good by increasing the transmission of flu’, as taking painkillers will increase the likelihood of people with flu returning to work while still infectious.

C, if anything, weakens the argument. We have already seen that the evidence for thinking that taking painkillers increases the likelihood of transmitting flu as presented in the argument is a little weak; C would only weaken it even further.

D and E, like A, might seem to give some support to the argument at first sight, as they both point to reasons for questioning the use of painkillers. However, neither of them, as they stand, give clear further support. A careful reading of D reveals it is almost irrelevant: no one is suggesting people take painkillers as a defence against flu. The argument is about what happens ‘Next time you feel the flu coming on’, i.e. once you have already got flu.

E is tempting, as it does appear to give a further reason for thinking twice about reaching for painkillers when you have flu. However, on closer reading, this is not the case. E gives you a reason for perhaps being a little more careful when taking the painkillers, but it does not give a reason for not taking them at all.

Only B strengthens the argument; therefore, B is the right answer.
The account number is made up from four square numbers which do not include a 0. So to achieve the eight-digit account number, the only numbers that can be used are 16, 25, 36, 49, 64 and 81. The digit 7 does not occur in any of these numbers so cannot be part of the account number. The correct answer is D.

Although it is not necessary to work out which numbers must be in the account number, it is possible to deduce which of them are included. Since no digit can appear more than once, only one of 16, 36 and 64 can be included in the number. This means that 25, 49 and 81 must be included, and the remaining number must be 36.
Drivers of motor vehicles are not the only threat to the safety of pedestrians. Official road casualty statistics for 2012 show that, per billion kilometres travelled, cyclists seriously injured 21 pedestrians, compared with 24 pedestrians seriously injured by vehicle drivers. Cyclists who ride on the pavement are regarded as a problem by pedestrians, but statistics show that most collisions between pedestrians and cyclists occur when pedestrians step into the road without seeing a cyclist. Analysis of road casualty data shows that cyclists killed 23 pedestrians in the decade to 2012 and seriously injured 585.

Assuming that 2012 is a representative year, which of the following conclusions can be drawn from the above passage?

1. A pedestrian is almost as likely to be seriously injured by a cyclist as by a motor vehicle driver.
2. As a proportion of distance travelled, the risk of a cyclist causing serious injury to pedestrians is almost as great as the risk posed by vehicle drivers.
3. Pedestrians are less likely to be seriously injured by a cyclist when walking on a pavement than when stepping into the road.

A 1 only
B 2 only
C 3 only
D 1 and 2 only
E 2 and 3 only
F 1, 2 and 3

Like questions 4 and 13, this question is asking you to judge what it is reasonable to conclude, or infer to be true, given the information in the passage. The difference is that instead of having to identify one correct conclusion from a possible four, this question asks you to choose amongst various combinations of three different, potential conclusions.

Although this is an ‘understanding argument’ question, the passage involves a large amount of data/statistical material, and indeed getting the answer right is really a question of thinking carefully about what conclusions can and can’t be drawn from the data.

Conclusion 1 might seem tempting at first given that the passage says that per billion kilometres travelled, cyclists injure nearly as many people as do motor vehicles (21 compared to 24). However, both conclusions 2 and 3 also seem like very safe conclusions to draw. This could mean that F is the right answer. But it is worth rechecking the answers, as sometimes what sounds instinctively right is not.

In the case of 1, although we know that for every billion kilometres a bike travels, it is almost as likely as a car to seriously injure a pedestrian, this does not actually mean that a pedestrian is (almost) as likely to be injured by a bike as a car – for the simple reason that there may be a lot more cars around than bikes. If cars and bikes are just as dangerous and there are a lot more cars around than bikes, then you are much more likely to be hit by a car than a bike (not because cars are more dangerous but simply because you are more likely to bump into one!).

Conclusions 2 and 3, however, are hard to deny: 2 follows directly from the second sentence; 3 follows directly from the third sentence. Therefore, 2 and 3 are conclusions that can be drawn, and E is the right answer.
There is an initial temptation to look at the options as two images separately, but it needs to be remembered that we are looking at two faces at a time (and these faces are at an angle to each other). Clearly, the outlines of the two shapes must be adjacent shapes on the net. The shape that is partially visible behind must be two places around the net and will be seen as the reflection of the view in the net. The only diagram which matches this description is A, where the left-facing triangle window is next to the square window on the front of the view. The diamond window is behind the left-facing triangle window, and the vertical-slot window is behind the square window.
This kind of question asks you to recognise the difference that additional information makes in terms of strengthening or weakening a given theory. A theory is an attempt to explain something, and explanations work a little differently from arguments. *In an argument, you infer the conclusion* – from the reason or reasons, whereas *in an explanation, you infer the reason or why* it is that something has happened (i.e. the cause) – from the evidence. In other words, in an argument it is the conclusion that is less certain – it all hangs on how good the reasons and the thinking (the inference) are; in an explanation, it is the reason that is less certain.

Strictly speaking, in an explanation you can never infer the reason, or the cause, with complete certainty; the best you can hope for is that if your explanation is right, then this would make the fact or phenomenon you are trying to explain more likely to have happened.

In this case, the phenomenon is morning sickness, and an explanation is being sought for the reason why it happens (*this phenomenon is still not fully understood*). The explanation being offered is an evolutionary one to do with avoiding certain foods that might be harmful.

Although we can never infer with complete certainty that a theory is true (there may always be further evidence that comes to light to suggest that there may be a better explanation), we can strengthen or weaken the theory (or at least our confidence levels in it) by finding further evidence that confirms or goes against it. This is what the question is asking us to consider.

So if we can never know if our explanation is the right one, in order to decide whether or not the evidence strengthens or weakens our theory, we need to think hypothetically. *If the theory was true, what else would we expect to find?* If there is something else that we *would expect* to see if our theory was true, and we found evidence that this was indeed the case, this would confirm – and therefore strengthen – the theory. If, however, there was something we would expect to see if our theory was true, but we didn’t find it, then this provides strong evidence that there is a problem with the theory. (Anything not implied by our theory, whether or not we find evidence of it happening, has no effect on our theory – it doesn’t confirm or falsify, strengthen or weaken it.)

So what we need to ask here is, if our theory was true, would we *also* expect to see any of these further phenomena (1–3) taking place?

If our theory was true, would we expect to see 1? Yes. If our theory is that morning sickness has evolved to protect the foetus from harmful substances the mother might consume, and if it is true that the foetus is in the most vulnerable stages of development in the first three months, then we might expect morning sickness to be stronger in the first three months. Option 1 therefore strengthens the theory.

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29 Half a million pregnant women are troubled by morning sickness each year in the UK, but this phenomenon is still not fully understood. One theory is that changing levels of hormones act on the brain to heighten an evolutionary adaptive response that helps prevent women from consuming substances that may be harmful. Although less important in the developed world, in the past this would have helped to protect a foetus during the first three months of pregnancy when it is at the most vulnerable stage of development. If the mother eats less, and sticks to simple foods, she is less likely to accidentally ingest something dangerous.

Which of the following would strengthen the theory presented in the above argument?

1. Morning sickness symptoms normally decline after the third month of pregnancy.
2. Pregnant women sometimes have strange food cravings.
3. Women with morning sickness tend to eat less and opt for very simple and bland food.

A  1 only
B  2 only
C  3 only
D  1 and 2 only
E  1 and 3 only
F  2 and 3 only
G  1, 2 and 3
If our theory was true, would we expect to see 2? No. There is nothing in the theory which implies, suggests or leads us to expect to see 2 happening (pregnant women sometimes having strange food cravings). If anything, this information goes slightly against the theory if we assume that 'strange food cravings' are less likely to be for simple, bland foodstuffs (and therefore according to the reasoning here, more likely to contain harmful substances). Therefore, 2 does not strengthen the theory.

Finally, if our theory was true, would we expect to see 3? Yes, we would because it is directly implied by what we are told about the theory. According to the theory, morning sickness makes women less likely to ingest something harmful, and we are also told that if the mother eats less and sticks to simple foods, she is less likely to ingest something dangerous. If it turned out that women with morning sickness did actually eat less and eat simpler food, this would help to strengthen/confirm the theory. If you’re unsure, think about what would happen if we found out that it wasn’t true that women with morning sickness ate less and ate simpler food. This would clearly be a problem for the theory: it would go against what it is predicting. Therefore, if it turns out that women with morning sickness did actually eat less and eat simpler food, then it must be confirming the theory. Option 3 therefore strengthens the theory, and therefore E is the right answer.

For both trains to complete the journey, they must pass during the time that they are at Laydon, as outside Laydon there is a single track which can only take one train at a time. The times that the trains arrive at Laydon are as follows:

The Express arrives at 12:10 since 10 miles at a speed of 60 mph will take a total of 10 minutes.

The Post train arrives at 12:30 since 15 miles at a speed of 30 mph will take a total of 30 minutes.

This means that the Express cannot leave Laydon until 12:30. The remaining journey will take 15 minutes, and so the train will arrive at Snelling station at 12:45 pm at the earliest. The correct answer is D.
Questions 31 – 35 refer to the following information:

The diagram below represents all the ferry routes between the islands in the Kuusi group.

Each ferry runs a shuttle service between two islands. The journeys between the main central island (Nolla) and each of the outer islands take 30 minutes in either direction and all journeys between two of the outer islands take 45 minutes.

All journeys on each route and in both directions start at 6 am and no journey starts at or after 9 pm.

Start times for routes between Nolla and the outer islands: 6.00 6.45 7.30 8.15 9.00 etc. repeating every 3 hours

Start times for routes between the outer islands: 6.00 7.00 8.00 9.00 etc.

It takes between 5 and 10 minutes to walk between ferry docking points on all the islands.

31 What is the smallest number of individual trips needed to visit all the islands, starting and finishing at Nolla?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>5</td>
</tr>
<tr>
<td>B</td>
<td>6</td>
</tr>
<tr>
<td>C</td>
<td>9</td>
</tr>
<tr>
<td>D</td>
<td>10</td>
</tr>
<tr>
<td>E</td>
<td>11</td>
</tr>
<tr>
<td>F</td>
<td>14</td>
</tr>
</tbody>
</table>

A journey visiting all of the islands must include a section which goes from Nolla to Yksi then Kaksi and then back to Yksi and then Nolla. Similarly, a route involving Viisi must have Nelja both before and after Viisi in the route and incorporate Kolme along the way.

A possible route would be:


This is a total of 9 trips. The correct answer is C.
The ferries from Nolla to Nelja leave either on the hour, at 15 minutes past the hour, 30 minutes past
the hour or 15 minutes to the hour. Since the journey takes 30 minutes, arrival times are also possible
at each of those times relative to an hour. Since ferries from Nelja to Viisi always leave on the hour,
the longest time that one might be on Nelja is if the ferry arrives on the hour and then the next ferry to
leave is 1 hour later. The correct answer is D.

The route would be Kaksi – Yksi – Nolla – Nelja.

Since the journey time is 45 minutes from Kaksi to Yksi, the ferry from Yksi to Nolla must be exactly 1
hour after the ferry from Kaksi to Yksi.

In the worst case, a ferry would just be leaving as you arrive on Nolla meaning that there would be a
45-minute wait for the next ferry.

The total time needed would be 1 hour (ferry trip from Kaksi to Yksi plus 15-minute wait on Yksi) + 30
minutes (ferry trip from Yksi to Nolla) + 45 minutes (maximum wait on Nolla) + 30 minutes (ferry trip
from Nolla to Nelja). This equates to 2 hours 45 minutes. The correct answer is C.
The two statements need to be checked individually:

Statement 1: The two ferry journeys are 30 minutes each, and there must always be at least a 15-minute wait on Nolla. This statement is true.

Statement 2: In the worst case, there would be a wait of 45 minutes at Nolla (if a ferry was just missed). The total journey time would be 1 hour 45 minutes. This statement is true.

The correct answer is C.

The 7 am ferry from Yksi arrives at Nolla at 7:30. Then, Mikko usually takes the 8:15 ferry from Nolla to Nelja. Therefore, he normally arrives at Nelja at 8:45, but today he will get to Kolme at that time. He will then get the 9:00 ferry, arriving at Nelja at 9:45. This is one hour later than usual. So the correct answer is B.
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