



# Admissions Testing Service

BIOMEDICAL ADMISSIONS TEST

BMAT 2014

Section 1 explained answers

- 1 The table below shows 'audience numbers' and 'time per visit' for a number of popular social networking sites. A comparison of figures for the month of February is shown for two consecutive years.

Site	February 2008		February 2007	
	Audience (000's)	Time per visit (hr:min:sec)	Audience (000's)	Time per visit (hr:min:sec)
<b>myspace.com</b>	55 419	2:12:19	53 362	2:00:24
<b>Facebook</b>	20 043	1:06:43	9 923	1:04:54
<b>LinkedIn</b>	7 392	0:10:31	1 990	0:05:10
<b>Flixster</b>	2 619	0:07:38	1 591	0:12:28
<b>Reunion.com</b>	4 323	0:04:34	4 348	0:04:49
<b>Meetup.com</b>	1 940	0:12:16	1 215	0:07:07
<b>Last.fm</b>	1 938	0:06:43	1 508	0:02:24
<b>myYearbook</b>	1 738	0:07:02	2 368	0:09:04

How many sites had an increase in both 'audience numbers' and 'time per visit' from 2007 to 2008?

- A 1  
 B 2  
 C 3  
 D 5  
 E 6

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.

Site	February 2008		February 2007		Increase
	Audience (000's)	Time per visit (hrs:mins:secs)	Audience (000's)	Time per visit (hrs:mins:secs)	
<b>myspace.com</b>	55,419	2:12:19	53,362	2:00:24	Y
<b>Facebook</b>	20,043	1:06:43	9,923	1:04:54	Y
<b>LinkedIn</b>	7,392	0:10:31	1,990	0:05:10	Y
<b>Flixster</b>	2,619	0:07:38	1,591	0:12:28	N
<b>Reunion.com</b>	4,323	0:04:34	4,348	0:04:49	N
<b>Meetup.com</b>	1,940	0:12:16	1,215	0:07:07	Y
<b>Last.fm</b>	1,938	0:06:43	1,508	0:02:24	Y
<b>myYearbook</b>	1,738	0:07:02	2,368	0:09:04	N

So 5 sites had an increase in both 'audience numbers' and 'time per visit' from 2007 to 2008. The answer is D.

2 There is a tendency to think that carnivores, given their precarious place at the top of the food chain, are the most at risk from extinction. Yet over the course of history it is likely that the opposite has been the case. Herbivores are often more specialist – evolved to suit a particular environment, to eat a particular plant. Carnivores, on the other hand, have tended to retain a more general set of attributes: teeth that could cut as well as chew; physical agility and acute senses, making them less vulnerable to changes in environment. 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.

Which one of the following best expresses the conclusion of the above argument?

- A Herbivores are more threatened by environmental changes than carnivores.
- B It is natural to think that carnivores are more at risk of extinction than herbivores.
- C Herbivores are more at risk of extinction than carnivores.
- D Carnivores are better at adapting to changes in environment than herbivores.
- E Carnivores' success is mostly down to their having more general adaptations than herbivores.

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 of 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.

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?

- |          |        |      |        |       |        |
|----------|--------|------|--------|-------|--------|
| <b>A</b> | Bertha | Rick | Oscar  | Gavin | Yasmin |
| <b>B</b> | Bertha | Rick | Graham | Gavin | Yasmin |
| <b>C</b> | Betty  | Rick | Bertha | Gavin | Yasmin |
| <b>D</b> | Oscar  | Rick | Graham | Gavin | Yasmin |
| <b>E</b> | 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.

4 Since the late 1990s wolves have been seen in the Haute-France region of the Alps. This places them once again in conflict with the shepherds who farm this region. Due to the protected status of the European wolf, French farmers are awarded a compensation payment for the loss of any of their sheep to a wolf. This payment amounts to considerably more than the livestock value of the animal. In addition to this, it is very difficult to distinguish between evidence of a wolf attack and dog attack. France has a population of 8 million dogs; 8 000 of these are estimated to be wild compared to only 200 wolves.

Which one of the following is a conclusion that can be drawn from the above passage?

- A The problem of wolves attacking sheep in the French Alps has been exaggerated.
- B Any claim that a sheep has been attacked by a wolf should be treated with caution.
- C The protected status of the European wolf is unpopular in the French farming community.
- D The wolf's reputation for killing sheep is undeserved.

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.

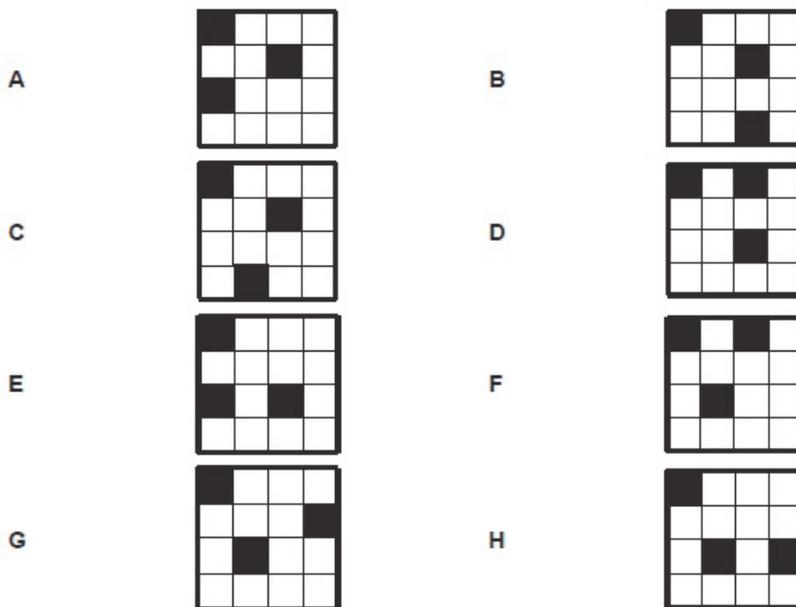
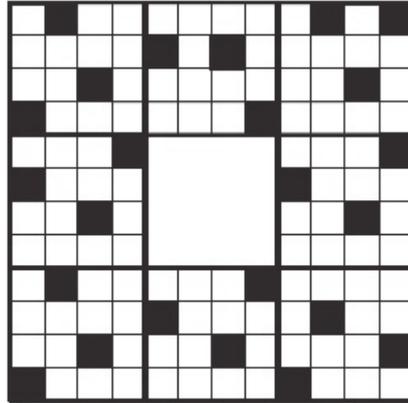
From this line of reasoning it follows that any claim that a sheep has been attacked by a wolf in the Haute-France region should be treated with caution. Therefore, B is a conclusion that can be drawn from the passage. The other three options (A, C, D) go beyond what is supported by the information presented.

- 5 This is part of a tiled floor in my house, surrounding a space where I have removed a broken tile.

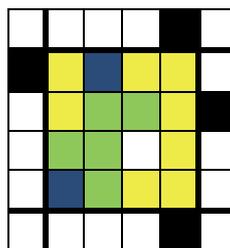
Each tile has a pattern of sixteen smaller squares, three of which are black. On each tile, one of the black squares is a corner square, one is an edge square and one is an inner square. No two black squares touch, either edge to edge or corner to corner.

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.

6 Perfect pitch – the ability to identify any note of music without inferring it from a reference note – is usually found to be a characteristic only of people who were taught music before the age of 6. So teaching music to children under the age of 6 should become a priority in primary schools. This could mean that in the future the majority of the population would have perfect pitch.

Which one of the following describes a flaw in the above argument?

- A It assumes that adults could acquire perfect pitch if they were taught music.
- B It ignores the possibility that other factors may be necessary for acquiring perfect pitch.
- C It assumes that having perfect pitch is necessary for success as a musician.
- D It ignores the possibility that children under the age of 6 may not enjoy learning music.

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.

- 7 When I buy my favourite brand of coffee from the supermarket I normally have a choice of three jar sizes, as follows:

small - 100 g

medium - 200 g

large - 400 g

At present, all three jars contain 25% extra for the normal price and, in addition, customers who buy a large jar get a small jar free.

For customers who buy a large jar of coffee, what is the total extra percentage of coffee for the normal price of the large jar?

- A**  $33\frac{1}{3}\%$
- B** 36%
- C**  $46\frac{2}{3}\%$
- D** 50%
- E**  $56\frac{1}{4}\%$
- F**  $87\frac{1}{2}\%$

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  $400\text{ g} \times 1.25 = 500\text{ g}$  of coffee.

Similarly, the small jar will contain  $100\text{ g} \times 1.25 = 125\text{ g}$  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  $500\text{ g} + 125\text{ g} - 400\text{ g} = 225\text{ g}$  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:**

1 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.

2 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 948 (14%) local. In total 632 participants developed dementia over the eight-year follow-up period.

3 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.

4 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.

5 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.

6 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."

7 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  $27\% \div 1.35 = 20\%$ . 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.]

- 12 One of the games at a charity fund raising event was 'Guess How Many Jelly Beans are in the Jar'. Prizes were awarded according to how close the guesses were to the exact number. The results of the game are shown below in the table.

Position	Guess	Winner
1st	125	Jessie
2nd	140	Saul
3rd	142	Imran
4th	121	Marie
5th	120	Hank

How many jelly beans were in the jar?

- A 129
- B 130
- C 131
- D 132
- E 133

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.

**13** Recorded crime figures – the figures which police authorities produce – have always been a poor way to identify crime trends. They are really a measure of police activity and priorities. A big operation to tackle knife crime, for instance, may uncover and record many more offences involving knives: it does not mean knife crime is rising. Added to that, there is an inbuilt temptation for police officers to ‘adjust’ their crime figures when targets need to be met. As with all recorded activity or performance data, there is always a risk of inaccuracy, confusion and fraud. A much more reliable measure of crime is the Crime Survey of England and Wales which produces figures by asking people if they have been victims of crime.

Which one of the following is a conclusion that can be drawn from the above passage?

- A The police regularly prioritise the tackling of crimes which help them meet their targets.
- B The police care more about meeting targets than they do about tackling crime.
- C Much less crime takes place than police figures tend to indicate.
- D Victims of crime fear retaliation from criminals if they report them to the police.
- E To find out whether crime levels are increasing we should survey people’s experience of crime.

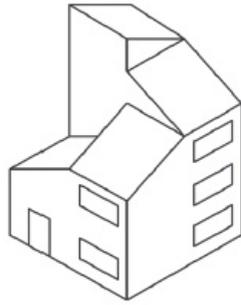
As with question 4, this question focuses on what can be concluded *from* the passage. What this question is asking you to do is assuming that the information here is *true*, what else would it be reasonable to conclude as being true?

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).

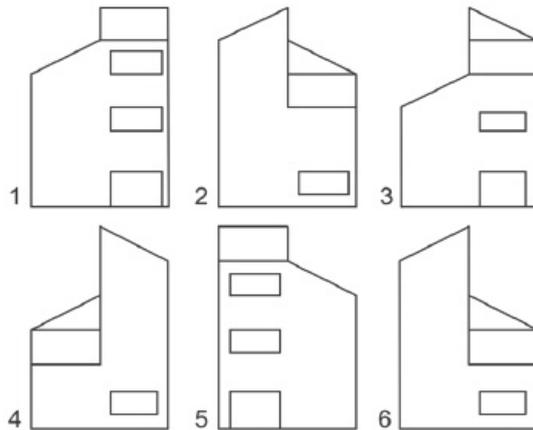
E is therefore a conclusion that can be drawn.

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.

14 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.

15 Plans to share the medical records held by doctors, on a national database, have had to be shelved as a result of public pressure. Yet the public's hostility to this proposal is misguided. Of course people's medical records are personal matters, which they might not want divulged. And yet, while it is in everyone's interests to maintain a degree of privacy, for their own peace of mind, it is also in their interests for medical science to find new treatments for ill-health. If the data were allowed to be shared, medical researchers would have access to an enormous pool of data, which could advance their understanding of illnesses and how they are caused.

Which one of the following is an assumption underlying the above argument?

- A Possible benefits that would come from improvements in medical science outweigh concerns about personal privacy.
- B The medical records will not be made anonymous.
- C The hostility shown by some members of the public is representative of the general mood.
- D People have a tendency to be overly anxious when it comes to online privacy.

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.

- 16 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:

Number of pages	Black and White	Colour
4	\$50	\$80
8	\$90	\$150
16	\$160	\$250

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  $\$60 + (5 \times \$10) = \$110$ . The correct answer is D.

17 We are all becoming used to warnings of a shortage of science, technology, engineering and mathematics (STEM) recruits. In a world increasingly dominated by careers that involve these fields, organisations and politicians repeatedly state that we really must train more of these people to secure our prosperity. 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. Instead of looking to produce scientists or engineers, we should focus on turning out agile minds. The ability to process, synthesise and communicate information efficiently is the premium skill of the future.

Which one of the following best expresses the flaw in the argument above?

- A It assumes that being agile-minded cannot be taught.
- B It ignores the fact that STEM courses are growing in popularity.
- C It fails to use comparative data from other countries.
- D It assumes that agile minds are equally effective with or without STEM training.
- E It ignores the views of STEM employers.

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.

18 The draw for the quarter-finals of the Staveland Cup took place last night.

Eight balls, numbered from 1 to 8, were drawn, one by one, from a bag. The numbers represented the teams involved, as follows:

- |   |            |
|---|------------|
| 1 | Clefs      |
| 2 | Crotchets  |
| 3 | Flats      |
| 4 | Keys       |
| 5 | Minims     |
| 6 | Quavers    |
| 7 | Semibreves |
| 8 | Sharps     |

The first two teams drawn out of the bag will play each other, as will the third and the fourth, the fifth and the sixth, and the last two.

Although the balls were drawn out at random, they alternated between even and odd numbers, and there was always a difference of at least 3 between one ball and the next.

The first number drawn was 6 (Quavers) and the last number drawn was 5 (Minims).

Which teams will the Quavers and the Minims play in the quarter-finals of the Staveland Cup?

- A The Quavers will play the Clefs and the Minims will play the Crotchets.
- B The Quavers will play the Clefs and the Minims will play the Sharps.
- C The Quavers will play the Flats and the Minims will play the Crotchets.
- D The Quavers will play the Flats and the Minims will play the Sharps.

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)**

<i>Geographic region</i>	<i>Actual population of region (millions)</i>	<i>Percentage of the population sentenced</i>
North East	2.6	0.88%
Yorkshire	5.0	0.64%
North West	6.8	0.62%
West Midlands	5.3	0.57%
London	7.4	0.55%
Wales	3.0	0.5%
South West	5.0	0.5%
South East	8.1	0.47%

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

<i>Offence type</i>	<i>Percentage of total recorded offences</i>
Arson	0.4%
Breach of Bail	1.9%
Breach of Conditional Discharge	0.6%
Breach of Statutory Order	6.0%
Criminal Damage	13.9%
Death or Injury by Reckless Driving	0.04%
Domestic Burglary	2.4%
Drugs Offences	4.8%
Fraud and Forgery	0.8%
Motoring Offences	9.4%
Non Domestic Burglary	1.8%
Other	2.7%
Public Order	8.6%
Racially Aggravated Offences	1.0%
Robbery	2.4%
Sexual Offences	0.8%
Theft and Handling	19.7%
Vehicle Theft	3.0%
Violence against a Person	19.4%

19 Which of the following is a safe inference to draw from the above data?

- 1 London has the highest crime rate in the country.
- 2 The number of sentences handed down in Yorkshire was more than twice that of Wales.
- 3 In the North West more than 6 out of every 1 000 population have been sentenced in 2010.

- 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
- H None of the statements

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.

20 Which one of the following is the best estimate of the ratio of sentences to population in London?

- A 55 for every 1 000 inhabitants
- B 1 for every 155 inhabitants
- C 1 for every 182 inhabitants
- D 18.2 for every 10 000 inhabitants
- E 1 for every 1 818 inhabitants

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.

**21** Table 1 shows that there were 25 000 sentences handed down in the South West region in 2010. Table 2 shows that 0.4% of recorded offences were arson attacks, revealing that in the South West exactly 100 arson sentences were given for arson in that year.

Which of the following assumptions, if any, are required for this argument?

- 1** The number of recorded arson attacks in the South West is proportionate to the total number of such attacks across all regions.
  - 2** The number of recorded offences in each region is the same as the number of sentences in that region.
- A** 1 but not 2
- B** 2 but not 1
- C** Both 1 and 2
- D** Neither 1 nor 2

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.

**22** There have been various proposals over the years for a system of decimal time.

Under one system the day would remain the same length of time as it is at present, but would be the basic unit of time, divided into 10 decadays each made up of 100 millidays. Clocks would show the time in decadays and millidays instead of hours and minutes. Midday would be 0:00 and midnight would, therefore, be 5:00.

If this system were ever to be introduced and a new-style digital clock was compared with an old-style digital clock, what would the old clock read when the new clock showed 1:75?

- A** 14:52
- B** 15:02
- C** 16:12
- D** 16:20
- E** 16:40

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

As 24 hours is  $(24 \times 60) = 1,440$  minutes, we know that 1 decaday 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 decadays after midday.

1.75 decadays =  $1.75 \times 144$  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.

**23** Memory loss and growing mental incapacity used to be seen as inevitable consequences of ageing. Now we talk of dementia as an illness that could possibly be cured or prevented. The incidence of new cases of dementia is falling. A survey in the UK in 1994 revealed roughly 650 000 cases of dementia. With a subsequent increase in the average age at death, a survey in 2013 should have found nearly 900 000 cases, but in fact the total was less than 700 000. Why should this be so? Over the same period rates of heart disease have fallen, and in general the health of the blood vessels of the elderly has improved. Given that brain function requires the supply of oxygen to the brain from blood vessels, the improvement in the health of blood vessels ...

Which one of the following most logically completes the above argument?

- A** must be the explanation as to why people are living longer.
- B** and the fall in new cases of dementia must both be due to some other factor.
- C** is the cause of the reduction in the incidence of new cases of dementia.
- D** could be a contributory factor in the reduction of the incidence of new cases of dementia.

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.

**24** Four friends need to stay in a hotel for one night after a concert. They are working out what it is going to cost them. The prices per room are as follows:

Single: £40,     Double: £65,     Family: £90 (This is up to a max of 3 adults)

Special offers:

10% discount for four rooms in a single booking

5% discount for three rooms in a single booking

One of them has a voucher for £10 which can be used once for a booking of a double room.

What is the cheapest option?

- A**     Four single rooms
- B**     Two double rooms
- C**     One double and two single rooms
- D**     One single and a family room

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.

25 Next time you feel the flu coming on, you should think twice before reaching for painkillers because they could do more harm than good by increasing the transmission of flu. Obviously painkillers can make you feel better by reducing muscle pains and headaches, but they also lower fever. Fever is thought to be an antiviral weapon, because many viruses find it hard to replicate at temperatures higher than the normal human body temperature. Some studies have shown that lowering fever can prolong viral infections and increase the amount of the virus that can be passed on to others.

Which one of the following, if true, strengthens the above argument?

- A Overuse of painkillers can reduce their effectiveness in curing headaches.
- B Taking painkillers increases the likelihood that flu sufferers will return to work while still infectious.
- C The studies of the effect of lowering fever were carried out on animals, not humans.
- D The most effective defence against flu is an annual anti-flu injection.
- E People are more likely to take an accidental overdose of painkillers when they have a virus.

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.

**26** Most people remember a PIN because it has only four digits and it is used regularly, but few know their bank account number.

I have no trouble remembering my eight-digit account number, however, because squaring each of the four digits of my debit card PIN in turn produces it.

All the digits of my account number are different, and there is no zero in it. Which other digit does it not contain?

- A**      2
- B**      3
- C**      5
- D**      7
- E**      8

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.

27 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.

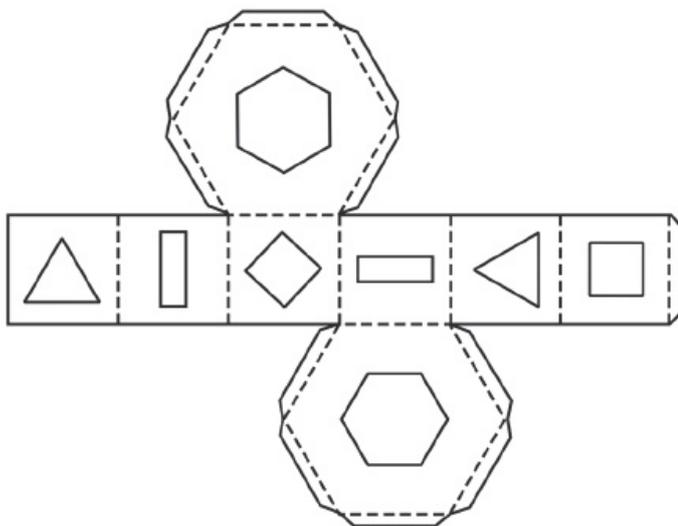
Although this is an 'understanding argument' question, the passage involves a large amount of data/statistical material, and indeed getting the answer right is really a question of thinking carefully about what conclusions can and can't be drawn from the data.

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.

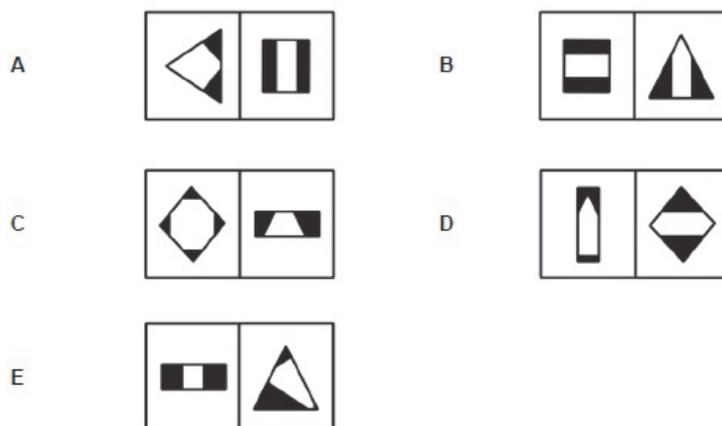
In the case of 1, although we know that for every billion kilometres a bike travels, it is almost as likely as a car to seriously injure a pedestrian, this does not actually mean that a pedestrian is (almost) as likely to be injured by a bike as a car – for the simple reason that there may be a lot more 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.

28 The drawing below shows the outer surface of the net of a hexagonal package with geometric shaped windows in each side. The inner surface is painted black.



Which one of the drawings could represent a correct side view of the assembled package?



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.

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

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.

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.

- 30 There are three stations on a single-track railway. The middle station of Laydon has two platforms and two separate tracks, each capable of taking any size train using the track.



The Express leaves Singebourne station at 12:00 noon and travels at an average speed of 60 mph between stations. The Post train leaves Snelling station at 12:00 noon and travels at an average of 30 mph between stations. Each train remains at Laydon station for at least 5 minutes.

What is the earliest time of arrival for the Express at Snelling station?

- A 12:25 pm
- B 12:30 pm
- C 12:40 pm
- D 12:45 pm
- E 12:50 pm

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:

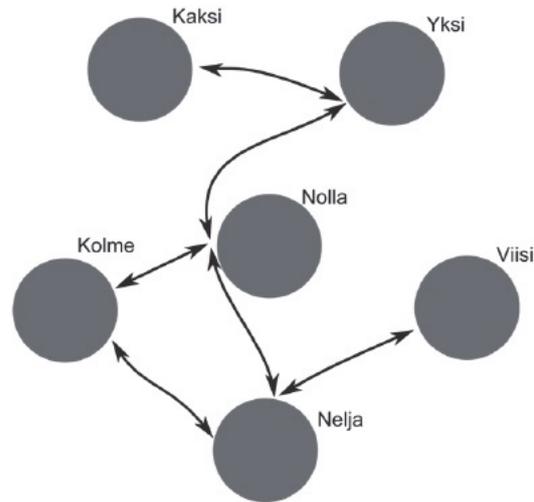
The Express arrives at 12:10 since 10 miles at a speed of 60 mph will take a total of 10 minutes.

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?

- A 5
- B 6
- C 9
- D 10
- E 11
- F 14

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:

Nolla – Yksi – Kaksi – Yksi – Nolla – Nelja – Viisi – Nelja – Kolme – Nolla

This is a total of 9 trips. The correct answer is C.

- 32 What is the longest time one might be on Nelja if arriving from Nolla, then leaving by the next available ferry that same day to Viisi?
- A 15 minutes
  - B 30 minutes
  - C 45 minutes
  - D 1 hour
  - E 1 hour 15 minutes

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.

- 33 What is the longest time it could take from Kaksi to Nelja by the most direct route, assuming the next available ferry that same day is always taken?
- A 2 hours 15 minutes
  - B 2 hours 30 minutes
  - C 2 hours 45 minutes
  - D 3 hours 00 minutes
  - E 3 hours 15 minutes

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.

**34** Which of the following statements is/are true about journeys from Kolme to Yksi, assuming the next available ferry that same day from Nolla is always taken?

- 1** Journeys from Kolme to Yksi never take less than 1 hour 15 minutes.
- 2** Journeys from Kolme to Yksi never take longer than 2 hours.

- A** 1 only
- B** 2 only
- C** Both 1 and 2
- D** Neither 1 nor 2

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.

**35** Mikko commutes from Yksi to Nelja each morning starting on the 7:30 am ferry. One day when he arrives at the Yksi terminal, he finds that the Nolla – Nelja ferry is not running. How much later than normal will he arrive at work?

- A** 45 minutes
- B** 1 hour
- C** 1 hour 15 minutes
- D** 1 hour 30 minutes
- E** 2 hours

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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