**BMAT MINI MOCK**

**Mock Examination 1**

# BMAT mini-paper: answers

# Section 1 – Aptitude and Skills

**Question 1**

1. INADEQUATE DATA

There is not enough data to support this inference, for three reasons. Firstly, we are not given any information on what is meant by “the general standard of living”. This could refer to individual income, or to more general social welfare measures such as standards of healthcare, infrastructure and education.

Secondly, the paragraph has not established the direction of causality between heart disease and income: just because low income is *associated* with more heart disease does not necessarily mean that low income *causes* increased risk of heart disease. It could even be that causation is in the opposite direction, i.e. heart disease causing chest pain and limited exercise tolerance, making people less to work, and thus reducing their average income. Unless we have more data showing that the two factors are causally related, we cannot infer that raising income would help to eliminate heart disease.

Finally, there is nothing to suggest that raising general standard of living (whether or not this refers to income) would be the *easiest* way to eliminate heart disease. We don’t know how the association between income and heart disease compares to that of other risk factors, such as smoking and high blood pressure. If income is merely weakly correlated with increased risk of heart disease (in comparison to smoking and high blood pressure, which are robustly proven risk factors for heart disease), then it is unlikely that targeting income would be the “easiest” way to try and reduce heart disease. However, the paragraph doesn’t address any of this, so the data available are inadequate.

1. PROBABLY TRUE

This is probably true. The paragraph tells us that people with higher income have less chance of developing heart disease than those with lower income, and this effect is independent of the geographical variation between Northerners and Southerners. It is therefore likely that people in high-income brackets are in a better position to avoid developing heart disease than people in low-income brackets.

1. TRUE

This is a straightforward one. Risk of heart disease is higher in the high-income South than in the low-income North, BUT, as the paragraph states, “there is little if any difference, however, in the rate of heart disease between northerners and southerners who have the same level of income”. Richer Northerners with incomes equivalent to the higher Southern averages are therefore at less risk of heart disease than the poorer Northerners.

1. FALSE

This is false, for exactly the same reasons as outline in the answer for statement C – it seems that income has an effect on the risk of developing heart disease.

**Question 2**

1. TRUE

In 1970, 60.4% (i.e. the majority) of adults had completed 11 years or less of schooling, implying that they had left school at 16 or earlier, and not entered sixth form education.

1. FALSE

This is false. Over a 20-year period, between 1970 and 1990, the percentage of adults who had completed 3 or more years of university rose from 4.6% to 7.1%. Don’t be daunted by the lack of calculator – all you need to do is approximate these numbers to the slightly easier 4.5 and 7. You can then see that the percentage has almost doubled, but not quite, and that the trend over 20 years is roughly a 1.5-fold increase. So continuing the 20-year trend, we would expect the percentage for the year 2010 to be roughly 10.5% (1.5 x 7). Therefore, we can confidently say that if the trend towards more education continues *“at the rate indicated by the above figures”,* it will certainly not have reached 25% by the year 2000.

1. TRUE

The paragraph tells us that in 1990, 40.0% of adults had completed 11 years or less of schooling, while 7.1% had completed 3 or more years of university. You know that 40 / 7.1 will be more than 5, so you can confirm that for every adult who had completed 3 or more years of university, there were more than 5 adults who had completed no more than 11 years of schooling.

**Question 3**

The answer is B: 2 and 3.

Statement 1 is wrong: the erythromycin has *increased* the effect of Mr Jones’s warfarin, meaning his blood will take even longer to clot, so he is at higher risk of bleeding.

Statement 2 is true: if you read off the graph at INR = 2.0, you can see that it will be at least 72 hours before Mr Jones’s INR has come down to 2.0, at which it is safe to operate.

Statement 3 is true: for the first 12 hours after taking warfarin with erythromycin, Mr Jones’s INR would be less than 2.0. This means an operation within this window would be safe.

# Section 2 – Scientific Knowledge and Applications

**Question 1**

1. FALSE

Enough information has been given in the question about the features of Spinal Muscular Atrophy Type 1 to enable you to deduce that Fred is not affected by this condition.  If we consider Fred's parents, who must both have been carriers for the condition in order for Fred's sister to have been affected, and we let their genotypes be Ss and Ss (where S is the wild-type allele for SMA and s is the mutant allele for SMA), then the 4 possible genotypes for their offspring are SS, Ss, sS and ss.  SS is the homozygous normal, Ss and sS are carriers, and ss is the homozygous mutant (i.e. affected) individual.  We know that Fred is not ss (from information given in the question) so he has a 2/3 chance of being a carrier.

1. FALSE

The question states that the condition is inherited in an autosomal recessive manner.  If both Lucy and Fred are carriers for the condition, then the chance that their baby is affected is 1 in 4

1. TRUE

We have already established that the chance that Fred is a carrier is 2/3.  As Lucy and Fred are not related, the chance that Lucy is a carrier is 1/50.  If both are carriers, the chance that the baby is affected is 1/4, so the overall chance that the baby is affected is 2/3 x 1/50 x1/4 = 1/300.

1. FALSE

With rare recessive conditions, the probability of two unrelated individuals having a mutation in the same gene is very small.  However, if both parents are descended from a common ancestor, they are much more likely to both carry the mutation, meaning that the risk of SMA (and other recessive conditions) in their offspring is much higher.

1. FALSE

The word “penetrant” in the question stem is important here. Penetrance is the chance that, given a certain genotype, an individual will develop the corresponding phenotype. A good example is in familial breast cancer, caused by mutations in BRCA1 or BRCA2.  Penetrance here is about 80-85%, i.e. 80-85% of women who have a mutation in one of these genes will go on to develop breast cancer.  In the case of this question, Spinal Muscular Atrophy is a fully (100%) penetrant condition, i.e. ALL individuals who have 2 mutated copies of the relevant gene will develop the condition.  a+√2

**Question 2**

The answer is C: 2.

The key to this question is to draw out the triangle, without panicking about values for a and b. You can even set them as zero. Then, we can see that the width of the triangle is √2, and that its height is 2√2. Don’t be fazed by the (a + 2√3) coordinate – this determines position on the x axis, and is irrelevant to the triangle’s height.



Having done this, we can calculate the area of a triangle as usual: ½ x base x height.

½ x √2 x 2√2

= √2 x √2

= 2

**Question 3**

The answer is A: 99.97%.

The key to working this out is to draw a table of the possible outcomes.

|  |  |  |
| --- | --- | --- |
|  | Test is positive (i.e. ‘yes’) | Test is negative |
| Has the virus | 97% | 3% |
| Is virus-free | 2% | 98% |

Then:



Start by checking that all the percentages add up:

0.97% + 0.03% + 1.98% + 97.02% = 100%

Now, we want to know what the probability is that he actually does not have the virus.

Out of all the tests, 97.05% come back negative. The proportion of those that are *true negatives,* i.e. people that actually do not have the virus, is 97.02 / 97.05.

Even without your calculator, you can tell that this will be almost 100%. The correct answer is therefore A – 99.97%.

# Section 3 – Writing Task

There is no right or wrong answer to an essay, but the key thing is to structure it well and address everything that the question asks of you. In the BMAT, you WILL be pushed for time, so it is even more important to collect your thoughts before you start the essay. Spend a few minutes outlining how you are going to address each part of the question.

The explanation should be brief. Hippocrates is proposing a reciprocal relationship between food – i.e. healthy food reinforces general health, and vice versa.

The bulk of your essay should focus on parts 2 and 3. Components of your argument could include:

* The rising prominence of both the health-food industry and the obesity epidemic
* The advantages and disadvantages of natural remedies – i.e. using foods for their medicinal properties
* The blurred lines between the food and health industries: where do nutritionists fit in?
* The potential harmful interpretations of this statement: letting food be your medicine could clearly lead to obesity and ill health, whereas letting medicine be your food draws in concepts of over-medication, dependence and even addiction to medicines

It is always tempting to discuss the points both in favour and against, but the question specifically asks you to argue against, so you MUST ensure that you do this, even if you briefly acknowledge the points in favour.

Don’t ramble – keep it concise and logical. Stick to your plan, separate it sensibly into paragraphs and try to sum up with a punchy, one-sentence conclusion.