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Some questions proved to be quite challenging to a number of candidates and centres would be well advised to focus some time on these areas when preparing candidates for a future examination.

In particular, to enhance performance, centres should focus their candidate's attention on the following topics, ensuring that they read examination questions carefully.

- Manipulation of inequalities
- Mapping diagrams
- Trigonometry of non-right angled triangles
- Equating identical vectors
- Effective solutions in 'Show that' problems

In general, candidates should be encouraged to identify the number of marks available for each part of a question and allocate a proportionate amount of time to each part of the question.

Candidates should also be reminded that if they are continuing a question on a page which does not relate to the question that they are answering, they must say...'continuing on page xxx'.

It should be pointed out that the methods identified within this report and on the mark scheme may not be the only legitimate methods for correctly solving the questions. Alternative methods, whilst not explicitly identified, earn the equivalent marks. Some candidates use methods which are beyond the scope of the syllabus and, where used correctly, the corresponding marks are given.

Question 1

The majority of candidates were able to correctly identify one inequality $(x \leq 2)$ but the second inequality proved to be more elusive with the most popular, but erroneous, answer being $x \leq -\frac{3}{2}$. This common mistake usually followed a statement of the form $-2x \leq 3$ with candidates forgetting that when dividing both sides of an inequality by a negative number, the inequality sign changes. In part (b), the key phrase was integer values and many who had a completely correct answer for part (a) lost this mark by writing down $-\frac{3}{2}$ as one of their values.

Question 2

Whilst a majority of candidates were fully successful, there were a significant number of candidates who just found the price of one pair in each case and added these to give an answer of £151. These candidates did not take enough care when reading the question. .A large majority successfully obtained one or both of the totals for the first 100 and next 50 pairs. However, a noticeable minority then failed to find that there were another 130 pairs left at 45% and so did not reach the final required solution.

Question 3

Again, a popular question with many candidates correctly finding both required answers. A significant minority of candidates, however, failed to convert 0.9 hours to minutes in part (a) or simply used the ratio $\frac{50}{45}$. These candidates scored, at most, one mark. Although part (b) was answered well by the majority, weaker candidates simply found 80% rather than 180% of their answer to part (a) or they seemed to be confused between minutes and hours and $97.2\times70=6804$ was a popular, but erroneous answer which only earned one mark.

Question 4

Despite the formula being given for the inverse of a matrix, there were still a number of candidates who made simple arithmetical slips and lost at least one of the marks for part (a). Very few candidates used their inverse for part (b) and there were mixed responses for these candidates. Indeed a number simply **post** multiplied the column vector $\begin{pmatrix}-1\\1\end{pmatrix}$ losing all marks. The majority however used the 'otherwise' method and wrote down two simultaneous equations and in many cases successfully solved the equations to arrive at the required answers.

Question 5

The majority of candidates did not seem to know where to begin with the mapping diagram to part (a) and many scripts either had no answers for this part or, at most, had the correct answer to part (i) only. Indeed, it was not uncommon to see answers of the form $x+z$ for part (ii) and $z+x$ for part (iii). There were very few completely correct answers to this part of the question. Many recovered in part (b) and at least earned the mark for method. Failing to write their answer in the required form meant that some candidates lost the final mark. The majority of those who had been successful in (b) were able to handle part (c) without difficulty. Problems generally were confined to careless slips, mainly sign errors, which did prove costly.

Question 6

Most candidates produced correct probabilities on the tree diagram for part (a). However, there was a minority who were not able to cope with the idea of conditional probability and so used 5/6 and 1/5 on both right hand branches, even though they clearly do not add up to 1.

In part (b), the correct approach and answer were popular but there were a few candidates who added the probabilities rather than multiplying them.

A majority used the correct method in part (c) and, if their tree diagram was correct, produced the correct final answer. However, a significant number of candidates just attempted to combine the probabilities 1/5 and 1/6 either by adding or by multiplying, demonstrating a lack of understanding of this topic.

Question 7

The majority of answers were correct in part (a). Incorrect answers were generally as a result of not identifying the number of minutes in two days. In part (b), despite some candidates working out the surface area of the pool (and consequently losing all five marks), the majority of candidates found the correct volume in m^3 and proceeded to the correct solution. Of those candidates who achieved some, but not all marks, either they failed to convert to litres, minutes or hours, or they incorrectly multiplied instead of dividing or divided instead of multiplying. Using a divisor of $\frac{125}{60}$ instead of 125×60 was a noticeable error. There were many correct solutions to part (c). For some candidates however there was confusion over units. The majority did not use the simple ratio approach but went back to the original data, which was not overcomplicated in this instance.

Question 8

Despite the formulae being given, a minority of candidates were not prepared to use sine and cosine rules and so invented right angles throughout the question. This enabled very few marks to be scored. Of those candidates who did make good use of the formulae, the majority scored well on the first two parts of the question. Many candidates correctly identified and used Pythagoras in part (c) but giving an answer of 5.2 (rather than 5.20) meant that the final A mark was invariably lost. Many good attempts were seen in part (d) with the correct use of the cosine rule or the symmetry of the isosceles triangle being used to enable a large number of candidates to arrive at the required answer. Part 9e) proved to be quite a discriminator. Many candidates correctly approached finding the areas of triangles *AEB* & *DEC*. Also quite a few candidates used the correct method for finding the area of triangle *EBC*. The particularly weak point was that of trying to find the area of triangle *EDA*. Some candidates did this correctly but quite a few decided that it was the same area as triangle *EBC*. Another, less common, error was to include the rectangular base. As a consequence, 2 marks out of 5 proved to be the most popular score for this part of the question.

Question 9

Part (a) was generally well done, with many fully correct answers. A small number of candidates had the wrong fraction in (ii) suggesting more practice needed with ratios. Most candidates knew what to do in (iii), even if they had problems with (ii). Similarly, in part (b) candidates seemed to have had very few problems with (i) and there were many correct methods in (ii), mostly leading to a fully correct vector. In part (c) there were a significant number of fully correct answers here but, for some candidates, failing to multiply the $\mu\mathbf{b}$ term by λ proved to be very costly. There was a significant minority of candidates who had no idea about equating coefficients and such candidates clearly needed greater practice in dealing with identical vectors. In part (d), there were some extremely complex approaches to this, with some candidates arriving at the correct solution. Only a small number were able to see the simple relevance of λ and were able to obtain the correct ratio with little, or no, working.

Question 10

Many candidates did not seem to be aware of the thoroughness needed in a "show that" question. As a consequence, parts (a) and (c) were poorly done. Indeed, in part (a) there were very few fully correct answers. Many left this part out completely, along with parts (b) and (c). Many of those candidates who were successful still need to learn that the use of words to describe what they are doing goes a long way. In this case, making it clear which areas they were finding, because, once found, there is very little manipulation needed to obtain the required expression. A key term in this expression was the $\frac{1}{2}\pi xy$ because this must come from using a radius of $y/2$ and this needed to be made clear in the candidate's working. A few candidates confused the issue by including the floor in their expression for the surface area. Part (b) was well done by candidates who had some confidence in algebra. Like part (a), part (c) proved to be quite problematic for many candidates.
Most either left this out, or just wrote down the given answer and hoped. Very few candidates found a convincing way to find $2A$, many having to either ignore a 2 or insert an extra 2 for no valid mathematical reason, other than it gave the required expression.
Candidates fared better on the remainder of the question with many complete and accurate tables in part (d) and well-drawn graphs in part (e). In part (f), many candidates obtained the expected values for x, but of these, a large number failed to put them in an inequality.

Question 11

This question was well done by a majority of candidates, although being the last question some did not get very far or even made no visible attempt. The usual errors fell into two categories – those candidates who made careless slips in multiplying matrices and those who made careless slips in plotting the points they had found.
Part (e) was not possible for those who did not obtain the right triangle D. Of those with the correct triangle, most obtained the required transformation but rotation was a popular incorrect description of the single transformation.

Grade Boundaries

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