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Principal Examiner Feedback

Summer 2013

GCSE Mathematics Linked Pair Pilot
Application of Mathematics (2AM01)

Higher Paper 1H

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GCSE Mathematics 5AM1H
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Introduction

Candidates persevered with questions throughout this paper with blank responses rarely seen. It would appear that correct decisions had been made regarding tier of entry with little evidence of candidates who would have been better advised to take the Foundation paper.

Some of the strongest candidates lost marks on earlier questions, by over-complicating some involving percentages or making arithmetic errors. Confident candidates who are working quickly through the paper need to take their time to check their work on the easiest material.

Questions assessing Quality of Written Communication (QWC) were generally well attempted with candidates giving clear full sentences when asked for reasons or comparisons.

Otherwise accurate work was hampered in some cases by inaccuracies with unit conversions with candidates unable to apply convert centimetres to metres or vice versa or recall the kilometre to mile conversion factor.

Students need to be encouraged to consider their final answers in the context given to decide whether it is sensible. Common errors on this paper leading to exceptionally high (or low) investment returns, unrealistic quantities of tiles for a bathroom or a mean outside the range of a data set could have been spotted and rectified in this way.

Report on individual questions

Question 1

This unitary method question was answered with complete accuracy by the vast majority of candidates. A few either misread £12.15 or entered it incorrectly on their calculator to use 12.5 instead. Students should be encouraged to take care and not rush into the first few questions on the paper.

Question 2

Where relatively few candidates lost a mark on this question they did so by over-complicating it and finding the reduced price was taken off rather than the discount. Again, a moment to reread the actual question could prevent loss of marks by more able candidates at this early stage.

Question 3

Good questions with appropriate responses boxes were given by most candidates for part (a). A few misunderstood the question and asked, “How long did you go on holiday for”, or gave data collection sheets instead. Some candidates showed inequalities in their response boxes, and so lost a mark despite often having exhaustive, non-overlapping options.

Most candidates did well in part (b), correctly identifying reasons for bias or unfair representation of the population. Students should take care to give two distinct reasons as some effectively repeated one answer.

Question 4

There were many good answers with clear working out and answers given showing clearly that Peter would get 23 $20 notes as required by this starred question testing Quality of Written Communication.

Many went further than strictly necessary and found out how much change Peter should get from his £300. Candidates who reached 23.7 understood the need to round down with 24 notes very rarely seen.

The most common error occurred when candidates did not choose to divide £300 by 1.58 but instead multiplied. Students could be encouraged to think first about the size of the answer that they expect to get when converting between currencies.

Question 5

Over 80% of candidates found the correct lower bound in part (a) but there was less success in part (b) with only about 50% finding the upper bound.

The most common incorrect upper bounds were 57.4 and 57.49 but only answers showing the digit 9 recurring or repeated at least twice with 57.499 or better were acceptable alternatives to 57.5

Question 6

Some candidates who clearly knew what to do to find a mid-point were let down by poor arithmetic. Others who used a number line approach did not realise that the y coordinate could be a non-integer and gave 6 instead of 5.5

Question 7

Over 80% of candidates achieved full marks and those who did not typically managed to get at least one mark through working out either $\frac{1}{5}$ of 240 or adding the fractions given. Misunderstandings occurred where candidates deducted the First class passengers from the total and then found $\frac{3}{8}$ of the remaining passengers rather than $\frac{3}{8}$ of the 240 total.

Question 8

Candidates understood the context of the spreadsheet and showed an intent to use the correct cells and correct operation. Incorrect notation caused loss of the final mark with × instead of * for multiplication frequently seen.

A few candidates made the mistake of adding the numbers in the cells, as opposed to putting cell numbers and others gave (C2:C5) alone for the sum in part (a).

Question 9

There were many errors made on part (a) with 15 or 1500 read straight from the graph. Many attempting to use the context or use the gradient gave both 60 and 15 but then divided incorrectly and had the final answer of 4 from 60 ÷ 15. Of those who correctly worked out 15 ÷ 60, there were some who did not interpret the answer correctly and gave the answer as 0.25p rather than 25p.

Part (b) was well answered with good explanations in keeping with a starred question. Some candidates were unaware that they could read the price for Tariff A directly from the graph and instead attempted calculations with gradient to find the cost in two parts for each slope on the graph. This poor choice of method inevitably led to inaccuracy.

Question 10

Part (a) was exceptionally well answered with over 98% of candidates gaining full marks for correctly scaling up the envelope width.

Nearly two thirds also had fully correct explanations in part (b). Most took a numerical approach and calculated the area of both envelopes but a significant number gave explanations showing clear understanding that the area scale factor would be the square of the linear scale factor.

Question 11

This question was well attempted with full marks achieved by 75% of candidates. The two methods using area or side lengths were used almost equally. Some candidates lost marks through incorrect unit conversions, which were usually avoided if the conversion was carried out prior to any calculation. Otherwise, the most common mistake was to use a length scale factor to convert an area.

Once the areas or the number of rows and columns of tiles was found, almost every candidate was correctly able to demonstrate the final steps in order to work out the number of boxes of tiles used. Students need to be encouraged to consider whether their final answer is sensible in the given context so that final answers of 33 or 343 boxes of tiles might lead to reconsideration of working and conversions.

Question 12

Over 75% of candidates reached the correct final answer. As well as a formal algebraic method, there were various approaches to this question with some successful candidates appearing to reach their answer by a mixture of trial and improvement and algebraic methods.

A common mistake was to think that Dan had $4x$ or $12x$ marbles rather than $3x + 4$, and inevitably lost candidates a lot of marks, particularly if using a trial and improvement method.

Question 13

Nearly 90% of candidates were successful with this question, especially those who clearly labelled or described what they were calculating at each stage. Two-way tables were put to good use but some tried to use Venn diagrams with less success. Unfortunately some otherwise fully correct working was led down by poor arithmetic, especially subtracting 8 from 13

Question 14

Parts (a) and (b) were done well with full marks for 75% of candidates.

As in the previous question involving percentages, many candidates over-complicated part (a) and calculated a percentage multiplier but failed to subtract 1 to reach the percentage change required.

In part (b) those who did not secure full marks usually managed to calculate the correct total after the first year's interest was added.

Just under a quarter of candidates used a correct method to calculate the AER in part (c) and usually wrote down the formula that they had learnt to do so. Others used incorrect methods to combine the interest rates for the three years such as finding the mean.

Question 15

Part (a) was answered extremely well with box plots drawn by virtually all candidates a few of whom lost a mark due to a plotting slip - none of which would constitute a common error.

In part (b) marks were lost through failure to present the comparisons between the distributions for boys and girls in the context of heights.

Question 16

Cumulative frequency graphs were completed accurately by about two-thirds of the candidates. Some incorrect graphs appeared cumulative but showed bars rather than points plotted.

The correct graphs that were drawn did not always lead to a good attempt at part (b) as the percentage aspect caused difficulties.

Most candidates did make a reading at 64 marks with only a few errors dealing with the scale intervals of 2 units per small square. There were a few excellent answers involving interpolation rather than use of the graph

Question 17

This question caused many candidates problems with only about 30% gaining full marks and most of the others making early errors.

Dealing with the half for the trapezium area caused many problems, as did some basic calculations with 20 × 80 often given as 160. Many candidates omitted brackets for the area of the rectangle.

A few candidates did not read the question carefully enough and gave the answer 30, which was the value of x, instead of the length of the rectangle. Students need to take care to use correct algebraic manipulation techniques even when a question begins in a geometrical context.

Question 18

Candidates were not generally comfortable with standard form with just less than 50% getting the mark for correct positioning of the decimal point in part (a). Many rounded the 6.244 to give 6.2×10^8 presumably thinking that the number preceding the power of 10 should only have one digit after the decimal point.

There was slightly more success with part (b) but many candidates did not select the correct operation and instead found the difference in distance. There was little evidence of students using their calculators to work with standard form with many converting numbers before calculation.

The main issue in part (c) was difficulty with the correct kilometre to miles conversion to use and as a result about two-thirds of candidates scored no marks.

Question 19

Almost every candidate who recognised that the amount given was equal to 85% managed to go on to find the correct answer.

By far the most common error for the 40% who gained no marks was to find 15% of the discounted amount and add it back on.

Question 20

Just over half of candidates reached the correct answer but some rounded up to 21 instead. Others lost accuracy by working out a percentage in the required category first and then rounded poorly before applying to the 306 population. Once more a moment to check whether the answer was sensible in the light of the question could have retrieved lost marks and hopefully prevented a number of final answers over 50

Question 21

There were fully correct answers to this question using simultaneous equations in a context from 60% of candidates. Some candidates managed to set up the two simultaneous equations for two marks but were then were unable to progress any further.

There were some who solved by trial and improvement but they needed to get both the final answers correct as no part marks were available for this method. Unfortunately some who had completed perfect algebraic solutions missed out on the final mark through omission of £ or pence units.

Question 22

A wide variety of work was seen working with linear programming with the structure of the question allowing students to pick up various part marks at all stages.

A number of candidates who had no success on other question parts were able to draw at least two correct lines for the grid in (b) although those showing all three often did not show the correct feasible region.

Most candidates who were successful maximising profit had previously given the correct objective function but many who showed no answer in (c) did have numerical work for profit worthy of a mark in part (d).

Question 23

The fact that this question was at the end of the paper appeared to hamper candidates in recognising a straightforward mean from grouped frequency table demand.

Many candidates mixed up different ways of processing data in a frequency table with a few even attempting cumulative frequency, while others multiplied the frequency by the class width when finding the mean.

A common error after correctly obtaining the total of fx was to divide by 4 instead of 50 with no recognition that this answer was unrealistic.

In part (b), if candidates knew the formula for frequency density, then they generally managed to get some - or all - of the marks. Marks were then lost by omitting a frequency density label or by making the last bar too wide.

Sometimes, the calculations for frequency density would be found written by the table but not translated in any way onto the grid. A few candidates chose a poor scale for their frequency density axis, cramming it up and making it difficult to award marks as the bar height could not be determined accurately.

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