OCR
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GCSE

Mathematics A (Two Tier)

General Certificate of Secondary Education **J512**

Examiners' Reports

June 2011

J512/R/11

Oxford Cambridge and RSA Examinations

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General Comments

There were many pleasing performances in all papers and at both tiers of entry. It is clear that centres have prepared their students well and given them the mathematical knowledge and the confidence to apply that knowledge in sometimes unfamiliar situations.

The papers were all very accessible to the candidates, giving them the opportunity to display what they knew and could do. It appeared that everyone was prepared to 'have a go' at all the questions. The vast majority of candidates were entered at the correct tier. Examiners saw a high standard of work from many. Though presentation and the provision of working is improving there are still some who write before they think and end up with a scattered series of half started methods. This can pose problems for the examiner. After completing a question, candidates should review their answer, cross out any unwanted work and make sure their answer is clear and unambiguous with no overwriting of figures.

Examiners have reported a continued improvement in work on all topics though basic arithmetic can still be a problem across all abilities. Drawing is still to a high standard. However, candidates have difficulty in correcting work when it is done in pen; this should be discouraged. Many, particularly at Foundation Tier, fail with questions due to a lack of equipment, including a calculator. Centres should make every effort to ensure that candidates attend each exam with the appropriate equipment. If they do, it is certain that these candidates will be rewarded with higher scores. The lack of a calculator forces candidates to use appropriate non-calculator methods with inevitable errors.

Questions requiring explanations or reasons are being answered with more confidence. However, this is an area which does require further work encouraging clear, concise answers.

Centres requiring further information about this syllabus, details of support materials and details of training sessions in the coming year should contact a Mathematics Qualifications Manager at OCR.

J512/01 Paper 1 (Foundation Tier)

General Comments

The paper was accessible to all levels of ability. All candidates scored well on the earlier questions but the later questions proved very challenging for most, particularly Question 18. Generally, candidates remained focused throughout the paper and the standard of work was generally high with no apparent lack of time although weaker candidates left some questions unanswered. Even though there were questions in the middle of the paper that weaker candidates did not understand or attempt, they continued to find parts on latter questions that allowed them to achieve extra marks.

Candidates should be encouraged to show some working for calculations even those that they do 'in their head' as, in many questions, method marks are available. They should ensure that working for each individual part is contained within the answer space for that question. Candidates should check they have transferred correctly to the answer line any answers written in the working space. Candidates should avoid doing working on the periphery of the paper.

Examiners commented on many candidates' lack of rulers and compasses often indicated by freehand drawings seen in Question 19. Diagrams should be drawn in pencil, rather than ink, as it is then easier to erase incorrect answers. Often, wrong answers are overwritten making them impossible for examiners to read. Candidates should always cross out the wrong answer and replace it with the corrected one. Some of the numbers written by candidates are very difficult to read. If candidates have developed a personalised style of writing 'numbers' they should be encouraged to use a 'normal' style for examinations.

Examiners also mentioned the ambiguity of many decimal points and candidates would be well advised to mark them clearly in a small space between the digits and raised above the answer line. Moreover 'rubbings' should be brushed off their script before it is handed in.

Comments on Individual Questions

1 This was an accessible first question with 90% of candidates scoring at least 3 marks. There was some confusion between octagons, hexagons and pentagons, but the trapezium was well answered. The scalene triangle proved the most difficult with many thinking it to be an isosceles triangle. The cuboid was the most successfully answered with just a few incorrectly identifying it as a cube.

2 Part (a) was mostly correct, the main error was having more than 5 sticks in the 5-bar gate or missing out this part, but it was rare not to award 2 marks. The method of crossing through the first 4 marks for the fifth mark was well known. Incorrect answers were extremely rare in parts (b) and (c). Part (d) was more challenging. Many showed 50-12 and attempted some addition towards the 47 thus gaining part marks, although the addition total sometimes needed searching for by the table.

3 Part (a) was usually answered correctly. A few answers of 449 were seen by forgetting to carry. Although part (b) was answered reasonably well, as might be expected, the subtraction resulted in several types of error. 624 was most commonly seen by subtracting either way; 684 and 604 were also seen. Few candidates were successful in dividing by 8 in part (c), many giving up after scratchy attempts. Some used trial and improvement but were rarely successful. In part (d) there were many arithmetical errors highlighting a weakness in multiplication tables The most frequently used method for multiplying 46 by 27 was by the box method. There were some good totals but the most common mistakes were 40×20 resulting in 80 and 6×7 giving several wrong products. The 'Chinese' method was also used successfully but sometimes the table total was not read correctly. Rarely was 'long' multiplication used. The answer of 842 was quite common from multiplying 40×20 and 6×7 and then adding the sum. Nevertheless, examiners have noticed an improvement in the success rate in this type of question over the last few years.

4 This was a reliable source of marks for most candidates with only the weakest 10% scoring fewer than 3 out of 6. Most read the question correctly and chose 2 options for each part, with only a small number selecting just one, and very few selecting more than 2 numbers. Throughout the question there was very little sign of working out such as cancelling down of the fractions. In part (a) most were able to identify 4/12 but the 21/84 was not identified as often. With more options to choose from, parts (b) and (c) proved slightly more difficult. In part (b), 75% was the most commonly identified correct value while 75/10 and 7.5% were common errors. In part (c) common errors were 0.03 and 1/3.

5 Both parts were correct in 90% of responses. In part (b), a significant number who did not score 2 marks managed 1 mark for 1 correct number. Some did not read the question carefully and gave two numbers after 17 or two before. A very small minority gave even numbers.

6 In part (a), just over three quarters of candidates gained full marks for correctly evaluating $30 \times 4 + 30$ although weaker candidates stopped at 120. There was some evidence of poor arithmetic indicated by such working as $30 \times 4 = 124$. In part (b) most candidates realised they had to calculate $30 \times 8.5 + 30$ but they often failed to write down this initial line and so lost the method mark. 8.5×30 proved very difficult. 8×30 was often found and then 0.5 added followed by +30 leading to 270.5. Alternatively, candidates found $8 \times 30 + 30$ and then added $0.5 \times 30 + 30$ giving an incorrect value and demonstrating that they did not fully appreciate how the formula works. Weaker candidates used part (a) to find 8×30 by doubling 150. Many forgot about the +30 altogether. Many scored their only mark for conversion to hours and minutes although some did not take account of 60 minutes to the hour and gave 245 minutes as 2hrs 45mins. A few gave an answer in hours and minutes without any working. As there was no evidence of a conversion from minutes, marks could not be awarded.

7 Part (a) of this question was answered well by about half of candidates with ruled lines and very little evidence of 'flaps' or additional lines drawn on nets. A number of candidates did not draw the internal lines, though this was condoned. Weaker candidates found this question very challenging with around a third not answering it at all or attempting some form of freehand 3D drawing. Many candidates who did not gain 3 marks were able to get at least 1 mark for a correctly sized base rectangle, or a correct net for an open cuboid. Very few attempted a net for a closed cuboid. In part (b)(i), there was a high proportion of correct answers with most candidates gaining 2 marks. The most common method was to total 10% and 5% and those answering this way usually got full marks. Those attempting $400/100 \times 15$, were generally less successful. Others who used continuous halving to get 50%, 25%, 12.5% … could not use these values to find 15%. Many candidates showed no working out making it difficult for examiners to award method marks. Two thirds of candidates realised that part (b)(ii) required multiplication and at least got the method mark for either 400×0.08 or for an answer with the figures 32. However, only half of those were able to give an answer with correct place value. The most successful method was 0.08×100 then $\times 4$. A number of unrealistic answers were given such as 3200 mm, and a number of candidates were unable to evaluate 8×4 correctly.

8 Finding the median did not seem to be a problem in part (a)(i) for three quarters of the candidates. Working was often shown as crossings out from both ends to identify the middle. There were a few answers of 0, 1.5 and 2 with the occasional 5. A few candidates confused the median with mode or range. The explanation in part (a)(ii) was more difficult with many simply repeating the question. The best answers showed the candidates' understanding of the median as the middle number. Part (b)(i) was well answered by many students, with only a few mixing up the mean with the median or mode. Most knew what the mean was and added the data correctly, knew to divide by 10 and most got 2.8. A common wrong answer was 2 r8. Part (b)(ii) caused far more problems, with many candidates feeling that "5" was the complete answer. For those who did realise that the 5 had to be added to their 28, the common mistake then was to divide the sum by 10 instead of 11. Furthermore, relatively few went on to subtract. Confused or no working in this part often made it difficult for examiners to award method marks.

9 This question proved a good discriminator and a test of candidates' numerical skills with weaker candidates scoring few marks and only the strongest getting all parts correct. Part (a) was generally well done but common errors were 2, 4, 0.5 and 1 x 1 or 1^2 evaluated to be 2. Part (b) proved much more difficult with few candidates scoring full marks in (b)(i). Common misconceptions included 2^3 as 2×3 and $\sqrt{9}$ as 81 or 4½. Candidates who simply wrote down the wrong answer (eg 89) did not gain any credit for one or other of these 2 part answers. 87 was the most common wrong answer and a few multiplied instead of adding the two parts. Very few understood the cube root notation in part (b)(ii) with many not attempting this part. Incorrect attempts included answers of 25, 125/3 or even 125×3 or 125^3. There were some answers of 25 and 15. Most attempted part (b)(iii) and answers usually had the digit 4 but the decimal point more often than not was in the wrong place with 4.0 probably the most common answer seen. Weaker candidates added instead of multiplying. Part (c) was generally well attempted with many recognising 3 and 7 as factors of 21 in part (c)(i). The answers were often poorly expressed with confusion over 'factor' and 'multiple' as well as dividing 'by' or 'into', but candidates were generally not penalised for poor expression. Some candidates failed to realise that 1 and 21 are factors of 21 so stating that 21 has (two) factors is not adequate. Some confused prime numbers with squares whilst others thought they couldn't end in 1 or had to be even. Common wrong answers in part (c)(ii) were 15, 16 and 19 but a good number were successful.

10 This was a functional Mathematics question and, as such, it confused over half of candidates who appeared to be unfamiliar with the layout of a timetable. Only around 10% of candidates scored full marks with 376 often seen. The following were common errors:

- Problems with time calculations, usually involving base 100. For example, finding the time between 1018 and 0852 as 166;
- Understanding the complexities of the journey. Some didn't bother with the meeting, or even getting off the train. For example, finding the time between 1754 and 0852;
- Use of the timetable. There was confusion about which way to use it and which one to use eg 0852 to 1241 (staying at Whitby), or confusion over the change of train on the return journey.

Some candidates had many calculations of the differences between train times and often picked up 1 or 2 marks for the required individual journey times seen. Some solutions resulted in unrealistically high answers. This was a question where the logical presentation of working benefited candidates considerably.

11 In part (a), over half of candidates identified the triangle as isosceles and found m as 70°. Those showing working gained the method mark where 70 was not on the answer line. Some measured the angle with a protractor. In part (b), most could quote the rule for angles on a straight line but some interpreted this incorrectly and thought that all three base angles should sum to 180. The actual quotation of the rule was generally good. Weaker candidates quoted the rule for angles in a triangle.

12 Most candidates gained some marks for this question but there was a significant number who were clearly unfamiliar with stem and leaf diagrams and did not attempt it. Many candidates did not attempt part (a) or did not get the mark as they left out the decimal point. Virtually all candidates who attempted the question were able to position the 8 correctly in part (b) and then attempted to count the number of plants, usually correctly, for part (c). The common error was 21, often from those who had not answered part (b), or sometimes 23.

In part (d), although most candidates showed they knew what the range involved, many left the answer as 5.6 − 2.3 or, if they evaluated it, omitted the decimal point. A missing decimal point in (e) was not penalised since the concept of modal height had been demonstrated.

13 Satisfyingly there were many fully correct answers to parts (a) and (b) with three quarters of candidates scoring at least 2 out of 3. The most common error was an answer of 22 in part (b). In part (c), although a lot of candidates gave the correct expression, common errors seen were $5t$, t^4 and even 5^t.Weaker candidates tended to leave out the algebra questions.

14 Although some were clearly measuring the correct angle in part (a), their answers were often inaccurate eg 60°. There were a number of answers greater than 90° particularly 114°. Compass points were occasionally given; particularly NE. Part (b) rarely saw a correct answer. 15° was often quoted but candidates were clearly not measuring the angle clockwise from North. 165° was also common. Part (c) was more successful. Many measured the distance in centimetres and converted successfully to miles. A number of candidates used a distance of 6cm indicating an incorrect rounding of the scale distance or inaccurate measuring. Some had difficulty multiplying eg $6.1 \times 20 = 120.2$ was often seen. 120.4 was also a common answer. Those students who drew the line connecting E and C were generally more accurate in their measurement. Often only the answer was given eg 120.2. This may well have come from a measurement of 6.2 but this actual measurement was not written down so could not score a part mark.

15 Three quarters of candidates achieved 2, 3 or 4 marks for this question despite it being a common question with the higher paper. However, very few gained the full 6 marks. Some candidates used the working out space to write a description of the journey, which was then transferred to the answer box. Perhaps because of this there was very little evidence of any working out. Consequently very few candidates scored the method mark available for calculating either of their speeds. The most common answer for the first speed was 2. Despite getting this wrong, many were able to get a follow through mark for the second speed being double their first speed. The middle 3 parts were those most commonly answered correctly. Most candidates seem to recognise that the horizontal line indicated they were stationary and got the marks for "stopped" or "waited" and for the correct time period. Many candidates used the hint from the first line of the answer to describe the second speed as "constant". Others compared it to the first part and used faster or higher, the most common error was "fast" or "high".

16 There was quite a lot of trial and error here with an answer of 4 being very common. It was difficult to know if the equation was solved algebraically as an answer of 16 was often the only evidence. There were a small number of acceptable embedded answers. Many of those candidates who attempted to multiply out the brackets in part (b) managed to get $6x$ (a few got $5x$) but did not multiply 5 by 3. Many of those who did find $6x - 15$ did not proceed further with the calculation. It was surprising that when some candidates got as far as $6x = 45$ they failed to divide, leaving that as their answer. Those candidates who did not expand the brackets and used trial and improvement methods were rarely successful and used up valuable time.

17 Few correct answers were seen to part (a). A few realised they just needed to double 46 to make it out of 100 but very few used 46/50 in their working. Many tried to break down the 100% into parts that would add to 46 but were generally unsuccessful. The most common wrong answer was 96. In part (b), those that recognised they needed 10%, 5% and 2.5% were nearly always successful. Others, who wrote down the values for 10%, 5%, 1% and 0.5% often only added 16.5% to 820. Others only found 17% and then added. It is important to indicate which value goes with which percentage. The increase of 143.5 was frequently seen as the final answer. Poor addition using decimals accounted for some incorrect answers. Very few tried 820×0.175 or 820×1.175; those who did found the multiplication too difficult.

18 There were few correct answers to part (a)(i) seen, with 108 being the most popular answer from 12×9. Not many appeared to know the formula; of those who did a few gained a method mark as they could not correctly multiply 9 by 12. Part (a)(ii) was the least well-answered question on the paper with only one or two correct answers seen. Most common was to multiply by 10 or 100 (and sometimes by 1000). Several correct answers were seen to part (b). Of those who did attempt Pythagoras, many could not square the numbers correctly, or did not try to find the square root, or were unable to find the correct square root. Of the correct answers many appeared without working, suggesting that they had been taught the 3,4,5 triangle.

19 Many good responses were seen to this question with most students gaining some marks. Arcs centred on the tree or the corner of the house were often seen, as were lines parallel to the house walls. Some students did not draw parallel lines but a succession of arcs to establish the position of the lines; this resulted in shading errors as they shaded up to the arcs drawn. Many students constructed either arcs or lines but not always both. The weakest students drew objects in selected regions showing some understanding of the task but unsure how to attempt the construction. Many candidates did not have access to compasses or rulers which severely restricted how many marks they could get.

J512/02 Paper 2 (Foundation Tier)

General Comments

The paper was of an appropriate level and the majority of candidates were able to attempt most of the questions. Few papers had a significant number of no responses, suggesting that even the higher level questions were accessible. The paper had a good spread of marks and differentiated well. There were few candidates who scored over 80%, signifying that more able candidates had been entered appropriately at the Higher Tier. There were few really low scores, which suggest that there were enough suitable questions for the less able to have some success.

There were indications that a small number of candidates did not have a calculator. This puts them at a significant disadvantage as many questions are designed for them to be used.

Most candidates attempted to show a complete method on how they found their solution, which was encouraging. However, on some of the more involved questions this could be difficult to follow.

The questions that involved percentages were generally done poorly. Many candidates employed techniques that are suitable for non-calculator papers and when confronted with questions that involve more complicated numbers these methods become tortuous, inefficient and often lead to inaccuracies. Candidates who used simple methods that can be easily carried out on their calculator were usually successful.

Comments on Individual Questions

1 This question was well answered. There were a very small number of reversed coordinates in parts (a) and (b). Nearly all candidates were able to plot the fourth vertex of the square successfully in part (c).

2 Most candidates were able to recognise an obtuse angle in part (a) and nearly all could identify which triangles had lines of symmetry in part (d). They were less sure of triangles that were isosceles with a right angle in part (b) and congruent triangles in part (c). The explanations as to why the triangle was not equilateral in part (e) were usually correct and often quite well expressed, which was encouraging.

3 Parts (a) and (b) were well answered with just a small number of candidates losing marks for giving negative answers. It was not so easy for candidates to find the temperature in part (c), but the majority found the correct answer.

4 Most candidates obtained full marks, with many showing a full and complete method. A few misread the question and used only one shirt. Others gave an answer of 17.6, the value from their calculator. Candidates need to give appropriate answers when the question is set in the context of money.

5 This question was generally well answered. A few did not know the meaning of sum, difference and square root in parts (a), (c) and (e) or how to find a third of a quantity in part (b). Many successfully computed the answer in part (d).

6 Nearly all were able to find and extend the patterns in the sequence in parts (a), (b) and (c)(i). Part (c)(ii) caused more problems. Incorrect attempts often involved doubling the result for pattern 6 or something similar. Many candidates attempted this part by extending the table to pattern 12; a surprising number made errors. Most candidates appreciated that numbers in the pattern needed to be even in part (d) and gave a good explanation.

7 Nearly all candidates were able to complete and interpret the pictogram in parts (a) and (b). A small number could not interpret the question in part (c) and gave answers of 3 or 10, rather than 13.

8 Many found the correct area in part (a); a small number found the perimeter.
A significant number gave no units in part (b). Many gave an answer of cm rather than the correct answer of cm^2.

9 The correct reflection was drawn by many in part (a); a few did not use a ruler.

Most candidates made a good attempt at constructing the triangle though there were some inaccuracies in the use of the protractor. A small number appeared not to have access to a protractor.

10 The majority were successful in converting from pounds to dollars in part (a). Candidates were less secure in reversing the process in part (b) with many dividing instead of multiplying. A few used a trial and improvement approach (trying to find which number you multiply by 1.58 to give an answer of 120) but were not able to give an accurate answer using this method.

11 Many candidates gave correct answers in parts (a) and (b). Most errors came from thinking that there were 180° in a full turn.

12 This question was poorly done. Many did not recognise that 220/880 is 25% in part (a)(i). Solutions involving long and inefficient methods were often seen in part (a)(ii) and correct answers were rarely seen. Part (b) was done a little better as it could be broken down into stages more successfully. Generally candidates did not demonstrate techniques that can be carried out with a calculator in a concise and efficient manner.

13 The majority of candidates appreciated that a quarter of the day was spent in lessons in part (a) and gave the correct answer. A very common error in part (b)(i) was to give one third as the answer. Those who went on to use this result in part (b)(ii) gained some credit. There was generally a lack of clarity in how to approach the use of the pie chart in part (b).

14 There was some confusion with the numbers, particularly in part (a), but there were many correct answers in both parts. There were a significant number of answers given as ratios. Weaker candidates used words such as 'likely' for their answers.

15 Although most candidates made an attempt at part (a)(i), many failed to explain that the widths and lengths needed to be added. The majority found the correct width in part (a)(ii). A common error was to subtract only one eight. Weaker candidates did not know how to approach part (b). A common error for part (b)(i) was m^5, with similar results in parts (ii) and (iii). The numbers in part (b)(ii) caused particular problems. Stronger candidates found this part of the question straightforward.

16 Nearly all candidates understood how the sequence worked and consequently obtained the correct result in part (a)(i). Part (a)(ii) was generally well answered with many achieving all three marks. Some scored 2 marks for 17 and the first two terms would add to 10. Most did not know how to approach the algebra in part (b), but some more able candidates scored both marks. There were some marks for the fifth box following through from an incorrect fourth box.

17 Many candidates showed good geometrical awareness in answering this question correctly. Others unsuccessfully based solutions on 'angles on a straight line' which involved dividing by 2 rather than 3.

18 The more able found the correct solutions. A common error was to divide by seven rather than eight.

19 Using the correct order of operations with a calculator caused problems in part (a) and some candidates failed to round their answer correctly.

Part (b) was answered a little better, with the majority gaining both marks.

20 Many candidates failed to score on this question. Some ignored the fact that there were 1.75 metres of denim and just used 1 metre in their calculations. Others tried to compute the cost of the denim, but did not find an appropriate method. When they had found their total costs, they failed to express their profit as a percentage of the selling price. A few used a trial and improvement method, but most of these were not accurate.

21 Few used algebra to solve this problem. There were a good number of correct solutions. Some candidates did not show a full method. A common error was to divide 225 by 3 rather than 5.

22 A few identified the correct diagram in part (a) and the modal class in part (b)(i). Only the most able could apply the technique for finding the mean from a grouped frequency table in part (b)(ii). Many candidates did not understand what was required in part (c) and gave inappropriate answers.

23 Very few candidates knew how to find the volume of the cylinder. Many just multiplied the diameter of the base by the height of the cylinder in part (a). A small number gained a mark in part (b) for stating whether their answer to part (a) was greater or less than 500 and making a decision. Many answers were not specific enough.

J512/03 Paper 3 (Higher Tier)

General Comments

Candidates had been prepared well for the exam and this was reflected in the high standard of knowledge and understanding of mathematics displayed in the scripts. Scores were generally higher this year with many more high scoring scripts and fewer low scoring ones. There were fewer cases where candidates had been entered at an inappropriate level. Most candidates were able to attempt all the questions on the paper and to demonstrate positive achievement.

Though presentation is improving for most, with logical and concise working and answers clearly legible, for a minority, presentation is scrappy with several methods scattered around the page and with answers overwritten and difficult to decipher. Candidates must make sure that their response is contained within the answer area, any surplus working is crossed out and if an answer is to be changed then the original should be deleted and replaced.

Work on questions involving Shape and Space and Data Handling topics continue to be answered well and with confidence. Algebra continues to improve and though Arithmetic methods are understood, the calculations they require are lacking. Not being able to work out 45 ÷ 6 (Question 4(b)) or √225 (Question 6(b)) are examples of the poor computation skills displayed by some candidates.

Drawing was, in general, done well with the appropriate instruments used effectively and accurately. Some are still using pen when drawing; this makes correcting errors difficult and should be avoided. The clarity needed in explanations (particularly Question 8) defeated all but the better candidates.

Candidates had sufficient time to complete the paper. There was no evidence of work being rushed or questions not being considered.

Comments on Individual Questions

1 All parts of this question were answered well. Very few candidates failed to add the decimals correctly in parts (a) and (c). Part (b) caused the most problems; multiplying 200 and 0.3 was sometimes found to be too difficult while others worked out 200 ÷ 0.3. Some failed to read the question correctly in part (c) and found the number of times you might expect to get either 2 or 3.

2 Better candidates scored full marks here. Most others had the middle three statements completed correctly but failed to calculate the speed in km/h. Even when candidates knew to divide 2 by 6, they did not know how to proceed to finish the calculation. Some carelessly worked out 6 ÷ 2 or even 6 × 2 for the first speed.

3 Although many scored full marks in part (a), it was not uncommon for one of the three elements of the answer to be omitted. Some did not read the question carefully and offered a rotation followed by a translation. There were very few wrong answers in part (b). Part (c) fared less well where triangle B was often reflected in an incorrect vertical line. Very occasionally the line $y = 1$ was confused with the line $x = 1$.

4 There were some pleasing responses to both parts. Though these were fairly straightforward equations, it is good to see candidates showing a better understanding of algebraic techniques and providing well laid out solutions. It was very unusual to see part (a) answered incorrectly. In part (b), many reached $6x = 45$ but could go no further or

achieved 7.3 as their answer. Less able students thought $3 \times 2x = 5x$ or failed to deal with the 3×5.

5 This question posed little problem for many candidates. However, a surprising number failed to see that, in part (a), it was just a case of doubling the 46. These got very confused trying to work out, in stages, what percentage of 50 was equivalent to 46. Part (b) was more successful with most candidates choosing either to find 10%, 5% and 2.5% of 820 or 10%, 1% and 0.5% of 820. Problems did occur later in the addition of the parts and often just 17% was found. Those attempting a long multiplication approach rarely had the correct answer. Some just found the difference in weight and not the total weight.

6 Part (a)(i) was generally answered correctly though some either forgot to divide by two or could not cope with the multiplication. It was very rare to see a correct answer in part (a)(ii), most multiplied the answer to part (a)(i) by 100 instead of 10 000. Pythagoras' rule was usually applied correctly though, once again, the arithmetic caused a problem to many.

7 There were a large number of accurate, carefully drawn diagrams earning full marks. Most candidates had access to the required equipment and could use it successfully. Weaker attempts just concentrated on the arc from the tree and ignored the parallel lines from the house. Some drew a series of circles from the house instead of the parallel lines.

8 Part (a) was well answered with very few failing to show that their answer was a multiple of 3. Those who understood the meaning of the word 'sum' in part (b) generally performed well though others confused 'sum' with 'product' and ended up with a cubic expression. Some thought that a numerical example was sufficient in part (b). The explanation in part (b)(ii), though often vague, usually related to the fact that both terms were divisible by three. Most found the correct three numbers in part (c) but not from an equation as required. Unfortunately, many candidates did not read the question fully in part (d) and continued to add numbers rather than multiply. It was often the case that candidates failed to show their answer was a multiple of six even when they had a correct product. The explanation in part (d)(ii) eluded all but the very best candidates.

9 Most realised that they had to round the figures in part (a) and could get as far as 400 or $\sqrt{400}$ but no further. Less aware candidates tried long multiplication and division with no success. A majority knew to change to 'top heavy' fractions in part (b) but could not proceed correctly. A recurring error was to try to change these to fractions with a common denominator. This was invariably followed by incorrect multiplications or a spurious method involving a mix of addition and multiplication of fractions. A significant number failed to reduce their answer to its simplest form. Some did not know the required method and multiplied the whole numbers and the fractions separately.

10 This question was answered well by many candidates who knew the index laws and could apply them correctly. Common wrong answers were p^{12} in part (a), p^4 or $p^{1/3}$ in part (b) and p^8 or $6p^2$ in part (c).

11 Candidates struggled to find the gradient of the line often ending up with a value of $-½$ or 2. Many did go on to substitute values for m and c into $y = mx + c$, usually with the correct -2 replacing c. Others had no knowledge of the formula and just quoted a variety of figures and letters.

12 The majority of candidates knew to equalise coefficients of x or y but then added or subtracted their equations with varying levels of success. A significant number reached $14x = 7$ or the equivalent but surprisingly then reduced this to $x = 2$. Very few used trial and improvement to solve the equations.

13 Quite a patchy response to these questions on surds. Most knew the answer to part (a) but some left $\sqrt{9}$ as their answer. The most common answer in part (b) was $\sqrt{18}$ with very few being able to go further. In part (c), those who knew to multiply numerator and denominator by $\sqrt{3}$ generally went on to produce a correct final response though some failed to simplify their answer completely. Clearly some candidates had little knowledge of surds and interpreted, for example, $\sqrt{6}$ as $6 \div 2$.

14 It was common to see a sound technique for expanding brackets. Most managed to achieve the correct four terms though some could not collect them correctly. Part (b) was generally well done with very few only partially factorising the expression. Better candidates had no trouble with part (c). Some, however, had difficulty in dealing with $(2x - 3)$ and gave 3 as their solution. A surprising number ignored the demand to factorise and used the quadratic formula, usually with little success.

15 Many fully correct answers to all of part (a). Candidates, in general, have a good working knowledge of cumulative frequency. Very few drew histograms or plotted at mid-intervals. Reading from the graph was accurate though some forgot to subtract from 100. Completing the histogram in part (b) produced some errors, usually in the height of the third bar. This was often drawn 18 squares high rather than 6, showing a failure to take into account its larger width. There were many correct answers to part (b)(ii) though some just wrote 3 and 2, the heights shown on the diagram.

16 Most multiplied the lower bound weight of one card by ten to reach 245g. Others were content with 250g as their answer though some adjusted this to 249.5g. Part (b) was less successful since two levels of accuracy were used and not all candidates selected the largest card to test against the smallest envelope. Some solved the problem by using a counter example e.g. 'A card could measure 10.53cm and this would not fit into an envelope measuring 10.5cm.' The most common errors were to use incorrect bounds (some still think that the upper bound of 10.5 to the nearest 0.1 is 10.54) or attempting to use an argument based on areas or perimeters. Candidates do need more practice in presenting an argument clearly, logically and concisely.

17 There were some excellent tree diagrams drawn, though many found this unnecessary. Some candidates did overlook the fact that the probabilities for the second sweet were different. Fewer candidates were adding probabilities when they should have been multiplying. Once again the arithmetic of fractions caused problems for many, with incorrect addition, multiplication and cancelling.

18 Most were able to draw the vectors $2\mathbf{b}$ and $-3\mathbf{a}$. Though $\mathbf{a}$ and $\mathbf{b}$ were correctly placed, their resultant, $\mathbf{a} + \mathbf{b}$, was often missing. Very few omitted arrows or drew inaccurately. Candidates found part (b) challenging. All but the better candidates failed to score.

J512/04 Paper 4 (Higher Tier)

General Comments

Generally candidates appeared well prepared for this higher tier examination with the overall standard of responses improved from previous years. In particular the trigonometry questions were answered far better than previously.

Examiners noted that candidates of all abilities were able to answer questions on the more challenging concepts with greater confidence and that weaker candidates were able to gain marks throughout the paper. However, many candidates did not answer the question on percentage profit using an efficient method.

More noticeable this year than in previous exam sessions were poor handwriting skills. Candidates should be aware if their numbers are not clear, marks cannot be awarded.

Examiners felt that the standard of the paper was similar to previous sessions and that candidates had sufficient time to attempt every question.

Comments on Individual Questions

1 This question caused no difficulties. Candidates were familiar with the concept and could apply a correct method accurately.

2 Part (a) generally caused no difficulties. To gain the mark in part (b), since the answer of 960 can be easily obtained from the calculator, a full explanation with logical steps between the two calculations is required. Good responses were well presented starting with the given calculation. Many made vague statements about moving decimal points.

3 In part (a), option A was the correct response. Some candidates seemed to have guessed with any of the four options given. Common errors in part (b)(ii) included using the upper bound or just multiply the frequencies by 20 for their total. A division of estimated total frequency by 6 was also seen as well as 32/6.

Candidates should be encouraged to read the question carefully to ensure that they have answered what has been asked. In part (c)(i), the mark was awarded for the <u>effect</u> on the mean, not a recalculation of the mean.

4 This question differentiated well. The most common error was not calculating the total amount of material needed, but marks were awarded for *their* profit and *their* profit percentage. Using an inefficient method to find the percentage, starting with 1%, 10% or 20%, generally proved to be unsuccessful.

5 Part (a)(i) generally caused no difficulties. However, a common error was where the sum of angles in a quadrilateral did not equal 360°. A variety of quadrilaterals were suggested in part (a)(ii). The common error in part (b) was to find 180/20.

6 A variety of correct methods were used to gain full marks for example using a scale factor of 420 ÷ 250 = 1.64 or using 160 ÷ 250 = 0.64 to find the extra amount to be added. Occasionally candidates used the ratio of the weights of the ingredients, such as 0.8 for chocolate, and those who calculated the number of eggs as 4.92 realised this needed to be rounded to 5. Incorrect methods included 410 – 250 = 160, and then multiplying the other ingredients by 1.6 or by adding 160 to 200. Others calculated percentages using 410 as the base such as 160/410 = 0.39 and then assumed the quantities should be increased by 61%. Candidates should reflect on the appropriateness of their answers in the context of the question.

7 Common errors in part (a) included confusing the diameter with the radius, confusing volume and curved surface area formulae and answers that did not involve pi. To gain the mark in part (b) candidates needed to state both "½ litre = 500" (ml or cm^3) and give the conclusion "No".

8 There were some excellent responses to this question with all working shown. To gain full marks candidates needed to respond to all the questions set. Those that did attempt to write down an equation sometimes had the two sides of a correct equation on two separate lines of working, without connecting them up. Frequent errors included 'x times 6x' becoming '7x', leading to 'x = 5.357' or '4 times (6x times x) = 4x times 24x'. Candidates who reached $6x^2 = 37.5$ usually gave $x^2 = 6.25$, but did not always find x. It was common to see 6.25 stated without the correct equation or without the x^2. A preferred method for those who did not begin with an equation was trial and improvement leading to 6 x 2.5 = 15 and 2.5 x 15 = 37.5. Not all were explained as well as this, most were presented in a haphazard fashion. There was much confusion between 'area' and 'perimeter' with many candidates assuming the perimeter was 150 though they may have believed they were dealing with area.

9 The preferred method was to use a factor tree and generally this was done correctly. There were some numerical errors and some did not go far enough with the tree. There were some answers given as 2 x 2 x 2 x 2 x 3 x 3 or $2^4 + 3^2$.

10 In part (a), candidates were more successful where they found and plotted coordinates on the line. Incorrect lines tended to be with negative gradient and no working to show where they came from. All lines were ruled. Part (b) caused no difficulties.

11 In this question candidates demonstrated a sound understanding of basic algebra, however parts (a)(iv) and (d) were found to be more challenging. Common errors in part (a)(i) were $4(x + 3.5)$ and $2(x + 7)$ and in part (a)(iii) $(x + 8)(x – 8)$, $x(x – 16)$ or $(x – 4)^2$. The demand 'factorise' does not always mean into two brackets. In part (a)(iv), candidates achieved more success through using the factors in the given expression and did give $(x + y + 8)$ as part of their solution. The approach involving multiplying out the expression was less successful. In part (c), a final answer $21x – 2$ without any working was insufficient to gain part marks. In part (d), a consideration of factors in both numerator and denominator was successful while multiplying the numerator was not a useful first step. The common error was an answer 2^2.

12 This question generally caused no difficulties. 3^8 was the most common error in part (a) while in part (b) errors included $6.5 \div 10^7$ and 65 or 0.65 instead of 6.5 though with the 'correct' index.

13 In part (a), candidates were able to gain at least one mark for angle c as 68° while a common error for angle d was 146°. For full marks clear, concise complete reasons were needed. Insufficient reasons included reference to "the angle above" or "quadrilateral", as opposed to cyclic quadrilateral.

The common error in part (b) was 1:3. In part (c), common errors showed confusion between sector area and arc length and between radius and diameter. The required major arc was shown in the diagram; candidates who correctly found the minor arc did gain some credit.

14 This question differentiated well with the preferred method being to use a basic trig ratio rather than the sine rule. A minority did not give the answer to a suitable degree of accuracy. There were instances where a correct first statement was wrongly rearranged. Candidates who chose not to write the first step and gave just an incorrect rearrangement could not be awarded any marks.

15 To get the marks for this question, candidates needed to write down the complete calculation with the correct values substituted. If they subsequently made a mistake, part marks could be awarded. A common error after writing a correct first line was to work out $(b^2+c^2-2bc)\cos A$ or not to account for cos110 being negative. Method marks cannot be awarded where no method is shown.

16 Part (a)(i) generally caused no difficulties. In part (a)(ii) it should be emphasised to candidates that examiners are looking for similarities or differences between the summary values of the statistical data, such as median, range and interquartile range, and not comparisons between individual values. A number of interesting well reasoned responses were given in part (a)(iii). Candidates should be encouraged to read and answer the question asked, a common mistake was to write down the reasons why they thought it was a particular student rather than the reasons why the other students were being eliminated. The most common error in the interpretation of the data was to state that Freddie and Shane did not score zero as they had not appreciated that the frequency diagrams use the midpoint when plotting the values. Other candidates wasted a lot of time working out the means of all the candidates which was not an essential part of the question. In part (b), candidates were more successful if they employed a method which first found the total number of students. Those who used a ratio approach often faltered.

17 This question was very accessible to all candidates. In part (a), a common mistake was to assume that if $x = 0$ then $y = 0$. A common misunderstanding was to assume that 4^x means $4x$ and hence values of 0 and 6 were given. In part (b), many candidates appreciated what the shape of the curve should be and a mistake in the y value at $x=0$ from part (a) did not deter them from drawing an appropriate curve and ignoring their value. It was pleasing that some candidates had clearly reflected on their curve and rectified their error in part (a). Candidates should also be encouraged to use a pencil when drawing graphs so that any mistakes in the lines can be erased and another attempt be made. The result should be a single smooth curve. Part (c) was assessing reading from their graph and not the ability to find a solution using trial and improvement.

18 Marks were gained in part (a) from a variety of methods both algebraic and from trial and improvement. Embedded answers did not gain full credit. Common errors were $\sqrt{x} = 9$ and then $x = 3$ or $\sqrt{x} = 18 - 2$ or $2x = 18^2$. In part (b), two answers were needed. The most common error in this part was to work out cos 0.5 in order to solve the equation, showing a lack of appreciation of having to take the inverse.

19 Candidates showed an understanding of the concept of direct proportionality by answering part (b), but were not able to write down an equation connecting h and d in part (a). Errors in part (a) included using the proportionality sign throughout or writing only 24 = 120k or finding a value for 'k' without any link to an equation or even to h and d. It was not always clear whether the answer had been obtained correctly in part (b) or through two errors in their understanding. Errors included only considering the 15 cm rather than 135 or to use 105 having subtracted the value.

20 In part (a), candidates who approached the question by completing the square were more successful. In part (b) candidates were required to give a value for x and not a coordinate.

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