

UNIVERSITY OF MALTA

**SECONDARY EDUCATION CERTIFICATE
SEC**

**MATHEMATICS
May 2015**

EXAMINERS' REPORT

**MATRICULATION AND SECONDARY EDUCATION
CERTIFICATE EXAMINATIONS BOARD**

**SEC Mathematics
May 2015 Session
Examiners' Report**

Part 1: Statistical Information

Table 1 shows the distribution of grades for the May 2015 session of the examination.

GRADE	1	2	3	4	5	6	7	U	ABS	TOTAL
PAPER A	266	336	466	335	408			89	14	1914
PAPER B				136	404	491	453	774	203	2461
TOTAL	266	336	466	471	812	491	453	863	217	4375
% OF TOTAL	6.08	7.68	10.65	10.77	18.56	11.22	10.35	19.73	4.96	100

Part 2: Comments regarding candidates' performance

The total number of registered candidates was 4375. Compared to May 2014, there were 674 less candidates registering for the Mathematics SEC examination. This large drop in registration does not appear to be explained by the demographic statistics for the births in the years 1998 – 1999 when the majority of candidates sitting for this examination would have been born. (See NSO, 2009, Demographic Statistics 2008, p.21).

There was a small increase in the proportion of candidates registering for the IIA paper; from 41.3% in May 2014 to 43.7% in May 2015. Despite this increase, the performance of the candidates who registered for the IIA paper did not suffer. Indeed in May 2015, 1914 candidates registered for the IIA paper, of which only 89 candidates obtained U (4.6%) and 14 candidates were absent (0.7%). On the other hand in May 2014, 2088 candidates registered for the IIA paper, of which 109 candidates obtained U (5.2%) and 21 candidates were absent (1.0 %) for this session.

2.1 GENERAL COMMENTS

Analysis of the results revealed that the three papers in order of increasing difficulty were Paper IIB, Paper I and Paper IIA, as intended when the papers were constructed. The candidates' marks ranged from very low to very high in all the papers. In the case of the IIA candidates, the highest mark attained was 100% in Paper I and 98% in Paper IIA. In the case of the IIB candidates, the highest marks on both Paper I and Paper IIB were 91% and 94% respectively.

2.2 COMMENTS REGARDING PERFORMANCE IN PAPER I – SECTION A

Section A of Paper I consisted of 20 questions each carrying one mark, giving a total of 20 marks. The IIA candidates gave a very good performance on this section, achieving a mean mark of 15.85. However, the IIB candidates gave a much weaker performance and only achieved a mean mark of 9.02 marks overall. Some comments about candidates' performance on each individual question in this paper follow.

- Q1.** Most candidates gave a correct answer. Some IIB candidates giving an incorrect response appeared to take the sum of angles of a triangle as 360° rather than 180° .
- Q2.** The majority answered correctly. The less achieving candidates often made a mistake in converting a quarter of an hour to minutes, often taking 25 minutes for this time interval.
- Q3.** Most candidates answered this question correctly. A common mistake amongst the IIB candidates was to give 1136 rather than 11036 as an answer.

- Q4.** The vast majority of candidates answered this question correctly. However, a few of the IIB candidates incorrectly gave 844 as their answer instead of 8400 suggesting that they might have problems with place value.
- Q5.** In this question, a common mistake was to ignore the requirement to give the answer in metres and to give 6000 as their answer.
- Q6.** Many candidates lost the mark allotted to this question because they did not give their answer in standard form as requested.
- Q7.** This question was suitably answered by most candidates. This was true even when it came to the IIB candidates. However, some candidates were not exact when it came to drawing the top line of their figure one and a half squares long. Instead they drew it either two or one box long.
- Q8.** This question was suitably answered by most candidates. A few candidates lost the mark because they simplified the fraction $\frac{2}{6}$ to $\frac{1}{2}$ incorrectly.
- Q9.** Most IIA candidates answered correctly expressing the required probability as 0.987 or $\frac{987}{100}$ or $\frac{98.7}{100}$. However, a considerable number of the IIA candidates made mistakes when working out $1.000 - 0.013$ giving answers such as 0.887 or 0.087. Many IIB candidates did not appear to realise that they needed to subtract 0.013 from 1 and did not tackle the question; those suitably attempting the appropriate subtraction, often made mistakes in this process.
- Q10.** The majority gave a correct answer. Some however ignored that they needed to give their answer correct to one decimal place giving answers such as 6.37.
- Q11.** Most gave a correct answer. A common mistake amongst the IIB candidates was to consider -17 rather than -27 as the smallest number.
- Q12.** Many candidates gave a correct answer. Mistakes were often made when the question was answered using the proportion statement. Using this method, candidates ended up with the expression $\frac{8 \times 6}{1.5}$ which they often did not manage to simplify appropriately.
- Q13.** The majority answered this question correctly. However a good number of IIB candidates did not attempt the question. A few candidates gave 25×5 rather than 5 as an answer.
- Q14.** Many candidates gave a correct answer. However, some candidates made mistakes with signs when it came to opening the brackets. Some IIB candidates lost the mark allotted to this question because they failed to collect like terms to simplify their expression.
- Q15.** Many of the IIB candidates and some IIA candidates lost time working out $999 \times 7 = 6993$ and adding 7 to give 7000 correctly; not realising that they could work it out directly by multiplying 7 by 1000.
- Q16.** Most IIB candidates and a good number of IIA candidates got an incorrect response after failing to work out successfully $1\frac{1}{2} \times \frac{1}{2}$. Indeed answers like 7.5 and 75 were often given for this multiplication.
- Q17.** In this question, candidates needed to check which of the given points lie on the graph of $y = 4x + 5$. Candidates giving a correct answer usually showed working to check which point fitted this equation. Candidates giving an incorrect response usually showed no working, and usually appeared to choose (4, 5), the only point with whole number coordinates. This question was often answered incorrectly, especially with the IIB candidates.
- Q18.** Although many answered this question correctly, the lesser achieving candidates did not appear to realise that since the mean of three numbers was 10, their total could be found by multiplying 10 by 3.
- Q19.** Many candidates gave a correct response to this question. Some candidates found difficulty with converting their answer to one significant figure and gave 6 instead of 6000 for their answer.
- Q20.** This question needed to be completed on squared paper. Candidates were required to draw a rectangle on a given base, 2 squares long, so that its area is 15 squares. Most of the IIB candidates and a good number of IIA candidates did not realise that they could draw a rectangle $7\frac{1}{2}$ squares long and gave shapes which are anything but rectangles.

2.3 COMMENTS REGARDING PERFORMANCE IN PAPER I – SECTION B

The overall facility of each question in this paper was worked out using the formula:

$$\text{Facility} = \frac{\text{mean mark on question}}{\text{maximum mark awarded on question}}$$

The facility of each question lies between 0 and 1 and gives a measure of the overall difficulty of the question, with the easier questions having a facility closer to 1. For each question in Paper I Section B, its facility and the percentage number of candidates achieving full marks on the question was worked out separately for the IIA and the IIB candidates. The results are shown in Tables 2 and 3 below. The two tables are followed by comments about the individual questions in this paper.

Table 2: Facility of the questions in the Paper I – Section B for the IIA candidates $n=1900^*$

Question No	1	2	3	4	5	6	7	8	9	10
Facility	0.79	0.87	0.83	0.77	0.69	0.67	0.77	0.47	0.62	0.71
IIA Candidates achieving full marks (%)	37.4	49.9	40.6	51.7	31.2	18.4	36.2	32.2	23.4	34.6

* n stands for the number of candidates who actually sat for the IIA paper

Table 3: Facility of the questions in the Paper I – Section B for the IIB candidates $n=2252^*$

Question No	1	2	3	4	5	6	7	8	9	10
Facility	0.29	0.47	0.46	0.25	0.30	0.40	0.32	0.11	0.26	0.30
IIB Candidates achieving full marks (%)	2.4	10.6	4.8	4.6	2.0	1.9	5.8	3.5	2.5	2.4

* n stands for the number of candidates who actually sat for the IIB paper

Q1a. Many IIA candidates scored full marks on this part question. However IIB candidates made many errors in this question involving manipulation of simple algebraic expressions. The most common errors involved ignoring the minus sign and mixing up addition with multiplication. Moreover many IIB candidates often showed that they do not have a clear understanding of the expressions $2a$ and a^2 .

Q1b. Many candidates used the given formula for the volume of a sphere correctly. However a number of IIB candidates multiplied their answer by 2 thinking it was for a hemisphere. A good number of candidates failed to find the volume of the cylinder either ignoring it completely or applying the wrong formula.

Q2a. This question concerned the interpretation and use of a spreadsheet used for tabulating and calculating two cases of simple interest. Most candidates found no difficulty in working the simple interest in the two cases but some did mistakes in writing a correct formula compatible with the spreadsheet.

Q2b. In this question, candidates needed to share €900 in the ration of 3 : 4 : 5. Most candidates obtained full marks on this part question. However some IIB candidates ignored the given ratio and simply divided 9000 by 3. Others stopped at finding that 1 share is 75 euro.

Overall, question 2 turned out to be the easiest question in Paper I Section B.

Q3a. Generally candidates used the correct formula for speed, namely they divided distance by time. Many IIA candidates gave a fully correct response. Mistakes were usually encountered at the final steps when they had to change their result to standard form and to three significant figures. IIB candidates were also seen to make even more basic mistakes with many ignoring the units for time and failing to multiply 162 days by 24 to convert this time to hours.

Q3b. In this question, candidates were asked to find the time when two bells one ringing every 15 minutes and the other every 40 minutes would next ring together after ringing together at 8.00 a.m. Many good attempts were made to arrive at a solution. A good number tried listing the times when each bell rings and noting the time when they ring together. This approach was the

most common and good results were obtained by those who did not make mistakes in their calculations and listing of the various different times. Some of the higher achieving IIA candidates used the LCM method taking less time to come to the correct solution.

Q4. This question involved using Circle theorems from Euclidean geometry to determine the size of some angles and to give reasons for their answers. Generally, the IIB candidates were observed to perform poorly in this question, especially where it came to supporting their answers with appropriate reasons. The IIA candidates performed much better with very good responses on the first two parts. The latter two parts of this question were observed to be more demanding, especially where it came to the explanation demanded in part (iv) where the candidates needed to put together different properties of the circle and its tangents to come to a suitable justification.

Q5. Many candidates answered part (i) of this question suitably. Marks were usually lost in this part question when candidates left out the monthly charge and just used the cost per minute of the phone calls.

Part (ii) was more difficult. Following from their work in part (i), some candidates missed adding the monthly charge in their equation for C in terms of t . In constructing this equation, other candidates did not appear to realise that the monthly charge and the cost of the calls needed to be converted to the same unit of currency; the euro or the cent.

For part (iii), many IIA candidates drew the correct graph, even though some of these had given an incorrect equation in part(ii). This is because they did not use their equation for drawing the graph but used the raw data given in the question.

Most candidates did not manage part (iv) successfully and did not use the two graphs suitably to determine the time of calls for which it is more profitable to use Infinity Plan rather than the Watch Out Plan.

Q6. Although the facility for this question turned out to be one of the highest, still few candidates got full marks on this question.

Parts (i) and (ii) were completed successfully by the vast majority of candidates. Candidates losing marks on part (i) usually failed to compare the shown data for Malta and Venice and simply gave readings from the graph but did not use these to compare the temperatures of the countries. In part (ii), a number of candidates were interpreting the range of a data set as the interval between the smallest and highest value rather than the difference between the highest and lowest value in the data set.

A significant number of candidates who obtained a correct value for the range of the given data did not manage a correct response to part (iii) and do not appear to understand that the range gives a measure of the variation within a distribution.

In part (iv), many found the mean temperature correctly. Some however found the mean over the whole year rather than over the four months requested. A few amongst the IIB population added the extreme values of the temperature for Malta and found the mean of these values.

Q7. Most IIA candidates performed well in this question, however marks were frequently lost for identifying the angles of depression incorrectly. IIA candidates generally showed good use of the trigonometric ratios required. Still a significant number of these candidates obtained an incorrect answer through apparently correct working, which could mean incorrect use of the calculator. On the other hand, a good number of IIB candidates were observed to have difficulties with using trigonometric ratios appropriately. Other IIB candidates correctly found the distances BM and BS but in part (i) they did not subtract ZM from BM to find the length of the breakwater. Similarly, in part (ii) they did not subtract BT from BS to find ST as requested.

Q8. This question was a non-routine question and required candidates to work out the time taken by two printers, working at different speeds, to print 10,000 adverts. There were two lines of reasoning that could lead to a solution. Firstly one could note that the rate of the two printers working together is the sum of the individual rates of printing of each of the two printers and proceed from there. Alternatively, one could find the amounts printed by both machines in specific time intervals. An iterative process is then used to find out the total no of adverts printed in the times considered, adding more time and more printouts until the amount of 10,000 printouts is reached.

Q8 turned out to be the most difficult question in the paper with the vast majority of IIB candidates and a good number of IIA candidates gaining zero marks from it. On the other

hand, candidates who reasoned out a correct strategy for working the question often obtained full marks. Still a considerable number of candidates only lost the last mark allotted to this question because they interpreted their final answer, 6.15 hours, as 6 hours 15 minutes.

- Q9.** As can be seen from Table 2, this question registered one of the lowest percentage of candidates achieving full marks amongst the IIA candidates. This was because part (iii) offered considerable difficulty. Many mistakes in all parts of the question were evident amongst the IIB candidates. Part (i) was an easy question, yet a considerable amount of IIB candidates gave very absurd answers like 1cm^3 or 512cm^3 , suggesting these candidates do not have a basic understanding of what a cm^3 is and were just plucking in numbers to give an answer. Similarly part (iv) was rather easy and even amongst the IIB candidates, many answered appropriately. A common error for this part question was to give 3 as an answer.
- Q10.** The majority of candidates gave correct answers in the first two parts. The last two parts were found to be more difficult. In the last two parts, many candidates correctly ticked that the statements were sometimes true and sometimes false, but failed to give correct examples to illustrate each case. In their answers to the third part of the question, many IIB candidates were seen to make mistakes with the multiplication of negative numbers, giving a negative number when squaring a negative number, by for example taking -3^2 to be equal to -9 .

2.4 COMMENTS REGARDING PERFORMANCE IN PAPER IIA

The overall facilities of the questions in Paper IIA are set out in Table 4 below. These facilities were worked out in the same way as described in Section 2.3 for the questions in Paper I Section B.

Table 4 is followed by the examiners' comments about the individual questions in this paper.

Table 4: Facility of the questions in the Paper IIA $n=1900^*$

Question No	1	2	3	4	5	6	7	8	9	10	11
Facility	0.75	0.56	0.64	0.27	0.72	0.49	0.73	0.44	0.48	0.63	0.54
IIA Candidates achieving full marks (%)	44.6	18.1	29.7	4.9	6.3	8.1	35.6	7.9	5.5	23.4	15.0

n stands for the number of candidates who actually sat for the IIA paper

- Q1.** The question turned out to be the easiest in this paper with almost 45% the IIA population gaining full marks on it. Most candidates got parts (i) and (ii) correct. A good number of candidates lost a mark in part (ii) because they found the probability the bus is late on both Monday and Tuesday rather than the requested probability that the bus is NOT late on both these days. Part (iii) was the more difficult part. In calculating the probability that the bus is late on at least one of the two days, a common method used was to add the probability the bus is late on both days to that of being late on Monday only and finally to that of being late on Tuesday only. In using this method some were not accurate as to which probabilities they needed to add. Instead they only added two of the required probabilities and some also added the probability the bus was late on both days.
- Q2a.** The question involved the solution of two simultaneous equations, one linear and the other quadratic. Many lost marks for one or more of the following three reasons: (i) Mistakes were evident in the manipulation of algebraic expressions, most notably in the expansion of the expressions $-(1+2y)y$ and $(1+2y)^2$. (ii) A considerable number of candidates obtained a pair of values for one of the unknowns, x or y but then did not continue to find the corresponding values for the other unknown. (iii) A number of candidates who used correct working that led to the result that one of the values for y was zero were seen to be unwilling to accept zero as one of their answers. Some actually crossed out this result. Others appeared to ignore this value by not continuing to find the related x value.
- Q2b.** Two approaches were evident in this question. Many used an algebraic method by writing the constraints as two equations in two unknowns. Candidates using this method were seen to write one of the equations ($x + y = 5468$) correctly but some made mistakes when it came to writing the other equation. A good number of candidates used a trial and error method for solving the question. Usually such candidates managed a correct response to this question.

Q3. Both parts of this question involved the manipulation of algebraic expressions involving fractions. In both cases, some candidates were observed to cross out terms from the numerator and denominator which were not factors of both numerator and denominator.

In part (a), most candidates gained marks for cross multiplying the given formula and for opening the brackets correctly. A number of candidates did not manage to continue working correctly from this step onwards, apparently they were at a loss on finding a strategy to make x the subject of their equation.

Part (b) involved the addition of two algebraic fractions as a single fraction. The most common mistake involved the use of an incorrect denominator. A good number of candidates managed to obtain a correct addition as a single fraction; only few of these were however seen to simplify their answer as much as possible.

Q4i. In this part, candidates were asked to show that the diagonals of a rhombus meet at right angles. Many correct approaches were evident in the responses but a substantial number of candidates did not even tackle the question.

The vast majority of candidates tried to tackle this problem by using congruent triangles. Usually correct responses involved proving two adjacent triangles like $\triangle ABX$ and $\triangle BXC$ or $\triangle AXD$ and $\triangle AXB$ congruent and in consequence angles AXB and BXC or angles AXD and AXB are two equal angles on a straight line and therefore equal to 90° . A less common correct solution involved proving all four triangles ($\triangle ABX$, $\triangle BXC$, $\triangle CXD$ and $\triangle AXD$) congruent and therefore the four angles at point X must be 90° since they should add up to 360° .

Other correct responses did not make use of congruent triangles. Some showed that since triangle ABC is isosceles (AB , BC are sides of rhombus) and $AX=XC$ (diagonals of rhombus bisect each other), BX is the altitude of the triangle and therefore should cut AC at 90° . Another correct method used the argument that angles BAD and ADC add up to 180° (interior angles between parallel lines); moreover since the diagonals bisect the angles of a rhombus, the sum of angles XAD ($\frac{1}{2}$ angle BAD) and XDA ($\frac{1}{2}$ angle ADC) is 90° ($\frac{1}{2}$ of 180°). This leads to the explanation that angle AXD is equal to 90° (angles in a triangle).

A number of common responses were not considered to constitute suitable proof and were not awarded any marks. A considerable number of candidates proved $\triangle ABX$ and $\triangle XDC$ or $\triangle ABC$ and $\triangle ADC$ to be congruent. Although these pairs of triangles are indeed congruent, these results do not lead to the required proof. Others assumed that the angles at point X are all equal without giving any reasons. Others claimed that angles DAB , ABC , BCD and CDA are all right angles, and that angles DAX , XAB , ABX , XBC , BCX , XCD , CDX and XDA are all 45° and concluded that the angles at X are right angles by using the sum property of angles in a triangle. Others just measured angles BAX and ABX from the diagram with the protractor and then used that the angles in a triangle add up to 180° to conclude that angles AXB is 90° .

Q4ii. The vast majority of candidates correctly indicated that the diagonals of a square meet at right angles. However where it came to their explanation, few candidates appeared to realise that a square is really a rhombus and did not make any connection to the previous part. The most frequent correct explanation was that since the diagonals of a square bisect the angles in its corners, they make 45° with the sides of the square; and using the sum property of angles in a triangle concluded that the diagonals always meet at right angles. Incorrect explanations included the argument "*the sides of a square are always equal and the angles of a square are 90°* ".

Q5. The first three parts of the question were completed successfully by most candidates. Some made minor mistakes in the arithmetic calculations when trying to work out the values of y for the given values of x . In plotting their graph, some candidates chose awkward scales like 3cm for 1 unit and then encountered difficulty in the correct plotting of points. Others used too small a scale leading to a cramped graph and thus had greater difficulty when it came to reading the co-ordinates of points correctly.

In part (iv), a substantial number of candidates presented a correct explanation why the given equation is satisfied at the points of intersection of the two graphs. Oddly enough, some of these candidates did not use their graphs to find the solutions for the equation, suggesting that these candidates would have done similar problems in class but actually do not have any idea what they were actually doing. Indeed, some such candidates tackled this question by using

the trial and error method and claimed that $x = 2$ is the solution of the given equation, even though their graph had three points of intersection.

Few candidates gave fully correct responses to part (v) where they had to use their graph to determine the values of x for which the given inequality was satisfied. There were various sources of error here. Some did not present the whole range of values for x , some had inaccurate graphs or else read the points incorrectly from the graphs, other candidates made mistakes in writing out their answers using the inequality symbols.

- Q6.** Few candidates managed a complete proof of Pythagoras theorem as targeted in this question. This was due to two main reasons. Many candidates did not manage the geometrical proofs demanded in parts (i) and (ii). Moreover, even though in parts (iii) and (iv) many correctly deduced two different expressions for the area of the square ABCD, in part (v) few candidates realised that equating the two expressions obtained in the previous two parts actually leads to a proof of Pythagoras theorem.
- Q7.** This question proved to be one of the easiest in Paper IIA with a good number giving fully correct solutions. A common mistake in part (i) was to write $2x^2$ instead of $4x^2$. In part (ii), the most common mistake was for candidates to write multiply by 2 instead of multiply by 4. In some cases this was clearly a follow-up mistake from the previous part. Others might have just guessed an answer. Part (iii) was found to be the most difficult part, suggesting that a good number of candidates do not realise that in finding the inverse of a composite function, one needs to take the inverses of the functions and reverse the order of composition.
- Q8a.** In this question, candidates were required to prove that triangles QRS and PQS were similar. A large number of candidates appear to confuse similarity with congruence, in fact they appeared to attempt to prove congruency rather than similarity of the two triangles. Marks were also lost when candidates named equal angles appropriately but did not give reasons for their results. A common reading error also occurred here with some candidates proving triangles QRS and **PQR** (instead of **PQS**) similar.
- Q8b.** Two similar jars were given in this question. The volume of the two jars as well as the height of one of the jars was also given. In determining the height of the other jar, the large majority of candidates assumed that the heights of the two jars are in the same proportion as their volumes. The high incidence of this mistake, even amongst high performers, suggests that candidates may have not been sufficiently exposed to similar situations in class.
- Q9.** A few candidates tried to solve this question by drawing the given triangle to scale, then measuring the requested lengths and angles with their ruler and protractor. No marks were awarded in this case, since candidates were specifically asked to use trigonometry to work out this question.

In part (i), the majority of the candidates realized that they had to use the cosine formula. However, not all of them were able to use their calculator properly to obtain a correct result.

In part (ii), most candidates used the sine formula correctly to obtain the required angle.

In part (iii), most candidates used the tangent ratio correctly. However, quite a few candidates lost marks since they marked angle BDA as 90° (instead of angle BAD).

In this question many candidates ignored the rounding which they were asked for in each part of this question. Those attempting to give answers to the nearest cm in parts (ii) and (iii), were often observed to make mistakes in the process. These mistakes suggest that rounding may not be well understood, even amongst some of the higher achievers.

- Q10.** Most candidates answered part (i) correctly. However, quite a few candidates were imprecise with the upper bounds, considering for example that when a sack of flour weighs 20kg to the nearest kg, the weight $W < 20.4$ kg or $W < 20.49$ kg.
- Part (ii) required candidates to find the maximum number of small bags of weight 500g, to the nearest 10g, that could be filled from one sack. Even in this case, most candidates answered correctly. However some candidates were seen to divide the largest weight of the sack by the largest weight of the smaller sack. Such candidates made a similar mistake in part (iii) where they were required to find the smallest number of bags that can be filled from one sack.

Part (iv) asked for the maximum profit that could possibly be made from selling one large sack in small bags. A good number of candidates re-worked part (ii) so as to find the maximum number of small bags and then multiplied their integral answer by €1.05 to find the selling price. However, surprisingly, a lot of candidates forgot to subtract the cost price of €12.00 so as to find the profit.

- Q11a.** The question involved finding the amount after a sum of money had been invested at compound interest. The vast majority of candidates correctly used the equation $A = P(1 + 0.06)^n$. Some opted to use the repeated multiplication factor but managed to get the right value, save for a very few who stopped after the 6th year rather than after the 7th year. Many lost the final accuracy mark for the question because of premature rounding.
- Q11b.** The question involved finding the principal that needed to be invested at compound interest so that it amounts to €20000 after 5 years. Again, most candidates used the equation $A = P(1 + 0.07)^n$ appropriately. Some however wrongly substituted €20000 instead of P rather than instead of A . Many who attempted the question using the repeated division method failed as they multiplied rather than divided by the factor 1.07 for each year. Many lost the final accuracy mark for the question because of premature rounding.
- Q11c.** Many attained the correct solution through valid reasoning about ratios suitably interpreting the given shares as fractions of an unknown amount S . However, a good number of candidates were simply juggling with the figures given, simply adding $8 + 7 + 5 = 20$ and $7 + 5 + 4 = 16$. Many others just wrote the fractions $\frac{8}{20}$ and $\frac{7}{16}$ but did not manage to construct an equation involving these fractions.

2.5 COMMENTS REGARDING PERFORMANCE IN PAPER IIB

The overall facilities of the questions in Paper IIB are set out in Table 5 below. These facilities were worked out in the same way as described in Sections 2.3 for the questions in Paper I Section B. Table 5 is followed by the examiners' comments about the individual questions in this paper.

Table 5: Facility of the questions in the Paper IIB

$n = 2242^*$

Question No	1	2	3	4	5	6	7	8	9	10
Facility	0.60	0.62	0.77	0.63	0.54	0.67	0.41	0.50	0.57	0.28
IIB Candidates achieving full marks (%)	22.7	41.3	70.0	6.6	21.1	41.0	22.3	14.9	24.2	12.8
Question No	11	12	13	14	15	16	17	18	19	
Facility	0.51	0.43	0.45	0.60	0.55	0.58	0.79	0.49	0.30	
IIB Candidates achieving full marks (%)	30.6	5.6	8.3	44.1	52.0	20.3	77.5	9.8	24.9	

* n stands for the number of candidates who actually sat for the IIB paper

- Q1.** Many candidates did well in this question. However, in part (i) of this question, most candidates did not manage to name the supplementary angle to m .
- Q2.** Many candidates used algebra to find the cost of the buns and of the milk. Such candidates usually got a correct solution but mistakes were sometimes made in the manipulation of the simultaneous equations produced.
A number of candidates were awarded full marks for a correct solution using a trial and error method when the working was shown. Others who just wrote down the answer were not awarded any marks, even because in this question a correct answer could be given through incorrect reasoning.
- Q3.** Most candidates got full marks on the question. However, a good number from amongst the lowest achieving candidates got no marks on this question.

Q4. Very few candidates gained full marks on this question. The most common mistakes were to convert 33.3% to 0.3 and to $\frac{3}{10}$. However most candidates made suitable conversions for the other given fractions.

Q5. Almost all candidates completed part (i) successfully.

The majority of candidates lost some or all the marks allotted to part (ii). This occurred for two main reasons. Some candidates suitably worked out that Jane had enough ingredients to make the given recipe for 12 biscuits for 20 times. However, they then gave their answer as 20 biscuits rather than 240 biscuits. A good number of other candidates opted to work with the total weights of the ingredients in Jane's cupboard completely disregarding that Jane needed to use her ingredients according to the ratio given in her recipe. Candidates using this method lost all the marks allotted to this part. In this part question, a small number of candidates were also observed to make mistakes in converting from kilograms to grams.

Part (iii) was completed successfully by most students. However, a small number of candidates got incorrect answers through improper use of the calculator.

Q6. The first two parts were very easy and almost all candidates gained the two allotted marks. Although many also gave a correct response to the last two parts, the majority did not. The latter candidates did not appear to understand what the key of a pictogram is and usually considered that each small car in the pictogram just represented one car.

Q7. In part (i), almost half the candidates found difficulties with finding the area of the composite shape. Many mistakes were noted where candidates did not know how to find the area of a triangle. Others did not break up the area into simpler shapes and just multiplied 4m by 6.5m.

In part (ii), a common frequent mistake was to use triangle BCD to find the length BC treating this triangle as if it were right angled.

A good number of candidates did not even attempt part (iii). Many did not use the appropriate trigonometric function to find the unknown angle.

Q8. Usually candidates knew how to reflect the grey shape in the vertical line, however almost half of them did not translate both shapes by 3 squares down properly.

Part (ii) was more difficult with many not giving suitable description of the transformations. Many seemed to have an idea as what transformations were involved but did not describe them sufficiently, by for example not including the mirror line when naming a reflection.

Q9. In part (i), candidates usually successfully identified the lines of symmetry of the shape. However a small number wrongly considered the diagonals of the shape as lines of symmetry.

In part (ii), most candidates worked out the area of the rectangle correctly and found it to be 216m². Finding the area of the two semicircles proved to be more difficult. Marks were lost either because a wrong formula for area of circle or semicircle was applied or because the radius was taken to be 6m instead of 3m.

Q10. The vast majority of candidates started to solve the problem appropriately by trying to convert the weights to the same unit (either grams or lbs). However, they then failed to apply an appropriate comparison to decide which jar was the best buy. They just found the difference in the weight and price of the two jars and jumped to a conclusion without any further calculations.

Example: $1.1 \text{ lb} = \text{€}5.25$

$1 \text{ lb} = \text{€}4.99$

So first jar is better because it has more weight and costs only 30c more.

The few students who managed to get full marks for this question applied various correct methods of comparison. Full marks were given in each case.

Example: *for second jar* $1 \text{ lb} = \text{€}4.99$

$0.1 \text{ lb} = 49\text{c}$

$1.1 \text{ lb} = \text{€}5.49$

So first jar is better value since 1.1lb costs less.

- Q11.** In part (i), the large majority converted from Yen to Euro suitably.
In part (ii), working with three different currencies proved to be more difficult. Many did start off correctly by multiplying €1.346 by 1000 to find the equivalent in euros of £1000 but then failed to work out the second proportion and to convert the amount in euros to dollars.
- Q12.** A very small percentage of candidates got full marks for part (i) of the question. It was evident that students either did not read the instructions carefully or failed to understand that, since the cost of the bags and seat reservations was per flight they had to be charged twice.
Many did answer part (ii) correctly. An attempt to find the time difference from 21:30 to 03:25 was seen in all scripts and most candidates found it correctly as 5 hours 55 minutes. Quite a few students gave this as an answer and ignored the time difference. Others added instead of subtracted the two hours and gave the answer as 7 hours 55 minutes. In some scripts only one hour was subtracted.
- Q13.** Many candidates made a good attempt, however few candidates gained full marks on the question. The most difficult part turned out to be the identification of the length of the rectangle forming the cylindrical part of the cylinder as being the circumference of the circular faces.
- Q14.** This question was well answered by a good number of candidates. At the same time, as many as 24% of the candidates got zero marks on the question showing that a substantial proportion of candidates are very limited where it comes to applying fractions.
- Q15.** Many candidates did very well on this question involving Pythagoras theorem, with 52% gaining full marks. Some candidates lost marks because they took incorrect values for the lengths of BP and PD, suggesting that they did not read the question properly.
- Q16.** A good number of candidates completed all the sequences successfully. The most common difficulty encountered was in identifying the n^{th} term of the sequences, this was particularly true for sequences B and D.
- Q17.** As can be seen from Table 5, this question turned out to be the easiest question in Paper IIB. One common mistake was when candidates found the value of $\sqrt{7.2 * 10^6}$ and then divided by 5 instead of by $\sqrt{5}$.
- Q18.** The performance on this question suggests that many IIB candidates do not seem to be able to make simple interpretations from distance-time graphs.
In part (i), candidates needed to read the distance travelled from a distance time graph. Only around half the candidates gave a correct response to this simple question.
In part (ii), some candidates interpreted a horizontal section on the distance time graph as a distance travelled at constant speed.
Part (iii) involved finding the speed at a given time interval. Not many candidates managed to find the speed by finding the gradient of the associated line and some of these did not include units for their speed.
In part (iv), candidates needed to sort out the from the graph the time of fastest travel. As in the previous part, few candidates got this question correct.
- Q19.** Only about a quarter of the population managed a fully correct response to this question and a good number did not even attempt it. There were two methods which could be used to find the unknown angle in this question. One could either use the fact that the sum of the exterior angle of a polygon is 360° or else use the property that the sum of an n sided polygon is $180(n - 2)$ degrees. The latter method was by far the more popular method, however the presentation of work was so poor in some scripts that the method being used could not be deciphered. Another common mistake was to wrongly assume that the given hexagon was regular.