Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

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In Algebra Level 2 (AAL20_01)

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Introduction

The paper provided students with the chance to demonstrate their knowledge and skills. They had enough time to complete the paper and most students presented their work in a clear and coherent way.
A majority of students showed proficiency across most areas of the specification, though compared to previous examination sessions, there appeared to be more students who were less confident in setting out the stages of their working when solving equations. There were more students who tried the more informal approach of writing down operations and their inverses. This approach was generally not successful.
A good knowledge of standard techniques was evidenced by the work in many scripts. The main areas where centres might seek to help students improve their performance further were in finding the gradient and the equation of straight lines, sketching the graph of a quadratic function, formulating and simplifying algebraic expressions, changing the subject of a formula and solving equations where the unknown appeared on both sides of the equation.

Reports on Individual Questions

Question 1

This question provided a good start to the paper for many students.
Nearly all students were successful in parts (a) and (b) showing that they understood how to apply the laws of indices to simple cases. Where errors were made, n^{20} and t^7 were the most commonly seen incorrect answers.
Parts (c), (d) and (e) were less well done but the majority of students scored at least one of the two marks available in each part. For part (c), most students scored a mark for r^8, but fewer students scored both marks for the correct answer $81r^8$. Incorrect responses given by a significant number of students included $3r^6$, $81r^6$, $3r^8$ and $12r^6$. It is disappointing to report that many responses to part (d) consisted of expressions which were not fully simplified, for example $5w^3 \times 2y$ instead of $10w^3y$. Surprisingly, a significant number of students gave expressions containing addition signs, for example $10 + w^3 + y$. There were also many errors seen in answers to part (e). $3p + m - 1$ was a frequently seen incorrect answer but in this case examiners could award 1 mark for 2 terms out of 3 correct.

Question 2

This question was generally well answered. Where answers were not fully correct, it was often because one or both of the expressions seen in parts (b) and (c) were only partial factorisations. Answers to these parts of the question were often awarded one mark. Students are always advised to check that their factorised expressions are equivalent to the original expression by multiplying out their final answer. It is encouraging to report that most students seem to have done this. Weaker students sometimes gave $20g$ as their answer in part (a) and $15y^2$ or $15y^3$ as their answer in part (b). In part (c) the most common partial factorisations seen were $4em(4em - 3m^2)$, $4m^2(4e^2 - 3em)$ and $em^2(16e - 12m)$. These scored 1 mark. Answers of $4em^1$ and $4em^{-1}$ were seen in some attempts by weaker students.

Question 3

A large majority of students gained full marks for their answers to this question. Weaker students made errors in the calculation of their values, particularly when x was negative. This often resulted in students drawing two line segments rather than one. They appeared not to be concerned when their graph was not a straight line. A few students did not attempt the question.

Question 4

Some students presented their working clearly in this question on solving equations. However, there was an absence in the writing of clear steps applied to equations in many scripts and a student's ability to deal effectively with solving equations where the variable appears on both sides of the equation was clearly hampered by this.
Nearly all students successfully answered part (a) of this question.
Part (b) of the question was the least well answered part of the question. It was relatively uncommon to see steps written down clearly as is expected in a paper testing proficiency in algebra in general and in solving equations in particular. Most students were unable to score any marks for their working in this part of the question. Students who adopted the approach of multiplying throughout the equation by 2 almost always forgot to multiply the 3 on the right hand side of the equation by 2 and wrote $14 + 2k = k + 3$ or equivalent. Where the alternative method of isolating terms in k to begin with was adopted and some correct working was seen to get $\frac{1}{2}k = -4$, the answer -2 was seen quite often. This was the result of the incorrect evaluation of $-4 \div \frac{1}{2}$ but could be credited with 1 mark for a correct first stage.
In part (c), most students made a good start by multiplying out the brackets on each side of the equation. However, careless errors were frequently seen even at this early stage in the process of solving the equation and, as a result, students scored only 1 mark out of the 3 marks available. Many students did solve this equation successfully though and scored all 3 marks.
The most common combination of marks scored in this question was 2, 0, 3 in parts (a), (b) and (c) respectively.

Question 5

Students could usually work out the first two terms of the sequence whose nth term is $3(n + 1)$ and scored 2 marks in part (a). However, a surprising number of students gave 4 and 7 as their first two terms which suggested they had worked out their values using $3n + 1$ instead of $3(n + 1)$.
Part (b) was also quite well answered. Many students completed this part by writing down and solving an equation. However, there was also a significant number of students who used a more informal approach using trial and improvement or a flow chart approach using operations and inverse operations. Unfortunately, the latter approach was often not written down in an organised way and this frequently led to the inverse operations being applied to 123 in the wrong order. Students who could be awarded 1 mark out of 2 marks for their working in

part (b) usually were able to divide the 123 by 3 but then failed to subtract 1 to get the correct answer, 40.

Question 6

Part (a) of this question was usually correctly answered. Part (b) was also quite well answered though in some cases there seemed to be a lack of care with indices and a significant number of students wrote q^2 instead of q^3 or q^3 instead of q^4 in their answers. Many of these candidates scored 1 mark for one correct term. Weaker responses in both parts of the question included those where a student had correctly expanded the bracket but then went on to try to further simplify the expression by wrongly collecting terms, for example in part (a) $2u^2$ + *uw* + 3*u* followed by $5u^2$ + *uw*.

Question 7

The most common error seen by examiners in this question was caused by a confusion between “equation” and “expression”. About two thirds of all students taking the examination scored full marks.

Question 8

This question was a good discriminator with students usually scoring a total of at least 2 marks for their answers.
Finding the speed, that is the gradient of the graph, proved to be a challenge to a significant number of students. Sometimes, students could identify that they needed to calculate 7.5 ÷ 0.75 or an equivalent calculation such as 5 ÷ 0.5 but were unable to process this accurately. Students often used minutes as their unit of time and showed calculations such as 7.5 ÷ 45. Examiners were able to award 1 mark for such expressions.
Completing the graph in part (b) was usually correctly done and most students scored both marks for their graph. A minority of students drew a graph where the line representing Lily’s stay at her brother’s house was of an incorrect length. However, nearly all students gained the mark for the line drawn to represent Lily’s journey home.

Question 9

The majority of students gave a correct response to each part of this question, particularly to parts (a), (b) and (c). In part (a), students sometimes wrote their answer in the form $3 \geq x$. This was acceptable for 2 marks. The most commonly seen unacceptable answers included $3 \leq x$, and $-5 \leq x \leq 3$. The latter expression was awarded 1 mark.

Most students scored full marks in part (b). Few errors were seen but where they were, they included getting only one end of the interval correct or using a full circle instead of an empty circle or vice versa.

Part (c) was also well answered, the most common error seen was where students gave the integers −1, 0, 1 and 2 only.

Students usually scored at least 2 marks in part (d) for finding the critical value, 4 and about two thirds of all students gave a fully correct answer. Those students who did not gain any credit in this part of the question had often suggested that they would divide each side of the inequality by 2 but then wrote $5w < 5$.

Question 10

There were fewer good responses to this question on graph sketching than in recent previous sessions. Part (a)(i) of the question was usually correctly answered. However some candidates gave the answer −9 instead of the correct 9. Part (a)(ii) was answered less well. Answers seen were often incorrect with −9 as the most frequently occurring incorrect answer. It is disappointing to report that only a small proportion of students seemed to realise that they should use their answers to part (a) to help them sketch their graph. Many students drew a parabola but often with the *y*-axis as a line of symmetry. These sketches sometimes showed (0, 9) as the point of intersection of the *y*-axis. Such graphs could usually be awarded 2 of the 3 marks available. The realisation that the graph should touch the *x*-axis at (−3, 0) was much less often evident and only a small number of students scored full marks. It was good to see that there were not many students who tried to plot and draw the graph.

Question 11

This question was a good discriminator across the ability range with most students able to score some marks. However, the number of students scoring full marks was disappointing.

Part (a) was successfully answered by most students. Expressions written in the form $5m$ and the form $5 \times m$ were awarded the mark. Answers to part (b), where a fully simplified answer was required, were disappointing with many of students losing the mark because they gave their answer in an unsimplified form, usually either $2m \times 3$ or $3 \times 2m$. A significant number of students gave the incorrect expression $2m + 3$ as their answer to this part of the question.

Only a minority of students scored 2 marks in part (c). However, it was common to see partially correct expressions with $4n$ correct but with the term in m incorrect or absent.

Question 12

Students could usually interpret the graph and parts (a) and (b) were usually answered correctly Some students gave inaccurate readings showing they did not have a clear understanding of the scale used on the vertical axis and disappointingly, a significant number of students seemed not to read the question in part (b) with sufficient care and gave the answer 24.
In part (c) some students scored both marks and most students made a good start by considering a triangle drawn onto the line. A significant proportion of students who did start correctly gave the answer 45 instead of the correct −45 and so lost a mark. Part (d) was quite well answered though there were some students who tried to explain what a gradient is in general, for example referring to the steepness of the graph, and not what it represented in the context of the question. Communication that the gradient represents the amount of money repaid each month (or equivalent) was required in order for examiners to give credit.

Question 13

This question discriminated well between more able students. It attracted totally correct answers only from about one in every six students.
Most students showed a correct substitution into the formula in part (a) and they often went on to give a correct value. However, too many students interpreted the square root sign as a division sign and divided 16 by 5 to get their answer.
In part (b), few students were able to change the subject of the formula successfully. Students often started incorrectly by attempting to square each side of the formula, a correct intention, but then writing $t^2 = 5(g - 3)$ or $t^2 = 5\,g - 3$. These students were unable to access any marks for their answers to this part of the question. More success was achieved by students who divided both sides of the formula by 5 as their first step. Students who did this often completed the question to give a correct final expression, though the absence of brackets around $\frac{t}{5}$ for the second stage of working and beyond often led to a loss of marks.
It was noticeable that more students than usual approached the question by identifying a sequence of operations together with their inverses. Unfortunately, hardly any of these students set out the steps of applying the inverse operations to the formula stage by stage, for example by writing $\frac{t}{5} = \sqrt{g - 3}$ as a first step, so they rarely scored any marks.

Question 14

A majority of students provided a good answer to this question, completing the table of values correctly and going on to plot and draw the curve. Many students could also find two estimates for the solution of the equation given in part (c).
Where there were errors in the table, they usually involved the calculation of *y* values for negative *x* values. Points were usually plotted accurately but if there were incorrect values in the table, this usually resulted in a curve which was clearly not a smooth parabola. The specification requires students to be able to sketch quadratic functions so candidates should know what to expect and are advised to check their working if they do not get a smooth curve in the form of a

parabola. There were only a few students who lost a mark because they joined their points with straight line segments rather than a smooth curve, but there were more students who joined the points with coordinates $(-1, 1)$ .and (0, 1) with a straight line and so forfeited the mark for drawing a correct curve.
About one third of all students were able to score both marks in part (c) for reading off the two values corresponding to y = 6 from their graph. Some students did not attempt this part of the question.

Question 15

This question was not well done and attracted fully correct answers from only the most able students taking the paper. A large number of students seemed to have little understanding of what was required and matched graph 1 to graph A and graph 3 to graph B.

Question 16

The equation in this question was solved successfully and most students gained full marks for an answer of 11.5 or $\frac{23}{2}$. Answers in the form $11\frac{1}{2}$ were rarely seen but were of course acceptable. Where a correct answer was not obtained, few students scored part marks for their working. The main error seen was for students to add 3 to both sides of the equation as a first step to get $\frac{2c}{5}$ = 4 + 3. These students could not be awarded any marks. About three quarters of students scored full marks for their answer to this question.

Question 17

Although there were some fully correct answers to this question, it was one of the least well done questions on the paper. However, most students scored at least 1 mark, either for a correct method to find the gradient or for giving an answer of the form $y = mx + 4$, $m \neq 0$, $\frac{4}{3}$ or 4, thereby recognising the use of the intercept of the y axis in the equation. The incorrect answer $y = -\frac{4}{3}x + 4$ was seen quite often and could often be awarded 2 out of the 3 marks available.
A large number of students either used an incorrect gradient, for example $\frac{3}{4}$ or $-\frac{4}{3}$ or processed its value incorrectly, for example using $\frac{4}{3}$ = 0.75.

Summary

Based on their performance on this paper, students are offered the following advice:

- practise solving equations where the unknown appears on both sides of the equation.
- when solving equations or changing the subject of a formula, set out each step separately so that examiners can give some marks for correct intermediate steps in cases where the final answer is incorrect.
- practise writing and simplifying algebraic expressions representing situations in real life.
- include in your method for finding the gradient of a straight line, a safeguard to take into account when the gradient is negative
- practise how to interpret the gradient of a graph in a real life context.

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