Examiners' Report
Principal Examiner Feedback

January 2018

Pearson Edexcel Level 3 Award
In Algebra (AAL30)

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Principal Examiner Feedback – Level 3

Introduction

This level 3 examination paper provided all students with the opportunity to succeed in this qualification. It was accessible to students.

Good students were able to display a wide range of skills and techniques. These included graph sketching and algebraic manipulation. However, a common error continues to be the failure to consider both negative and positive square roots for both numbers and expressions.

A small number of students continue to lose marks through avoidable arithmetic errors. Students should be encouraged to check their calculations.

Reports on Individual Questions

Question 1

Part (a) was well answered with the vast majority of students correctly factorised. A very small number just failed to give any reasonable answer. The incorrect answers did not form any pattern.

Again, part (b) was virtually always answered correctly. A few students put the signs the wrong way around but this was rare.

Question 2

A significant number of students gained full marks on this question. The lines were usually drawn correctly but occasionally the wrong region was indicated. Students should be encouraged to shade as well as label R or clearly show all the 'edges' of the required region with clearly drawn lines, especially if an axis is an edge. On a few occasions it was unclear where the boundary of the region was.

Question 3

This question was well answered but a surprising number of students were unable to expand the brackets correctly, usually the mistake was to get $5x+1$ instead of $5x+5$. If the expansion was correct most students went on to arrive at either $23x > 7$ or $-23x < -7$, some stopped at this point. For those that did try to rearrange fully, there was a significant difference in accuracy for those that worked with $23x > 7$ rather than or $-23x < -7$.

Question 4

Most students recalled the quadratic formula correctly and were usually able to substitute in the required values and simplify to $\frac{-2\pm\sqrt{24}}{10}$, gaining 2 marks. However, it was evident that there were difficulties with manipulating the surd to fully simplify their answer. This was frequently simplified to $\sqrt{12}$ rather than $\sqrt{6}$. When quoting the quadratic formula, students should ensure the quotient line is of the correct length.

Question 5

Part (i) was almost always correct.

In part (ii), many could cope with the either the factorisation or the inversion and often only one of these skills were shown. Factorising $x^2 - x$ caused some problems, $(x-1)(x+1)$ was a common incorrect answer. Those who did not factorise and did not connect part (i) with part (ii), often left the final answer as a very complex algebraic expression.

Question 6

In part (a), most students were successful with this question. Only a few hand drawn circles were seen. A few students drew circles of radius 4 instead of 8 but all those that drew circles centred them on the origin. There were a small number of straight lines drawn.

In part (b), 1 mark was frequently awarded for correctly isolating y^2. The accuracy mark was often not able to be awarded, as students did not consider that square rooting would give a positive and negative solution, missing off the ± symbol. In other cases, full marks could not be awarded as students misunderstood applying the square root and incorrectly simplified $\pm\sqrt{(64 - x^2)}$ to $\pm 8 - x$. Square rooting the given equation as the first step, to give $x + y = 8$, was a commonly seen, incorrect method worthy of no marks. The order of operations and the ability to square root correctly were seen as a challenge by a significant number of students

Question 7

Many correct solutions were seen. Students either expanded the brackets and then simplified the square roots or simplified the separate brackets to $4\sqrt{5}$ and $\sqrt{2}$ and then multiplied. Both approaches were equally successful. The most common error seen was in the expansion of the brackets and the use of $-\sqrt{10}$ instead of $+\sqrt{10}$.

Question 8

A good proportion of correct answers were seen in part (a), but students are reminded that any simplification on this specification must be to the simplest form.

In part (b) many fully correct answers were seen. Even if full marks were not awarded 1 mark was given for 64 or y^2. The most common incorrect responses were $4y^2$, not cubing the 4, or $64y^{\frac{6}{9}}$ demonstrating a misunderstanding of how to multiply an integer by a fraction.
In part (c) the majority of students scored 1 or 2 marks. When 1 mark was awarded for 2 correct answers it was usually for simplifying to $3x^4$. Several students made an error in simplifying $2x^0$ to 1, incorrectly applying the power of 0 to all of $2x$. Another common error seen was to multiply the powers together rather than add them.

In part (d) the modal score was 2 marks. Students who did not score both marks were usually able to gain 1 mark for correctly expanding one of the brackets. The most common incorrect answer was 8 where the subtraction was only applied to the first term of the second expansion.

Question 9

Students found this question more challenging.
In (a) a majority of students were able to show a method to get the gradient of L_1. Of those that arrived at $-\frac{7}{4}$ many could not cope with the manipulation of the fractions to gain the final equation. Arithmetic errors were common in this question. Students should also be reminded to read the question carefully to ensure they give their final answer in the required format.

Students were more successful in part (b) of this question than in part (a). They were able to use their gradient from (a) to gain the required gradient for L_2 and then find the value of '*c*'. The answer was usually given in the correct format here.

In part (c) the majority of students knew the condition required for 2 lines to be perpendicular and successfully argued that the given lines had gradients of 3 and $\frac{1}{3}$ which do not give a product of -1. Others, however, were very vague; not mentioning gradients or talking about 'flipping' equations or saying that there were no negatives in the given lines. A full explanation was required for this mark.

Question 10

For part (a) it was pleasing to see a good number of fully correct graphs supported by a table of values. Arithmetic errors in calculating the correct coordinates were invariably with the negative x values. Even with these errors, students who had evaluated 4 or more of the points correctly were generally awarded a second mark for plotting their points accurately. A small number of parabolas were seen as final answers, students should be encouraged to consider the general shape of the graph they are being asked to draw as a check of their working. Part (b) was less successfully answered with too many students reading off the value at $y = 4$ rather than rearranging the given equation and realising they needed the solution where $y = 0$.

Question 11

On the whole this question was well answered with the modal score being full marks. When full marks were not given part (a) was often well done but the students then only gave the one answer of 2 for (b). The other common error seen in (a) was the inability to be able to evaluate 10 ÷ 0.25, 2.5 was a common incorrect answer. There were a few students who did not get the initial relationship correct but they could score a method mark if they went on to use their equation correctly in part (b).

Question 12

Again the modal score for this question was full marks. The main errors seen were arithmetic. In part (a) the most common error was to calculate the first point as 3 not $\frac{1}{3}$.

In part (b) most who were able to recall the formula for the trapezium rule usually gained at least 2 marks. However, errors in basic arithmetic and applying the correct order of operations again led to an incorrect final answer. In particular, students who worked out the areas of the four trapeziums separately often had difficulty with the fractions and calculating $\left(\frac{1}{3}+1\right)/2$.

Question 13

This question was not answered so well. An interesting collection of graphs was seen including parabolas, hyperbolas, circles and cubics. There were a sizeable number of students who sketched a parabola in the correct orientation but still did not gain all the marks because they did not provide the values at the intercepts. Providing the points of intersection is an integral part of this specification.

Question 14

Accurate recall of the formulas for arithmetic sequences was required for both parts of this question. In part (a) many incorrect attempts were made using the formula for the sum of the first n terms. Students who wrote out the correct the formula $a + (n - 1)d$ were generally able to substitute in and evaluate correctly. Frequently students used the formula in the form ($a - d + nd$) leading to the calculation $202.5 - 51 \times 2.5$. This approach often led to an incorrect final answer due to errors in basic arithmetic.

In part (b) many students could recall the formula correctly and were then generally able to substitute in, but had difficulty in correctly processing to isolate terms in a. Some students attempted to evaluate 790×40 rather than 40000/40 which would be a more prudent method without a calculator. Other errors seen were in initially recalling the formula with the omission of the addition sign between $2a$ and $(n - 1)d$, or the replacement of $2a$ with a.

Question 15

Part (a) and (c) of this question were very well answered.

However, in part (a) many made things difficult for themselves by not factorising by 2 initially and so worked with the $6x^2$... equation. There were a small, but significant, minority who left the answer in the factorised form and didn't solve it, which is disappointing at this level. Others struggled with the quadratic equation formula, which on a non calculator paper is not to be advised if factorisation is possible.

In part (b) some students were able to divide the 15 by 3 appropriately and get the value of p. Others used x^2+15x, having only partially factorised by 3.

Of those that found the correct value of p, about half went on to correctly find the value of $q, -\frac{43}{4}$. Any equivalent fraction or -10.75 were acceptable and students do not need to simplify fractions further unless specifically asked to do so.

Question 16

This question was generally well answered by students who understood in part (a) that the area under the graph represented the distance travelled. Where full marks were not awarded, 1 mark was frequently given for finding one area, usually for where the speed was constant. The most common error seen was not applying the correct formula for the area of a triangle, forgetting to half the base multiplied by the height; this kind of error is not expected at this level. In part (b), where students knew to calculate the gradient of the line, they usually scored both marks. A common error was to divide the distance travelled in the final part of the journey by the time.

Question 17

The simple approach of squaring the second equation to get an expression for $9y^2$, which could then be substituted in the first equation, was only employed by a minority of students. This was by far the most successful method as it eradicated a lot of the fraction work. The vast majority opted to work with either $y=(\frac{4}{3})x$ or $x=(\frac{3}{4})y$. Here the fraction manipulation was weak; many did $9\times(\frac{4}{3})x$ then squared this answer. Often the x was completely missed out in the attempted substitution and so these students ended up with a 3 term quadratic to solve. Those that did arrive at either $16x^2=1$ or $9y^2=1$ often only gave the positive value of the square root. The need to use both the negative and positive square root of a number should be reiterated to students.

Some students arrived at $-16x^2=1$ from incorrect working and then ignored the negative sign to find their value of x. Centres should note marks are only awarded where the answers come from correct methods.

Question 18

More students gave correct answers to part (a) than to part (b).

In both parts of the question, poor labelling of the coordinates often led to the loss of a mark. In part (a) students often knew to reflect the given graph but did so in the y-axis rather than the x-axis. If the reflection was carried out correctly the turning point $(-2, 3)$ was frequently labelled as $(2, 3)$ even though it was clearly in the correct quadrant. Students should be encouraged to check that all labelling is sensible. In part (b) lots of attempts to enlarge by a scale factor of ½ in the direction of the x-axis were seen rather than in the direction of the y-axis. Again poor labelling of 4 rather than -4 on the x-axis was again seen.

Question 19

Most students knew the general shape of the curve that was required, although there were a few sine curves offered and the period of the curve was sometimes incorrect.

Again, students should be reminded that when asked for a sketch of a graph the intercepts on the axes should be labelled.

Question 20

Students need to read questions carefully; far too many did not use the initial equation to show the given relationship. Many correctly stated the need to use the discriminant but substituted in $a = 1$, $b = -20$ and $c = 36$ rather than working with the algebraic values, in terms of p as necessary.

Many attempts to solve the given inequality were seen in part (a) as well as in part (b).

Part (b) was generally well answered with many students gaining at least 2 of the marks for identifying 2 and 18 as the critical values for p. Those students who correctly identified the required inequality signs often sketched a diagram of the parabola in assisting their final answer. This method was usually successful and should be encouraged.

Summary:

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

- To encourage the use of both positive and negative roots.

- To look for 'smart' arithmetic options in questions e.g. to half first or look for common factors.

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