Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

Summer 2019

Pearson Edexcel Level 3 Award
In Algebra (AAL30)
Paper 1

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Introduction

A typical student in this examination presented their working in a clear and logical way and worked accurately to demonstrate a good performance overall. Questions where this was not quite so evident included questions 6 and 21. However there was still a good proportion of completely correct answers to these questions and where they were not completed successfully, good starts were often made. Very few students presented weak scripts.
Most students showed a good knowledge of standard techniques and formulae. It is encouraging to report improvements in success rates on questions involving proportionality, straight lines and simultaneous equations.

Reports on Individual Questions

Question 1

The majority of students fully factorised the expressions in parts (a) and (b) to score full marks. However, a significant minority of students only partially factorised the expressions, particularly in part (a).
Most students recognised the expression in part (c) as the difference of two squares. Acceptable expressions given included the expected $(5-2x)(5+2x)$ as well as $-(2x-5)(2x+5)$ and $(-2x-5)(2x-5)$. Less able students sometimes gave the incorrect answer $(5-2x)2$

Question 2

The big majority of students gave the correct answer to the straightforward linear inequality in part (a).
In part (b) most students identified the correct critical values of $\frac{1}{2}$ and −5 and many students scored full marks for the correct response $-5 < x < \frac{1}{2}$. However, a significant minority of students either found incorrect critical values or made errors in the way they used inequality notation in their final answer.

Question 3

The first part of this question on the change of subject of a given formula was very well answered.
In part (b) nearly all students applied an appropriate first operation, multiplying by c^2 and many students then divided throughout by P. This usually led to the award of at least one mark. However far fewer students scored full marks here because they gave the answer
$c = \sqrt{\frac{4a^2b}{P}}$ and not $c = \pm\sqrt{\frac{4a^2b}{P}}$

Question 4

A majority of students scored both marks in part (a) of this question and it was relatively rare to see freehand attempts to draw a circle. Incorrect responses seen included circles with centre (0, 0) but not with radius 6 units and circles which had a centre other than (0, 0).
Part (b) presented few problems for students sitting this paper. The line was nearly always drawn accurately.
Answers to part (c) varied widely. Many students scored both marks for using their graphs with reasonable accuracy to give the two pairs of solutions to the given simultaneous equations. However, a surprising number of students attempted, unsuccessfully, to solve the equations using algebra.

Question 5

The great majority of students could write down the quadratic formula and so scored at least one mark for their response to the question. Most of these students obtained accurate solutions to the equation but only a small proportion of students could successfully write their solutions in the required form, that is $\frac{2\pm\sqrt{22}}{9}$. Many students were unable to replace $\sqrt{88}$ correctly with $2\sqrt{22}$. Instead $\sqrt{88}$ was often replaced with $4\sqrt{22}$. or $2\sqrt{44}$. A small but significant minority of students gave the answer $\frac{-2\pm\sqrt{22}}{-9}$ on the answer line. Unfortunately, this could only be awarded 2 of the three marks available. About one quarter of students scored full marks in this question.

Question 6

Answers to this question were disappointing. Most students realised the need to use the discriminant but a much smaller number of students stated or used the correct condition for there to be real roots, that is $b^2 - 4ac \geq 0$. Instead $b^2 - 4ac > 0$ and $b^2 - 4ac = 0$ were more commonly seen. Consequently, few students scored full marks. Substitution into the discriminant was usually accurate and a good proportion of students found the critical values 6 and −6 but they were often unable to go on to give the correct solution to the inequality.

Question 7

Nearly all students correctly expanded the brackets in part (a) and simplified the resulting expression fully to score both marks. Students who did not get the answer fully correct usually scored 1 mark for a correct method. Where full marks were not scored, it was usually because of either an incorrect simplification of $-8x + x$ or in the evaluation of -4×1 as $+4$.
Answers to part (b) were usually fully correct though a surprising number of students had a "$25y$" in their final expression instead of "$25y^2$". A few less able students expanded $(3x - 5y)2$ as $9x2 + 25y^2$

Question 8

This question was answered very well with the great majority of students gaining at least 3 marks and most students gaining 4 marks or more. Where there were errors in drawing the lines, it was often where students were careless in drawing the line $2x + y = 6$ or had drawn the line with equation $y = -1$ instead of the line $x = -1$. Diagrams were, in general, clear and accurate. The region defined by the three inequalities given was often correctly identified but common errors included indicating the region defined by
$x > -1$, $2x + y < 6$ and $y > 4 - x$ or only indicating the part of the correct region where $y > 0$.

Question 9

Many students found this question to be routine and they often scored full marks, particularly in parts (a) and (b). However, a common error was to evaluate 3^3 as 9. There were some students who were unable to write down a correct link between the variables h and x at the beginning of the question and so ruled out the possibility of gaining any credit for their answers. Students are advised to check that they have read the question carefully. A number of students used an incorrect relationship between *h* and *x*, for example, $h = kx^2$ or $h = \frac{k}{x^3}$.
Students who were successful with the first two parts of the questions were sometimes able to sketch a correct graph in part (c). However, straight lines were commonly drawn in this part and only the more able students produced a good sketch.

Question 10

This question differentiated well between students of different abilities. Most students gained at least 1 mark for their attempt to find the gradient of the line L in part (a) of this question though a good number of students did not give a negative gradient. A common mistake was to leave the equation of the line in the $-\frac{3}{4}x + 4$ or to make an error when trying to find the value of c in $y = mx + c$. Examiners were surprised to see that many students did not read the value of "*c*" from the given graph but instead opted for a route needing algebraic manipulation, a method which often resulted in errors creeping in.
Students were usually successful in part (b) of the question, realising that all they needed to do was to give the same gradient as in part (a). A few students gave the response "$-\frac{3}{4}x$". These students could not be awarded the mark available.

Question 11

This question was answered well and there were no commonly seen errors in part (a) which tested the recall and application of standard results. A few students tried, unsuccessfully to use factorisation or the quadratic formula in order to get the answers.

Part (b) was answered well and a majority of students gave a fully correct answer. However, a number of students started off by using $(x + 4)^2$ and so spoiled their chance of scoring any credit for their answers to this part of the question.

Question 12

The success rate in all three parts of this question was high, particularly so in parts (b) and (c). In part (a), a relatively small number of students gave 180 (15 × 12) or 0.8 (12 ÷ 15) as their answer. The main errors in part (b) were where students gave "speed", "velocity" or "acceleration" as their answer. There were no commonly seen incorrect answers to part (c).

Question 13

Over a half of students sitting this paper scored full marks in this question and most students scored at least three marks for their answers, two marks from part (a) and one mark from part (b). Mistakes made often stemmed from arithmetic errors involving signs or the multiplication of fractions at the stage where students were trying to determine the value of "c" in the equation.

Question 14

This question attracted less fully correct responses than most of the other questions in this paper though most students gained some credit for their answers.
In part (a) many candidates scored a mark for either "64" or "x^2" but a completely correct answer was much less frequently seen. Commonly seen incorrect responses included expressions $64x^3$ and $2x^2$.
In part (b) many more students scored the mark for correctly stating the value of "b" than those who scored a mark for the value of "a". Commonly seen incorrect values given included −8 for "a" and 9 for "b". As in the first part of the question, there were relatively few students who scored both marks.

Question 15

Answers to this question were generally much improved on earlier series. Full marks were scored in this question by about one third of all students who were entered for the examination. Most students scored some credit for their responses. Students almost always used the approach of replacing "y" with "$7 - 2x$" in the second equation to get an equation in one variable. This was usually carried out successfully although a good number of students made an error when expanding $(7 - 2x)^2$ so limiting the total number of marks they scored to two. Some candidates did not organise their answers appropriately as two pairs. They could not be awarded full marks. Some less able students started by "squaring" the first equation to give $4x2 + \boldsymbol{y}2 = 49$ thereby denying themselves the opportunity of getting any credit for their response.

Question 16

Most students made some progress by identifying a common denominator for the two algebraic fractions and going on to combine the two fractions. These students scored at least one of the marks available. The most common error was for students to make a mistake when expanding $(4 - x)(2x - 3)$. These students could still score two of the three marks available.

Question 17

Students usually gained some credit for their answers to this question. However, examiners were disappointed at the proportion of students who scored only the mark available for sketching the general shape of the parabola. These students had often placed the parabola symmetrically about the *y* axis and so could not gain marks for correctly identifying the coordinates of either the turning point or of the intercepts with the *x* axis. Just under a half of students scored full marks for their sketches.

Question 18

Part (a) of this question was usually answered correctly. Nearly all students scored at least one mark for a correct substitution but a surprising number of students left their answer in a form where the $\sqrt{4}$ was not simplified, for example $\frac{23}{16-3\sqrt{4}}$. Some students simplified the denominator to $13\sqrt{4}$. Multiplying the numerator and the denominator by $16 + 3\sqrt{4}$ was also commonly seen in an attempt by candidates to rationalise the denominator, $16 - 3\sqrt{4}$. This was hardly ever evaluated accurately.
There were many fully correct answers to part (b) but some students misguidedly multiplied by $\frac{6-\sqrt{7}}{6-\sqrt{7}}$ or $\frac{\sqrt{7}}{\sqrt{7}}$.

Question 19

Most students used a correct version of the trapezium rule with about forty per cent of students scoring full marks. Less successful attempts were characterised by students either not knowing the formula for the trapezium rule using four strips or because they read off the *y* values from the graph incorrectly, particularly 2.2 instead of 2.4. Students who made a single incorrect reading from the graph could still access two of the three marks available. A significant number of students used areas of rectangles and triangles. This was rewarded accordingly provided their areas were equivalent to the four trapezia. It is noted that such an approach tended to attract more errors than the approach using the formula for the trapezium rule.

Question 20

This question was well answered by many students and sketches were generally clear and accurate. Common errors seen in part (a) included students reflecting the graph in a line with equation of the form $y = c,\ c \neq 0$. Such responses were awarded one mark

for the graph and could also be awarded a follow through mark for the coordinates of the turning point.
In part (b), answers were usually correct. The most common error was to translate the shape by one unit to the right instead of by one unit to the left.

Question 21

The most able students were able to score full marks in this question. However, this was not the norm and the marks gained on this question were generally some of the lowest on the paper.
In part (a) of the question, a good proportion of the students were able to score some credit for getting one term of the expression for the 10th term correct or by starting the problem by finding the common difference of the sequence. Incorrect formulae were seen quite often and some students used the formula for the sum of a series instead of the formula for the *n*th term of an arithmetic series.
Answers to part (b) of the question were generally weak. Again incorrect formulae were often stated and used and repeated addition was used by a large number of students. This latter method was awarded no marks unless the final answer given was correct. Many students who did show correct recall and then used the formula for the sum of an arithmetic series substituted $n = 49$ or 51 instead of 50. A surprising number of students mistakenly tried to link this part of the question to part (a) with working seen involving terms in k.

Summary

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

- ensure you always take care to consider signs carefully in questions involving the manipulation of algebraic and numerical expressions, for example in questions 13, 16 and 18 on this paper.

- remember that in questions involving squares in the change of subject of a formula there may be a need to use "±" in final answers, for example in question 3(b) on this paper.

- practise questions such as 2(b) and 6 which involve inequalities to ensure that correct final ranges are given once the critical values have been found.

- always check that numerical answers are given in their simplest form, for example

  $\frac{1}{2}$ not $\frac{4}{8}$.

- practise questions involving sketching graphs of quadratic and cubic functions.

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