Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

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Those who were well prepared for this paper made a good attempt at all questions. It was good to see several students having a go at the grade 8 and 9 questions and gaining a couple of marks for these, even if they could not see the question all the way through.
The paper differentiated well.

Students tended to mainly show good working but some need to be reminded that when working is requested, they are unlikely to score marks without every step in the working shown; this was especially true for Question 1, the fraction, Question 7 simultaneous equations, Question 17 on surds and Question 22 the quadratic inequality

In some of the longer questions, premature rounding lost students the accuracy mark even though we gave a range of values for the answer.

We found that some higher tier students were more able to attempt the harder questions than some of the more straightforward ones, and they must be reminded to revise the easier topics as well as the harder ones set at higher grades.

Question 1

Most students understood the stages required to divide the 2 mixed fractions and showed enough working to convincingly demonstrate the given result. Those who did not often missed out the 208/91 stage from either 26/7 × 8/13 or 208/56 ÷ 91/56 instead going to 16/7. It should be noted that a calculator gives 16/7 in both cases. Students must practise these types of questions without a calculator.

Question 2

Most students managed to do at least one conversion, either kilometres into metres or hours into seconds. However, many believed that the right approach was to multiply by 1000 and then by 60 × 60. A few used 60 instead of 3600. Another common mistake was to convert 90 km to 9000 m rather than 90,000 m. Largely though, the question was completed with few problems.

Question 3

Many fully correct responses were seen. The most common error being the swapping of the values in the set $(A' \cap B)$ with those for the set $(A' \cap B')$

Question 4

The key to solving this question was equating the two unknown sides to find the value of *x*. When this was done, a successful outcome was usually achieved, though 24 + 24 + 4.2 + 4.2 was sometimes seen and a few just gave 4.2 as their answer. Without the equation for *x*, some gained one mark for a correct algebraic expression for the perimeter. When an incorrect value of *x* was used, students often failed to appreciate that the lengths of the two unknown sides must be equal. It was surprising how many students multiplied ($5x – 1$) by ($3x + 7.4$) in their working. It was also common to see these two sides added and then divided by 8 to give $x + 0.8$, which was usually interpreted as $x = 0.8$

Question 5

Over half the students sitting this paper were able to correctly identify the upper and lower bounds of 2.75 with common mistakes being 2.7 or 2.754 for the lower bound and
2.8 or 2.76 for the upper bound.
Part (c) was done well by those who were willing to follow the instruction to round figures to 1 significant figure. Many wanted to complete a more accurate calculation, sometimes rounding their final answer to 1 significant figure. They scored no marks unless a proper estimate was also shown. A common mistake was to round the figures to the nearest integer, which was not sufficient.

Question 6

Most students were able to identify the values of j and k that were requested. An error seen regularly however was to find half the difference between the x coordinates 6 and 17 and give this as the value of the x coordinate of the midpoint without adding 6. Some students tried to use a gradient calculation, an approach which was of no use in calculating what was needed.

Question 7

Most students were able to solve the simultaneous equations given. Most students used elimination – normally of y as this required the addition of the equations after the coefficients of y were made equal. A smaller number of students used substitution – normally correctly. Only a small number of students tried to show the values of x and y without showing sufficient working.

Question 8

Mixing simple interest and compound interest in the same question seemed to mislead some students. It was quite common to see 160 as the total interest for Bank G and, to a lesser extent, either 2×145 or annual compound interest for Bank H.
Students should be aware that expressions like 2.9% of 5000 do not score a method mark if the calculation is evaluated incorrectly, whereas 0.029×5000 does score the mark. They must show what the percentage means.
An interesting mistake was failing to add interest to bank H due to the wording of “interest added after two years”. Some even wrote comments justifying this thinking.

Question 9

In (a) nearly 75% of students correctly answered this question requiring knowledge that the power of zero means the answer is 1

For part (b), wrong answers included $3a^5b^7$, $9a^5b^7$, $27a^5b^7$, $3a^6b^{12}$, $9a^6b^{12}$ and $27a^8b^{12}$. There were also many correct answers.

In part (c) the majority of responses scored full marks for the correct full factorisation of the expression given. Some responses were correct partial factorisation while a small number of responses showed little understanding of what was required sometimes trying to express the expression as a quadratic function or by trying to multiply out the 2 parts of the expression given.

The vast majority of students managed to score at least 1 mark for part (d), usually for writing an equation in the correct form with a y intercept of 4. There were many answers with a gradient of 2, usually from using "change in y divided by change in x" without thinking about how it relates to the direction of slope. A significant number of students did not seem to be aware of $y = mx + c$ as the general equation of a straight line, giving answers such as $2x + 4$ and $2y + 4x$. One mark was available for an answer of $-2x + 4$, but most of those who did get that far were able to give the correct equation.

Question 10

Nearly all students were able to work out the length of the 2 missing sides of the isosceles triangle given the perimeter and the base length. Students then needed to find the perpendicular height of the triangle. A wide variety of approaches were seen – application of Pythagoras being the simplest although many correct approaches were seen including the Cosine rule. Most who found the height then correctly calculated the area of the triangle. If students could not identify a method to find the height, they tended to multiply the side lengths – an approach that was incorrect and therefore received no credit.

Question 11

The mixture of answers was very varied. The first graph was often confused with E and, more surprisingly, with D. It was the least likely graph to be identified correctly. The second graph was the most likely one to be correct. Most common errors were to label it D or sometimes F. Letters seen for the last graph seemed almost random from those who did not recognise it as F.

Question 12

This three part question was generally well answered. In part (a) most correctly used the graph to find the median . The most common error was to find the middle of the time axis. In part (b) a reading of the cumulative frequent axis linked to a time of 55 minutes was needed. Students needed then to do the total frequency (60) minus this number and give the answer as an integer. Common errors were not to subtract the reading from 60 – or to give the answer not as an integer..In part (c) the students were required to find the frequency of each group working back from the cumulative frequency graph. This tended to be either fully correct – or to write out the cumulative values for each group.

Question 13

This sort of question appears regularly and students are answering it quite well. Some still fail to multiply terms on the left when cross multiplying and a few just lose the common denominator completely, but the most common mistake is always with the signs when removing the second bracket, in this question writing $4x$ instead of $-4x$. Few students seem to check their answer to questions of this kind.

Question 14

Part (a) Many students correctly identified the required angle using the cyclic quadrilateral, and most identified the property of cyclic quadrilaterals that had been used. A minority found the angle at the centre of the diagram drawn and incorrectly assumed that a quadrilateral drawn within a circle must be a cyclic quadrilateral – even though one vertex was the centre of the circle. In part (b) a number of routes were available to identify angle *ADO* as 16. A common error was to assume that there was a line of symmetry in the given shape to incorrectly conclude Angle *ADO* =Angle *ABO*.

Question 15

Though many students gained 2 marks for a correct calculation of 34 – 4=30, a surprising number could not even identify the quartiles, quite disappointing for a discrete set of data already sorted in numerical order. Some of the incorrect attempts were just picking the wrong quartiles but other students worked out the range, the sum of values or the mean value. Some thought that ¼ × 72 and ¾ × 72 were useful calculations. An understanding of the meaning of interquartile range was less common than knowing how to find it. Only a simple comparison was needed, without any contradictory statement, but it had to refer to the interquartile ranges, not to the number of runs, which was commonly seen. Students must realise that the word *range* has a different meaning in statistics.

Question 16

This is another topic that seems to be taught in some Centres but not others. Many of those who were familiar with this sort of question were able to complete the proof reliably, usually using 10x and 1000x, but a few tried to use x and 1000x or made a mistake in the subtraction. Just listing values for x, 10x, 100x and 1000x was not enough to score the first mark; it was necessary to identify a pair that would lead to the elimination of the recurring decimal and indicate an intention to subtract them. Students were better than usual in showing values to sufficient accuracy, either as recurring decimals or to at least 5 significant figures. The recurring decimal was occasionally interpreted as 0.438438…

Question 17

Part (a) was quite straightforward for those knowing the meaning of surds, and we saw about half the answers correct.

For part (b) blocks of responses that showed no understanding of this topic suggested that some Centres choose not to cover it. There were mixed responses in other blocks. Multiplying by 1 - √2 was quite common. There were some errors in expansions and others who simply tried to manipulate an answer to match their calculator or failed to show all stages of working, as instructed by the question.

Question 18

On the face of it, this was rather more straightforward than the usual questions on histograms but it caused plenty of problems. Those who understood the topic frequently drew the final bar with a height of 1.6. Others attempted bar charts or frequency polygons or plotted height equal to frequency divided by upper boundaries of classes

Some of the more common mistakes in part (b) were to use a numerator of 12 + 9 or 1/3 × 12 + 9, or simply to give 17 as the answer.

Question 19

This question testing geometric similarity in 3 dimensions was not well answered. A very small number of students correctly found the volume of the smaller vase. Some students found the scale factor of each dimension by square rooting the ratio of their surface area and scored the first method mark. Very few could then proceed to use the difference of the volumes given with the volume scale factors. Many students seemed unfamiliar with this type of question.

Question 20

This was answered very well by students in the target range for the question, with many students gaining 5 marks. Below the target range many were unable to make any meaningful progress, though it was quite common to see the first mark scored for a correct substitution. $(7 – 2x)^2$ was expanded to $49 – 4x^2$ far too often. This meant that a three-term quadratic could not be obtained, depriving the student of possible follow through marks. Factorisation and the quadratic formula were both used well to solve the quadratic equation. Those who made minor errors were able to score up to four marks if all working was shown clearly. Students who found all *x* and *y* values must understand that these must be clearly paired to score the final mark.

Question 21

This was done quite well for a question near the end of the paper. A few students mixed up their formulae, using an r^2 in the volume formula for instance, and others struggled to find the value of *r* from a correct starting point. Many students misread the surface area as 49.

Question 22

Many students realised that the expression given needed to be rearranged as a quadratic = 0 and then to find the 2 roots. Students were told to show clear algebraic working and most showed a factorisation or correctly used the quadratic formula. Using a calculator to find the roots will not be credited. Students then needed to express the solution set correctly as lying between the 2 roots including the roots.

Question 23

Students found this a very challenging question, even if they knew which angle they were trying to calculate. It required considerable perception to identify useful lengths to find and suitable triangles to use. The few who were able to analyse the problem clearly usually completed the working accurately. Others sometimes picked up odd marks, finding the value of *x*, for instance, but many mistakes were made trying to apply Pythagoras' theorem, the sine rule, the cosine rule, trigonometric ratios and angle properties. Failing to mark and use the midpoint of *GH* was an obstacle, often leading to attempts to find angle *JAH* or angle *DAB*. Students who get hopelessly lost on difficult questions often persevere well beyond the point where it is clear they are wrong. For example, a couple of responses were seen where the working continued with a side length of -4, filling all of the space available.

Question 24

Students found the transformation of the sine curve difficult but it was set at the highest grade so this was expected. Around 30% of students were able to gain marks and generally if they found one of the values needed, they found both.

Question 25

This question tested the topic of finding the inverse function of a quadratic function. Completing the square and rearranging was the technique normally used by the relatively small proportion of students who gave good solutions. Many could not start the question – or used methods that are inappropriate for quadratic functions. The method of setting the function =y and then rearranging to equate to 0, and then use the quadratic formula was sometimes seen. Of those who completed the square and rearranged most correctly used the variable x in their final answer, although some did not realise that only the negative root was correct using the domain of the function given.

Question 26

Unsurprisingly as this was the last question testing the most demanding aspects of the specification very few students scored any marks. Many tried to combine the base numbers and their indices in mathematically incorrect way. The function given included powers of 2 and powers of 5 with indices that were functions of *n*. The key to the question was in recognising that 10^{4n} could be expressed as $(2 \times 5)^{4n}$ allowing the expression to be expressed in terms of powers of 2 only. Those who did recognise this often then went on to solve the resultant quadratic in n to find the 2 values that *n* could take.

Summary

Based on their performance on this paper, students should:

- Ensure they show all stages in their working when requested to show working clearly
- Even when not requested to show working, please show it in as organised a manner as possible as valuable marks are often picked up if a student makes an arithmetic error or copies something incorrectly from their calculator
- Read questions carefully and make sure you are answering what is asked
- Remember that various formulae are written on page 2 of the paper
- Ensure other basic formulae are learned and not mixed up – eg Pythagoras' theorem and make sure you know when to add and when to subract
- As higher level students, revision needs to cover the whole of the specification and not just the harder topics – students seem to forget how to do topics such as perimeter and remembering that rectangles have equal length opposite sides as in question 4

- Read scales very carefully on graphs – eg on the histogram where 1.6 was frequently plotted instead of 1.8

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