Examiners' Report/ Principal Examiner Feedback

Summer 2010

GCE

Core Mathematics C1 (6663)

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Introduction

The paper seemed to work well this summer and the candidates had been well prepared for the examination. Many now quote formulae before using them, this enables the examiners to award M marks even if some substitutions are incorrect, and this was especially helpful to candidates in Q8.

The usual problems of poor or weak arithmetic were still evident in some questions (notably Q9) but overall the general standard of work was good.

Report on individual questions

Question 1

This was a successful starter to the paper with very few candidates failing to attempt it and many securing both marks. The $\sqrt{27}$ was usually written as $3\sqrt{3}$ but $5\sqrt{5}$ and $3\sqrt{5}$ were common errors for $\sqrt{75}$. The most common error though was to subtract 27 from 75 and then try and simplify $\sqrt{48}$ which showed a disappointing lack of understanding.

Question 2

This question was answered very well. Most knew and applied the integration rule successfully although the simplification of $\frac{6}{\frac{3}{2}}$ proved too difficult for some with 9 being a common incorrect answer. Very few differentiated throughout but sometimes the 5 was "integrated" to zero although the other terms were correct. Only a few omitted the constant.

Question 3

Most handled the linear inequality in part (a) very well with only occasional errors in rearranging terms. The responses to part (b) though were less encouraging. It was surprising how many multiplied out the brackets and then tried factorising again (often incorrectly) or used the formula to find the critical values rather than simply writing them down as was intended. Those who found the critical values did not always go on to solve the inequality and those who did often gave their answer as $x < -1$, $x < 3.5$. Those who sketched a graph of the function were usually more successful in establishing the correct interval.

Part (c) was answered well by many of those who had correct solutions to parts (a) and (b) and some successfully followed through their incorrect answers to gain the mark here. Some did not seem to realise that the intersection of the two intervals was required and simply restated their previous answers making no attempt to combine them. Drawing a number line was helpful for some candidates.

Question 4

Part (a) was answered well with many scoring both marks. Some gave q = 20 from adding 11+9 instead of subtracting but most understood the principle of completing the square.

Quite a number of candidates struggled with the sketch in part (b). Most had the correct shape but the minimum was invariably in the wrong position: on the y-axis at (0, 11) or on the x-axis at (-3, 0) were common errors but the intercept at (0, 11) was more often correct.

Some candidates did not know what the discriminant was. Some confused it with the derivative, others knew it was something to do with the quadratic formula and simply applied the formula to the original equation. The correct formula was used by many candidates but a few faltered over the arithmetic with "36 - 44 = -12" being quite common.

Few candidates seemed to spot the connections between the parts in this question: (a) was intended to help them with the sketch in part (b) and a negative discriminant in (c) confirmed that their sketch did not cross the x-axis. Candidates should be encouraged to identify these connections.

Question 5

This proved to be a straightforward question for most candidates who worked through it carefully and gained full marks. A few noticed that the numbers inside the square root formed an arithmetic sequence and this sometimes distracted them as they tried to use formulae for arithmetic series.

There were still some candidates who did not understand the notation and interpreted a_n as $\sqrt{n^2+3}$.

Some were confused by the nested square roots and we saw $a_3 = \sqrt{7^2+3}$ and others thought $\left(\sqrt{7}\right)^2 = 49$ but overall this question was answered well.

Question 6

Most candidates have a good idea of the principles in these transformations (as was evident from their rough working) but sometimes their sketches did not do them justice.

In part (a) many knew that the graph underwent a translation of 3 units to the left but their minimum was in the 4^{th} quadrant even though it was correctly labelled (0, -5).

In (b) many knew that the curve was stretched in the y direction but their curve did not pass through the origin and a mark was lost. The most common error in (a) was a translation of +3 in the x direction and in (b) we saw both $y = \text{f}(\frac{1}{2}x)$ and $y = \frac{1}{2}\text{f}(x)$.

Part (c) proved to be a little more difficult with candidates unable to visualise the translation and unwilling to draw themselves a diagram. There were many wrong answers of $a = \pm 3$ and sometimes a = -5.

Question 7

There were many perfect answers here with candidates securing their marks in 3 or 4 clear lines of working. The division caused problems for some but even these candidates could differentiate $8x^3$ correctly and sometimes $-4\sqrt{x}$ as well.

There were two common approaches to the division with splitting and dividing usually proving more successful than multiplying by x^{-1} as this often resulted in a $3x^{-2}$.

A minority of candidates had problems in writing $\sqrt{x}$ as $x^{\frac{1}{2}}$ choosing $x^{-\frac{1}{2}}$ or x^{-1} instead and it was encouraging to see very few cases of integration or correct differentiation with a $+c$ this year.

Question 8

Most candidates could find the gradient of the line *AB* but the usual arithmetic slips spoilt some answers: $\frac{-4}{-5} = -\frac{4}{5}$ was quite frequent. Finding the equation of the line was usually answered well too with $y = mx + c$ or $y - y_1 = m\left(x - x_1\right)$ being the favoured approaches and only a few failing to write their answer in integer form.

Part (b) was answered very well and many correct answers were seen, a few candidates quoted an incorrect formula and some made arithmetic errors eg 25+16 = 31.

Some candidates made heavy weather of part (c) adopting an algebraic approach, others tried drawing a diagram (as intended) but mistakenly thought *AC* was parallel to the *x*-axis and arrived at $t = 4$ which was a common error. Those with a correct diagram would often proceeded to a correct answer to part (d) using $\frac{1}{2}bh$ with few problems but there were a number of other successful, but less efficient, solutions using a determinant method or even the semi perimeter formula.

A common error was to treat *ABC* as a right-angled isosceles triangle and this led to $\frac{1}{2}\sqrt{41} \times \sqrt{41} = 20.5$.

Question 9

Part (a) was often answered correctly but some quoted $a + 29d$ but failed to use the value of 40.75 to form an equation. Most scored well in part (b) but some failed to give sufficient working to earn both marks in this “show that” question. A successful solution requires the candidates to show us clearly their starting point (which formula they are using) and then the values of any variables in this formula. Those using $\frac{n}{2}(a+l)$ in particular needed to make it clear what value of n they were using. Candidates might also consider that a 2 mark question will usually require 2 steps of working to secure the marks.

Many students had a correct strategy for finding a and d but not always a sensible strategy for doing so without a calculator. Starting from the given equation in part (b) the “sensible” approach is to divide both sides by 15 and then subtract 40.75 even this though proved challenging for some with errors such as $\frac{1005}{15}=61$ and $67-40.75=27.25$ spoiling a promising solution. Those who chose the more difficult expansion of the bracket in part (b) often got lost in the ensuing arithmetic. A number of candidates failed to spot that $\frac{14.5}{29}=\frac{1}{2}$ and lost the final mark.

It was encouraging though to see most candidates using the given formulae to try and solve this problem; there were very few attempting a trial and improvement or listing approach.

Question 10

The majority sketched a quadratic and a cubic curve in part (a) but not always with the correct features. The quadratic was often U shaped and although the intercepts at (0, 0) and (4, 0) were mostly correct, sometimes the curve passes through (- 4, 0) and (4, 0). The cubic was sometimes a positive cubic and whilst it often passes through (0, 0) and (7, 0) the turning point was not always at the origin and the intercept was sometimes at (- 7, 0).

Part (b) caused few problems with most candidates scoring full marks here.

Most could start part (c) and the quadratic formula was usually used to solve their equation. Although many simplified $\sqrt{48}$ to $4\sqrt{3}$ several candidates failed to divide by 2 correctly and gave their answers as $x=4\pm4\sqrt{3}$. Most realised they needed to find the *y*-coordinate as well and usually they substituted their value of x into the quadratic equation to find y, though some chose the much less friendly cubic equation instead.

The selection of the correct solution defeated all but the best candidates. Most successful solutions involved checking the y coordinates for both $x=4+2\sqrt{3}$ and $x=4-2\sqrt{3}$ and, if the calculations were correct, selecting the one that gave a positive y coordinate. Only a rare minority realised that the required point would have an x coordinate in the interval (0, 4) and therefore only the $x=4-2\sqrt{3}$ case need be considered.

Question 11

In part (a) most integrated correctly although the fractional power caused a few problems: some thought $\frac{5}{\sqrt{x}} = 5x^{\frac{1}{2}}$ and obtained $\frac{10}{3}x^{\frac{3}{2}}$ whilst others divided by 2 instead of $\frac{1}{2}$. The $+c$ was usually included and $x = 4$ was often substituted but sometimes the expression was set equal to 0 rather than 5.

In part (b) the majority attempted to find the gradient using $\mathrm{f}'(4)$ and most went on to find the equation of a tangent although some had mistakes with the arithmetic. A few found the equation of a normal and a handful still did not know how to find the gradient of the tangent and used one of the coefficients from the given expression or their integration in part (a).

Grade Boundary Statistics

The table below gives the lowest raw marks for the award of the stated uniform marks (UMS).

Module		**Grade**	**A***	**A**	**B**	**C**	**D**	**E**
		Uniform marks	**90**	**80**	**70**	**60**	**50**	**40**
AS	6663 Core Mathematics C1			59	52	45	38	31
AS	6664 Core Mathematics C2			62	54	46	38	30
AS	6667 Further Pure Mathematics FP1			62	55	48	41	34
AS	6677 Mechanics M1			61	53	45	37	29
AS	6683 Statistics S1			55	48	41	35	29
AS	6689 Decision Maths D1			61	55	49	43	38
A2	6665 Core Mathematics C3		68	62	55	48	41	34
A2	6666 Core Mathematics C4		67	60	52	44	37	30
A2	6668 Further Pure Mathematics FP2		67	60	53	46	39	33
A2	6669 Further Pure Mathematics FP3		68	62	55	48	41	34
A2	6678 Mechanics M2		68	61	54	47	40	34
A2	6679 Mechanics M3		69	63	56	50	44	38
A2	6680 Mechanics M4		67	60	52	44	36	29
A2	6681 Mechanics M5		60	52	44	37	30	23
A2	6684 Statistics S2		68	62	54	46	38	31
A2	6691 Statistics S3		68	62	53	44	36	28
A2	6686 Statistics S4		68	62	54	46	38	30
A2	6690 Decision Maths D2		68	61	52	44	36	28

Grade A*

Grade A* is awarded at A level, but not AS to candidates cashing in from this Summer.

- For candidates cashing in for GCE Mathematics (9371), grade A* will be awarded to candidates who obtain an A grade overall (480 UMS or more) *and* 180 UMS or more on the total of their C3 (6665) and C4 (6666) units.
- For candidates cashing in for GCE Further Mathematics (9372), grade A* will be awarded to candidates who obtain an A grade overall (480 UMS or more) *and* 270 UMS or more on the total of their best three A2 units.
- For candidates cashing in for GCE Pure Mathematics (9373), grade A* will be awarded to candidates who obtain an A grade overall (480 UMS or more) *and* 270 UMS or more on the total of their A2 units.
- For candidates cashing in for GCE Further Mathematics (Additional) (9374), grade A* will be awarded to candidates who obtain an A grade overall (480 UMS or more) *and* 270 UMS or more on the total of their best three A2 units.

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