OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE

MATHEMATICS (MEI) 4751

Introduction to Advanced Mathematics (C1)

QUESTION PAPER

Candidates answer on the Printed Answer Book

OCR Supplied Materials:
- Printed Answer Book 4751
- MEI Examination Formulae and Tables (MF2)

Other Materials Required:
None

Monday 11 January 2010
Morning

Duration: 1 hour 30 minutes

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INSTRUCTIONS TO CANDIDATES

These instructions are the same on the Printed Answer Book and the Question Paper.

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the spaces provided on the Printed Answer Book.
- **The questions are on the inserted Question Paper.**
- **Write your answer to each question in the space provided in the Printed Answer Book.** If you need more space for an answer use a 4-page answer book; label your answer clearly. Write your Centre Number and Candidate Number on the 4-page answer book and attach it securely to the Printed Answer Book.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- You are **not** permitted to use a calculator in this paper.
- Final answers should be given to a degree of accuracy appropriate to the context.

INFORMATION FOR CANDIDATES

This information is the same on the Printed Answer Book and the Question Paper.

- The number of marks is given in brackets **[ ]** at the end of each question or part question on the Question Paper.
- You are advised that an answer may receive **no marks** unless you show sufficient detail of the working to indicate that a correct method is being used.
- The total number of marks for this paper is **72**.
- The Printed Answer Book consists of **12** pages. The Question Paper consists of **4** pages. Any blank pages are indicated.

No calculator can be used for this paper

Answer all questions on the Printed Answer Book provided.

Section A (36 marks)

1 Rearrange the formula $c = \sqrt{\frac{a+b}{2}}$ to make a the subject. **[3]**

2 Solve the inequality $\frac{5x-3}{2} < x+5$. **[3]**

3 **(i)** Find the coordinates of the point where the line $5x + 2y = 20$ intersects the x-axis. **[1]**

(ii) Find the coordinates of the point of intersection of the lines $5x + 2y = 20$ and $y = 5 - x$. **[3]**

4 **(i)** Describe fully the transformation which maps the curve $y = x^2$ onto the curve $y = (x+4)^2$. **[2]**

(ii) Sketch the graph of $y = x^2 - 4$. **[2]**

5 **(i)** Find the value of $144^{-\frac{1}{2}}$. **[2]**

(ii) Simplify $\frac{1}{5+\sqrt{7}} + \frac{4}{5-\sqrt{7}}$. Give your answer in the form $\frac{a+b\sqrt{7}}{c}$. **[3]**

6 You are given that $\mathrm{f}(x) = (x+1)^2(2x-5)$.

(i) Sketch the graph of $y = \mathrm{f}(x)$. **[3]**

(ii) Express $\mathrm{f}(x)$ in the form $ax^3 + bx^2 + cx + d$. **[2]**

7 When $x^3 + 2x^2 + 5x + k$ is divided by $(x+3)$, the remainder is 6. Find the value of k. **[3]**

8 Find the binomial expansion of $\left(x + \frac{5}{x}\right)^3$, simplifying the terms. **[4]**

9 Prove that the line $y = 3x - 10$ does not intersect the curve $y = x^2 - 5x + 7$. **[5]**

Section B (36 marks)

10

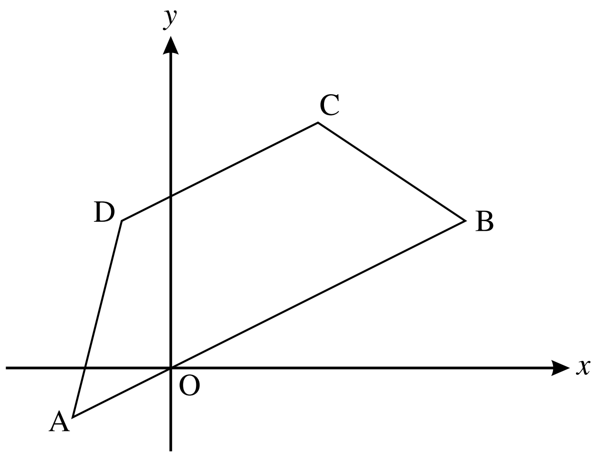

Fig. 10

Fig. 10 shows a trapezium ABCD. The coordinates of its vertices are A $(-2, -1)$, B $(6, 3)$, C $(3, 5)$ and D $(-1, 3)$.

(i) Verify that the lines AB and DC are parallel. **[3]**

(ii) Prove that the trapezium is not isosceles. **[3]**

(iii) The diagonals of the trapezium meet at M. Find the exact coordinates of M. **[4]**

(iv) Show that neither diagonal of the trapezium bisects the other. **[3]**

11 A circle has equation $(x - 3)^2 + (y + 2)^2 = 25$.

(i) State the coordinates of the centre of this circle and its radius. **[2]**

(ii) Verify that the point A with coordinates $(6, -6)$ lies on this circle. Show also that the point B on the circle for which AB is a diameter has coordinates $(0, 2)$. **[3]**

(iii) Find the equation of the tangent to the circle at A. **[4]**

(iv) A second circle touches the original circle at A. Its radius is 10 and its centre is at C, where BAC is a straight line. Find the coordinates of C and hence write down the equation of this second circle. **[3]**

[Question 12 is printed overleaf.]

12 The curve with equation $y = \frac{1}{5}x(10 - x)$ is used to model the arch of a bridge over a road, where x and y are distances in metres, with the origin as shown in Fig. 12.1. The x-axis represents the road surface.

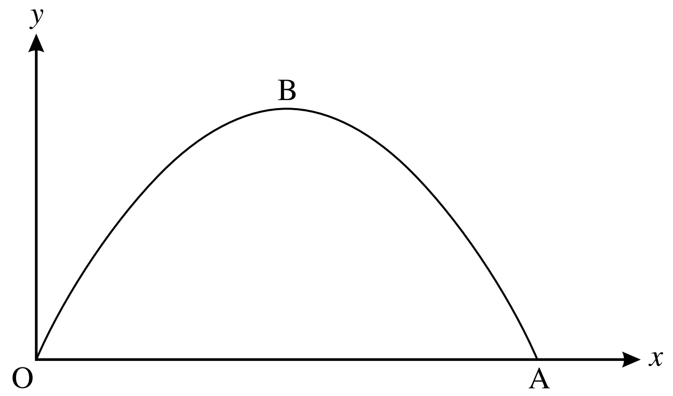

Fig. 12.1

(i) State the value of x at A, where the arch meets the road. **[1]**

(ii) Using symmetry, or otherwise, state the value of x at the maximum point B of the graph.

Hence find the height of the arch. **[2]**

(iii) Fig. 12.2 shows a lorry which is 4 m high and 3 m wide, with its cross-section modelled as a rectangle. Find the value of d when the lorry is in the centre of the road. Hence show that the lorry can pass through this arch. **[3]**

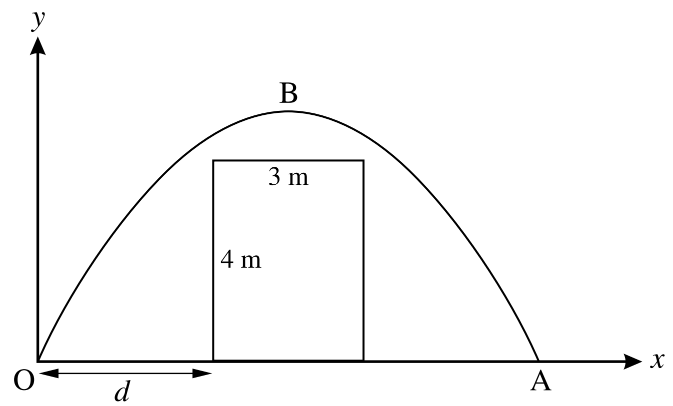

Fig. 12.2

(iv) Another lorry, also modelled as having a rectangular cross-section, has height 4.5 m and just touches the arch when it is in the centre of the road. Find the width of this lorry, giving your answer in surd form. **[5]**

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1	$[a=]2c^2 - b$ www o.e.	**3**	**M1** for each of 3 complete correct steps, ft from previous error if equivalent difficulty
2	$5x-3<2x+10$ $3x<13$ $x<\frac{13}{3}$ o.e.	 **M1** **M1** **M1**	condone '=' used for first two Ms **M0** for just $5x-3<2(x+5)$ or $-13<-3x$ or ft or ft; isw further simplification of 13/3; M0 for just $x<4.3$
3 (i)	(4, 0)	**1**	allow $y=0$, $x=4$ bod **B1** for $x=4$ but do not isw: **0** for (0, 4) seen **0** for (4, 0) and (0, 10) **both** given (choice) unless (4, 0) clearly identified as the x-axis intercept
3 (ii)	$5x+2(5-x)=20$ o.e. (10/3, 5/3) www isw	**M1** **A2**	for subst or for multn to make coeffts same and appropriate addn/subtn; condone one error or **A1** for $x=10/3$ and **A1** for $y=5/3$ o.e. isw; condone 3.33 or better and 1.67 or better **A1** for (3.3, 1.7)
4 (i)	translation by $\begin{pmatrix}-4\\0\end{pmatrix}$ or 4 [units] to left	**B1** **B1**	**0** for shift/move or 4 units in negative x direction o.e.
4 (ii)	sketch of parabola right way up and with minimum on negative y-axis min at (0, −4) and graph through −2 and 2 on x-axis	**B1** **B1**	mark intent for both marks must be labelled or shown nearby
5 (i)	$\frac{1}{12}$ or $\pm\frac{1}{12}$	**2**	**M1** for $\frac{1}{144^{\frac{1}{2}}}$ o.e. or for $\sqrt{144}=12$ soi
5 (ii)	denominator = 18 numerator = $5-\sqrt{7}+4\left(5+\sqrt{7}\right)$ $=25+3\sqrt{7}$ as final answer	**B1** **M1** **A1**	**B0** if 36 after addition for **M1**, allow in separate fractions allow **B3** for $\frac{25+3\sqrt{7}}{18}$ as final answer www

6 (i)	cubic correct way up and with two turning pts touching x-axis at −1, and through it at 2.5 and no other intersections y- axis intersection at −5	**B1** **B1** **B1**	 intns must be shown labelled or worked out nearby
6 (ii)	$2x^3 - x^2 - 8x - 5$	**2**	**B1** for 3 terms correct or **M1** for correct expansion of product of two of the given factors
7	attempt at f(−3) $-27 + 18 - 15 + k = 6$ $k = 30$	**M1** **A1** **A1**	or **M1** for long division by $(x + 3)$ as far as obtaining $x^2 - x$ and **A1** for obtaining remainder as $k - 24$ (but see below) equating coefficients method: **M2** for $(x + 3)(x^2 - x + 8)$ [+6] o.e. (from inspection or division) eg M2 for obtaining $x^2 - x + 8$ as quotient in division
8	$x^3 + 15x + \frac{75}{x} + \frac{125}{x^3}$ www isw or $x^3 + 15x + 75x^{-1} + 125x^{-3}$ www isw	**4**	**B1** for **both** of x^3 **and** $\frac{125}{x^3}$ or $125x^{-3}$ isw and **M1** for 1 3 3 1 soi; **A1** for **each** of $15x$ **and** $\frac{75}{x}$ or $75x^{-1}$ isw **or** **SC2** for completely correct unsimplified answer

9	$x^2 - 5x + 7 = 3x - 10$	**M1**	or attempt to subst $(y + 10)/3$ for x
	$x^2 - 8x + 17$ [= 0] o.e or $y^2 - 4y + 13$ [= 0] o.e	**M1**	condone one error; allow **M1** for $x^2 - 8x = -17$ [oe for y] only if they go on to completing square method
	use of $b^2 - 4ac$ with numbers subst (condone one error in substitution) (may be in quadratic formula)	**M1**	or $(x - 4)^2 = 16 - 17$ or $(x - 4)^2 + 1 = 0$ (condone one error)
	$b^2 - 4ac = 64 - 68$ or -4 cao [or $16 - 52$ or -36 if y used]	**A1**	or $(x - 4)^2 = -1$ or $x = 4 \pm \sqrt{-1}$ [or $(y - 2)^2 = -9$ or $y = 2 \pm \sqrt{-9}$]
	[< 0] so no [real] roots [so line and curve do not intersect]	**A1**	or conclusion from comp. square; needs to be explicit correct conclusion and correct ft; allow '< 0 so no intersection' o.e.; allow '−4 so no roots' etc allow A2 for full argument from sum of two squares = 0; A1 for weaker correct conclusion some may use the condition $b^2 < 4ac$ for no real roots; allow equivalent marks, with first A1 for 64 < 68 o.e.
10 (i)	grad CD = $\frac{5-3}{3-(-1)}\left[=\frac{2}{4}\text{ o.e.}\right]$ isw	**M1**	NB needs to be obtained independently of grad AB
	grad AB = $\frac{3-(-1)}{6-(-2)}$ or $\frac{4}{8}$ isw	**M1**	
	same gradient so parallel www	**A1**	must be explicit conclusion mentioning 'same gradient' or 'parallel' if M0, allow **B1** for 'parallel lines have same gradient' o.e.
10 (ii)	[BC^2=] $3^2 + 2^2$ [BC^2 =] 13 showing $AD^2 = 1^2 + 4^2$ [=17] [$\neq BC^2$] isw	**M1** **A1** **A1**	accept $(6 - 3)^2 + (3 - 5)^2$ o.e. or [BC =] $\sqrt{13}$ or [AD =] $\sqrt{17}$ or equivalent marks for finding AD or AD^2 first alt method: showing AC ≠ BD – mark equivalently

10 (iii)	[BD eqn is] $y = 3$ eqn of AC is $y - 5 = 6/5 \times (x - 3)$ o.e [$y = 1.2x + 1.4$ o.e.] M is (4/3, 3) o.e. isw	**M1** **M2** **A1**	eg allow for 'at M, $y = 3$' or for 3 subst in eqn of AC or **M1** for grad AC = 6/5 o.e. (accept unsimplified) and M1 for using their grad of AC with coords of A(−2, −1) or C (3, 5) in eqn of line or **M1** for 'stepping' method to reach M allow : at M, $x = 16/12$ o.e. [eg =4/3] isw A0 for 1.3 without a fraction answer seen
10 (iv)	midpt of BD = (5/2, 3) or equivalent simplified form cao midpt AC = (1/2, 2) or equivalent simplified form cao or 'M is 2/3 of way from A to C' conclusion 'neither diagonal bisects the other'	**M1** **M1** **A1**	or showing BM ≠ MD oe [BM = 14/3, MD = 7/3] or showing AM ≠ MC or $AM^2 \neq MC^2$ in these methods A1 is dependent on coords of M having been obtained in part (iii) or in this part; the coordinates of M need not be correct; it is also dependent on midpts of both AC and BD attempted, at least one correct alt method: show that mid point of BD does not lie on AC (M1) and vice-versa (M1), A1 for both and conclusion

11 (i)	centre C' = (3, −2) radius 5	**1** **1**	 0 for ±5 or −5
11 (ii)	showing $(6-3)^2 + (-6+2)^2 = 25$ showing that $\overrightarrow{AC'} = \overrightarrow{C'B} = \begin{pmatrix} -3 \\ 4 \end{pmatrix}$ o.e.	**B1** **B2**	interim step needed **or B1** each for two of**:** showing midpoint of AB = (3, −2); showing B (0, 2) is on circle; showing AB = 10 **or B2** for showing midpoint of AB = (3, −2) and saying this is centre of circle **or B1** for finding eqn of AB as $y = -4/3\ x + 2$ o.e. and **B1** for finding one of its intersections with the circle is (0, 2) **or B1** for showing C′B = 5 and **B1** for showing AB = 10 or that AC′ and BC′ have the same gradient **or B1** for showing that AC′ and BC′ have the same gradient and B1 for showing that B (0, 2) is on the circle
11 (iii)	grad AC' or AB = −4/3 o.e. grad tgt = −1/their AC' grad $y-(-6) =$ their $m(x-6)$ o.e. $y = 0.75x - 10.5$ o.e. isw	**M1** **M1** **M1** **A1**	or ft from their C', must be evaluated may be seen in eqn for tgt; allow M2 for grad tgt = ¾ oe soi as first step or **M1** for $y =$ their $m \times x + c$ then subst (6, −6) eg **A1** for $4y = 3x - 42$ allow **B4** for correct equation www isw
11 (iv)	centre C is at (12, −14) cao circle is $(x-12)^2 + (y+14)^2 = 100$	**B2** **B1**	B1 for each coord ft their C if at least one coord correct

12 (i)	10	**1**	
12 (ii)	[x =] 5 or ft their (i) ÷ 2 ht = 5[m] cao	**1** **1**	not necessarily ft from (i) eg they may start again with calculus to get $x = 5$
12 (iii)	$d = 7/2$ o.e. [y =] $1/5 \times 3.5 \times (10 - 3.5)$ o.e. or ft = 91/20 o.e. cao isw	**M1** **M1** **A1**	or ft their (ii) − 1.5 or their (i) ÷ 2 − 1.5 o.e. or $7 - 1/5 \times 3.5^2$ or ft or showing $y - 4 = 11/20$ o.e. cao
12 (iv)	$4.5 = 1/5 \times x(10 - x)$ o.e. $22.5 = x(10 - x)$ o.e. $2x^2 - 20x + 45$ [= 0] o.e. eg $x^2 - 10x + 22.5$ [=0] or $(x - 5)^2 = 2.5$ $[x =]\dfrac{20 \pm \sqrt{40}}{4}$ or $5 \pm \dfrac{1}{2}\sqrt{10}$ o.e. width = $\sqrt{10}$ o.e. eg $2\sqrt{2.5}$ cao	**M1** **M1** **A1** **M1** **A1**	 eg $4.5 = x(2 - 0.2x)$ etc cao; accept versions with fractional coefficients of x^2, isw or $x - 5 = [\pm]\sqrt{2.5}$ o.e.; ft their quadratic eqn provided at least M1 gained already; condone one error in formula or substitution; need not be simplified or be real accept simple equivalents only

4751 Introduction to Advanced Mathematics (C1)

General Comments

Many candidates showed a good knowledge of basic skills and did well on many of the questions in section A. In particular, the remainder theorem and use of the discriminant to show that a line and curve did not intersect were done better than usual. Curve sketching remains a problem for a few and there were some quite poor attempts at both the quadratic and cubic curves.

Last January I commented that some candidates were thrown by anything that required them to think beyond questions that they had done in practice. This was certainly true for some parts of the questions in section B this year. In order to take account of this the 'a' threshold was set rather lower than in recent series.

The pre-printed answer booklet worked quite well in keeping responses in order so that they could be marked online. However, there were a few candidates who answered in the wrong place or allowed their answer to spill over to the next question. Centres who issued answer booklets instead of additional sheets to candidates who needed extra space created some unnecessary scanning and checking through of blank pages, especially when candidates had used only the first page of an 8 page booklet. Centres are also asked to note that candidates should not hand in their pages of rough work.

Comments on Individual Questions

Section A

1 This was generally well answered. The common error in the first step was to write $2c = \sqrt{a+b}$ and those that made it were usually able to take advantage of the follow through marks available.

2 A few 'equals signs' were seen and a few inequalities the wrong way round were in evidence, but in the main this was often well done using correct notation throughout. The most common error was getting $2x+5$ from multiplying $(x+5)$ by 2. There were quite a few who seemed unsatisfied with $\frac{13}{3}$ or $4\frac{1}{3}$ and felt they had to express the answer as a recurring decimal.

3 Part (i) was usually correct but some spoiled good work in obtaining $x=4$ by giving (0,4), or found (0,10) or gave the intersections with both axes as though they were unsure which one was required.

In part (ii) there were many correct answers from the substitution method. The elimination approach was popular and these solutions were often wholly correct, but some were longwinded, getting there eventually but at a cost of time. A few sign errors were seen and there were a few who stopped after correctly finding the value for x. There were also quite a few who gave the y value as $(5-{}^{10}\!/\!_{3})$ or similar as if they could not perform the evaluation.

4 Many candidates omitted to describe the transformation as a translation (which was required for full marks), preferring terms such as 'movement' or 'shift', but most candidates showed they had the right idea. Responses ranged from a vector to quite verbose descriptions. Contradictory statements were not uncommon.

Many good, correct sketches were seen. Most candidates were able to produce a parabola but not always in the right place or right orientation – some were clearly sketching the curve from part (i). Failure to label all (or even any) of the intercepts often lost the second mark. A few did not attempt this question at all.

5 Many candidates were able to answer part (i) without a problem, but with varying amounts of working shown. Weaker candidates often knew that $144^{\frac{1}{2}} = \sqrt{144} = 12$ and gained a mark for this.

In part (ii), many correct expressions were seen, but the weaker candidates had problems here, often with wrong methods for adding fractions such as multiplying 4 by $5-\sqrt{7}$ instead of by $5+\sqrt{7}$. Denominators of 32 instead of 18 (from $25 + 7$ instead of $25 – 7$) were not uncommon and some final additions led to denominators of 36.

6 In part (i), most candidates drew a cubic curve and most had it the right way up. Most had a turning point at (–1, 0), with a few at (1, 0). The common error was not to identify the y -intercept, whilst some had the intercept on the positive x -axis at 5 instead of $\frac{5}{2}$.

Expanding the brackets was generally well done. Some did this in part (i), not realising that there was an easier way to find the *y*-intercept there. The most common error was to write $(x+1)^2$ as x^2+1. A small number of candidates tried to multiply all three brackets at once, and there were consequent errors.

7 Most candidates used the remainder theorem, and most were successful apart from minor slips. A small number used f(3). Long division was also quite a popular method; in this case, the final step turned out to be difficult unless matching coefficients was also used to obtain the constant as 8, and answers of 24 or 18 for k from this method were as common as 30.

8 This was much the worst answered question in section A. Some candidates tried to multiply out the brackets, but generally failed to find correct terms. Most used the binomial method and Pascal's triangle, not all being quite sure which row they were on. Candidates who wrote the coefficients as combinations often had errors. The biggest difficulty was the powers of 5/*x*, often with either numerator or denominator powered, but not both. This in turn led to terms which should have been kept separate being combined. It was quite common to see unsimplified terms such as $\dfrac{15x^2}{x}$ in the final answer. A few candidates, not liking algebraic fractions at all, insisted on multiplying through by x^3 at some stage of their working.

9 Showing that the line and the curve do not intersect was quite well done. The majority of candidates eliminated y and found the correct quadratic in x and most then knew what to do, pleasingly many confining themselves to the discriminant. There were occasional slips in the arithmetic, particularly writing ½√(64 - 68) as √(-2), but most candidates knew what was expected of them. A small number of candidates tried to draw, and then work with the proximity of, the two separate graphs.

Section B

10 **(i)** Proving that the lines are parallel was done very well, with nearly all candidates knowing the condition for the gradients of parallel lines and just a few candidates making errors such as 4/8 = 2.

(ii) Many candidates gained full marks here, although some of these wasted time by obtaining the lengths of all 4 sides. Some showed that the gradients of AD and BC were not equal and thought that this was sufficient, presumably thinking that they had shown the base angles were unequal. A few candidates successfully used other properties of an isosceles trapezium, such as showing that the line joining the midpoints of AB and DC is not perpendicular to those lines. A small proportion of candidates did not know what isosceles meant.

(iii) Some candidates had forgotten basic work on quadrilaterals and a significant proportion of candidates found the intersection of AD and BC instead of that of AC and BD. With the benefit of hindsight it would have helped if the question had read 'The diagonals AC and BD of the trapezium meet at M …' as the intention was to examine candidates' understanding of coordinate geometry and ability to apply that. Those who knew what diagonals were, and correctly worked with AC and BD, were usually successful in gaining the method marks in this part, although errors in arithmetic were fairly common.

(iv) This was often well done; however a very common error was to try to establish instead whether the diagonals were perpendicular, a result perhaps of familiarity with the term 'perpendicular bisector', although such candidates did not pay any attention to the 'bisecting' aspect.

11 **(i)** This part was done successfully by all but a handful of candidates. Very occasionally the signs for the coordinates were wrong and the radius was given as 25.

(ii) A large majority of candidates managed to pick up one or two marks in this question, but only about 30% of them succeeded in gaining all three. Very few candidates failed to show that the point with coordinates (6, -6) was on the circle. Most did it by substituting the coordinates into the equation of the circle, but a few did it by showing that the distance between the centre and that point was equal to the radius (5). Many candidates were not rigorous enough in showing that the point B, at the other end of the diameter, had the coordinates (0 , 2); very many of them considered that it was sufficient to simply show that B was on the circle or, alternatively, to show that the length of the line AB was twice the radius. Similarly a few candidates thought that it was sufficient to find the centre of the line AB but didn't relate this point to the centre of the circle in order to complete the argument. However, there were some fully correct arguments, with a few candidates choosing to do more than was really necessary in order to be certain, rather than following a specific line of reasoning. Of the few candidates who tried to use the equation of line AB, hardly any went on to show that (0, 2) was the intersection of the line and the circle. The method based on vectors was rarely used, though some candidates succeeded in showing this with the help of diagrams.

(iii) The majority of candidates understood what was required in terms of their knowledge about perpendicular gradients and of methods for determining the equation of a straight line. Although there were many correct solutions, answers were often spoiled by careless arithmetic or algebra. In finding the gradient of AB, some candidates made errors in working with the negative numbers, and the gradient of the tangent was sometimes written down as simply the reciprocal of that of AB. However the vast majority correctly used <u>their</u> gradient in conjunction with the coordinates (6, -6).

(iv) Only a few candidates made a success of this final part. There was little evidence of methodical thought in trying to determine the centre of this new circle. Those who drew diagrams tended to be more successful, and having found the coordinates of the centre nearly always wrote down correctly the equation of the required circle.

12 **(i)** This was quite well answered, with some candidates appreciating that with the factors of x and $(10 - x)$ they could just write down the answer. However, some did try to make it over-complicated via their algebra – multiplying out brackets, then using the quadratic formula, with errors often creeping in during the process.

(ii) Again, this was generally well answered although too many candidates gave a single answer of 5 only and thus just scored a single mark. A few candidates benefited from the follow through mark here.

(iii) A high proportion correctly identified their *d*. However, significantly fewer candidates went on to use the figure successfully to score either of the next two marks. A common error was to state *d* = 3, although a small number of candidates did go on and use their value and gain a method mark for doing so. The last A mark was earned in various successful ways - $\frac{91}{20}$ or $4\frac{11}{20}$ or 4.55 or $\frac{22.75}{5}$ were common. It was sad to see, however, just how many times this mark was lost through the candidates' inability to work with either fractions or decimals.

(iv) This part was omitted by 40% of the candidates, although some were able to make a fresh start here and gain several of the marks. The most common wrong approach by candidates who could not see how to begin otherwise was to consider the cross-sectional area of the lorry, whilst Pythagoras was attempted by some. A significantly high proportion of those who did know where to get started had insufficient algebraic skills to continue past obtaining the quadratic equation – a fair number scored the first two marks only. Some who obtained a correct form of the equation did not simplify the fractional coefficients before they attempted to apply the quadratic formula; they very often became confused when sorting out their end results and made spurious cancelling errors. The quadratic formula was usually well-quoted, which was pleasing, although a small number of candidates did benefit from the allowance of one error. A small number of candidates attempted to complete the square, often with success. Many candidates who obtained the correct pair of values for x failed to go on and work out the width of the lorry.
A few candidates opted for the alternative approach of expressing x in terms of the width and making the substitution – leading to an elegant solution.