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 24 May 2010
Afternoon

Duration: 1 hour 30 minutes

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.** Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).
- 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.

INSTRUCTION TO EXAMS OFFICER / INVIGILATOR

- Do not send this Question Paper for marking; it should be retained in the centre or destroyed.

No calculator can be used for this paper

Section A (36 marks)

1 Find the equation of the line which is parallel to $y = 3x + 1$ and which passes through the point with coordinates (4, 5). **[3]**

2 **(i)** Simplify $(5a^2b)^3 \times 2b^4$. **[2]**

(ii) Evaluate $\left(\frac{1}{16}\right)^{-1}$. **[1]**

(iii) Evaluate $(16)^{\frac{3}{2}}$. **[2]**

3 Make y the subject of the formula $a = \dfrac{\sqrt{y} - 5}{c}$. **[3]**

4 Solve the following inequalities.

(i) $2(1 - x) > 6x + 5$ **[3]**

(ii) $(2x - 1)(x + 4) < 0$ **[2]**

5 **(i)** Express $\sqrt{48} + \sqrt{27}$ in the form $a\sqrt{3}$. **[2]**

(ii) Simplify $\dfrac{5\sqrt{2}}{3 - \sqrt{2}}$. Give your answer in the form $\dfrac{b + c\sqrt{2}}{d}$. **[3]**

6 You are given that

- the coefficient of x^3 in the expansion of $(5 + 2x^2)(x^3 + kx + m)$ is 29,
- when $x^3 + kx + m$ is divided by $(x - 3)$, the remainder is 59.

Find the values of k and m. **[5]**

7 Expand $\left(1 + \frac{1}{2}x\right)^4$, simplifying the coefficients. **[4]**

8 Express $5x^2 + 20x + 6$ in the form $a(x + b)^2 + c$. **[4]**

9 Show that the following statement is false.

$$x - 5 = 0 \iff x^2 = 25$$ **[2]**

Section B (36 marks)

10 **(i)** Solve, by factorising, the equation $2x^2 - x - 3 = 0$. **[3]**

(ii) Sketch the graph of $y = 2x^2 - x - 3$. **[3]**

(iii) Show that the equation $x^2 - 5x + 10 = 0$ has no real roots. **[2]**

(iv) Find the x-coordinates of the points of intersection of the graphs of $y = 2x^2 - x - 3$ and $y = x^2 - 5x + 10$. Give your answer in the form $a \pm \sqrt{b}$. **[4]**

11

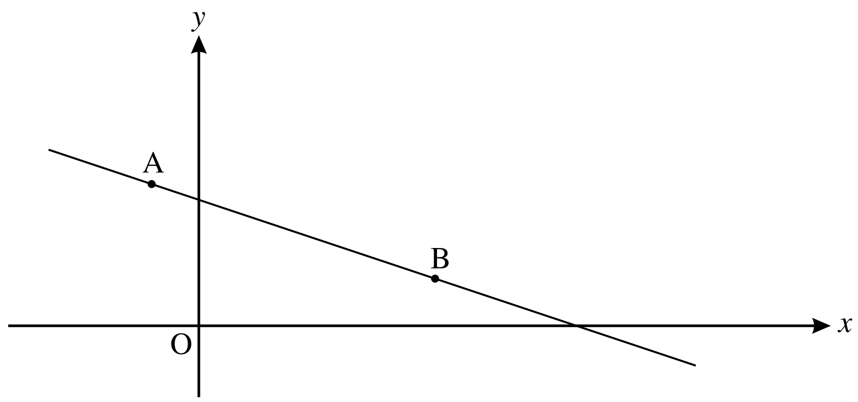

Fig. 11

Fig. 11 shows the line through the points A $(-1, 3)$ and B $(5, 1)$.

(i) Find the equation of the line through A and B. **[3]**

(ii) Show that the area of the triangle bounded by the axes and the line through A and B is $\frac{32}{3}$ square units. **[2]**

(iii) Show that the equation of the perpendicular bisector of AB is $y = 3x - 4$. **[3]**

(iv) A circle passing through A and B has its centre on the line $x = 3$. Find the centre of the circle and hence find the radius and equation of the circle. **[4]**

12 You are given that $f(x) = x^3 + 6x^2 - x - 30$.

(i) Use the factor theorem to find a root of $f(x) = 0$ and hence factorise $f(x)$ completely. **[6]**

(ii) Sketch the graph of $y = f(x)$. **[3]**

(iii) The graph of $y = f(x)$ is translated by $\begin{pmatrix} 1 \\ 0 \end{pmatrix}$.

Show that the equation of the translated graph may be written as

$$y = x^3 + 3x^2 - 10x - 24.$$ **[3]**

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE.

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ADVANCED SUBSIDIARY GCE

MATHEMATICS (MEI) 4751

Introduction to Advanced Mathematics (C1)

PRINTED ANSWER BOOK

Candidates answer on this Printed Answer Book

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Other Materials Required:
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Monday 24 May 2010
Afternoon

Duration: 1 hour 30 minutes

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

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Section A (36 marks)

1	
2(i)	
2 (ii)	
2 (iii)	

3	
4 (i)	

4 (ii)	
5 (i)	
5 (ii)	

6	
7	

8	
9	

Section B (36 marks)

10 (i)	

10 (ii)	
10 (iii)	
10 (iv)	

11 (i)

11 (ii)

11 (iii)

11 (iii)	**(continued)**
11 (iv)	

12 (i)	

12 (ii)	
12 (iii)	

12 (iii)	(continued)

RECOGNISING ACHIEVEMENT

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GCE

Mathematics (MEI)

Advanced Subsidiary GCE **4751**

Introduction to Advanced Mathematics (C1)

Mark Scheme for June 2010

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by Examiners. It does not indicate the details of the discussions which took place at an Examiners' meeting before marking commenced.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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SECTION A

1	$y = 3x + c$ or $y - y_1 = 3(x - x_1)$ $y - 5 =$ their $m(x - 4)$ o.e. $y = 3x - 7$ or simplified equiv.	**M1** **M1** **A1**	allow M1 for 3 clearly stated/ used as gradient of required line or (4, 5) subst in their $y = mx + c$; allow M1 for $y - 5 = m(x - 4)$ o.e. condone $y = 3x + c$ and $c = -7$ or **B3** www
2	(i) $250a^6b^7$ (ii) 16 cao (iii) 64	2 1 2	**B1** for two elements correct; condone multiplication signs left in SC1 for eg $250 + a^6 + b^7$ condone ±64 **M1** for $[\pm]4^3$ or for $\sqrt{4096}$ or for only −64
3	$ac = \sqrt{y} - 5$ o.e. $ac + 5 = \sqrt{y}$ o.e. $[y =](ac+5)^2$ o.e. isw	**M1** **M1** **M1**	**M1** for each of 3 correct or ft correct steps s.o.i. leading to y as subject <u>or</u> some/all steps may be combined; allow **B3** for $[y =](ac+5)^2$ o.e. isw or **B2** if one error
4 (i)	$2 - 2x > 6x + 5$ $-3 > 8x$ o.e. or ft $x < -3/8$ o.e. or ft isw	**M1** **M1** **M1**	or $1 - x > 3x + 2.5$ for collecting terms of their inequality correctly on opposite sides eg $-8x > 3$ allow **B3** for correct inequality found after working with equation allow **SC2** for −3/8 o.e. found with equation or wrong inequality
4 (ii)	$-4 < x < ½$ o.e.	2	accept as two inequalities **M1** for one 'end' correct or for −4 and ½
5 (i)	$7\sqrt{3}$	2	**M1** for $\sqrt{48} = 4\sqrt{3}$ or $\sqrt{27} = 3\sqrt{3}$

5 (ii)	$\frac{10+15\sqrt{2}}{7}$ www isw	**3**	**B1** for 7 [B0 for 7 wrongly obtained] and **B2** for $10+15\sqrt{2}$ or **B1** for one term of numerator correct; if **B0**, then **M1** for attempt to multiply num and denom by $3+\sqrt{2}$
6	5 + 2k soi k = 12 attempt at f(3) 27 + 36 + m = 59 o.e. m = −4 cao	**M1** **A1** **M1** **A1** **A1**	allow M1 for expansion with $5x^3 + 2kx^3$ and no other x^3 terms or M1 for (29 − 5) / 2 soi must substitute 3 for x in cubic not product or long division as far as obtaining $x^2 + 3x$ in quotient or from division m − (−63) = 59 o.e. or for 27 + 3k + m = 59 or ft their k
7	$1+2x+\frac{3}{2}x^2+\frac{1}{2}x^3+\frac{1}{16}x^4$ oe (must be simplified) isw	**4**	**B3** for 4 terms correct, or **B2** for 3 terms correct or for all correct but unsimplified (may be at an earlier stage, but factorial or ${}^nC_r$ notation must be expanded/worked out) or **B1** for 1, 4, 6, 4, 1 soi or for $1+...+\frac{1}{16}x^4$ [must have at least one other term]
8	$5(x+2)^2 - 14$	**4**	**B1** for a = 5, and **B1** for b = 2 and **B2** for c = −14 or **M1** for c = 6 − their ab^2 or **M1** for [their a](6/their a − their b^2) [no ft for a = 1]
9	mention of −5 as a square root of 25 or $(-5)^2 = 25$ −5 −5 ≠ 0 o.e. or x + 5 = 0	**M1** **M1**	condone $-5^2 = 25$ or, dep on first M1 being obtained, allow **M1** for showing that 5 is the only soln of x − 5 = 0 allow M2 for $x^2 - 25 = 0$ $(x + 5)(x - 5)$ [= 0] so x − 5 = 0 or x + 5 = 0

Section A Total: 36

SECTION B

10 (i)	$(2x-3)(x+1)$ $x = 3/2$ and -1 obtained	**M2** **B1**	**M1** for factors with one sign error or giving two terms correct allow M1 for $2(x-1.5)(x+1)$ with no better factors seen or ft their factors
10 (ii)	graph of quadratic the correct way up and crossing both axes crossing x-axis only at 3/2 and -1 or ft from their roots in (i), or their factors if roots not given crossing y-axis at -3	**B1** **B1** **B1**	for $x = 3/2$ condone 1 and 2 marked on axis and crossing roughly halfway between; intns must be shown labelled or worked out nearby
10 (iii)	use of $b^2 - 4ac$ with numbers subst (condone one error in substitution) (may be in quadratic formula) $25 - 40 < 0$ or -15 obtained	**M1** **A1**	may be in formula or $(x-2.5)^2 = 6.25 - 10$ or $(x-2.5)^2 + 3.75 = 0$ oe (condone one error) or $\sqrt{-15}$ seen in formula or $(x-2.5)^2 = -3.75$ oe or $x = 2.5 \pm \sqrt{-3.75}$ oe
10 (iv)	$2x^2 - x - 3 = x^2 - 5x + 10$ o.e. $x^2 + 4x - 13$ [= 0] use of quad. formula on resulting eqn (do not allow for original quadratics used) $-2 \pm \sqrt{17}$ cao	**M1** **M1** **M1** **A1**	attempt at eliminating y by subst or subtraction or $(x+2)^2 = 17$; for rearranging to form $ax^2 + bx + c$ [= 0] or to completing square form condone one error for each of 2nd and 3rd **M1s** or $x + 2 = \pm\sqrt{17}$ o.e. 2nd and 3rd **M1s** may be earned for good attempt at completing square as far as roots obtained

11 (i)	grad AB = $\frac{1-3}{5-(-1)}$ [= −1/3]	**M1**	
	y − 3 = their grad (x – (−1)) or y − 1 = their grad (x − 5)	**M1**	or use of y = their gradient $x + c$ with coords of A or B or **M2** for $\frac{y-3}{1-3}=\frac{x-(-1)}{5-(-1)}$ o.e.
	y = −1/3x + 8/3 or 3y = −x + 8 o.e isw	**A1**	o.e. eg $x + 3y - 8 = 0$ or 6y = 16 – 2x allow **B3** for correct eqn www
11 (ii)	when y = 0, x = 8; when x = 0, y = 8/3 or ft their (i)	**M1**	allow y = 8/3 used without explanation if already seen in eqn in (i)
	[Area =] ½ × 8/3 × 8 o.e. cao isw	**M1**	NB answer 32/3 given; allow 4 × 8/3 if first M1 earned; or M1 for $\int_0^8\left[\frac{1}{3}(8-x)\right]dx=\left[\frac{1}{3}\left(8x-\frac{1}{2}x^2\right)\right]_0^8$ and M1 dep for $\frac{1}{3}(64-32[-0])$
11 (iii)	grad perp = −1/grad AB stated, or used after their grad AB stated in this part	**M1**	or showing 3 × −1/3 = −1 if (i) is wrong, allow the first M1 here ft, provided the answer is correct ft
	midpoint [of AB] = (2, 2)	**M1**	must state 'midpoint' or show working
	y − 2 = their grad perp (x − 2) or ft their midpoint	**M1**	for **M3** this must be correct, starting from grad AB = −1/3, and also needs correct completion to given ans $y = 3x - 4$
	<u>alt method working back from ans</u>:	**or**	mark one method or the other, to benefit of candidate, not a mixture
	grad perp = −1/grad AB and showing/stating same as given line	**M1**	eg stating − 1/3 × 3 = −1
	finding intn of their y = −1/3x − 8/3and y = 3x − 4 is (2, 2)	**M1**	or showing that (2, 2) is on $y = 3x - 4$, having found (2, 2) first
	showing midpt of AB is (2, 2)	**M1**	[for both methods: for **M3** must be fully correct]

11	(iv)	subst $x = 3$ into $y = 3x - 4$ and obtaining centre = (3, 5) $r^2 = (5 - 3)^2 + (1 - 5)^2$ o.e. $r = \sqrt{20}$ o.e. cao eqn is $(x - 3)^2 + (y - 5)^2 = 20$ or ft their r and y-coord of centre	M1 M1 A1 B1	or using $(-1 - 3)^2 + (3 - b)^2 = (5 - 3)^2 + (1 - b)^2$ and finding (3, 5) or $(-1 - 3)^2 + (3 - 5)^2$ or ft their centre using A or B condone $(x - 3)^2 + (y - b)^2 = r^2$ o.e. or $(x - 3)^2 + (y -$ their $5)^2 = r^2$ o.e. (may be seen earlier)
12	(i)	trials of at calculating f(x) for at least one factor of 30 details of calculation for f(2) or f(−3) or f(−5) attempt at division by $(x - 2)$ as far as $x^3 - 2x^2$ in working correctly obtaining $x^2 + 8x + 15$ factorising a correct quadratic factor $(x - 2)(x + 3)(x + 5)$	M1 A1 M1 A1 M1 A1	**M0** for division or inspection used or equiv for $(x + 3)$ or $(x + 5)$; or inspection with at least two terms of quadratic factor correct or B2 for another factor found by factor theorem for factors giving two terms of quadratic correct; M0 for formula without factors found condone omission of first factor found; ignore '= 0' seen allow last four marks for $(x - 2)(x + 3)(x + 5)$ obtained; for all 6 marks must see factor theorem use first
12	(ii)	sketch of cubic right way up, with two turning points values of intns on x axis shown, correct (−5, −3, and 2) or ft from their factors/ roots in (i) y-axis intersection at −30	B1 B1 B1	0 if stops at x-axis on graph or nearby in this part mark intent for intersections with both axes or $x = 0$, $y = -30$ seen in this part if consistent with graph drawn

12	**(iii)**	($x - 1$) substituted for x in either form of eqn for $y = f(x)$ $(x - 1)^3$ expanded correctly (need not be simplified) or two of their factors multiplied correctly correct completion to given answer [condone omission of 'y =']	**M1** **M1 dep** **M1**	correct or ft their (i) or (ii) for factorised form; condone one error; allow for new roots stated as −4,−2 and 3 or ft or **M1** for correct or correct ft multiplying out of all 3 brackets at once, condoning one error [$x^3 - 3x^2 + 4x^2 + 2x^2 + 8x - 6x - 12x - 24$] unless all 3 brackets already expanded, must show at least one further interim step allow **SC1** for ($x + 1$) subst <u>and</u> correct exp of $(x + 1)^3$ or two of their factors ft <u>or</u>, for those using given answer: **M1** for roots stated or used as −4,−2 and 3 or ft **A1** for showing all 3 roots satisfy given eqn **B1** for comment re coefft of x^3 or product of roots to show that eqn of translated graph is not a multiple of RHS of given eqn

Section B Total: 36

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1 Hills Road
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CB1 2EU

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4751 Introduction to Advanced Mathematics

General comments
Many candidates answered most of the questions in both Sections A and B very competently, with the algebraic problem in question 6 being the question found hardest in section A. In section B, question 12(i) was done particularly well, with most candidates being successful in factorising a cubic expression despite being given no 'help'. Finding the equation of a circle in 11(iv) proved difficult for many, with frequent errors in finding the centre and / or radius, although most did know the general equation of a circle. Solving quadratic inequalities and completing the square remain weaknesses of many candidates. Candidates had sufficient time to complete the paper.

This was the second series of marking this paper online, with candidates using an answer booklet with pre-prepared spaces. Fewer candidates used additional pages than in January, with the most common questions for ‘overflow’ or second attempts being questions 6, 11(ii) and 11(iv).

Centres are reminded that separate sheets of rough work should not be handed in.

Comments on individual questions

1) Most candidates knew that the gradient of the required line was 3, although a few used 1/3. The value of the constant was usually found successfully, with very few arithmetic errors.

2) There were the usual errors of indices in this question. In the first part the power of *a* was sometimes given as 5 rather than 6 and often candidates failed to multiply 2 by 125 to get 250. The second part was usually correct. There were many correct answers to the last part but also a wide variety of errors; a few failed to complete, especially those who found 4096 first.

3) Rearranging the formula was on the whole well answered, apart from the last step when finding the square root was used instead of squaring or the two terms were squared separately.

4) Solving the linear inequality was usually done well, although those who took the *x* terms to the left did not always cope with the change of inequality when dividing by the negative number. Some candidates correctly multiplied out the brackets, but then made errors in collecting the terms of their inequality.

   Many found –4 and ½ as the limits of the quadratic inequality, but relatively few obtained the correct final answer. Answers such as ‘$x < –4$ or $x < ½$’ were common. Quite a few multiplied out the brackets and then used the quadratic formula to solve the equation they found, or gave up. Those who did a sketch were often more successful in writing the inequality correctly.

5) The majority knew how to deal correctly with the surds in the first part though occasionally $\sqrt{75}$ or $9\sqrt{3}+16\sqrt{3}$ were seen. In the second part, most candidates knew to multiply both numerator and denominator by $3+\sqrt{2}$ but attempted this with mixed success; surprisingly it was the numerator that caused more problems.

6) Fully correct answers were seen from only about 30% of the candidates. Many picked up marks by substituting 3 in the cubic, although it was disappointing to see that so many thought that 3^3 is 9. Many also picked up one mark for $5x^3 + 2kx^3$, often seen as part of a whole expansion, with candidates often not knowing how to proceed from there. However sometimes no marks were scored. Those who tried to divide by $(x - 3)$ rarely had any success.

7) A fair number managed to get to the correct answer, usually using the binomial expansion, but occasionally by expanding the brackets 'by hand'. However the majority made errors of one sort or another. The most common was to fail to raise ½ to the powers 2, 3, 4. Most at least picked up 1 mark for 1, 4, 6, 4, 1.

8) In this question on completing the square, most could find $a = 5$, but b varied, with the majority recognising it as 2 but many using 4 or 10. Many candidates did not find c correctly, failing to realise the part that the factor of 5 played in this term. Checking that their answer gave the correct quadratic could have helped them to realise their error – most who did this were successful.

9) Most realised that both –5 and 5 satisfy $x^2 = 25$ and often gained both marks on this question. A few weak candidates substituted other numbers into the equations as their only attempt.

10) (i) Most candidates factorised the given quadratic correctly, though of these a small minority omitted to solve the equation. An error sometimes seen was x = 2/3 instead of 3/2. Many of those who factorised incorrectly showed that they were able to obtain roots from factors and obtained the final mark. Some used the quadratic formula despite the instruction 'Solve, by factorising...' and some of these obtained the final mark if their roots were correct.

(ii) Most candidates obtained full marks for this part, where there were follow through marks from part (i) for incorrect roots. A minority of candidates lost marks through not labelling their intersections or scales. Although most candidates knew the general shape of a quadratic graph, some distorted the symmetry by treating the intersection with the y-axis as the minimum, and some had a poor shape as y increased.

(iii) Most candidates knew to use the discriminant and calculated it correctly, obtaining both marks – this part was particularly well done.

(iv) A high proportion of candidates obtained 3 out of 4 marks on this part. Almost all equated correctly for the first mark, and most of those made no more than one error in rearranging to zero, and so obtained the second mark. A small minority did not know how to proceed. Those who attempted subtraction to eliminate y tended to make more errors. Most candidates knew the quadratic formula correctly and substituted correctly to obtain the third mark. Subsequent arithmetic errors were quite common, and disappointingly few were able to complete and give their answer in the form asked for, failing to simplify $\sqrt{68}$ to $2\sqrt{17}$ or ignoring the surd completely when dividing by 2. Some candidates used completing the square instead of the quadratic formula, with varying success.

11) (i) The first part was generally done well with very many candidates scoring full marks. The most common error was to give the gradient with the wrong sign, sometimes following a correct attempt. One or two candidates calculated the change in *x* divided by the change in *y*. The calculation of the constant term in the equation did involve working with fractions and a negative, which resulted in an arithmetic error for some candidates. A few errors were made by transposing the values of *x* and *y* when putting the coordinate values into one of the general forms of the equation of a straight line. A number of candidates did not simplify the value of the gradient and worked with $-\frac{2}{6}$, but this did not hinder their progress. Most candidates left the final answer in the form "*y* = ", involving fractions, which was acceptable, but many multiplied through by the appropriate value to give an equation involving integers.

(ii) Most candidates understood what was required in this part and used the result of part (i) to determine where their line crossed the axes. Because of the nature of the fractions involved, it was a help to the candidates that the target answer was given in improper form rather than as a mixed number. A few candidates tried to work back from the answer, but the dependency of the method marks prevented them gaining undeserved credit. Some candidates realised here that their answer in part (i) did not give them the required answer and sensibly checked back and found their error in that part. A few candidates thought it appropriate to use Pythagoras' Theorem and there were also one or two unsuccessful attempts at using '*½ ab* sin*C'.*

(iii) In showing the result for the equation of the perpendicular bisector, candidates invariably worked with the correct gradient, but a significant number of the candidates failed to justify the value used for the gradient, which is necessary when they are given a final answer to work towards. For a number of candidates this was the only mark dropped in the whole paper. Some candidates made errors in using the condition for perpendicularity. Only a small number of candidates failed to determine and work with the midpoint.

(iv) Only a few candidates managed to answer this question correctly. This was caused by one, or both, of two fundamental errors. The first was the failure to determine the centre of the circle. Most candidates, although recognising the need to use $x = 3$, substituted into the equation of the line AB, rather than into the equation of the perpendicular bisector. Others assumed that the midpoint of AB would be the centre. A few candidates, rather than using the perpendicular bisector, used the condition that the centre would be equidistant from the points A and B. This led to more complicated working involving Pythagoras which often resulted in failing to reach the correct solution. The second fundamental error was to assume that AB was the diameter of the circle which often yielded the apparently correct value based on the incorrect calculation that $\sqrt{40} \div 2 = \sqrt{20}$. However many candidates made some attempt at using the general equation of a circle as well as an attempt to use Pythagoras to determine what they thought would be the radius and gained some credit for doing this. This part discriminated between those candidates who had understood the geometry of the problem and those who tried to apply some standard procedures without really understanding what they were doing.

12) (i) Only a small number of candidates failed to attempt this question. The vast majority used the factor theorem successfully to find the first factor, usually *x* – 2. A great many were then able to complete the factorisation (mainly by first dividing, or using inspection to find the relevant quadratic factor, although some used the factor theorem again to find further factors). Most candidates seemed to realise that they needed to try factors of 30. A few candidates reached the correct factorisation but did not show evidence of using the factor theorem and did not earn the first two marks.

(ii) The graphs of the cubic were generally good, with only occasional marks lost. As in 10(ii), the number of candidates who failed to show the *y*-intersection seemed to be fewer than previous years.

(iii) A pleasing number of candidates gained all 3 marks here, although some had no idea of how to start. The most profitable method was to start from the revised factors and expand these to obtain the required function. Some who chose to replace *x* with (*x* – 1) in the original equation came unstuck, more often by expanding –(*x* – 1) wrongly than in expanding the cubic term.