Name: _____

Quadratics

Date:

Time:

Total marks available:

Total marks achieved: _____

SHA

Questions

Q1.

(a) Expand $5(2m - 3)$

.....

(1)

(b) Factorise $3n + 12$

.....

(1)

(Total for question = 2 marks)

Q2.

(a) Expand $2a(a + 7)$

.....

(1)

(b) Factorise $14b - 7$

.....

(1)

(c) Solve $9(c - 6) = 63$

c = ...

(2)

(d) Simplify $3y^2 \times 4y^3$

.....

(1)

(Total for question = 5 marks)

Q3.

(a) Expand $2(a + d)$

.....

(1)

(b) Factorise $6y^2 - 5y$

.....

(1)

(c) Solve $4x - 7 = 37$

$x =$ .....

(2)

(Total for question = 4 marks)

Q4.

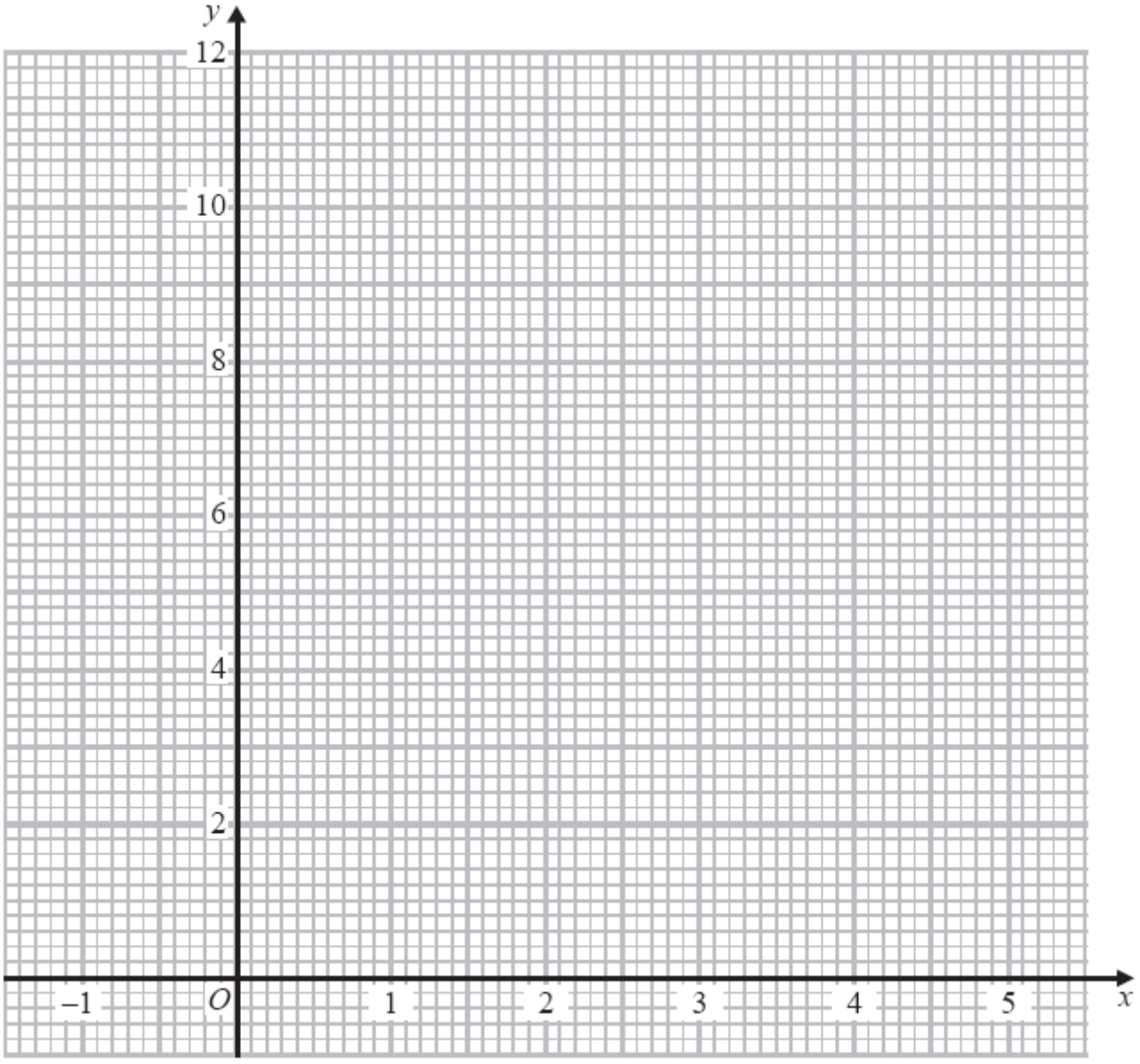
(a) Complete the table of values for $y = x^2 - 3x + 2$

x	−1	0	1	2	3	4	5
y	6				2		12

(2)

(b) On the grid, draw the graph of $y = x^2 - 3x + 2$ for values of x from –1 to 5

(2)



(c) Find estimates for the solutions of the equation $x^2 - 3x + 2 = 4$

.....

(2)

(Total for question = 6 marks)

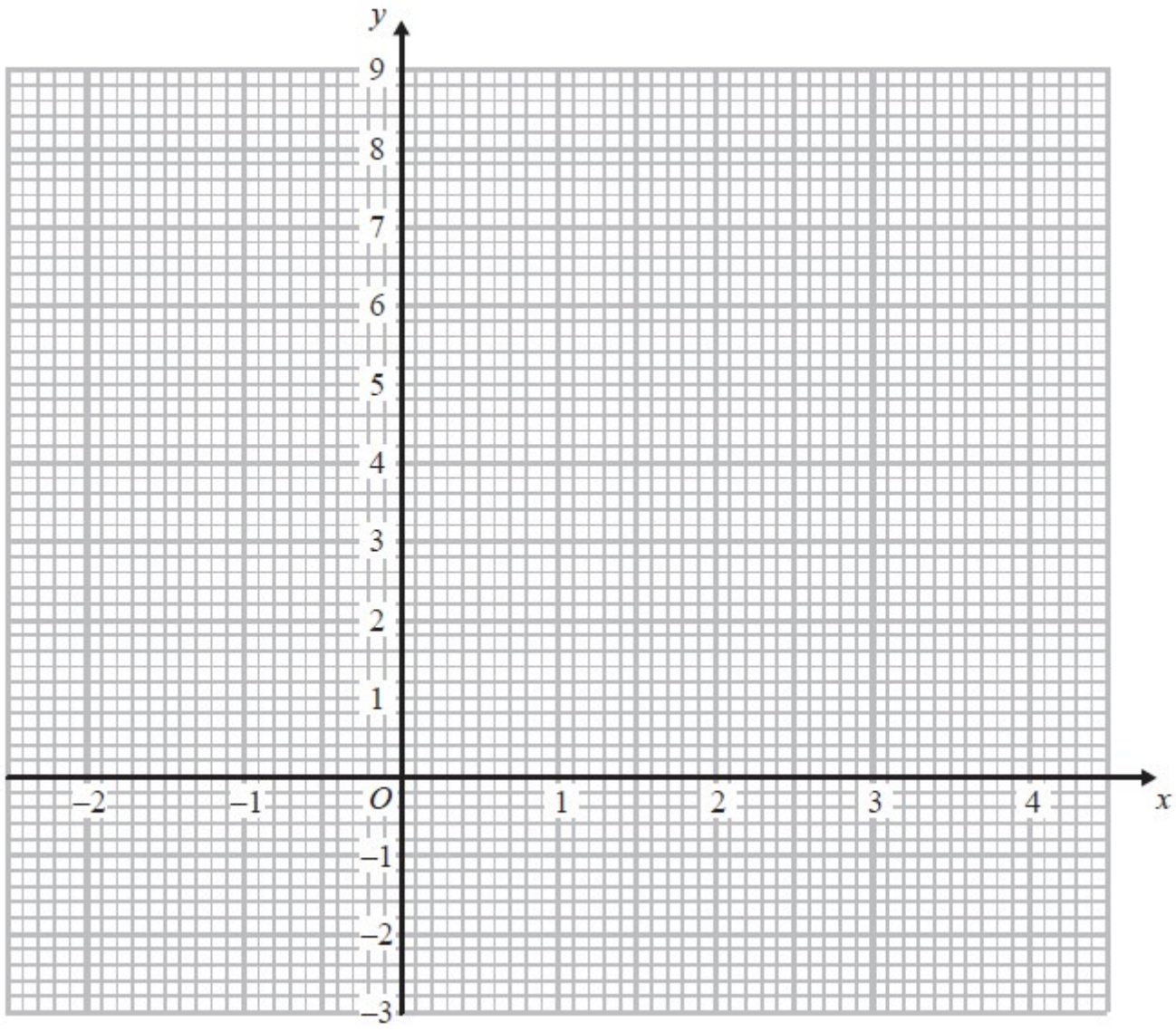
Q5.

(a) Complete the table of values for $y = x^2 - 2x - 1$

x	−2	−1	0	1	2	3	4
y	7			−2	−1		

(2)

(b) On the grid, draw the graph of $y = x^2 - 2x - 1$ for values of x from −2 to 4



(2)

(c) Solve $x^2 - 2x - 1 = x + 3$

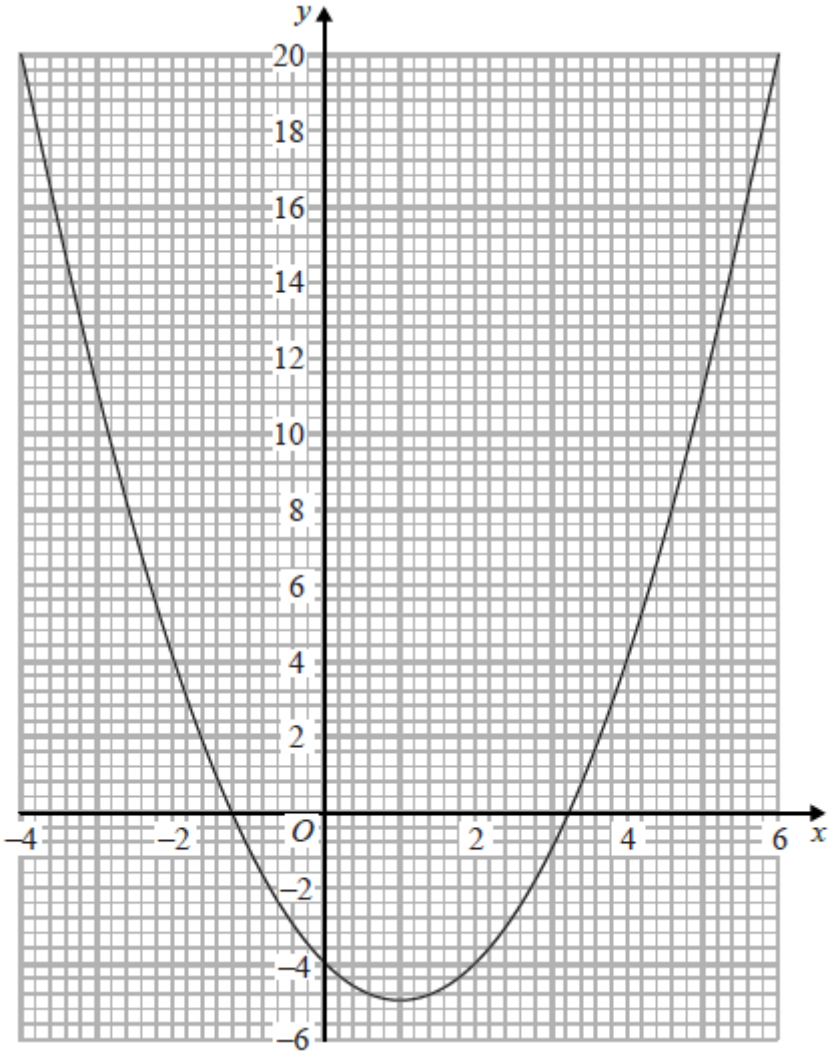
.....

(2)

(Total for Question is 6 marks)

Q6.

Here is the graph of $y = x^2 - 2x - 4$



(a) Write down estimates for the roots of $x^2 - 2x - 4 = 0$

.....

(2)

(b) Write down the coordinates of the turning point of $y = x^2 - 2x - 4$

(..... , ...)

(1)

(Total for question = 3 marks)

Q7.

(a) Expand and simplify $(x + 5)(x - 8)$

.....

(2)

(b) Factorise $x^2 - 16$

.....

(1)

(Total for Question is 3 marks)

Q8.

(a) Expand and simplify $(p + 9)(p - 4)$

.....

(2)

(b) Solve $\frac{5w - 8}{3} = 4w + 2$

$w =$ . . . . . .

(3)

(c) Factorise $x^2 - 49$

.....

(1)

(d) Simplify $(9x^8y^3)^{\frac{1}{2}}$

.....

(2)

(Total for Question is 8 marks)

Q9.

Factorise $x^2 - 121$

.....

(Total for question = 1 mark)

Q10.

(a) Factorise $2ax - 2ay + bx - by$

.....

(2)

(b) Expand and simplify $(n + 2)^2 + (n - 3)^2$

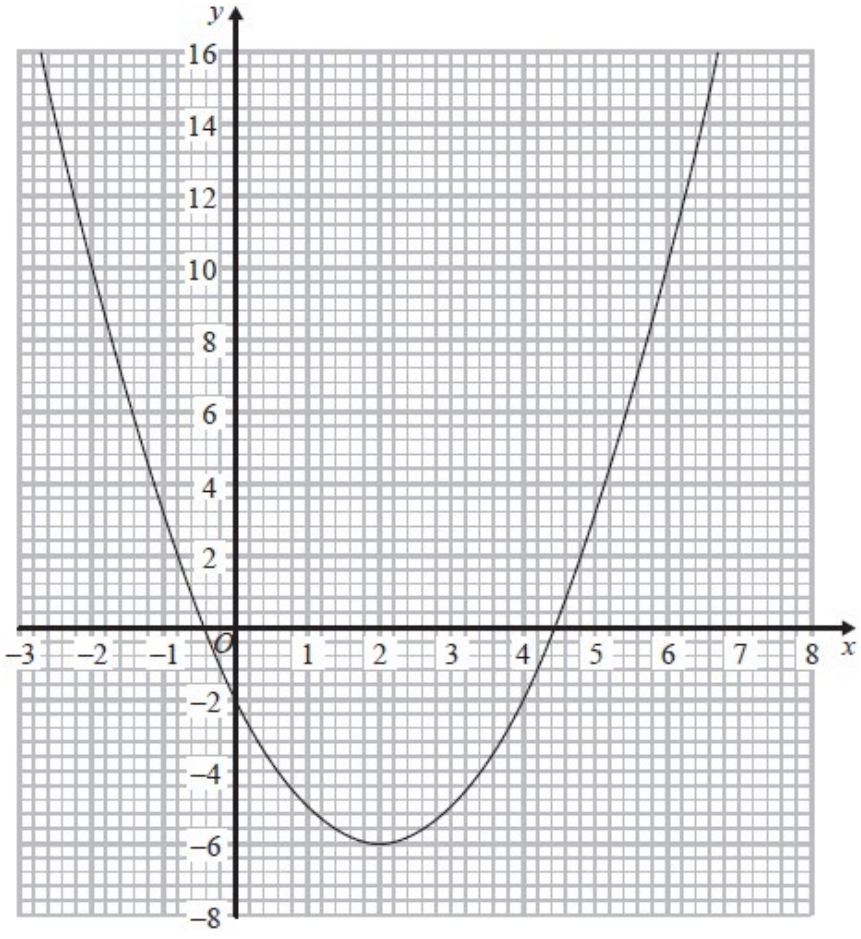
.....

(3)

(Total for question = 5 marks)

Q11.

The diagram shows the graph of $y = x^2 - 4x - 2$



(a) Use the graph to find estimates for the solutions of

(i) $x^2 - 4x - 2 = 0$

.....

(ii) $x^2 - 4x - 6 = 0$

.....

(3)

(b) Use the graph to find estimates for the values of x that satisfy the simultaneous equations

$$y = x^2 - 4x - 2$$
$$x + y = 6$$

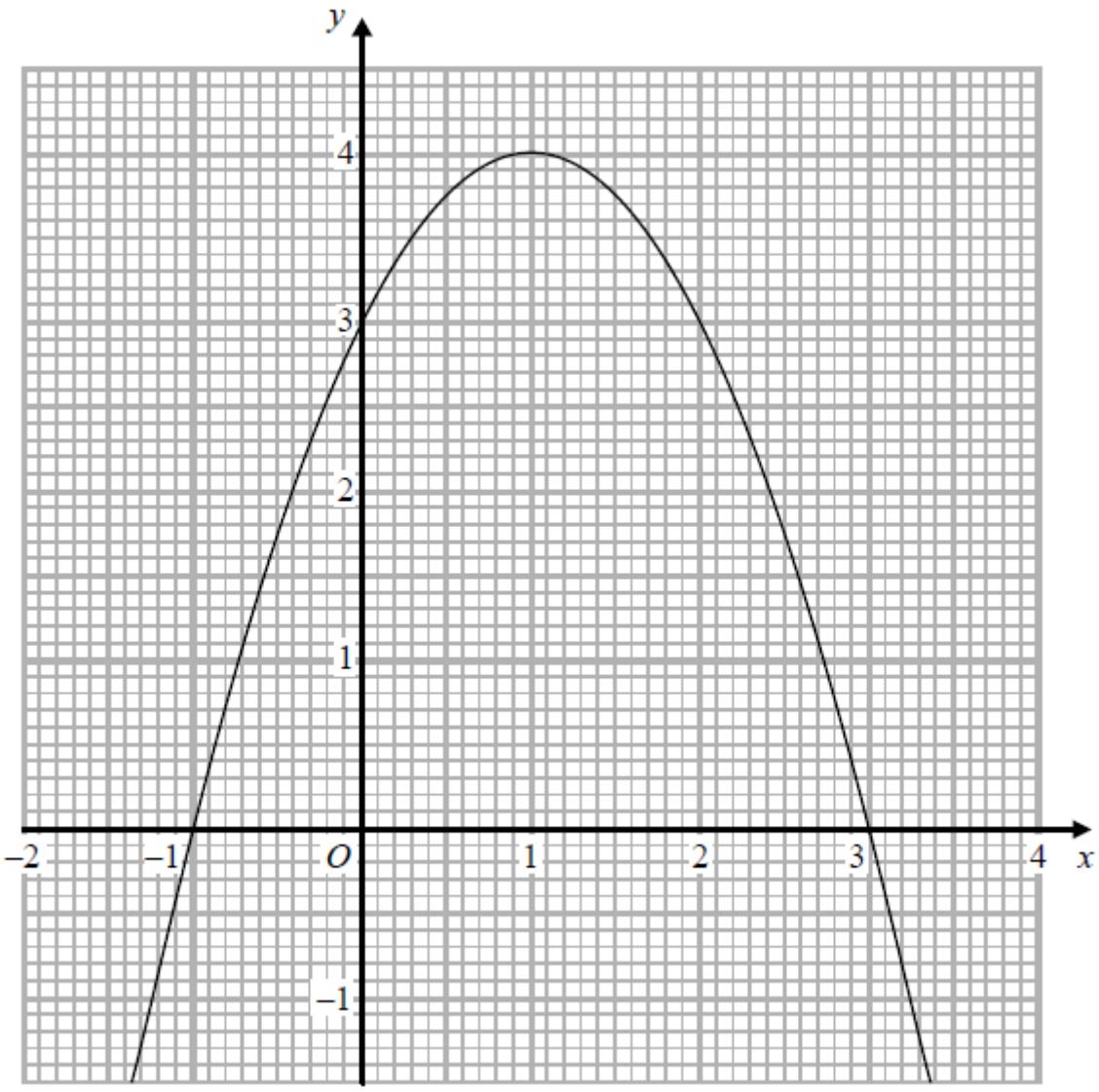
.....

(3)

(Total for question = 6 marks)

Q12.

The graph of $y = f(x)$ is drawn on the grid.



(a) Write down the coordinates of the turning point of the graph.

(....., ...)

(1)

(b) Write down the roots of $f(x) = 2$

.....

(1)

(c) Write down the value of f(0.5)

.....

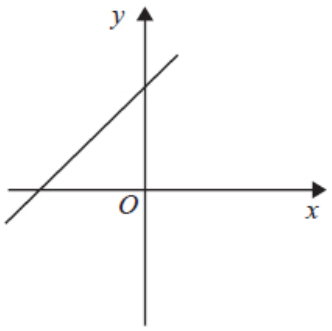
(1)

(Total for question = 3 marks)

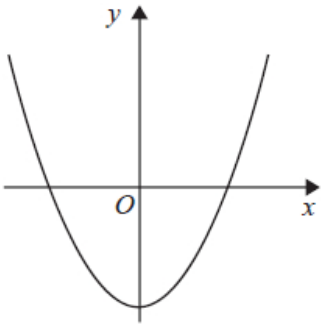
Q13.

Here are four graphs.

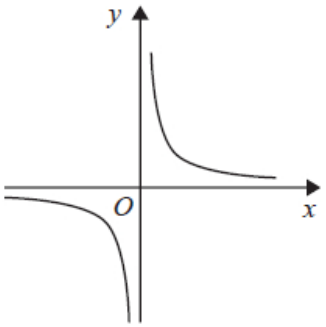
Graph A



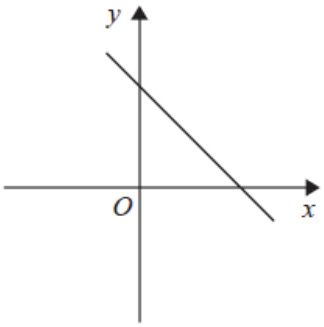
Graph B



Graph C



Graph D



Each of the equations in the table is the equation of one of the graphs.

Complete the table.

Equation	Letter of graph
$y = x^2 - 7$	
$y = 3 - 2x$	
$y = 2x + 3$	
$y = \frac{1}{x}$	

(Total for question = 2 marks)

Q14.
Sketch the graph of

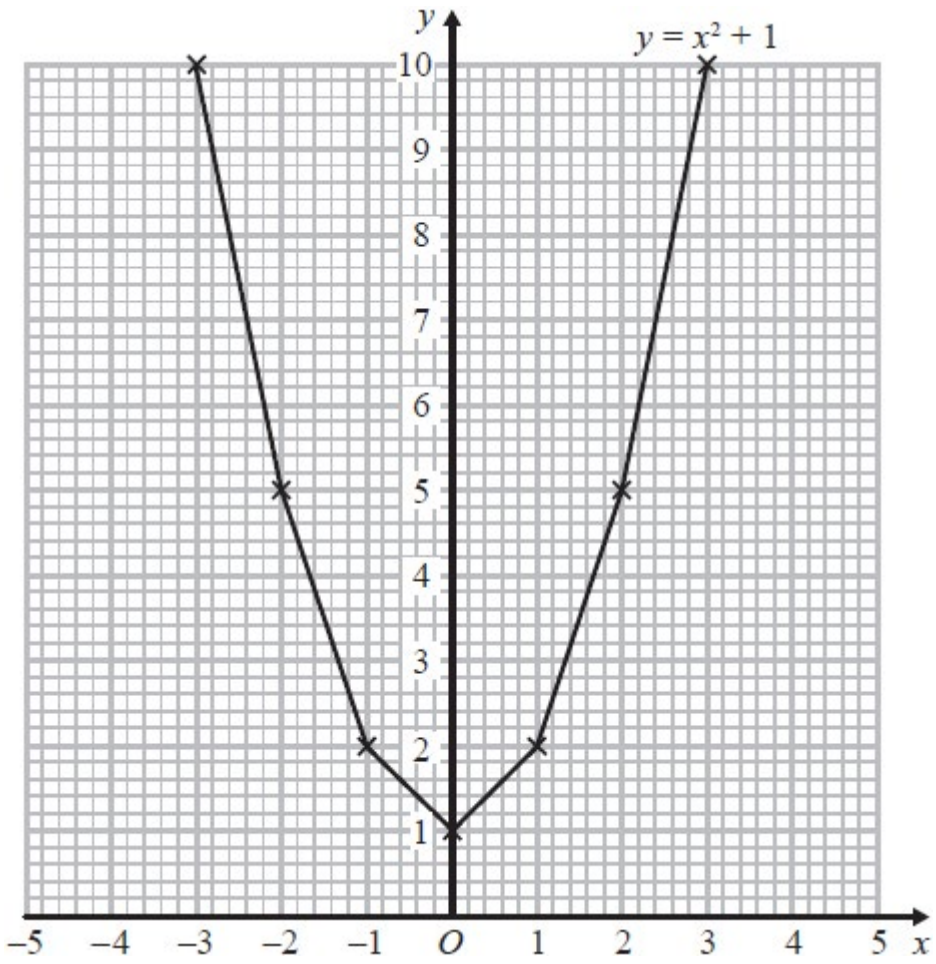
$$y = 2x^2 - 8x - 5$$

showing the coordinates of the turning point and the exact coordinates of any intercepts with the coordinate axes.

(Total for question = 5 marks)

Q15.
Brogan needs to draw the graph of $y = x^2 + 1$

Here is her graph.



Write down one thing that is wrong with Brogan's graph.

.....

.....

(Total for question = 1 mark)

Examiner's Report

Q1.

Overall, students performed well with the expansion in part (a). However, a small number of students tried to simplify their correct answer of $10m - 15$, commonly giving $15m$ and therefore losing the mark. Another common mistake was to only multiply the first term by 5, giving $10m - 3$ or $5\times2m - 3$ but full processing was required. Equally, some students thought the expression was an equation which they tried to solve. Part (b) was generally answered quite well with many students gaining the mark. In general, most students either got the correct answer or did not attempt the question. Common mistakes included $3(n + 12)$, $3n + 4$ and $n + 4$.

Q2.

No Examiner's Report available for this question

Q3.

The first two parts of this question were not answered well. $2ad$ or $2a + d$ were common incorrect answers in part (a), whilst in part (b) very few demonstrated any understanding of factorisation. y and y^2 were often incorrect answers offered here.

Students had greater success with part (c), gaining full marks for an answer of 11. Many students showed the value of x as 11 in their working but then gave an answer of 44 on the answer line. Very few students used algebra explicitly in the question and many took the wrong first step by subtracting instead of adding 7.

Q4.

Some good work was evident in part (a), but also a lot of errors with substituting both positive and negative values into the quadratic expression. There were many instances where no response was seen at all.

In part (b) students were usually able to plot the points they had created from the table. Most likely errors were those that included a zero value. Some students did not plot any points at all. There was obviously a lack of understanding about the shape of a quadratic graph, as those who plotted the correct points sometimes failed to join the points at all, or joined them with straight lines, and failed to go beneath the x axis at the bottom of the curve. Other students joined their points together with line segments as well as curved sections. Students do need to take more care to ensure their curve passes through the plotted points more accurately.

Part (c) was done least well. Most students did not give any answer at all. Those who did were typically trying to solve the given equation algebraically, but with little success. Even the few students who drew any type of line across $y=4$, usually failed to write the negative solution at all.

Q5.

The values of y corresponding to positive values of x were generally worked out correctly. There was less success with the negative values, especially the value of y at $= -1$. In part (b) values were generally plotted accurately and the points joined with a smooth curve, although the occasional set of straight line

segments was also seen. Part (c) proved beyond most candidates. Correct solutions were split between those who connected up the whole question and drew the straight line with equation $y = x + 3$. They were then able to pick out the required values of x for the two marks. Other candidates restarted, rearranged the equation and solved it, usually by factorisation. If the two values of x were given then the marks were awarded. Some candidates spotted that $x = 4$ satisfies the original equation, but without any of the two approaches shown they did not score any marks.

Q6.
No Examiner's Report available for this question

Q7.

Multiplication, by whatever method, of the two bracketed expressions in part (a) was often executed correctly, however poor 'collecting of terms' prevented the award of full marks on many occasions; $x^2 + 3x - 40$ and $x^2 \pm 13x - 40$ were common errors. Sometimes the 5 and -8 were added instead of multiplied together. In part (b), $(x - 4)^2$, $(x - 8)(x + 8)$ and $(x \pm 2)(x \pm 8)$ were the most common incorrect answers offered, with many candidates failing to recognise the 'difference of two squares' format.

Q8.

Candidates were generally quite successful in part (a). Most candidates appeared to know a method for expanding two sets of brackets with many achieving at least one mark. Methods seen included FOIL and the use of a grid. Common errors included ignoring the signs of the terms ($-4p$ was often given as $4p$) and adding the final two terms instead of multiplying. Simplifying the four-term expression sometimes resulted in errors, e.g. $-4p + 9p$ being simplified to $13p$ or $-5p$ or to just 5.

Part (b) was not answered so well. Most candidates realised that they needed to multiply both sides of the equation by 3 but many weren't sure how to carry this out. $15w - 24 = 12w + 6$ was seen often and the RHS was sometimes given as $4w + 6$ or $12w + 2$. Some candidates were able to rearrange their four-term equation correctly but many made errors when attempting to do this. Some candidates who got as far as $14 = -7w$ were unsure of how to deal with the minus sign.

Candidates who recognised the expression in part (c) as the difference of two squares almost invariably found the correct answer but there were many who gave the answer as either $(x + 7)^2$ or $(x - 7)^2$. Others tried to find a common factor and $x(x - 49)$ was a common incorrect answer.

Part (d) was answered less well although a good number of candidates did successfully apply the laws of indices to get either a fully correct answer or to gain one mark for having two correct terms within a product. Many candidates did not know that the power of 1/2 indicates square root and $9^{½}$ was commonly given as '4.5' or left as '9'.

Q9.
No Examiner's Report available for this question

Q10.

Most students were able to make a start with the factorization in part (a) of this question and so they scored at least 1 mark. Progress as far as $x(2a + b) - y(2a + b)$ or $2a(x - y) + b(x - y)$ was quite common. Only a small proportion of students could carry on to factorize the expression.

The expansion of $(n + 2)^2$ in part (b) of this question was usually correct and it was encouraging to see only a small number of expansions resulting in $n^2 + 4$.

There were more errors in the expansion of $(n - 3)^2$ with students making mistakes with signs or giving 6 as the constant term in the expansion. Success in adding the two expressions was varied and $n^2 + n^2 = n^4$ was seen far too often. However, a good proportion of attempts at this part of the question ended successfully.

Q11.

Part (a) was poorly answered. Those that attempted part (i) often misread the scale on the axes and part (ii) was often left blank. Some attempted to translate the graph but were inaccurate and those who drew the line at $y = 4$ often only gave one correct value.

Part (b) was often not attempted. Those who understood that they needed to draw the line $x + y = 6$ often gave their answer as coordinates. Algebraic methods were rarely successful.

Q12.
No Examiner's Report available for this question

Q13.
No Examiner's Report available for this question

Q14.

Again, only a very few students were able to make any headway in sketching a graph of the given quadratic. The *y*-intercept and the turning point were most often found by constructing tables of values. Some students did attempt to solve the quadratic, usually by completing the square, however this was often littered with mistakes. Many of the students who attempted this question drew a parabola which was symmetrical about the *y*-axis.

Q15.

This question was accessible to many students who showed an understanding that the error lay in the joining of the points with straight lines. They expressed this in a variety of ways but often used words such as curve or smooth line or commented on the incorrect use of a ruler.

However, incorrect answers showed a lack of confidence with plotting quadratics. There were several who thought that the wrong points had been plotted, the graph should have passed through 0 or that it should have been a straight line. Other common wrong answers did not relate to the graph itself but on the lack of a title or a table of values.

Mark Scheme

Q1.

Question	Answer	Mark	Mark scheme	Additional guidance
(a)	$10m - 15$	B1	for $10m - 15$ oe	Accept any reversing of order in the expression
(b)	$3(n + 4)$	B1	for $3(n + 4)$ oe	Accept any answer in reverse order

Q2.

Question	Working	Answer	Mark	Notes
(a)		$2a^2 + 14a$	B1	cao
(b)		$7(2b - 1)$	B1	cao
(c)		13	M1 A1	for correct expansion of the bracket, **or** for intention to divide both sides by 9 as the first step cao
(d)		$12y^5$	B1	cao

Q3.

Question	Answer	Mark	Mark scheme	Additional guidance
(a)	$2a + 2d$	B1	cao	Accept $2 \times a + 2 \times d$
(b)	$y(6y - 5)$	B1	cao	Accept $y \times (6y - 5)$
(c)	11	M1 A1	for isolating x terms, eg $4x = 37 + 7$ or $4x = 44$ **or** for $x - \frac{7}{4} = \frac{37}{4}$ **or** for $37 + 7 = 44$ followed by "44" ÷ 4 (= 11) cao	

Q4.

Question	Working	Answer	Mark	Notes
(a)		2, 0, 0, 6	2	B2 for 2, 0, 0, 6 (B1 for at least two of 2, 0, 0, 6); could be taken from graph
(b)		Correct curve	2	M1 (ft) for at least 5 points plotted correctly A1 for a fully correct curve
(c)		−0.6, 3.6	2	M1 (ft if M1 awarded in (b) and at least B1 in (a)) for indicating a point or line drawn at $y=4$, or one solution given A1 (ft) for both solutions

Q5.

PAPER: 1MA0_1H					
Question		Working	Answer	Mark	Notes
	(a)		2, –1, 2, 7	2	B2 for all correct (B1 for 2 or 3 correct)
	(b)		Correct graph	2	M1 (dep on at least B1) for at least 6 points from their table plotted correctly A1 cao for fully correct graph
	(c)	$x^2 - 3x - 4 = 0$ $(x-4)(x+1) = 0$	–1, 4	2	M1 for line $y = x + 3$ drawn correctly or for reduction to correct 3 term quadratic (=0) and : $(x \pm 1)(x \pm 4)$ or formula using $a = 1$, $b = -3$ and $c = -4$, allow one sign error in the formula, or $\left(x-\frac{3}{2}\right)^2 = 4 + \left(\frac{3}{2}\right)^2$ A1 cao

Q6.

Question	Working	Answer	Mark	Notes
(a)		–1.2 & 3.2	B2 (B1)	for both roots correct (for one correct root)
(b)		(1, –5)	B1	cao

Q7.

Question		Working	Answer	Mark	Notes
	(a)		$x^2 - 3x - 40$	2	M1 for 3 terms correct (out of no more than 4 terms) from x^2, $5x$, $-8x$ and -40 or 4 terms x^2, $5x$, $8x$ and 40 (ignoring signs) A1 for $x^2 - 3x - 40$ [Note: $x^2 - 3x + 40$ and $x^2 + 3x - 40$ with no working get M0A0]
	(b)		$(x + 4)(x - 4)$	1	B1 for $(x + 4)(x - 4)$ oe

Q8.

Question		Working	Answer	Mark	Notes
	(a)	$p^2 - 4p + 9p - 36$	$p^2 + 5p - 36$	2	M1 for all 4 terms correct (condone incorrect signs) or 3 out of 4 terms correct with correct signs A1 cao
	(b)	$5w - 8 = 3(4w + 2)$ $5w - 8 = 12w + 6$ $-8 - 6 = 12w - 5w$ $-14 = 7w$	-2	3	M1 for attempting to multiply both sides by 3 as a first step (this can be implied by equations of the form $5w - 8 = 12w + ?$ or $5w - 8 = ?w + 6$ i.e. the LHS must be correct M1 for isolating terms in w and the number terms correctly from $aw + b = cw + d$ A1 cao **OR** M1 for $^{5w}/_{3} - ^{8}/_{3} = 4w + 2$ M1 for isolating terms in w and the number terms correctly A1 cao
	(c)		$(x + 7)(x - 7)$	1	B1 cao
	(d)		$3x^4 y^{3/2}$	2	B2 for $3x^4y^{3/2}$ or $3x^4 y^{1.5}$ or $3x^4y^{1\frac{1}{2}}$ (B1 for any two terms correct in a product eg. $3x^4y^n$)

Q9.

Question	Working	Answer	Mark	Notes
		$(x + 11)(x - 11)$	B1	cao

Q10.

Question		Working	Answer	Mark	
	(a)	$(2a + b)(x - y)$		2	M1 for $2a(x - y)$ or $b(x - y)$ or $x(2a + b)$ or $y(2a + b)$ A1 for $(2a + b)(x - y)$ oe
	(b)		$2n^2 - 2n + 13$	3	B1 for $n^2 + 4n + 4$ or $n^2 - 6n + 9$ (need not be simplified) M1 (dep on B1) for '$n^2 + 4n + 4$' + '$n^2 - 6n + 9$' A1 cao

Q11.

Question	Working	Answer	Mark	Notes
(a)(i)		–0.4 to –0.5 4.4 to 4.5	3	B1 for value in range –0.4 to –0.5 and value in range 4.4 to 4.5 NB: condone values given as part of coordinates.
(ii)		–1.0 to –1.2 5.0 to 5.2		M1 for $x^2 - 4x - 2 = 4$ or line $y = 4$ drawn on graph or points marked with a y coord. of 4 or a value in range –1.0 to –1.2 or a value in range 5.0 to 5.2 A1 for value in range –1.0 to –1.2 and value in range 5.0 to 5.2; do not accept coordinates.
(b)		–1.6 to –1.8 4.6 to 4.8	3	M1 for $x + y = 6$ drawn on graph A2 for value in range –1.6 to –1.8 and value in range 4.6 to 4.8 (A1 for one correct value or both values given as coordinates)

Q12.

Paper 1MA1: 2H			
Question	**Working**	**Answer**	**Notes**
(a)		(1, 4)	B1
(b)		–0.4, 2.4	B1
(c)		3.75	B1 accept 3.7 – 3.8

Q13.

Question	Working	Answer	Mark	Notes
		B D A C	B2 (B1)	for all four correctly matched (for 2 correctly matched)

Q14.

Question	Answer	Mark	Mark scheme	Additional guidance
	Sketch graph with TP at (2, -13) and intercepts at (0, -5), $(2+\sqrt{\frac{13}{2}}, 0)$ and $(2-\sqrt{\frac{13}{2}}, 0)$	B1 M1 M1 B1 C1	for a parabola drawn with intercept at the point $(0, -5)$ for the start of a method to find the roots of $y = 0$, eg. $2(x-2)^2 - 13\ (=0)$ oe or $(x=)\ \frac{--8 \pm \sqrt{(-8)^2-4\times2\times-5}}{2\times2}$ (dep) for method to find the roots, eg. $2 \pm \sqrt{\frac{13}{2}}$ oe for turning point at $(2, -13)$ for a fully correct parabola drawn with turning point at $(2, -13)$ and intercepts at $(0, -5)$, $(2+\sqrt{\frac{13}{2}}, 0)$ oe and $(2-\sqrt{\frac{13}{2}}, 0)$ oe clearly shown	 Turning point may be just seen and labelled on the sketch

Q15.

Question	Working	Answer	Mark	Notes
		Comment	B1	for correct mathematical comment eg line segments not a curve **or** should draw freehand **or** should not use a ruler, **or** should be a curve NB Do not accept statements about scale or plotting accuracy.