1. Solve the simultaneous equations

$$y - 3x + 2 = 0$$

$$y^2 - x - 6x^2 = 0$$

(Total 7 marks)

---

2. The first term of an arithmetic series is a and the common difference is d.

The 18th term of the series is 25 and the 21st term of the series is $32\frac{1}{2}$.

(a) Use this information to write down two equations for a and d.

(2)

(b) Show that $a = -7.5$ and find the value of d.

(2)

The sum of the first n terms of the series is 2750.

(c) Show that n is given by

$$n^2 - 15n = 55 \times 40.$$

(4)

(d) Hence find the value of n.

(3)
(Total 11 marks)

---

3. (a) By eliminating y from the equations

$$y = x - 4,$$

$$2x^2 - xy = 8,$$

show that

$$x^2 + 4x - 8 = 0.$$

(2)

(b) Hence, or otherwise, solve the simultaneous equations

$$y = x - 4,$$

$$2x^2 - xy = 8,$$

giving your answers in the form $a \pm b\sqrt{3}$, where a and b are integers.

(5)
(Total 7 marks)

---

4. Solve the simultaneous equations

$$y = x - 2,$$

$$y^2 + x^2 = 10.$$

(Total 7 marks)

---

5. Solve the simultaneous equations

$$x - 2y = 1,$$

$$x^2 + y^2 = 29.$$

(Total 6 marks)

---

6. Solve the simultaneous equations

$$x + y = 3,$$

$$x^2 + y = 15.$$

(Total 6 marks)

---

7. Solve the simultaneous equations

$$x + y = 2$$

$$x^2 + 2y = 12.$$

(Total 6 marks)

---

8. The curve C has equation $y = x^2 - 4$ and the straight line l has equation $y + 3x = 0$.

(a) In the space below, sketch C and l on the same axes.

(3)

(b) Write down the coordinates of the points at which C meets the coordinate axes.

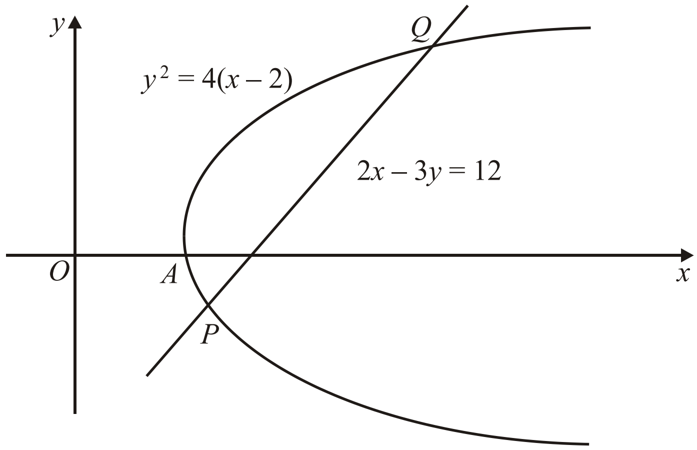
(2)

(c) Using algebra, find the coordinates of the points at which l intersects C.

(4)

(Total 9 marks)

9.



The diagram above shows the curve with equation $y^2 = 4(x - 2)$ and the line with equation $2x - 3y = 12$.

The curve crosses the x-axis at the point A, and the line intersects the curve at the points P and Q.

(a) Write down the coordinates of A.

(1)

(b) Find, using algebra, the coordinates of P and Q.

(6)

(c) Show that $\angle PAQ$ is a right angle.

(4)
(Total 11 marks)

---

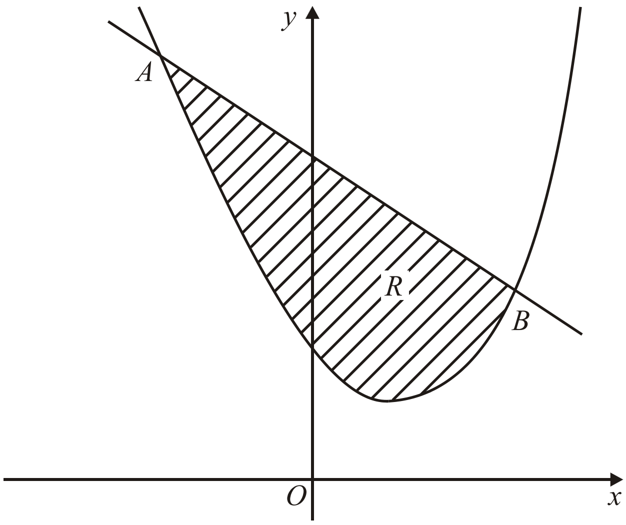
10. Solve the simultaneous equations

$$x - 3y + 1 = 0,$$

$$x^2 - 3xy + y^2 = 11.$$

(Total 7 marks)

11.



The diagram above shows the line with equation $y = 9 - x$ and the curve with equation $y = x^2 - 2x + 3$. The line and the curve intersect at the points A and B, and O is the origin.

(a) Calculate the coordinates of A and the coordinates of B.

(5)

The shaded region R is bounded by the line and the curve.

(b) Calculate the area of R.

(7)
(Total 12 marks)

---

12. (a) Given that $3^x = 9^{y-1}$, show that $x = 2y - 2$.

(2)

(b) Solve the simultaneous equations

$$x = 2y - 2,$$

$$x^2 = y^2 + 7.$$

(6)
(Total 8 marks)

---

13. (a) Show that eliminating y from the equations

$$2x + y = 8,$$

$$3x^2 + xy = 1$$

produces the equation

$$x^2 + 8x - 1 = 0.$$

(2)

(b) Hence solve the simultaneous equations

$$2x + y = 8,$$

$$3x^2 + xy = 1$$

giving your answers in the form $a + b\sqrt{17}$, where a and b are integers.

(5)
(Total 7 marks)

---

1. $y = 3x - 2$ $\quad (3x-2)^2 - x - 6x^2$ (= 0)

$9x^2 - 12x + 4 - x - 6x^2 = 0$

$3x^2 - 13x + 4 = 0$ (or equiv., e.g. $3x^2 = 13x - 4$) A1cso

$(3x-1)(x-4) = 0$ $\quad x = \ldots$ $\quad x = \frac{1}{3}$ (or <u>exact</u>
equivalent) $x = 4$ A1

$y = -1$ $y = 10$ (Solutions need not be "paired") A1

<u>**Note**</u>

1st M: Obtaining an equation in x only (or y only). Condone missing "= 0"
Condone sign slips, e.g. $(3x + 2)^2 - x - 6x^2 = 0$, but <u>not</u> other algebraic mistakes (such as squaring individual terms... see bottom of page).

2nd M: Multiplying out their $(3x - 2)^2$, which must lead to a 3 term quadratic, i.e. $ax^2 + bx + c$, where $a \neq 0$, $b \neq 0$, $c \neq 0$, <u>and</u> collecting terms.

3rd M: Solving a 3-term quadratic (see general principles at end of scheme).

2nd A: Both values.

4th M: Using an x value, found algebraically, to attempt at least one y value
(or using a y value, found algebraically, to attempt at least one x value)…

allow b.o.d. for this mark in cases where the value is wrong but working is not shown.

3rd A: Both values.

If y solutions are given as x values, or vice-versa, penalise at the end, so that it is possible to score M1A1 A1 M0 A0.

<u>"Non-algebraic" solutions</u>:

No working, and only one correct solution pair found (e.g. $x = 4$, $y = 10$):

M0 M0 A0 M0 A0 A0

No working, and both correct solution pairs found, but not demonstrated:

M0 M0 A0 A1 A1

Both correct solution pairs found, and demonstrated: Full marks

<u>Alternative</u>:

$x = \frac{y+2}{3}$ $\qquad y^2 - \frac{y+2}{3} - 6\left(\frac{y+2}{3}\right)^2 = 0$

$y^2 - \frac{y+2}{3} - 6\left(\frac{y^2+4y+4}{9}\right) = 0$	$y^2 - 9y - 10 = 0$	A1
$(y+1)(y-10) = 0 \quad y = \ldots$	$y = -1$ $y = 10$	A1
	$x = \frac{1}{3} \quad x = 4$	A1

Squaring each term in the first equation,

e.g. $y^2 - 9x^2 + 4 = 0$, and using this to obtain an equation in x only could score at most 2 marks: M0 M0 A0 A0 A0.

[7]

2. (a) $a + 17d = 25$ or equiv. (for 1st B1),
$a + 20d = 32.5$ or equiv. (for 2nd B1), B1, B1 2

Note

Alternative:

1st B1: $d = 2.5$ or equiv.or $d = \frac{32.5 - 25}{3}$, No method required, but $a = -17.5$ must not be assumed.

2nd B1: Either $a + 17d = 25$ or $a + 20d = 32.5$ seen, or used with a value of d…
or for 'listing terms' or similar methods, 'counting back' 17 (or 20) terms.

(b) Solving (Subtract) $3d = 7.5$ so $\boldsymbol{d} = \underline{\mathbf{2.5}}$
$a = 32.5 - 20 \times 2.5$ so $\boldsymbol{a} = \underline{\mathbf{-17.5}}$ (*) A1cso 2

Note

In main scheme: for a full method (allow numerical or sign slips) leading to solution for d or a without assuming $a = -17.5$
In alternative scheme: for using a d value to find a value for a.

A1: Finding correct values for both a and d (allowing equiv. fractions such as $d = \frac{15}{6}$), with no incorrect working seen.

(c) $2750 = \frac{n}{2}[-35 + \frac{5}{2}(n-1)]$ M1A1ft

$\{ \quad 4 \times 2750 = n(5n - 75) \quad \}$

$4 \times 550 = n(n - 15)$

$\underline{n^2 - 15n = 55 \times 40}$ (*) A1cso 4

Note

In the main scheme, if the given a is used to find d from one of the equations, then allow M1A1 if both values are checked in the 2nd equation.

1st for attempt to form equation with correct S_n formula and 2750, with values of a and d.

1st A1ft for a correct equation following through their d.

2nd for expanding and simplifying to a 3 term quadratic.

2nd A1 for correct working leading to printed result (no incorrect working seen).

(d) $n^2 - 15n - 55 \times 40 = 0$ or $n^2 - 15n - 2200 = 0$

$(n - 55)(n + 40) = 0$ $\quad n = . . .$

$\boldsymbol{n = 55}$ (ignore – 40) A1 3

Note

1st forming the correct 3TQ = 0 . Can condone missing "= 0" but all terms must be on one side.

First can be implied (perhaps seen in (c), but there must be an attempt at (d) for it to be scored).

2nd for attempt to solve 3TQ, by factorisation, formula or completing the square (see general marking principles at end of scheme). If this mark is earned for the 'completing the square' method or if the factors are written down directly, the 1st is given by implication.

A1 for $n = 55$ dependent on both Ms. Ignore – 40 if seen.

No working or 'trial and improvement' methods in (d) score all 3 marks for the answer 55, otherwise no marks.

[11]

3. (a) $2x^2 - x(x - 4) = 8$

$x^2 + 4x - 8 = 0$ (*) A1cso 2

for correct attempt to form an equation in x only. Condone sign errors/slips but attempt at this line must be seen. E.g. $2x^2 - x^2 \pm 4x = 8$ is OK for

A1cso for correctly simplifying to printed form. No incorrect working seen. The = o is required.
These two marks can be scored in part (b).
For multiple attempts pick best.

(b) $x = \dfrac{-4 \pm \sqrt{4^2 - (4 \times 1 \times -8)}}{2}$ or $(x + 2)^2 \pm 4 - 8 = 0$

$x = -2 \pm$ (any correct expression) A1

$\sqrt{48} = \sqrt{16}\sqrt{3} = 4\sqrt{3}$ or $\sqrt{12} = \sqrt{4}\sqrt{3} = 2\sqrt{3}$ B1

$y = \left(-2 \pm 2\sqrt{3}\right) - 4$ M: Attempt at least one y value

$\underline{x = -2 + 2\sqrt{3}, y = -6 + 2\sqrt{3}}$ $\underline{x = -2 - 2\sqrt{3}, y = -6 - 2\sqrt{3}}$ A1 5

1st M1 for use of correct formula. If formula is not quoted then a fully correct substitution is required.
Condone missing $x =$ or just + or – instead of ± for
For completing the square must have as printed or better.
If they have $x^2 - 4x - 8 = 0$ then can be given for
$(x - 2)^2 \pm 4 - 8 = 0$.

1st A1 for $-2 \pm$ any correct expression. (The ± is required but $x =$ is not)

B1 for simplifying the surd e.g. $\sqrt{48} = 4\sqrt{3}$. Must reduce to $b\sqrt{3}$
so $\sqrt{16}\sqrt{3}$ or $\sqrt{4}\sqrt{3}$ are OK.

2nd M1 for attempting to find at least one y value. Substitution into one of the given equations and an attempt to solve for y.

2nd A1 for correct y answers. Pairings need <u>not</u> be explicit but they must say which is x and which is y.
Mis-labelling x and y loses final A1 only.

[7]

4. $(x-2)^2 = x^2 - 4x + 4$ or $(y+2)^2 = y^2 + 4y + 4$ M: 3 or 4 terms
$(x-2)^2 + x^2 = 10$ or $y^2 + (y+2)^2 = 10$ M: Substitute
$2x^2 - 4x - 6 = 0$ or $2y^2 + 4y - 6 = 0$ Correct 3 terms A1
$(x-3)(x+1) = 0, x = \ldots$ or $(y+3)(y-1) = 0, y = \ldots$
(The above factorisations may also appear as $(2x-6)(x+1)$ or equivalent).
$x = 3$ $x = -1$ or $y = -3$ $y = 1$ A1
$y = 1$ $y = -3$ or $x = -1$ $x = 3$ M1M1 7
(Allow equivalent fractions such as: $x = \frac{6}{2}$ for $x = 3$).

1st M: 'Squaring a bracket', needs 3 or 4 terms, one of which must be an x^2 or y^2 term.

2nd M: Substituting to get an equation in one variable (awarded generously).

1st A: Accept equivalent forms, e.g. $2x^2 - 4x = 6$.

3rd M: Attempting to solve a 3-term quadratic, to get 2 solutions.

4th M: Attempting at least one y value (or x value).

If y solutions are given as × values, or vice–versa, penalise at the end, so that it is possible to score M1A1 A1 M0 A0.

Strict "pairing of values" at the end is <u>not</u> required.

<u>"Non-algebraic" solutions:</u>
No working, and only one correct solution pair found (e.g. $x = 3$, $y = 1$):
M0 M0 A0 M0 A0 A0
No working, and both correct solution pairs found, but not demonstrated:
M0 M0 A0 A1 A1

Both correct solution pairs found, and demonstrated, perhaps in a table of values: Full marks

Squaring individual terms: e.g.

$y^2 = x^2 + 4$	M0	
$x^2 + 4 + x^2 = 10$	A0	(Eqn. in one variable)
$x = \sqrt{3}$	M0 A0	(Not solving 3-term quad.)
$y^2 = x^2 + 4 = 7$ $y = \sqrt{7}$	A0	(Attempting one y value)

[7]

5. $x = 1 + 2y$ and sub $\rightarrow (1 + 2y)^2 + y^2 = 29$

$\Rightarrow 5y^2 + 4y - 28(= 0)$ A1

i.e. $(5y + 14)(y - 2) = 0$

$(y =)2$ or $-\frac{14}{5}$ (o.e.) (both) A1

$y = 2, \Rightarrow x = 1 + 4 = 5$; $y = -\frac{14}{5} \Rightarrow x = -\frac{23}{5}$ (o.e)

[6]

1st Attempt to sub leading to equation in 1 variable

1st A1 Correct 3TQ (condone = 0 missing)

2nd Attempt to solve 3TQ leading to 2 values for y.

2nd A1 Condone mislabelling x = for y = … but then M0A0 in part (c).

3rd Attempt to find at least one x value (must use a correct equation)

3rd A1 f.t. f.t. only in x = 1 + 2y (3sf if not exact) Both values.

N.B False squaring. (e.g. $y = x^2 + 4y^2 = 1$) can only score the last 2 marks.

6. Forming equation in x or y by attempt to eliminate one variable

$(3 - y)^2 + y = 15$ *or* $x^2 + (3 - x) = 15$

$y^2 - 5y - 6 = 0$ *or* $x^2 - x - 12 = 0$ (Correct 3 term version) A1

<u>Attempt at solution</u> i.e. solving 3 term quadratic: $(y - 6)(y + 1) = 0,\ y = \ldots$

or $(x - 4)(x + 3) = 0,\ x = \ldots$

or correct use of formula or

correct use of completing the square A1

$x = 4$ and $x = -3$ **or** $y = -1$ and $y = 6$ A1 ft 6

Finding the values of the other coordinates (M attempt one, A both)

[6]

7. $x^2 + 2(2 - x) = 12$ or $(2 - y)^2 + 2y = 12$ (Eqn. in x or y only)

$x^2 - 2x - 8 = 0$ or $y^2 - 2y - 8 = 0$ (Correct 3 term version) A1

(Allow, e.g. $x^2 - 2x = 8$)

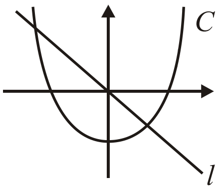
$(x - 4)(x + 2) = 0\ \ x = \ldots$ or $(y - 4)(y + 2) = 0\ \ y = \ldots$

$x = 4,\quad x = -2$ or $y = 4,\quad y = -2$ A1

$y = -2,\quad y = 4$ or $x = -2,\ x = 4$ (M: attempt one, A: both) A1ft 6

[6]

8. (a)



C : "U" shape B1
C : Position B1
l : Straight line through origin with negative gradient B1 3

(b) (2, 0), (–2, 0), (0, – 4)
2 of these correct: B1
All 3 correct: B1 2

(c) $x^2 - 4 = -3x$
$x^2 + 3x - 4 = 0 \quad (x + 4)(x - 1) = 0 \quad x = \dots$
$x = -4 \qquad x = 1$ A1
$y = 12 \qquad y = -3$ M: Attempt one y value A1 4

[9]

9. (a) (2, 0) (or $x = 2$, $y = 0$) B1 1

(b) $y^2 = 4\left(\frac{3y+12}{2} - 2\right)$ or $\left(\frac{2x-12}{3}\right)^2 = 4(x-2)$

$y^2 - 6y - 16 = 0$ or $x^2 - 21x + 54 = 0$ (or equiv. 3 terms) A1
$(y + 2)(y - 8) = 0$, $y = \dots$ or $(x - 3)(x - 18) = 0$, $x = \dots$ (3 term quad.)
$y = -2$, $y = 8$ or $x = 3$, $x = 18$ A1
$x = 3$, $x = 18$ or $y = -2$, $y = 8$ (attempt one for M mark) A1ft6
(A1ft requires both values)

(c) Grad. of $AQ = \frac{8-0}{18-2}$, Grad. of $AP = \frac{0-(-2)}{2-3}$ A1ft
(attempt one for M mark)

$m_1 \times m_2 = \frac{1}{2} \times -2 = -1$, so $\angle PAQ$ is a right angle (A1 is c.s.o.) A1 4

Alternative: Pythagoras: Find 2 lengths [
$AQ = \sqrt{320}$, $AP = \sqrt{5}$, $PQ = \sqrt{325}$ (O.K. unsimplified)[A1ft]
(if decimal values only are given, with no working
shown, require at least 1 d.p. accuracy for implied) A1)
$AQ^2 + AP^2 = PQ^2$, so $\angle PAQ$ is a right angle [A1]
requires attempt to use Pythag. for right angle at A , and
A1 requires correct exact working + conclusion.

[11]

10. $x = 3y - 1$ (n.b. Method mark, so allow, e.g. $x = 3y + 1$)

$(3y - 1)^2 - 3y(3y - 1) + y^2 = 11$ (Substitution, leading to an equation in only one variable)

$y^2 - 3y - 10 = 0$ (3 terms correct, "=0" possibly implied) A1

$(y - 5)(y + 2) = 0$ $\quad y = 5 \quad y = -2$ A1

$x = 14 \quad x = -7$ A1 ft 7

(If not exact, f.t. requires at least 1 d.p. accuracy).

Alternative approach gives: $y = \frac{x+1}{3}$, $x^2 - 7x - 98 = 0$.

[7]

11. (a) $x^2 - 2X + 3 = 9 - x$

$x^2 - x - 6 = 0 \qquad (x + 2)(x - 3) = 0 \qquad x = -2,\ 3$ A1

$y = 11,\ 6$ A1 ft 5

(b) $\int (x^2 - 2x + 3)\mathrm{d}x = \frac{x^3}{3} - x^2 + 3x$ A1

$\left[\frac{x^3}{3} - x^2 + 3x\right]_{-2}^{3} = (9 - 9 + 9) - \left(\frac{-8}{3} - 4 - 6\right) \qquad \left(= 21\frac{2}{3}\right)$ A1

Trapezium: $\frac{1}{2}(11 + 6) \times 5 \qquad \left(= 42\frac{1}{2}\right)$ B1 ft

Area = $42\frac{1}{2} - 21\frac{2}{3} = 20\frac{5}{6}$ A1 7

<u>Alternative:</u> $(9 - x) - (x^2 - 2x + 3) = 6 + x - x^2$ A1

$\int (6 + x - x^2)\mathrm{d}x = 6x + \frac{x^2}{2} - \frac{x^3}{3}$ A1 ft

$\left[6x + \frac{x^2}{2} - \frac{x^3}{3}\right]_{-2}^{3} = \left(18 + \frac{9}{2} - 9\right) - \left(-12 + 2 + \frac{8}{3}\right), = 20\frac{5}{6}$ A1, A1

[12]

12. (a) $3^x = 3^{2(y-1)}$ $x = 2(y-1)$ (*) A1

(b) $(2y-2)^2 = y^2 + 7$, $3y^2 - 8y - 3 = 0$ A1

$(3y+1)(y-3) = 0$, $y = \ldots$ (or correct substitution in formula)

$y = -\frac{1}{3}$, $y = 3$ A1

$x = -\frac{8}{3}$, $x = 4$ A1 ft

[8]

13. (a) $y = 8 - 2x$ $3x^2 + x(8-2x) = 1$

$x^2 + 8x - 1 = 0$ **(*)** A1 2

(b) $x = \frac{-8 \pm \sqrt{64+4}}{2} = -4 \pm \ldots$ A1

$\sqrt{68} = 2\sqrt{17}$; $x = -4 + \sqrt{17}$ or $x = -4 - \sqrt{17}$ B1

$y = 8 - 2(-4 + \sqrt{17}) = 16 - 2\sqrt{17}$ or $y = 16 + 2\sqrt{17}$ A1 5

[7]

1. Many candidates scored full marks for this standard question on simultaneous equations. Mistakes were usually in signs or in combining terms, leading to a loss of accuracy rather than method marks, but an exception to this was the squaring of the equation $y - 3x + 2 = 0$ to give $y^2 - 9x^2 + 4 = 0$. A few candidates, having found solutions for x, failed to find y values. It was disappointing to see many candidates resorting to the quadratic formula when factorisation was possible.

2. Although most candidates made a reasonable attempt at this question, only those who demonstrated good skills in algebra managed to score full marks. The structure of parts (a) and (b) was intended to help candidates, but when the initial strategy was to write down (correctly) $3d = 32.5 - 25$, there was sometimes confusion over what was required for the two equations in part (a). Even when correct formulae such as $u_{18} = a + 17d$ were written down, the substitution of $u_{18} = 25$ did not always follow. The work seen in these first two parts was often poorly presented and confused, but credit was given for any valid method of obtaining the values of d and a without assuming the value of a.
In part (c), many candidates managed to set up the correct sum equation but were subsequently let down by poor arithmetic or algebra, so were unable to proceed to the given quadratic equation. Being given 55 × 40 (to help with the factorisation in the last part of the question) rather than 2200 sometimes seemed to be a distraction.

Despite being given the 55 × 40, many candidates insisted on using the quadratic formula in part (d). This led to the problem of having to find the square root of 9025 without a calculator, at which point most attempts were abandoned.

3. In part (a) most tried the simple substitution of $(x - 4)$ into the second equation. Some made a sign error ($-4x$ instead of $+4x$) and proceeded to use this incorrect equation in part (b). Some candidates did not realise that part (a) was a first step towards solving the equations and repeated this work at the start of part (b) (sometimes repairing mistakes made there). The major loss of marks in part (b) was a failure to find the y values but there were plenty of errors made in trying to find x too. Those who attempted to complete the square were usually successful although some made sign errors when rearranging the 2 and some forgot the ± sign. Of those who used the quadratic formula it was surprising how many incorrect versions were seen. Even using the correct formula was no guarantee of success as incorrect cancelling was common:
$\dfrac{-4 \pm \sqrt{48}}{2}$ was often simplified to $-2 \pm \sqrt{24}$ or $\dfrac{-4 \pm 4\sqrt{3}}{2}$ became $-2 \pm 4\sqrt{3}$.

4. This question was a good source of marks for most candidates. Almost all realised the necessity to form an equation in one variable and the majority could perform the appropriate expansion and substitution, leading to the correct 3-term quadratic. There seemed to be less reliance on the quadratic formula than had been seen in previous papers, with most candidates trying to factorise and usually doing so correctly.
A disappointing number failed to score the final two marks because they finished after finding the two values of the first variable. Non-algebraic solutions were rare and, pleasingly, few candidates thought that $(x - 2)^2 = x^2 + 4$.

5. Generally this question was answered well although there were a number of sign slips either in the initial substitution, using $x = 1 - 2y$, or losing the minus sign from $y = -\frac{14}{5}$ when substituting back to find x. It was encouraging to see few students using the more difficult $y = \frac{x-1}{2}$ substitution.

This was one question where an ability to factorise a quadratic expression would have helped many candidates. A large number attempted to use the formula and sometimes could not simplify $\sqrt{576}$, another error that was seen using this approach was to call the solutions to their equation in y, $x = \ldots$ and this meant they lost the final two marks. There were only a few attempts that used "false squaring" namely $x^2 + 4y^2 = 1$ and the vast majority realized that simply "spotting" the solution (5, 2) did not constitute a full solution and therefore gained few marks.

6. This question was answered very well. Nearly all of the candidates managed to substitute correctly to get the correct quadratic, and most then found two values of one variable. Many also found the corresponding values of the other variable, though some candidates forgot to do the last step of finding the other values. A significant minority subtracted the original equations, but a number of these made errors or were unable to rearrange $x^2 - x = 12$.

7. Many candidates were able to produce fully correct solutions to this question. A small minority had difficulty in obtaining an equation in one variable, but apart from this, algebra was generally sound and mistakes were usually minor. Occasionally, having found values for x (or y), candidates failed to continue to find values for the other variable.

8. In part (a) of this question good sketches were usually drawn, but it was disappointing that many candidates had to resort to a table of values and that some did not use a ruler to draw the axes and the straight line graph. Where mistakes were made, it was surprisingly the straight line that caused more problems than the parabola. For part (b), many candidates gave only the coordinates of intersection with the x-axis, or failed to include zero coordinates in their answers. Even those who had difficulty with the sketch were often able to solve simultaneously in part (c), which was well done apart from occasional slips. A few candidates, referring back to their sketch, thought that only one intersection point was possible.

9. Although there were some excellent solutions to this question, it was for many candidates very demanding algebraically. Most were able to write down the co-ordinates of A in part (a), and then to attempt the elimination of either x or y to find an equation which should have led to the intersection points of the curve and the straight line. Algebraic mistakes were very common, and while some of these resulted in the loss of accuracy marks rather than method marks, that was not the case for mistakes such as $y^2 = 4x - 8 \Rightarrow y = \sqrt{4x-8} = \sqrt{4x} - \sqrt{8}$. Those candidates who sensibly started by finding a quadratic equation in y rather than x made the algebra easier for themselves and were generally more successful overall in the question.

It was not unusual for part (c) to be omitted, but for those who attempted it, methods using gradients and methods based on Pythagoras' theorem were equally popular. Those who found equations of AP and AQ did not always state the gradients explicitly, and some candidates failed to conclude their arguments.

10. Good marks were often scored in this question, the most popular method being to find x in terms of y ($x = 3y - 1$), then to form a quadratic equation in y. Although sign slips were common, methods were generally sound. Other approaches were seen occasionally, such as (a) finding y in terms of x (giving slightly more awkward manipulation), (b) first multiplying the linear equation by x, then subtracting, leading to $x = y^2 - 11$.

A few candidates, having solved a quadratic equation in y, thought that they had found x and substituted back incorrectly at the final stage.

11. The vast majority of candidates coped well with part (a), solving the equations simultaneously to find the correct coordinates of *A* and *B*. A few made it more difficult for themselves initially by finding a quadratic in *y* rather than *x*. Others simply used a table of values of *x* and *y* to find the intersection points.

The most popular method in part (b) was to find the area between the curve and the *x*-axis $\left(21\frac{2}{3}\right)$, and then to subtract this from the area of the trapezium, and many candidates completed this accurately to score full marks. Quite often the area of the trapezium was not considered at all, the answer being left as $21\frac{2}{3}$. Those who used integration to find the area under the straight line were more likely to make numerical mistakes. The alternative approach of subtracting first $(9-x)-(x^2-2x+3)$ and then integrating $(6+x-x^2)$ was sometimes used successfully, but was less than fully convincing when the initial subtraction was performed "the wrong way round". Occasionally *y* limits were wrongly used for the integration instead of *x* limits.

12. In part (a), most candidates were able to use $9 = 3$ to show convincingly that $x = 2y - 2$. Just a few used logarithms, usually correctly, to complete the proof. Part (b), however, proved to be a good test of algebraic competence. Forming an appropriate equation in *y* was the important step, and candidates who thought that $x = 2y - 2$ implied $x = 4y - 4$ (or similar) oversimplified the *y* equation to a two-term quadratic and limited themselves to a maximum of 2 marks.

Otherwise, apart from slips in expanding $(2y-2)$, many went on to achieve a fully correct solution. It was unfortunate, however, that some candidates solved the quadratic in *y* but gave their answers as values of *x*, substituting back to find "*y*". Others, having solved for *y*, omitted to find the corresponding values of *x*.

13. No Report available for this question.