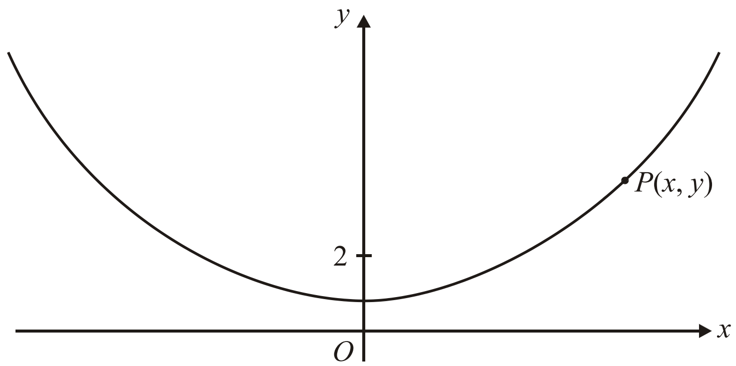
1.



The diagram shows a sketch of a curve.
The point $P(x, y)$ lies on the curve.
The locus of P has the following property:

> The distance of the point P from the point (0, 2) is the same as the distance of the point P from the x-axis.

Show that $y = \frac{1}{4}x^2 + 1$

(Total 4 marks)

2. (a) On the grid below, draw the graphs of

$$x^2 + y^2 = 100$$

and $$2y = 3x - 4$$

(3)

(b) Use the graphs to estimate the solutions of the simultaneous equations

$$x^2 + y^2 = 100$$

and $$2y = 3x - 4$$

....

....

(2)

For all the values of x

$$x^2 + 6x = (x + 3)^2 - q$$

(c) Find the value of q.

q = ...

(2)

One pair of integer values which satisfy the equation

$$x^2 + y^2 = 100$$

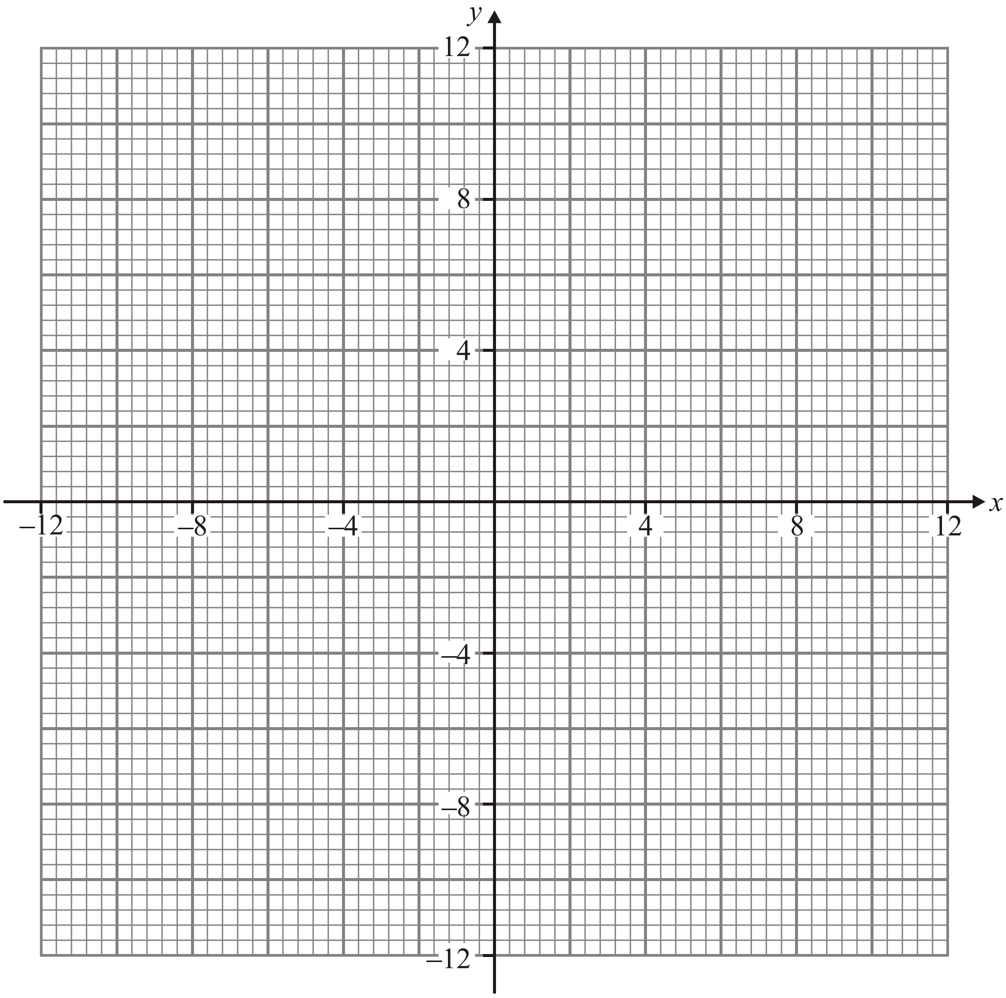
is $x = 6$ and $y = 8$

(d) Find one pair of integer values which satisfy

$$x^2 + 6x + y^2 - 4y - 87 = 0$$

$x =$ ...., $y =$ ....

(3)



(Total 10 marks)

1. Distance from x axis is y.

Distance from (0, 2) is $\sqrt{(x^2 + (y-2)^2)}$

$y^2 = x^2 + (y-2)^2$

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

$0 = x^2 - 4y + 4$

$4y = x^2 + 4$ and finish — 4

B1 for $(x-0)^2 + (y-2)^2$ *or* $\sqrt{((x-0)^2 + (y-2)^2)}$ *oe seen*

B1 for $y = \sqrt{(x-0)^2 + (y-2)^2}$

or $y^2 = (x-0)^2 + (y-2)^2$ *oe*

B1 $(y-2)^2 = y^2 - 4y + 4$ *seen*

B1 for $4y = x^2 + 4$ *and finish*

[4]

2. (a) Circle centre O Line — 3

B1 correct circle, within overlay

B2 correct line tol ± 1mm at (4, 4) and (0, –2)

(B1 for any straight line with the correct intercept on the y axis)

(b) $x = 6.4$,
$y = 7.7$
$x = -4.6$,
$y = -8.9$ — 2

B2 Two paired solutions, ft from a line and a curve with at least B1 scored in (a)

B1 Any two correct values, ft from a line and a curve with at least B1 scored in (a)

Tol ± 0.2

(c) $q = 9$ — 2

$(x + 3)^2 - 9$

B1 for $x^2 + 6x + 9$ *seen*

B1 for $q = 9$

(d) 3, 10 — 3

$(x + 3)^2 - 9 + (y - 2)^2 - 4 - 87 = 0$

$(x + 3)^2 + (y - 2)^2 = 100$

M1 for completing the square

A1 for $(y-2)^2 - 4$ *seen*

A1 any correct answer

[10]

1. This proved to be very difficult for the candidature. Most candidates if they did anything, substituted values into the equation and tried to show that they were on a curve which satisfied the description. Many candidates thought that this was a question about $y = mx + c$.

2. This was a long thematic question which most candidates were able to score some marks on.
Part (a) required the candidates to draw a circle and a straight line. The circle was rarely recognised and many candidates were unable to draw the straight line. A sizable minority of candidates 'simplified' the circle equation to
'$x + y = 10$'.
Part (b) required candidates to identify the point (s) of intersection of their graphs.
Part (c) was a standard completing the square and the success rate was pleasingly high. A few candidates found the value of q in the identity by substituting a value of x into the identity and then solving for q.
Part (d) was intended to follow the theme of completing the square and linking to the equation of a circle. Most candidates wisely ignored this idea and used their calculator to search out a suitable combination of values.