

## Lesson 5

## Simultaneous Equations : GCSE

### 5.1 Examination Style Questions

**The Question:** Solve the simultaneous equations

$$y = x^2$$

This a quadratic curve

$$y = 2x + 3$$

This is a straight line

**The Solution:** Using *the method of substitution*.

$$x^2 = 2x + 3$$

- Rearranging equations into the form  $f(x) = 0$

$$x^2 - 2x - 3 = 0$$

- Factorising quadratics

$$(x + 1) (x - 3) = 0$$

- Solving quadratic equations

$$\text{Either } x + 1 = 0 \text{ or } x - 3 = 0$$

$$x = -1 \text{ or } x = 3$$

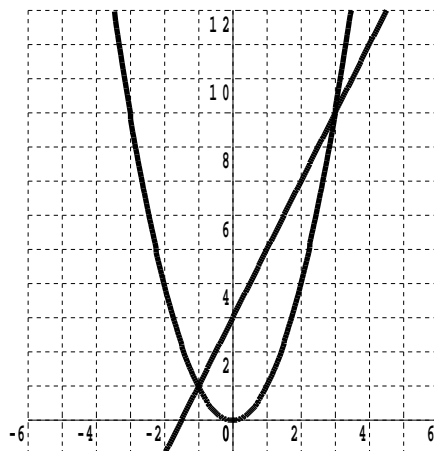
But this is not the final answer !

The final answer is the points where the straight line intersects the quadratic curve.  
Use the equation of the line  $y = 2x + 3$  with  $x$  is 2 and then with  $x$  is 3 to get,

$$\text{The Final Solutions : } (-1, 1) \text{ or } (3, 9)$$

### 5.2 Understanding What Has Been Achieved

On the graph below, the quadratic curve  $y = x^2$  has been plotted.  
So too, has the straight line,  $y = 2x + 3$



The line meets the curve at  $(-1, 1)$  and also at  $(3, 9)$  !

### 5.3 Exercise

Use the method of substitution to obtain a quadratic equation in the single variable,  $x$ . Solve your equation, and find the possible pairs of values for  $x$  and  $y$ .

(i)  $y = x^2$   
 $y = 8x - 12$

(ii)  $y = x^2$   
 $y = 11x - 28$

(iii)  $y = x^2$   
 $y = 2x + 24$

(iv)  $y = x^2 + 10$   
 $y = 4 - 7x$

$$\begin{aligned} \text{(v)} \quad y &= x^2 - 14 \\ y &= 2x + 21 \end{aligned}$$

$$\begin{aligned} \text{(vi)} \quad y &= x^2 + 3 \\ y &= 30 - 6x \end{aligned}$$

$$\begin{aligned} \text{(vii)} \quad y &= x^2 + 2x \\ y &= 5x + 28 \end{aligned}$$

$$\begin{aligned} \text{(viii)} \quad y &= x^2 - 4x + 2 \\ y &= 7x - 8 \end{aligned}$$

(ix)  $y = x^2 + 3x - 10$   
 $y = 4x + 20$

(x)  $y = x^2$   
 $y = 7x - 12$

#### 5.4 Examination Question

*GCSE, November 2006, paper 3H, Q18*

Solve the simultaneous equations

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

[ 5 marks ]