

## Lesson 5

### GCSE Mathematics Simultaneous Equations III

#### 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

$$\text{Either } x + 2 = 0 \text{ or } x - 3 = 0$$

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

But this is not the final answer !

The final answer is the points where the straight line intersects the quadratic curve.

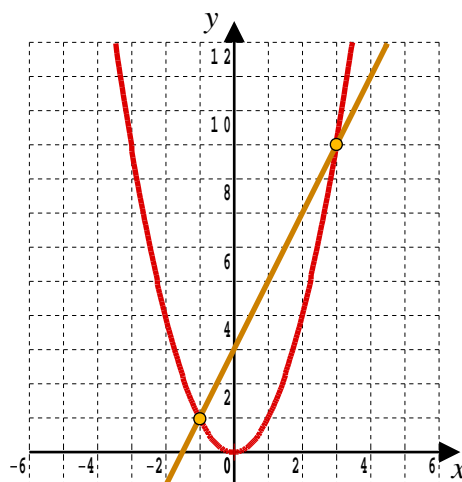
Use the equation of the line  $y = 2x + 3$  with  $x$  is 2 and then with  $x$  is 3 to get,

The Final Solutions :  $(-1, 1)$  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  $(3, 9)$ .

(Thus verifying, geometrically, the answers previously obtained algebraically)

### 5.3 Exercise

#### Question 1

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

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

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

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

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

$$\begin{aligned} \text{( ix ) } \quad y &= x^2 + 3x - 10 \\ y &= 4x + 20 \end{aligned}$$

$$\begin{aligned} \text{( x ) } \quad y &= x^2 \\ y &= 7x - 12 \end{aligned}$$

#### 5.4 Examination Question

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

Solve the simultaneous equations

$$\begin{aligned} y &= x^2 \\ y &= 2x + 15 \end{aligned}$$

[ 5 marks ]

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Teachers may obtain detailed worked solutions to the exercises by email from [MHHShrewsbury@Gmail.com](mailto:MHHShrewsbury@Gmail.com)

(Exercise 5.3 by JCA, Question 5.4 by Edexcel)