

# Mathematics

**Subject level** A-level

**Resource site** [www.wqe.ac.uk/tasteractivities](http://www.wqe.ac.uk/tasteractivities)

**Teacher** Gill Cooper

**Subject context** Algebra: to be successful at A level maths you need to have good algebra skills. This activity involves multiplying out brackets, factorising quadratics and proof.

**Estimated time required to complete activity** Approximately 2 hours

**Resources required** Pen and paper

**Assignment details** **Step 1**  
Write down three different integers between -4 and 4 inclusive, but not 0

**Step 2**  
Replace the squares below with your three numbers in any order.

$$(x + \square) (\square x + \square)$$

**Step 3**  
Expand and simplify your brackets.

**Step 4**  
List, the different ways that you can rearrange your three numbers.  
How many different ways are there?

**Step 5**  
For each possible arrangement repeat steps 2 and 3.  
List your results.

**Step 6**

Add up all your quadratics (including the first one) and simplify your answer.

### **Step 7**

Now factorise your answer to Step 6

### **Step 8**

What do you notice?

Compare your result to the example below, what do you notice?

### **Example:**

So what would a typical attempt at this look like? Suppose I choose the numbers 2, 3 and 4.

$$\begin{aligned}(x + 2)(3x + 4) &= 3x^2 + 10x + 8 \\(x + 2)(4x + 3) &= 4x^2 + 11x + 6 \\(x + 3)(2x + 4) &= 2x^2 + 10x + 12 \\(x + 3)(4x + 2) &= 4x^2 + 14x + 6 \\(x + 4)(3x + 2) &= 3x^2 + 14x + 8 \\(x + 4)(2x + 3) &= 2x^2 + 11x + 12\end{aligned}$$

Adding the right hand sides gives  $18x^2 + 70x + 52$ ,  
which is  $2(9x + 26)(x + 1)$ .

### **Investigation**

Does it matter what the starting list of numbers is?

Can you make any conjectures?

Can you prove them?

**Hint:** start with

$$(x + \boxed{a}) (\boxed{b}x + \boxed{c})$$

and follow the same steps 1 to 8.

Can you prove your theory?

**More A-level  
Mathematics  
preparation  
work**

Hegarty maths has lessons reviewing the topics from GCSE maths that will help prepare you to be successful with A level maths.

[https://www.youtube.com/watch?v=ziMiuyyQKNE&list=PLxHVbxbhSvleR5tntP2FxyBJCoY5-pD\\_Z8](https://www.youtube.com/watch?v=ziMiuyyQKNE&list=PLxHVbxbhSvleR5tntP2FxyBJCoY5-pD_Z8)