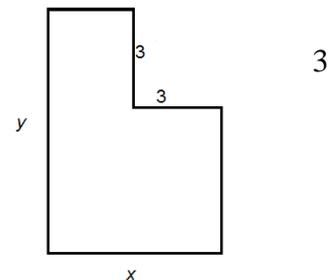# AQA Level 2 Further Mathematics Algebra IV

Section 3: The factor theorem

Exercise

1. (i) Show that $x + 1$ is a factor of $x^3 - 4x^2 + x + 6$.
   (ii) Hence factorise $x^3 - 4x^2 + x + 6$. completely.

2. $x - 2$ is a factor of the polynomial $x^3 + ax^2 - 4x + 12$.
   (i) Find the value of a.
   (ii) Factorise the polynomial completely.

3. Solve the equations
   (i) $x^3 - 2x^2 - 11x + 12 = 0$
   (ii) $x^3 + 4x^2 - 3x - 18 = 0$
   (iii) $x^3 - 19x - 30 = 0$

4. (i) Show that $(2x + 3)$ is a factor of $f(x) = 2x^3 + 5x^2 + 5x + 3$.
   (ii) Hence show that $2x^3 + 5x^2 + 5x + 3 = 0$ has only one real root.

5. (i) Show that neither $(x - 1)$ nor $(x + 1)$ are factors of $f(x) = 12x^3 - 4x^2 - 3x + 1$.
   (ii) Explain how you know that $12x^3 - 4x^2 - 3x + 1 = 0$ does not have any roots that are integers.
   (iii) Show that $(2x - 1)$ is a factor of $f(x)$.
   (iv) Solve the equation $12x^3 - 4x^2 - 3x + 1 = 0$.

6. Bob factorises $x^3 - 4x^2 - 7x + 10$ and gets $(x - 1)(x - 2)(x + 5)$.
   Explain how you know that Bob is wrong.

7. A rectangle with length x cm and width y cm has a square cm by 3 cm removed from a corner to leave an L shape.
   The area of the L shape is 15 cm^2.
   The perimeter of the L shape is 20 cm.

   Find the values of x and y.