

## Monster Equations

1. Solve the quadratic equation  $x^2 - 4x - 21 = 0$ . How many ways do you know how to do it?
2. Solve the quartic equation  $x^4 - 13x^2 + 36 = 0$ .
3. Find the dimensions of a rectangle
  - (a) ... whose perimeter is 10 meters and whose area is 6 meters<sup>2</sup>.
  - (b) ... whose perimeter is 10 meters and whose area is 8 meters<sup>2</sup>.
4. Can you find a rectangle such that ...
  - (a) ... the perimeter is an irrational number but the area is a rational number?
  - (b) ... the perimeter is a rational number but the area is an irrational number?
5. Solve the following equations for  $u$  and  $v$ :
  - (a) 
$$\begin{cases} u + v = -2 \\ uv = 1 \end{cases}$$
  - (b) 
$$\begin{cases} u + v = 7 \\ uv = -30 \end{cases}$$
  - (c) 
$$\begin{cases} u + v = -10 \\ uv = -651 \end{cases}$$
6. Find the sum of all numbers  $y$  which satisfy  $y^2 + 24y + 2 = 0$ .
7. Find the sum of all numbers  $y$  which satisfy  $y^2 + 14y + 49 = 0$ .
8. What happens when you substitute  $x = s - 3$  into the expression  $x^2 + 6x - 13$ ?  
What happens when you substitute  $x = t - \frac{b}{2a}$  into the expression  $ax^2 + bx + c$ ?
9. Express each of the following quantities in terms of  $x + y$  and  $xy$ :
  - $x^2 + y^2 =$
  - $x^3 + y^3 =$
10. Find a quadratic polynomial whose roots are the squares of the roots of  $x^2 - 5x + 45$ .