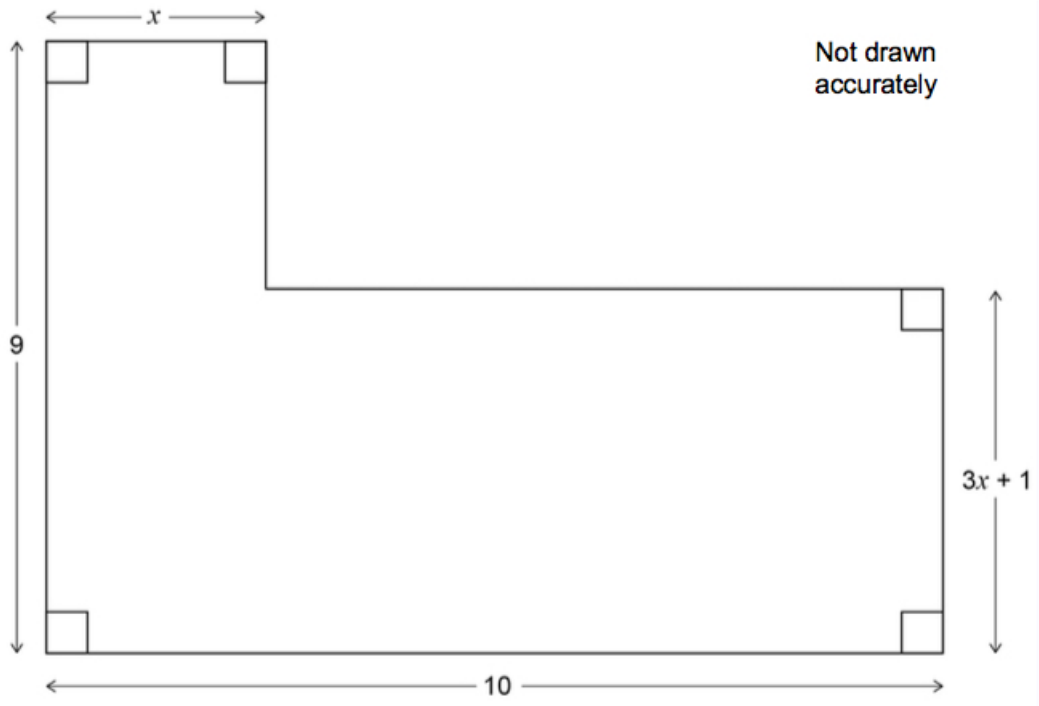
Dr Oliver Mathematics
Worked Examples
Quadratic Equation 1

From: AQA GCSE Mathematics June 2017 Paper 3 (Calculator)

1. Here is an L-shape. (6)
   All dimensions are in centimetres.



The area of the L-shape is 65 cm^2.

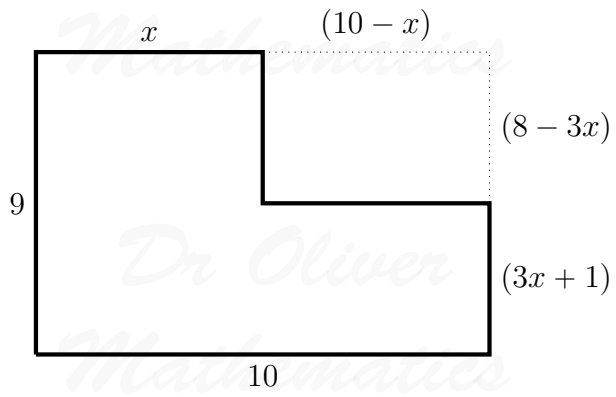
Work out the value of x.

Solution

Now,

$$9 - (3x + 1) = 8 - 3x$$

and so we have



Well,

$$\begin{aligned}
& \text{big rectangle} - \text{small rectangle} = 65 \\
\Rightarrow\quad & (10 \times 9) - [(10 - x) \times (8 - 3x)] = 65 \\
\Rightarrow\quad & 90 - (10 - x)(8 - 3x) = 65
\end{aligned}$$

$\times$	10	$-x$
8	80	$-8x$
$-3x$	$-30x$	$+3x^2$

$$\begin{aligned}
\Rightarrow\quad & 90 - (80 - 38x + 3x^2) = 65 \\
\Rightarrow\quad & 10 + 38x - 3x^2 = 65 \\
\Rightarrow\quad & 3x^2 - 38x + 55 = 0
\end{aligned}$$

add to: -38
multiply to: $(+3) \times (+55) = +165$ $\Big\}$ $-33,\ -5$

e.g.,

$$\begin{aligned}
\Rightarrow\quad & 3x^2 - 33x - 5x + 55 = 0 \\
\Rightarrow\quad & 3x(x - 11) - 5(x - 11) = 0 \\
\Rightarrow\quad & (3x - 5)(x - 11) = 0 \\
\Rightarrow\quad & 3x - 5 = 0 \text{ or } x - 11 = 0 \\
\Rightarrow\quad & x = 1\tfrac{2}{3} \text{ or } x = 11.
\end{aligned}$$

Clearly, $x \neq 11$ (why? hint: it is less than 10 ...) and so

$$\underline{\underline{x = 1\tfrac{2}{3}}}.$$