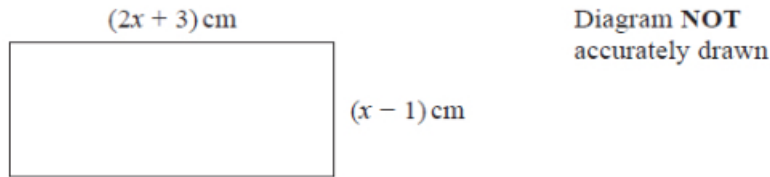# Dr Oliver Mathematics
Worked Examples
Quadratic Inequality 2

From: Edexcel GCSE Mathematics (9-1) Practice Tests Set 19: Paper 2H/3H (Calculator)

1. Here is a rectangle. (5)

$(2x + 3)$ cm

Diagram **NOT**
accurately drawn

$(x - 1)$ cm

Given that the area of the rectangle is less than 75 cm^2, find the range of possible values of x.

Solution

Well, we want the product of the linear dimensions to be less than 75:

$\times$	$2x$	$+3$
x	$2x^2$	$+3x$
-1	$-2x$	-3

So,

$$(2x + 3)(x - 1) < 75 \Rightarrow 2x^2 + x - 3 < 75$$
$$\Rightarrow 2x^2 + x - 78 < 0$$

$$\left.\begin{array}{l} \text{add to:} \qquad\qquad +1 \\ \text{multiply to:} \quad (+2) \times (-78) = -156 \end{array}\right\} - 12, \ +13$$

$$\Rightarrow 2x^2 - 12x + 13x - 78 < 0$$
$$\Rightarrow 2x(x - 6) + 13(x - 6) < 0$$
$$\Rightarrow (2x + 13)(x - 6) < 0.$$

Now, *if* $(2x+13)(x-6) = 0$ — it isn't, but trust me,

$$(2x+13)(x-6) = 0 \Rightarrow 2x + 13 = 0 \text{ or } x - 6 = 0$$
$$\Rightarrow x = -6\tfrac{1}{2} \text{ or } x = 6.$$

We now do a 'table of signs':

	$x < -6\tfrac{1}{2}$	$x = -6\tfrac{1}{2}$	$-6\tfrac{1}{2} < x < 6$	$x = 6$	$x > 6$
$2x + 3$	$-$	0	$+$	$+$	$+$
$x - 1$	$-$	$-$	$-$	0	$+$
$(2x+1)(x-3)$	$+$	0	$-$	0	$+$

Clearly,
$$-6\tfrac{1}{2} < x < 6.$$

Well, hold on! We need
$$2x + 3 > 0 \text{ and } x - 1 > 0.$$

There is no problem with the former one but the latter one?

$$x - 1 > 0 \Rightarrow x > 1.$$

Hence,
$$\underline{\underline{1 < x < 6}}.$$