Exercise WS4.1

1. Expand (= multiply out) the following:

(a) $(x+4)(x-1)$

(b) $(x+5)(x-5)$

(c) $(\frac{1}{4}x+\frac{1}{8})(3x-5)$

2. Explain with the aid of a diagram why $(x+a)(x-a)=x^2-a^2$. (Hint: Start by drawing a rectangle with one side of length x and the other of length $x + a$.)

Exercise WS4.2

By trial and error, solve the following quadratic equations (where possible). Then check your answers by solving them using the formula.

(a) $x^2+5x+6=0$

(b) $x^2-x-6=0$

(c) $x^2+\frac{3}{8}x+\frac{1}{32}=0$

(d) $6x^2+25x-9=0$

(e) $x^2+14x+49=0$

Exercise WS4.3

1. Sketch the graphs of the following quadratic functions. (Hint: it may help if you factorise them.) Take values of x between –5 and +5.

(a) $y=x^2-4x-5$

(b) $y=x^2+\frac{2}{5}x-\frac{1}{20}$

(c) $y=2x^2+7x-4$

2. Use your graphs from question 1 to find approximate solutions to the following quadratic equations, where possible. Then check your answers by factorisation or by applying the formula.

(a) $x^2 - 4x - 5 = 0$

(b) $x^2 + \frac{2}{5}x - \frac{1}{20} = 0$

(c) $2x^2 + 7x - 4 = 0$

3. You are given the following information about a quadratic function $y = ax^2 + bx + c$. Find *b* and *c* and sketch the graph.

a = 1; *y* = 0 when *x* = –1 or 3.

4. Given the quadratic function $y = ax^2 + bx + c$, show that the quadratic equation $ax^2 + bx + c = 0$ has no real roots if *b* = 0 and *a* and *c* have the same sign.

5. A quadratic function $y = ax^2 + bx + c$ has the following properties: a = –2, and *y* = 0 when *x* = 4 (and at no other point). Find *a*, *b* and *c*. Sketch the graph, taking *x* from 0 to 10.

Exercise WS4.4

1. Solve the following simultaneous equations, and draw sketch graphs of the functions, indicating your solution.

$y = x^2 + x - 9$; $y = -x^2 - 2x + 81$

2. Given the following supply and demand functions for a good, (i) find the equilibrium price and quantity. (ii) Draw sketch graphs of the functions, indicating your solution:

(a) $q^S = p^2 + 4p + 8$; $q^D = -0.5p + 21$

(b) $q^S = p^2 + p - 7$; $q^D = -2p + 81$

3. Given the following inverse supply and demand functions for a good, find the equilibrium price and quantity, and draw sketch graphs of the functions, indicating your solution:

$$p^S = 2q + 1 \quad ; \quad p^D = -q^2 + 4$$