IGCSE
Chapter 13
Quadratic equations

Solving quadratic equations by factorizing

Example 1:

$x^2 - 3x - 10 = 0$ is a quadratic equation.

$(x - 5)(x + 2) = 0$

$x - 5 = 0$ $\qquad$ $x + 2 = 0$

$x = 5$ $\qquad$ $x = -2$

Example 2: $x^2 - x - 12 = 0$

$(x - 4)(x + 3) = 0$

$x - 4 = 0$ $\qquad$ $x + 3 = 0$

$x = 4$ $\qquad$ $x = -3$

Example 3: $x^2 + 2x = 24$ $\qquad$ $x^2 + 2x - 24 = 0$

$(x + 6)(x - 4) = 0$

$x + 6 = 0$ $\qquad$ $x - 4 = 0$

$x = -6$ $\qquad$ $x = 4$

Example 2: $x^2 - 6x = 0$

$x(x - 6) = 0$

$x = 0$ $\qquad$ $x - 6 = 0$

$x = 0$ $\qquad$ $x = 6$

Example 3: $x^2 - 4 = 0$

$(x + 2)(x - 2) = 0$

$x + 2 = 0$ $\qquad$ $x - 2 = 0$

$x = -2$ $\qquad$ $x = 2$

Exercise 13.7

Solve the following quadratic equations by factorising:

1 **a** $x^2 + 7x + 12 = 0$ **b** $x^2 + 8x + 12 = 0$
c $x^2 + 13x + 12 = 0$ **d** $x^2 - 7x + 10 = 0$
e $x^2 - 5x + 6 = 0$ **f** $x^2 - 6x + 8 = 0$

2 **a** $x^2 + 3x - 10 = 0$ **b** $x^2 - 3x - 10 = 0$
c $x^2 + 5x - 14 = 0$ **d** $x^2 - 5x - 14 = 0$
e $x^2 + 2x - 15 = 0$ **f** $x^2 - 2x - 15 = 0$

3 **a** $x^2 + 5x = -6$ **b** $x^2 + 6x = -9$
c $x^2 + 11x = -24$ **d** $x^2 - 10x = -24$
e $x^2 + x = 12$ **f** $x^2 - 4x = 12$

4 **a** $x^2 - 2x = 8$ **b** $x^2 - x = 20$
c $x^2 + x = 30$ **d** $x^2 - x = 42$
e $x^2 - 2x = 63$ **f** $x^2 + 3x = 54$

Exercise 13.8

Solve the following quadratic equations:

1 **a** $x^2 - 9 = 0$ **b** $x^2 - 16 = 0$
c $x^2 = 25$ **d** $x^2 = 121$
e $x^2 - 144 = 0$ **f** $x^2 - 220 = 5$

2 **a** $4x^2 - 25 = 0$ **b** $9x^2 - 36 = 0$
c $25x^2 = 64$ **d** $x^2 = \frac{1}{4}$
e $x^2 - \frac{1}{9} = 0$ **f** $16x^2 - \frac{1}{25} = 0$

3 **a** $x^2 + 5x + 4 = 0$ **b** $x^2 + 7x + 10 = 0$
c $x^2 + 6x + 8 = 0$ **d** $x^2 - 6x + 8 = 0$
e $x^2 - 7x + 10 = 0$ **f** $x^2 + 2x - 8 = 0$

4 **a** $x^2 - 3x - 10 = 0$ **b** $x^2 + 3x - 10 = 0$
c $x^2 - 3x - 18 = 0$ **d** $x^2 + 3x - 18 = 0$
e $x^2 - 2x - 24 = 0$ **f** $x^2 - 2x - 48 = 0$

5 **a** $x^2 + x = 12$ **b** $x^2 + 8x = -12$
c $x^2 + 5x = 36$ **d** $x^2 + 2x = -1$
e $x^2 + 4x = -4$ **f** $x^2 + 17x = -72$

6 **a** $x^2 - 8x = 0$ **b** $x^2 - 7x = 0$
c $x^2 + 3x = 0$ **d** $x^2 + 4x = 0$
e $x^2 - 9x = 0$ **f** $4x^2 - 16x = 0$

7 **a** $2x^2 + 5x + 3 = 0$ **b** $2x^2 - 3x - 5 = 0$
c $3x^2 + 2x - 1 = 0$ **d** $2x^2 + 11x + 5 = 0$
e $2x^2 - 13x + 15 = 0$ **f** $12x^2 + 10x - 8 = 0$

8 **a** $x^2 + 12x = 0$ **b** $x^2 + 12x + 27 = 0$
c $x^2 + 4x = 32$ **d** $x^2 + 5x = 14$
e $2x^2 = 72$ **f** $3x^2 - 12 = 288$

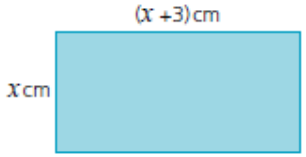
Exercise 13.9

In the following questions, construct equations from the information given and then solve to find the unknown.

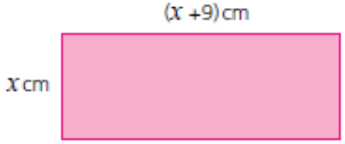
1 When a number x is added to its square, the total is 12. Find two possible values for x.

2 A number x is equal to its own square minus 42. Find two possible values for x.

3 If the area of the rectangle (below) is $10\,cm^2$, calculate the only possible value for x.



4 If the area of the rectangle (below) is $52\,cm^2$, calculate the only possible value for x.



5 A triangle has a base length of $2x$ cm and a height of $(x - 3)$ cm. If its area is $18\,cm^2$, calculate its height and base length.

6 A triangle has a base length of $(x - 8)$ cm and a height of $2x$ cm. If its area is $20\,cm^2$, calculate its height and base length.

7 A right-angled triangle has a base length of x cm and $(x - 1)$ cm. If its area is $15\,cm^2$, calculate the base leng

8 A rectangular garden has a square flower bed of side length x m in one of its corners. The remainder of the garden consists of lawn and has dimensions as shown (below). If the total area of the lawn is $50\,m^2$:

a form an equation in terms of x,

b solve the equation,

c calculate the length and width of the whole garden.