Topic assessment

1. Solve each of the following quadratic equations, if possible, giving answers in exact form.
   (i) $2x^2 - x - 3 = 0$
   (ii) $3x^2 - 2x + 4 = 0$
   (iii) $x^2 + 5x - 1 = 0$ [5]

2. (i) Write the quadratic expression $x^2 + 4x + 5$ in the form $A(x+B)^2 + C$. [2]
   (ii) Find the discriminant of the quadratic equation $x^2 + 4x + 5 = 0$. [2]
   (iii) What does the value of this discriminant tell you about the roots of the equation $x^2 + 4x + 5 = 0$? [1]
   (iv) Sketch the graph of $y = x^2 + 4x + 5$, showing the coordinates of the turning point and any points where the curve crosses the coordinate axes. [3]

3. (i) By factorising, solve the equation $2x^2 + x - 6 = 0$. [2]
   (ii) Sketch the graph of $y = 2x^2 + x - 6$, showing the coordinates of any points where the graph cuts the coordinate axes. [3]

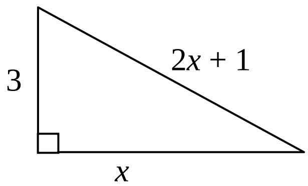
4. The quadratic equation $2x^2 + 5x + k = 0$ has equal roots.
   (i) Find the value of *k*. [3]
   (ii) Solve the equation $2x^2 + 5x + k = 0$. [2]

5. (i) Write the expression $2x^2 + 2x - 1$ in the form $a(x+p)^2 + q$. [3]
   (ii) Hence, or otherwise, solve the equation $2x^2 + 2x - 1 = 0$. [2]

6. Sketch the graph of $y = 12 + 4x - x^2$, showing the coordinates of any points where the graph cuts the coordinate axes. [4]

7. Solve these equations, giving your answers in exact form.
   (i) $x^{\frac{2}{3}} + x^{\frac{1}{3}} - 6 = 0$ [4]
   (ii) $x^4 + 3x^2 - 10 = 0$ [4]

8. The diagram shows a right-angled triangle. Find the value of *x*, correct to 3 s.f. [4]



9. Amy throws a ball so that when it is at its highest point, it passes through a hoop. The path of the ball is modelled by the equation $y = h + kx - \frac{1}{2}x^2$, where *y* is the height of the ball above the ground and *x* is the horizontal distance from the point at which the ball was thrown. The centre of the hoop is at the point where $x = 2$ and $y = 5$.
   Find the values of *h* and *k*, and find the value of *x* at which the ball hits the ground. [6]

Total 50 marks