Higher : Quadratic Theory   Revision
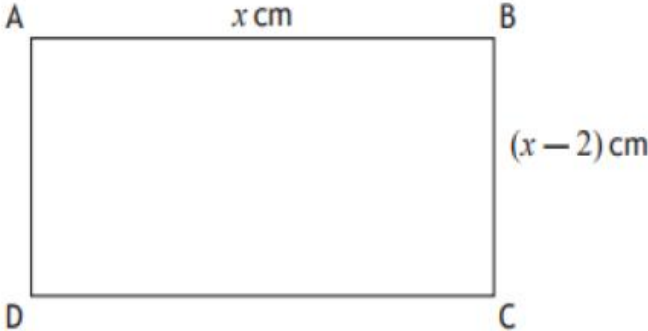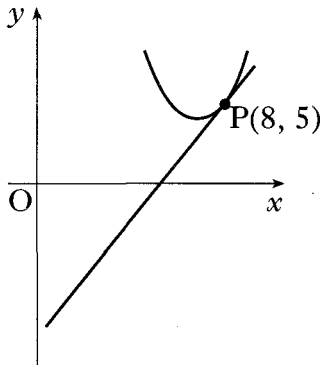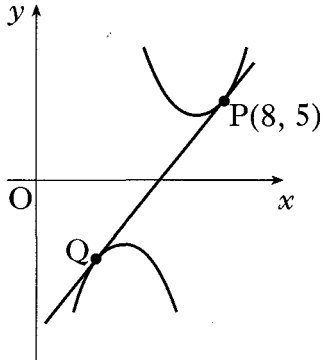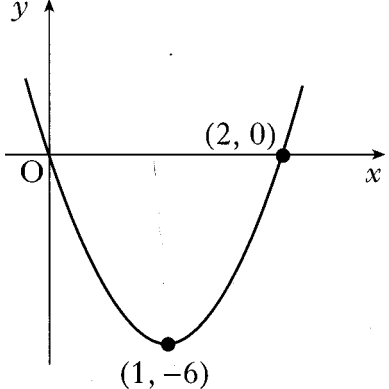
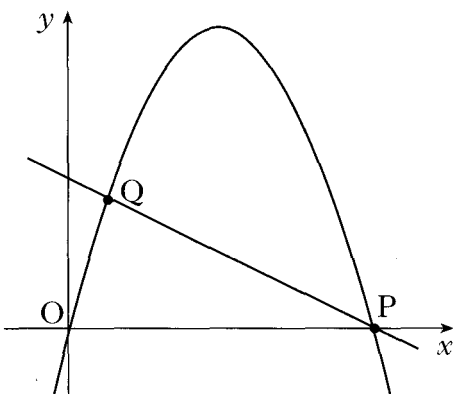|		
2018 P2 Q4	Express $-3x^2 - 6x + 7$ in the form $a(x+b)^2 + c$.	3
2018 P2 Q10	The equation $x^2 + (m-3)x + m = 0$ has two real and distinct roots. Determine the range of values for m.	4
2017 P1 Q4	Find the value of k for which the equation $x^2 + 4x + (k-5) = 0$ has equal roots.	3
2017 P2 Q4	(a) Express $3x^2 + 24x + 50$ in the form $a(x+b)^2 + c$.	3
2016 P2 Q2	Find the range of values for p such that $x^2 - 2x + 3 - p = 0$ has no real roots.	

2015 P1 Q 8	ABCD is a rectangle with sides of lengths x centimetres and $(x-2)$ centimetres, as shown. $\quad$ A $\qquad\qquad x$ cm $\qquad\qquad$ B $\qquad\qquad\qquad\qquad\qquad\qquad (x-2)$ cm $\quad$ D $\qquad\qquad\qquad\qquad\qquad$ C If the area of ABCD is less than $15\,\text{cm}^2$, determine the range of possible values of x.	4
2014 P1 Q17	$3x^2 + 12x + 17$ is expressed in the form $3(x+p)^2 + q$. What is the value of q?	2
2013 P1 Q21	Express $2x^2 + 12x + 1$ in the form $a(x+b)^2 + c$.	3
2012 P1 Q3	If $x^2 - 6x + 14$ is written in the form $(x-p)^2 + q$, what is the value of q?	2
2012 P1 Q19	Solve $6 - x - x^2 < 0$.	2
2011 P1 Q5	If $x^2 - 8x + 7$ is written in the form $(x-p)^2 + q$, what is the value of q?	2

2010 P1 Q18	What is the solution of $x^2 + 4x > 0$, where x is a real number?	2
2010 P1 Q6	The roots of the equation $kx^2 - 3x + 2 = 0$ are equal. What is the value of k?	2
2009 P1 Q19	For what values of x is $6 + x - x^2 < 0$?	2
2008 P1 Q16	$2x^2 + 4x + 7$ is expressed in the form $2(x + p)^2 + q$. What is the value of q?	2

2007 P1	4. Find the range of values of k such that the equation $kx^2 - x - 1 = 0$ has no real roots.	4
2006 P1	8. (a) Express $2x^2 + 4x - 3$ in the form $a(x + b)^2 + c$. (b) Write down the coordinates of the turning point on the parabola with equation $y = 2x^2 + 4x - 3$.	3 1
2006 P2	2. Find the value of k such that the equation $kx^2 + kx + 6 = 0$, $k \neq 0$, has equal roots.	4

3. The parabola with equation $y = x^2 - 14x + 53$ has a tangent at the point P(8, 5).

(*a*) Find the equation of this tangent.

4

(*b*) Show that the tangent found in (*a*) is also a tangent to the parabola with equation $y = -x^2 + 10x - 27$ and find the coordinates of the point of contact Q.

5

8. (*a*) Write $x^2 - 10x + 27$ in the form $(x + b)^2 + c$.

2

(*b*) Hence show that the function $g(x) = \frac{1}{3}x^3 - 5x^2 + 27x - 2$ is always increasing.

4

11. The diagram shows a parabola passing through the points (0, 0), (1, −6) and (2, 0).

(*a*) The equation of the parabola is of the form $y = ax(x - b)$.

Find the values of a and b.

3

3. Prove that the roots of the equation $2x^2 + px - 3 = 0$ are real for all values of p.

4

2. (*a*) Write $f(x) = x^2 + 6x + 11$ in the form $(x + a)^2 + b$.

2

(*b*) Hence or otherwise sketch the graph of $y = f(x)$.

2

2003 P1	**7.** Show that the line with equation $y = 2x + 1$ does not intersect the parabola with equation $y = x^2 + 3x + 4$.	5
2002W P2	**6.** The graph of $f(x) = 2x^3 - 5x^2 - 3x + 1$ has been sketched in the diagram shown. Find the value of a correct to one decimal place. 	3
2002 P1	**7.** (*a*) Express $f(x) = x^2 - 4x + 5$ in the form $f(x) = (x - a)^2 + b$.	2
2002 P2	**9.** Show that the equation $(1 - 2k)x^2 - 5kx - 2k = 0$ has real roots for all integer values of k.	5
2001 P1	**2.** For what value of k does the equation $x^2 - 5x + (k + 6) = 0$ have equal roots?	3
2001 P1	**4.** Given $f(x) = x^2 + 2x - 8$, express $f(x)$ in the form $(x + a)^2 - b$.	2
2001 P2	**11.** The diagram shows a sketch of a parabola passing through (−1, 0), $(0, p)$ and $(p, 0)$. (*a*) Show that the equation of the parabola is $y = p + (p - 1)x - x^2$. (*b*) For what value of p will the line $y = x + p$ be a tangent to this curve? 	3 3
2000 P2	**4.** The parabola shown crosses the x-axis at (0, 0) and (4, 0), and has a maximum at (2, 4). The shaded area is bounded by the parabola, the x-axis and the lines $x = 2$ and $x = k$. (*a*) Find the equation of the parabola. 	2

1. The parabola shown in the diagram has equation $y = 4x - x^2$ and intersects the x-axis at the origin and P.

The line PQ has equation $2y + x = 4$.

Find the coordinates of P and Q.

5

3. (*a*) Show that the function $f(x) = 2x^2 + 8x - 3$ can be written in the form $f(x) = a(x + b)^2 + c$ where a, b and c are constants.

3

(*b*) Hence, or otherwise, find the coordinates of the turning point of the function f.

1

8. The roots of the equation $(x - 1)(x + k) = -4$ are equal.

Find the values of k.

5