



Higher Mathematics

Quadratics - Questions

Marks are indicated in brackets after each question number

2013 Paper 1 Question 3, (2)

Calculate the discriminant of the quadratic equation $2x^2 + 4x + 5 = 0$.

2013 Paper 1 Question 19, (2)

Solve $1 - 2x - 3x^2 > 0$, where x is a real number.

2013 Paper 1 Question 21, (3)

Express $2x^2 + 12x + 1$ in the form $a(x + b)^2 + c$.

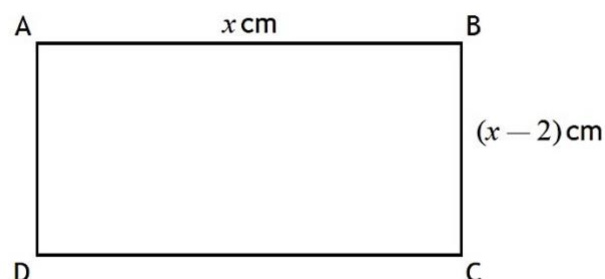
2014 Paper 1 Question 17, (2)

$3x^2 + 12x + 17$ is expressed in the form $3(x + p)^2 + q$.

What is the value of q ?

2015 Paper 1 Question 8, (4)

ABCD is a rectangle with sides of lengths x centimetres and $(x - 2)$ centimetres, as shown.



If the area of ABCD is less than 15 cm^2 , determine the range of possible values of x .



2015 Paper 1 Question 11, (4) (6)

$T(-2, -5)$ lies on the circumference of the circle with equation

$$(x + 8)^2 + (y + 2)^2 = 45.$$

- (a) Find the equation of the tangent to the circle passing through T .
- (b) This tangent is also a tangent to a parabola with equation $y = -2x^2 + px + 1 - p$, where $p > 3$.
Determine the value of p .

2016 Paper 1 Question 12, (2) (3)

The functions f and g are defined on $\mathbb{R}$, the set of real numbers by

$$f(x) = 2x^2 - 4x + 5 \text{ and } g(x) = 3 - x.$$

- (a) Given $h(x) = f(g(x))$, show that $h(x) = 2x^2 - 8x + 11$.
- (b) Express $h(x)$ in the form $p(x + q)^2 + r$.

2016 Paper 2 Question 2, (3)

Find the range of values for p such that $x^2 - 2x + 3 - p = 0$ has no real roots.

2017 Paper 1 Question 4, (3)

Find the value of k for which the equation $x^2 + 4x + (k - 5) = 0$ has equal roots.

2017 Paper 2 Question 4, (3) (2) (2)

- (a) Express $3x^2 + 24x + 50$ in the form $a(x + b)^2 + c$.
- (b) Given that $f(x) = x^3 + 12x^2 + 50x - 11$, find $f'(x)$.
- (c) Hence, or otherwise, explain why the curve with equation $y = f(x)$ is strictly increasing for all values of x .



2018 Paper 2 Question 4, (3)

Express $-3x^2 - 6x + 7$ in the form $a(x+b)^2 + c$.

2018 Paper 2 Question 10, (4)

The equation $x^2 + (m-3)x + m = 0$ has two real and distinct roots.

Determine the range of values for m .

2019 Paper 1 Question 2, (3)

The equation $x^2 + (k-5)x + 1 = 0$ has equal roots.

Determine the possible values of k .

2019 Paper 2 Question 7, (3) (3)

(a) Express $-6x^2 + 24x - 25$ in the form $p(x+q)^2 + r$.

(b) Given that $f(x) = -2x^3 + 12x^2 - 25x + 9$,
show that $f(x)$ is strictly decreasing for all $x \in \mathbb{R}$.

2022 Paper 1 Question 11, (3)

Express $2x^2 + 12x + 23$ in the form $p(x+q)^2 + r$.

2022 Paper 2 Question 2, (3)

The equation $2x^2 - 8x + (4-p) = 0$ has two real and distinct roots.

Determine the range of values for p .



2022 Paper 2 Question 5, (2) (1) (4)

Functions f and g are given by $f(x) = x^2 - 2$ and $g(x) = 3x + 5$, $x \in \mathbb{R}$.

(a) Find expressions for:

(i) $f(g(x))$ and

(ii) $g(f(x))$.

(b) Determine the range of values of x for which $f(g(x)) < g(f(x))$.

2023 Paper 1 Question 5, (3)

The equation $2x^2 + (3p - 2)x + p = 0$ has equal roots.

Determine the possible values of p .

2023 Paper 1 Question 12, (3)

Express $-2x^2 - 12x + 7$ in the form $a(x + b)^2 + c$.

2024 Paper 1 Question 8, (4)

The equation $x^2 + (m - 4)x + (2m - 3) = 0$ has no real roots.

Determine the range of values for m .

Justify your answer.

2025 Paper 1 Question 11, (4)

The equation $9x^2 + 3kx + k = 0$ has two real and distinct roots.

Determine the range of values for k .

Justify your answer.

2025 Paper 2 Question 2, (3)

Express $2x^2 + 16x + 5$ in the form $p(x + q)^2 + r$.



2026 Paper 1 Question 1, (3)

Express $2x^2 + 20x + 3$ in the form $p(x + q)^2 + r$.

2026 Paper 2 Question 1, (3)

The equation $x^2 + kx + (k + 3) = 0$ has equal roots.

Find algebraically, the values of k .