

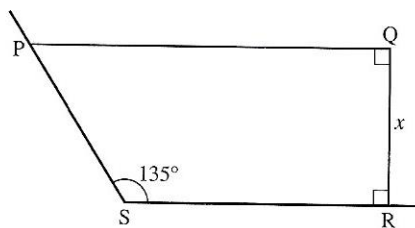
Exercise 1K: Examination questions

- 1 i) Write $x^2 + 6x + 16$ in the form $(x + a)^2 + b$, where a and b are integers to be found.
 ii) Find the minimum value of $x^2 + 6x + 16$ and state the value of x for which this minimum occurs.
 iii) Write down the maximum value of the function $\frac{1}{x^2 + 6x + 16}$. (MEI)

- 2 Show that $2x^2 - 36x + 175$ may be written in the form $a(x - b)^2 + c$, where the values of a , b and c are to be found.

State, with a reason, the least value of $2x^2 - 36x + 175$. (WJEC)

- 3 An enclosure PQRS is to be made as shown in the figure. PQ and QR are fences of total length 300 m. The other two sides are hedges. The angles at Q and R are right angles and the angle at S is 135° . The length of QR is x metres.



- a) Show that the area, $A \text{ m}^2$, of the enclosure is given by

$$A = 300x - \frac{3x^2}{2}$$

- b) Show that A can be written as $-\frac{3}{2}[(x - a)^2 - b]$, where a and b are constants whose values you should determine. Hence show that A cannot exceed 15 000. (AEB Spec)

- 4 Given that, for all values of x ,

$$3x^2 + 12x + 5 \equiv p(x + q)^2 + r$$

- a) Find the values of p , q and r .
 b) Hence, or otherwise, find the minimum value of $3x^2 + 12x + 5$.
 c) Solve the equation $3x^2 + 12x + 5 = 0$, giving your answers to one decimal place. (EDEXCEL)
- 5 Find the set of values of x for which $2(x^2 - 5) < x^2 + 6$. (EDEXCEL)
- 6 Find the set of values of x for which $x^2 - x - 12 > 0$. (NEAB)
- 7 Find the set of values of x for which $2x(x + 3) > (x + 2)(x - 3)$. (EDEXCEL)
- 8 Find the set of values of x for which $\frac{x}{x + 4} > 2$. (EDEXCEL)
- 9 Find all the values of x for which $\frac{3x^2 - 1}{x^2 + 1} > 1$. (UODLE)

- 10 A rectangular tile has length x cm and breadth $(6 - x)$ cm. Given that the area of the tile must be at least 5 cm^2 , form a quadratic inequality in x and hence find the set of possible values of x . (EDEXCEL)

- 11 A landscape gardener is given the following instructions about laying a rectangular lawn. The length x m is to be 2 m longer than the width. The width must be greater than 6.4 m and the area is to be less than 63 m^2 .

By forming an inequality in x , find the set of possible values of x . (EDEXCEL)

- 12** Find the range of values of k for which the quadratic equation

$$(3 + k)x^2 + 4x + k = 0$$

has real distinct roots. (WJEC)

- 13** Find the range of values of k for which the quadratic equation

$$x^2 + (k - 4)x + (k - 1) = 0$$

has real distinct roots. (WJEC)

- 14** The quadratic equation $x^2 + 6x + 1 = k(x^2 + 1)$ has equal roots. Find the possible values of constant k . (AEB 94)

- 15** Solve the simultaneous equations $y = x - 2$, $y^2 = x$. (UCLES)

- 16** Show that the elimination of x from the simultaneous equations

$$x - 2y = 1$$

$$3xy - y^2 = 8$$

produces the equation

$$5y^2 + 3y - 8 = 0$$

Solve this quadratic equation and hence find the pairs (x, y) for which the simultaneous equations are satisfied. (EDEXCEL)

- 17** Solve the simultaneous equations $x + y = 2$, $x^2 + 2y^2 = 11$. (UCLES)
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Exercise 1K

- 1 i) $(x+3)^2 + 7$ ii) 7 at $x = -3$ iii) $\frac{1}{7}$ 2 $(x-9)^2 + 13$ 3 b) $a = 100, b = 10\,000$
- 4 a) $p = 3, q = 2, r = -7$ b) -7 c) $-3.5, -0.5$ 5 $-4 < x < 4$ 6 $x < -3$ or $x > 4$ 7 $x < -6$ or $x > -1$
- 8 $-8 < x < -4$ 9 $x < -1$ or $x > 1$ 10 $x(6-x) \geq 5, 1 \leq x \leq 5$ 11 $8.4 < x < 9$ 12 $-4 < k < 1$ 13 $k < 2$ or $k > 10$
- 14 -2 or 4 15 $(1, -1)$ or $(4, 2)$ 16 $(3, 1)$ or $(-\frac{11}{5}, -\frac{8}{5})$ 17 $(3, -1)$ or $(-\frac{1}{3}, \frac{7}{3})$