

## AS Mathematics Exam Questions by Topic Chapter 3a: Quadratic Functions

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These questions are taken from the Specimen Exam materials and the real 2018 papers for the new syllabus AS and A-level mathematics courses and arranged by chapter of the textbooks by Goldie et al (available here: <https://amzn.to/39umfr5> and <https://amzn.to/3hE8kBL> ). There are a mixture of questions from OCR A, OCR B (MEI), Edexcel and AQA. Although the style of questions varies a little across the exam boards the content of the syllabus is almost identical so these are suitable for students preparing for any exam board.

Free problem sets for all other chapters, as well as video solutions, full past papers and other content for GCSE and A-level maths can be found at:

<https://mathsaurus.com/>

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### AQA Sample Paper 1 Question 7:

- 7 Find the values of  $k$  for which the equation  $(2k - 3)x^2 - kx + (k - 1) = 0$  has equal roots. **[4 marks]**
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### AQA Sample Paper 2 Question 6:

- 6 A curve  $C$ , has equation  $y = x^2 - 4x + k$ , where  $k$  is a constant.

It crosses the  $x$ -axis at the points  $(2 + \sqrt{5}, 0)$  and  $(2 - \sqrt{5}, 0)$

- 6 (a) Find the value of  $k$ . **[2 marks]**
- 6 (b) Sketch the curve  $C$ , labelling the exact values of all intersections with the axes. **[3 marks]**
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OCR A 2018 Paper 1 Question 3:

**3** In this question you must show detailed reasoning.

Find the two real roots of the equation  $x^4 - 5 = 4x^2$ . Give the roots in an exact form. [4]

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OCR A 2018 Paper 2 Question 1:

**1** (i) Express  $2x^2 - 12x + 23$  in the form  $a(x + b)^2 + c$ . [4]

(ii) Use your result to show that the equation  $2x^2 - 12x + 23 = 0$  has no real roots. [1]

(iii) Given that the equation  $2x^2 - 12x + k = 0$  has repeated roots, find the value of the constant  $k$ . [2]

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OCR A AS 2018 Paper 2 Question 4:

**4** (i) Express  $4x^2 - 12x + 11$  in the form  $a(x + b)^2 + c$ . [3]

(ii) State the number of real roots of the equation  $4x^2 - 12x + 11 = 0$ . [1]

(iii) Explain fully how the value of  $r$  is related to the number of real roots of the equation  $p(x + q)^2 + r = 0$  where  $p, q$  and  $r$  are real constants and  $p > 0$ . [2]

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OCR A AS Sample Paper 1 Question 7:

**7** (i) Sketch the curve  $y = 2x^2 - x - 3$ . [3]

(ii) Hence, or otherwise, solve  $2x^2 - x - 3 < 0$ . [2]

(iii) Given that the equation  $2x^2 - x - 3 = k$  has no real roots, find the set of possible values of  $k$ . [3]

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OCR B MEI 2018 Paper 3 Question 7:

- 7 In this question you must show detailed reasoning.

Fig. 7 shows the curve  $y = 5x - x^2$ .

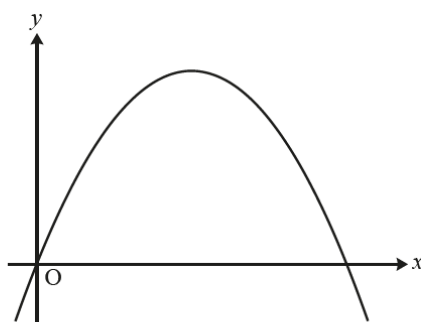


Fig. 7

The line  $y = 4 - kx$  crosses the curve  $y = 5x - x^2$  on the  $x$ -axis and at one other point.

Determine the coordinates of this other point.

[8]

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OCR B MEI AS 2018 Paper 2 Question 5:

- 5 Find the set of values of  $a$  for which the equation

$$ax^2 + 8x + 2 = 0$$

has no real roots.

[3]

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OCR B MEI AS Sample Paper 1 Question 4:

- 4 (i) Express  $x^2 + 4x + 7$  in the form  $(x+b)^2 + c$ . [2]
- (ii) Explain why the minimum point on the curve  $y = (x+b)^2 + c$  occurs when  $x = -b$ . [1]

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OCR B MEI Sample Paper 1 Question 13:

- 13 In this question you must show detailed reasoning.

Determine the values of  $k$  for which part of the graph of  $y = x^2 - kx + 2k$  appears below the  $x$ -axis. [4]

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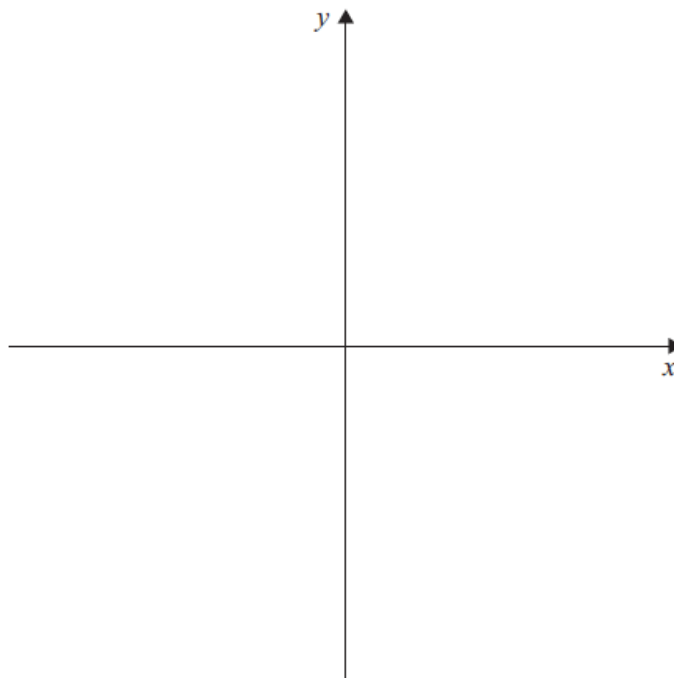
AQA 2018 Paper 2 Question 4:

4 A curve,  $C$ , has equation  $y = x^2 - 6x + k$ , where  $k$  is a constant.

The equation  $x^2 - 6x + k = 0$  has two distinct positive roots.

4 (a) Sketch  $C$  on the axes below.

[2 marks]



4 (b) Find the range of possible values for  $k$ .

Fully justify your answer.

[4 marks]

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AQA AS 2018 Paper 2 Question 7:

7 (a) Express  $2x^2 - 5x + k$  in the form  $a(x - b)^2 + c$

[3 marks]

7 (b) Find the values of  $k$  for which the curve  $y = 2x^2 - 5x + k$  does **not** intersect the line  $y = 3$

[3 marks]

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AQA AS Sample Paper 2 Question 4:

- 4** Find the coordinates, in terms of  $a$ , of the minimum point on the curve  $y = x^2 - 5x + a$ , where  $a$  is a constant.

Fully justify your answer.

**[3 marks]**

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AQA AS Sample Paper 2 Question 5:

- 5** The quadratic equation  $3x^2 + 4x + (2k - 1) = 0$  has real and distinct roots.

Find the possible values of the constant  $k$

Fully justify your answer.

**[4 marks]**

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