



A Level Mathematics Year 2 Exam Questions by Topic
Chapter 7: Further algebra

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/>

Edexcel 2018 Paper 2 Question 11:

11.

$$\frac{1 + 11x - 6x^2}{(x - 3)(1 - 2x)} \equiv A + \frac{B}{(x - 3)} + \frac{C}{(1 - 2x)}$$

(a) Find the values of the constants A , B and C .

(4)

$$f(x) = \frac{1 + 11x - 6x^2}{(x - 3)(1 - 2x)} \quad x > 3$$

(b) Prove that $f(x)$ is a decreasing function.

(3)

Edexcel Sample Paper 2 Question 7:

7. (a) Use the binomial expansion, in ascending powers of x , to show that

$$\sqrt{4-x} = 2 - \frac{1}{4}x + kx^2 + \dots$$

where k is a rational constant to be found.

(4)

A student attempts to substitute $x = 1$ into both sides of this equation to find an approximate value for $\sqrt{3}$.

- (b) State, giving a reason, if the expansion is valid for this value of x .

(1)

OCR A 2018 Paper 1 Question 8:

- 8 (i) Find the first three terms in the expansion of $(4-x)^{-\frac{1}{2}}$ in ascending powers of x . [4]

- (ii) The expansion of $\frac{a+bx}{\sqrt{4-x}}$ is $16-x \dots$. Find the values of the constants a and b . [3]

OCR A Sample Paper 3 Question 5:

- 5 (i) Find the first three terms in the expansion of $(1+px)^{\frac{1}{3}}$ in ascending powers of x . [3]

- (ii) Given that the expansion of $(1+qx)(1+px)^{\frac{1}{3}}$ is

$$1+x-\frac{2}{9}x^2+\dots$$

find the possible values of p and q . [5]

OCR B MEI Sample Paper 3 Question 1:

- 1 Express $\frac{2}{x-1} + \frac{5}{2x+1}$ as a single fraction. [2]

OCR B MEI Sample Paper 3 Question 2:

- 2 Find the first four terms of the binomial expansion of $(1-2x)^{\frac{1}{2}}$.

State the set of values of x for which the expansion is valid. [4]

AQA 2018 Paper 1 Question 6:

- 6 (a) Find the first three terms, in ascending powers of x , of the binomial expansion of $\frac{1}{\sqrt{4+x}}$ [3 marks]

- 6 (b) Hence, find the first three terms of the binomial expansion of $\frac{1}{\sqrt{4-x^3}}$ [2 marks]

- 6 (c) Using your answer to part (b), find an approximation for $\int_0^1 \frac{1}{\sqrt{4-x^3}} dx$, giving your answer to seven decimal places. [3 marks]

- 6 (d) (i) Edward, a student, decides to use this method to find a more accurate value for the integral by increasing the number of terms of the binomial expansion used.
Explain clearly whether Edward's approximation will be an overestimate, an underestimate, or if it is impossible to tell. [2 marks]

- 6 (d) (ii) Edward goes on to use the expansion from part (b) to find an approximation for $\int_{-2}^0 \frac{1}{\sqrt{4-x^3}} dx$
Explain why Edward's approximation is invalid. [2 marks]

AQA Sample Paper 2 Question 1:

- 1 State the values of $|x|$ for which the binomial expansion of $(3+2x)^{-4}$ is valid.
Circle your answer. [1 mark]

$$|x| < \frac{2}{3}$$

$$|x| < 1$$

$$|x| < \frac{3}{2}$$

$$|x| < 3$$

AQA Sample Paper 3 Question 5:

- 5 (a) Find the first three terms, in ascending powers of x , in the binomial expansion of $(1 + 6x)^{\frac{1}{3}}$ [2 marks]
- 5 (b) Use the result from part (a) to obtain an approximation to $\sqrt[3]{1.18}$ giving your answer to 4 decimal places. [2 marks]
- 5 (c) Explain why substituting $x = \frac{1}{2}$ into your answer to part (a) does not lead to a valid approximation for $\sqrt[3]{4}$. [1 mark]

Edexcel 2018 Paper 1 Question 11:

11. (a) Use binomial expansions to show that $\sqrt{\frac{1+4x}{1-x}} \approx 1 + \frac{5}{2}x - \frac{5}{8}x^2$ (6)

A student substitutes $x = \frac{1}{2}$ into both sides of the approximation shown in part (a) in an attempt to find an approximation to $\sqrt{6}$

(b) Give a reason why the student **should not** use $x = \frac{1}{2}$ (1)

(c) Substitute $x = \frac{1}{11}$ into

$$\sqrt{\frac{1+4x}{1-x}} = 1 + \frac{5}{2}x - \frac{5}{8}x^2$$

to obtain an approximation to $\sqrt{6}$. Give your answer as a fraction in its simplest form. (3)
