

Practice AS-Level Mathematics Test

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This document contains a practice test on the following selection of topics in the AQA AS-Level Mathematics course:

- Functions
- Vectors
- Sequences & Series
- Quadratics
- Coordinates & Lines
- The Binomial Expansion
- Surds & Indices

The 2017/2018 specification has been used as a reference for the material covered in each topic and the questions have been based on those found in past examination papers and assessments.

My written solutions to this test can be found at <https://jdgmiles.github.io/MMath/AssessmentSolutions/20171118.pdf>.

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Question 1

The curve $y = \sqrt{x}$ is translated onto the curve $y - 1 = \sqrt{x + 5}$.

Sketch both curves on the same set of axes, for $x > 0$.

The translation is described by a vector.

Find this vector.

(5 marks)

Question 2

$$7 - x^2 - 2x > 4.$$

Find the set of x values which satisfy the above inequality.

(4 marks)

Question 3

Write down the values of p , q , and x given that:

i.) $\sqrt{3} = 3^p$

ii.) $\frac{1}{9} = 3^q$

iii.) $\sqrt{3} \times 3^x = \frac{1}{9}$

(4 marks)

Question 4

Show that $\frac{5\sqrt{2}+2}{3\sqrt{2}+4}$ can be expressed in the form $m + n\sqrt{2}$,

where m and n are integers.

(3 marks)

Question 5

Find the coefficient of x^3 in $(2 + 3x)^6$.

(4 marks)

Question 6

The straight line l_1 has gradient 2 and passes through the point with coordinates $(4, -5)$.

i.) Find an equation for l_1 in the form $y = mx + c$.

The straight line l_2 is perpendicular to the line with equation

$3x - y = 4$ and passes through the point with coordinates $(3, 0)$.

ii.) Find an equation for l_2 .

iii.) Find the coordinates of the point where l_1 and l_2 intersect.

(8 marks)

Question 7

$$f(x) = x^{\frac{3}{2}} - 8x^{-\frac{1}{2}}$$

i.) Evaluate $f(3)$, giving your answer in its simplest form with a rational denominator.

ii.) Solve the equation $f(x) = 0$, giving your answers in the form $k\sqrt{2}$.

(7 marks)

Question 8

The unit vectors \mathbf{i} and \mathbf{j} are perpendicular.

i.) Find the magnitude of the vector $-20\mathbf{i} + 21\mathbf{j}$.

ii.) What is the angle between the vector \mathbf{i} and the vector $-20\mathbf{i} + 21\mathbf{j}$?

(5 marks)

Question 9

A sequence of terms $\{t_n\}$ is defined for $n \geq 1$ by the recurrence relation

$$t_{n+1} = kt_n - 7, \quad t_1 = 3,$$

where k is a constant.

i.) Find expressions for t_2 and t_3 in terms of k .

Given that $t_3 = 13$,

ii.) find the possible values of k .

(6 marks)

Question 10

The points $P(-5, -2)$, $Q(-1, 6)$, $R(7, 7)$, and $S(3, -1)$ are the vertices of a parallelogram.

- i.) Sketch the parallelogram in the x, y plane, clearly labelling the four vertices.
- ii.) Find the length of PQ in the form $k\sqrt{5}$, where k is an integer to be found.
- iii.) Find the coordinates of the point M , the mid-point of PQ .
- iv.) Show that MS is perpendicular to PQ .
- v.) Find the area of the parallelogram $PQRS$.

(15 marks)