

# 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>.

## Practice AS-Level Mathematics Test

### 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)