

Solution 5

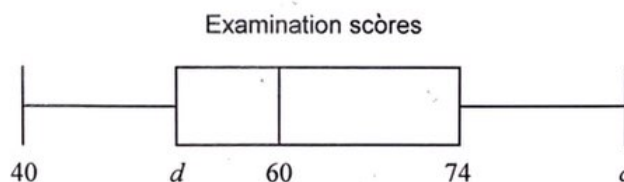
Full marks are not necessarily awarded for a correct answer with no working. Answers must be supported by working and/or explanations. Where an answer is incorrect, some marks may be given for a correct method, provided this is shown by written working. You are therefore advised to show all working.

Section A

Answer all questions in the boxes provided. Working may be continued below the lines if necessary.

1. [Maximum mark: 5]

The following box-and-whisker plot represents the examination scores of a group of students.



(a) Write down the median score.

[1]

The range of the scores is 47 marks, and the interquartile range is 22 marks.

(b) Find the value of

(i) c ;

(ii) d .

[4]

(a) 60 (1)

(b) Range = $c - 40 = 47$

(i) $c = 87$ (2)

(ii) IQR = $74 - d = 22$

$d = 52$ (2)



16EP03

Turn over

7. [Maximum mark: 6]

An arithmetic sequence has the first term $\ln a$ and a common difference $\ln 3$.
The 13th term in the sequence is $8 \ln 9$. Find the value of a .

$$u_{13} = \ln a + (13-1) \ln 3 = 8 \ln 9$$

$$\ln a + \ln 3^{12} = \ln 9^8 \quad 9^8 = (3^2)^8$$

$$\ln(3^{12}a) = \ln 3^{16}$$

$$3^{12}a = 3^{16}$$

$$a = 3^4$$

$$a = 81$$



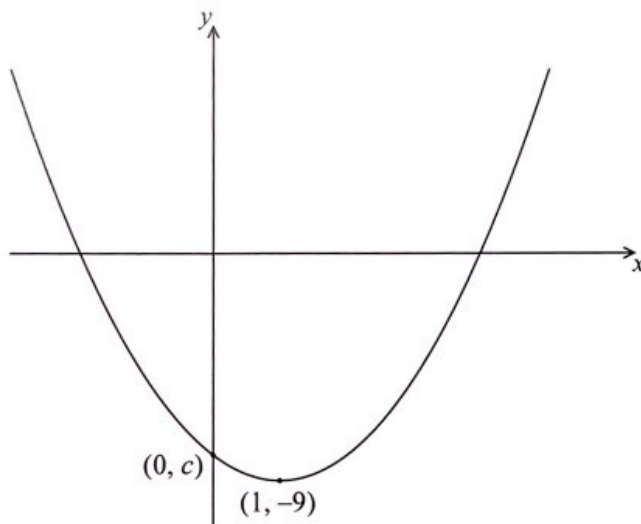
Do **not** write solutions on this page.

Section B

Answer **all** questions in the answer booklet provided. Please start each question on a new page.

8. [Maximum mark: 16]

The following diagram shows part of the graph of a quadratic function f .



The vertex is at $(1, -9)$, and the graph crosses the y -axis at the point $(0, c)$.

The function can be written in the form $f(x) = (x - h)^2 + k$.

(a) Write down the value of h and of k . [2]

(b) Find the value of c . [2]

Let $g(x) = -(x - 3)^2 + 1$. The graph of g is obtained by a reflection of the graph of f in the x -axis, followed by a translation of $\begin{pmatrix} p \\ q \end{pmatrix}$.

(c) Find the value of p and of q . [5]

(d) Find the x -coordinates of the points of intersection of the graphs of f and g . [7]



Solution

8. Quadratic function graph

(a) $h = 1$
 $k = -9$

(b) $c = f'(0) = (x-1)^2 - 9$
 $c = -8$

(c) g vertex $(3, 1)$

$(1, -9) \xrightarrow{\begin{pmatrix} p \\ q \end{pmatrix}} (3, 1)$

$p = 2$
 $q = 10$

(d) $f(x) = g(x)$

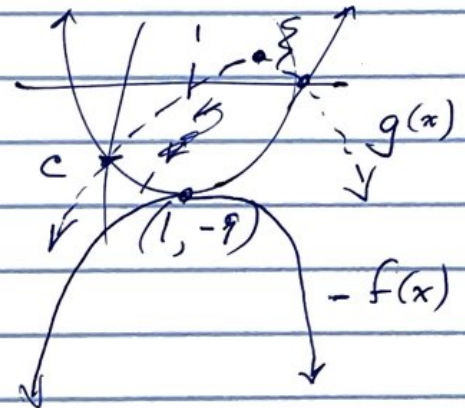
$(x-1)^2 - 9 = -(x-3)^2 + 1$

$x^2 - 2x + 1 - 9 = -x^2 + 6x - 9 + 1$

$2x^2 - 8x = 0$

$x(x-4) = 0$

$x = 0, 4$



check
 $f(0) = -8$
 $g(0) = -8$
~~g~~
 $f(4) = 0$
 $g(4) = 0$

4. [Maximum mark: 6]

(a) Write down the value of

(i) $\log_3 27$;

(ii) $\log_8 \frac{1}{8}$;

(iii) $\log_{16} 4$.

[3]

(b) Hence, solve $\log_3 27 + \log_8 \frac{1}{8} - \log_{16} 4 = \log_4 x$.

[3]

(a) i) 3

ii) -1

iii) 1/2

(b) $3 + (-1) - \frac{1}{2} = \log_4 x$

$\frac{3}{2} = \log_4 x$

$x = 4^{\left(\frac{3}{2}\right)} = 8$