Further Pure Maths: Logarithms and Exponential Equations: 30-minute Pack

EDEXCEL 4PM1 · Calculators not allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Solve $\log_2(x-1) + \log_2(x+2) = 3$. Check all candidates in the original equation.

(Total for Question 1 is 6 marks)

2 Solve $\log_3(x-1) + \log_3(x+1) = 2$. Check all candidates in the original equation.

(Total for Question 2 is 6 marks)

3 Write $2^5 = 32$ in logarithmic form.

(Total for Question 3 is 1 mark)

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4 Simplify $2\log_3(27) - \log_3(9)$. Give one logarithm.

(Total for Question 4 is 2 marks)

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5 Solve $2^x = 64$ and $3^y = 1/27$.

(Total for Question 5 is 3 marks)

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6 Solve $4^{x-1} = 8$. Give an exact value for x.

(Total for Question 6 is 3 marks)

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Mark scheme · Further Pure Maths: Logarithms and Exponential Equations: 30-minute Pack

Question 1

States the domain $x>1$	**M1**
Combines the logarithms as $\log_2((x-1)(x+2))=3$	**M1**
Forms $x^2+x-2=8$, hence $x^2+x-10=0$	**M1**
Solves to obtain $x=(-1+\sqrt{41})/2$ or $x=(-1-\sqrt{41})/2$; also award when a valid method restricted to the domain finds only the admissible root	**M1**
Rejects $(-1-\sqrt{41})/2$ because it is less than 1; also award a domain argument excluding all other roots without generating inadmissible candidates	**A1**
Gives $x=(-1+\sqrt{41})/2$ and verifies both arguments are positive; accept equivalent forms and valid alternative methods for the corresponding marks	**A1**

Answer: $x = (-1+\sqrt{41})/2$

Question 2

States the domain $x>1$	**M1**
Combines the logarithms as $\log_3((x-1)(x+1))=2$	**M1**
Forms $x^2-1=9$, hence $x^2=10$	**M1**
Finds candidates $x=\sqrt{10}$ and $x=-\sqrt{10}$; also award when a valid method restricted to the domain finds only the admissible root	**M1**
Rejects $-\sqrt{10}$ because it is below 1; also award a domain argument excluding all other roots without generating inadmissible candidates	**A1**
Gives $x=\sqrt{10}$ and verifies both arguments are positive; accept equivalent forms and valid alternative methods for the corresponding marks	**A1**

Answer: $x = \sqrt{10}$

Question 3

$\log_2(32) = 5$ stated correctly; accept equivalent forms and valid alternative methods for the corresponding marks	**B1**

Answer: $\log_2(32) = 5$

Question 4

Uses power and quotient laws to obtain $\log_3(27^2/9)$	**M1**
$\log_3(81)$; accept equivalent forms and valid alternative methods for the corresponding marks	**A1**

Answer: $\log_3(81)$

Question 5

Uses powers or logarithms to determine both exponents ($64=2^6$ and $1/27=3^{-3}$)	**M1**
$x=6$	**A1**
$y=-3$; accept equivalent forms and valid alternative methods for the corresponding marks	**A1**

Answer: $x = 6$, $y = -3$

Question 6

Writes both sides as powers of 2: $2^{2x-2}=2^3$, or takes logarithms to obtain $(x-1)\log(4)=\log(8)$	**M1**
Equates exponents: $2x-2=3$, or rearranges to $x=1+\log(8)/\log(4)$	**M1**
$x=5/2$; accept equivalent forms and valid alternative methods for the corresponding marks	**A1**

Answer: $x = 5/2$

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