Cambridge International AS & A Level

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Mathematics 9709/32

Paper 3 Pure Mathematics 3 **October/November 2022**

Question No (1)

1 Solve the equation $2^{3x-1} = 5(3^{1-x})$. Give your answer in the form $\frac{\ln a}{\ln b}$ where a and b are integers.

Solution:

ln properties

$\ln(a \times b) = \ln a + \ln b$

$\ln(a/b) = \ln a - \ln b$

$\ln(a^n) = n \ln a$

$2^{3x-1} = 5(3^{1-x})$

taking ln on both sides

$\ln(2^{3x-1}) = \ln(5(3^{1-x}))$

$(3x-1)\ln 2 = \ln 5 + \ln(3^{1-x})$ ∵ $\ln a^n = n \ln a$, $\ln(a \times b) = \ln a + \ln b$

$(3x-1)\ln 2 = \ln 5 + (1-x)\ln 3$

$3x \ln 2 - \ln 2 = \ln 5 + \ln 3 - x \ln 3$

$3x \ln 2 + x \ln 3 = \ln 5 + \ln 3 + \ln 2$

$x \ln 2^3 + x \ln 3 = \ln(5 \times 3 \times 2)$ ∵ $n \ln x = \ln x^n$

$x(\ln 2^3 + \ln 3) = \ln 30$

$x(\ln 8 + \ln 3) = \ln 30$

$x \ln(8 \times 3) = \ln 30$

$x = \frac{\ln 30}{\ln 24}$