Cambridge International AS & A Level

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Mathematics 9709/32

**Paper 3 Pure Mathematics 3** **October/November 2021**

Question No (1)

**1** Find the value of $x$ for which $3(2^{1-x}) = 7^x$. Give your answer in the form $\frac{\ln a}{\ln b}$, where $a$ and $b$ are integers.

**Solution:**

| Rule |
| --- |
| $\ln(x \cdot y) = \ln(x) + \ln(y)$ |
| $\ln(x / y) = \ln(x) - \ln(y)$ |
| $\ln(x^y) = y \cdot \ln(x)$ |

$$3(2^{1-x}) = 7^x$$

$$taking\ \ln on\ both\ sides$$

$$\ln\left(3(2^{1-x})\right) = \ln(7^x)$$

$$\ln 3 + \ln 2^{1-x} = x \ln 7$$

$$\ln 3 + (1 - x)\ln 2 = x \ln 7$$

$$\ln 3 + \ln 2 - x \ln 2 = x \ln 7$$

$$\ln 3 + \ln 2 = x \ln 7 + x \ln 2$$

$$\ln(3 \times 2) = x(\ln 7 + \ln 2)$$

$$\ln 6 = x(\ln(7 \times 2))$$

$$= x \ln 14$$

$$\boldsymbol{x = \frac{\ln 6}{\ln 14}}$$