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- 2016 14 e** Write $\log 2 + \log 4 + \log 8 + \dots + \log 512$ in the form of $a \log b$ where a and b are integers greater than 1.

2

$$\begin{aligned}\text{Consider } & \log 2 + \log 4 + \log 8 + \dots + \log 512 \\ &= \log 2^1 + \log 2^2 + \log 2^3 + \dots + \log 2^9 \\ &= \log 2 + 2 \log 2 + 3 \log 2 + \dots + 9 \log 2 \\ &= \log 2(1 + 2 + 3 + \dots + 9)\end{aligned}$$

As $1 + 2 + 3 + \dots + 9$ is arithmetic series with $a = 1$, $d = 1$, $n = 9$, $S_n = \frac{n}{2}[2a + (n - 1)d]$:

$$\begin{aligned}\text{Sum} &= \log 2 \times \left[\frac{9}{2}[2(1) + (9 - 1)1] \right] \\ &= \log 2 \times 45 \\ &= 45 \log 2\end{aligned}$$

$$\therefore \log 2 + \log 4 + \log 8 + \dots + \log 512 = 45 \log 2$$

State Mean:
0.79

* These solutions have been provided by [projectmaths](#) and are not supplied or endorsed by BOSTES.

BOSTES: Notes from the Marking Centre

This information is released by BOSTES in late Term 1 2017.