Given that $y=x^{2} \ln x$, find $\frac{d y}{d x}$

$$
y=x^{2} \ln x
$$

# Use the Product Rule 

$$
\begin{aligned}
& y=u v \\
& \frac{d y}{d x}=u \frac{d v}{d x}+\frac{d u}{d x} v
\end{aligned}
$$

$$
\begin{array}{ll}
u=x^{2} & v=\ln x \\
\frac{d u}{d x}=2 x & \frac{d v}{d x}=\frac{1}{x}
\end{array}
$$

$$
\frac{d y}{d x}=u \frac{d v}{d x}+\frac{d u}{d x} v
$$

$$
\frac{d y}{d x}=x^{2} \frac{1}{x}+2 x \ln x
$$

$$
\frac{d y}{d x}=x+2 x \ln x
$$

$$
\frac{d y}{d x}=x(1+2 \ln x)
$$

