Jack has been walking for 12 min ± 3 min. She has been walking at a speed of 4 m/min ± 2 m/min.

What is the uncertainty Δd in the distance he has traveled,

$$d \pm \Delta d = (v \pm \Delta v)(t \pm \Delta t) = 48 \text{ m} \pm \Delta d\,?$$

Note that $(4 \text{ m/min})\,(12 \text{ min}) = 48 \text{ m}$.

A) $\Delta d = 44$ m
B) $\Delta d = 36$ m
C) $\Delta d = 54$ m
D) $\Delta d = 48$ m
E) $\Delta d = 24$ m

$$\begin{aligned}
d \pm \Delta d &= (v \pm \Delta v)\,(t \pm \Delta t)\,, \quad \text{as given, so} \\
&= v\,t\left(1 \pm \frac{\Delta v}{v}\right)\left(1 \pm \frac{\Delta t}{t}\right) \\
&= d \pm (t\,\Delta v + v\,\Delta t + \Delta v\,\Delta t)\,, \quad \text{which reduces to} \\
\Delta d &= t\,\Delta v + v\,\Delta t\,, \quad \text{since} \\
\Delta v\,\Delta t &\approx 0 \quad \text{in first order}\,.
\end{aligned}$$

Using calculus notation, we have the same result

$$\begin{aligned}
\Delta d &= \left|\frac{\partial\,d}{\partial v}\right|\,\Delta v + \left|\frac{\partial\,d}{\partial t}\right|\,\Delta t \\
&= |t|\;\Delta v + |v|\;\Delta t \\
&= (12 \text{ min})\,(2 \text{ m/min}) + (4 \text{ m/min})\,(3 \text{ min}) \\
&= (24 \text{ m}) + (12 \text{ m}) \\
&= \boxed{36 \text{ m}}\,, \quad \text{since} \\
\frac{\partial\,d}{\partial v} &= \frac{\partial}{\partial v}\,v\,t = t = 12 \text{ min}\,, \quad \text{and} \\
\frac{\partial\,d}{\partial v} &= \frac{\partial}{\partial t}\,v\,t = v = 4 \text{ m/min}\,.
\end{aligned}$$

Answer **B**.