Joice has been riding for 8 min $\pm$ 2 min. Joice started riding from rest. She has been riding at a constant acceleration of 4 m/min^2 $\pm$ 1 m/min^2.

What is the uncertainty Δd in the distance
$d = \frac{1}{2}\, a\, t^2 = \frac{1}{2}\, (4 \text{ m/min}^2)\, (8 \text{ min})^2 = 128$ m she traveled?

A) $\Delta d = 64$ m/min
B) $\Delta d = 86$ m/min
C) $\Delta d = 96$ m/min
D) $\Delta d = 108$ m/min
E) $\Delta d = 144$ m/min

A first-order approximation is

$$\begin{aligned}
\Delta d &= \left|\frac{\partial\, d}{\partial a}\right| \Delta a + \left|\frac{\partial\, d}{\partial t}\right| \Delta t \\
&= \frac{1}{2}\, t^2\, \Delta a + a\, t\, \Delta t \\
&= \frac{1}{2}\, (8 \text{ min})^2\, (1 \text{ m/min}^2) + (4 \text{ m/min}^2)\, (8 \text{ min})\, (2 \text{ min}) \\
&= (32 \text{ m}) + (64 \text{ m}) \\
&= 96 \text{ m/min}\,,
\end{aligned}$$

since

$$\frac{\partial\, d}{\partial a} = \frac{\partial}{\partial a}\left(\frac{1}{2}\, a\, t^2\right) = +\frac{1}{2}\, t^2\,, \quad \text{and}$$
$$\frac{\partial\, d}{\partial t} = \frac{\partial}{\partial t}\left(\frac{1}{2}\, a\, t^2\right) = +a\, t\,.$$

Answer bf C.