Barbara started from rest. Barbara rode a distance of 128 m ± 32 m in a time of 8 min ± 2 min from her starting point.

What is the uncertainty Δa in her acceleration
$a = \frac{2\,d}{t^2} = \frac{2\,(128 \text{ m})}{(8 \text{ min})^2} = 4 \text{ m/min}\,$?

A) $\Delta a = 2$ m/min
B) $\Delta a = 3$ m/min
C) $\Delta a = 4$ m/min
D) $\Delta a = 5$ m/min
E) $\Delta a = 6$ m/min

A first-order approximation is

$$\begin{aligned}
\Delta a &= \left|\frac{\partial\, a}{\partial t}\right| \Delta t + \left|\frac{\partial\, a}{\partial d}\right| \Delta d \\
&= 4\,\frac{d}{t^3}\,\Delta t + 2\,\frac{1}{t^2}\,\Delta d \\
&= 4\,\frac{(128 \text{ m})}{(8 \text{ min})^3}\,(2 \text{ min}) + 2\,\frac{1}{(8 \text{ min})^2}\,(32 \text{ m}) \\
&= (2 \text{ m/min}^2) + (1 \text{ m/min}^2) \\
&= 3 \text{ m/min}^2\,,
\end{aligned}$$

since

$$\begin{aligned}
\frac{\partial\, a}{\partial d} &= \frac{\partial}{\partial d}\left(2\,\frac{d}{t^2}\right) = +2\,\frac{1}{t^2}\,, \quad \text{and} \\
\frac{\partial\, a}{\partial t} &= \frac{\partial}{\partial t}\left(2\,\frac{d}{t^2}\right) = -4\,\frac{d}{t^3}\,.
\end{aligned}$$

Answer bf B.