GUIDE to Midpoint Velocity

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I. Midpoints & Averages

A particle ***starts out from rest*** (i.e. initial velocity is zero), but with an ***acceleration*** of 4 m/s/s.

The particle continues to ***accelerate*** at a **constant** rate of 4 m/s/s for 20 seconds.

A) What is the particle's **instantaneous velocity** at t = 0 s?

This has been given.

B) What is its ***instantaneous velocity*** at t = 0.5 s?

Write down the definition of average acceleration.
Consider the period of time from t = 0 to t = 0.5.
Apply the definition of average velocity to this period of time.
Plug in what you know. Solve for what you don't.

C) - G) Just the same method as B).

H) Draw a neat, careful, scale ***graph*** of the particle's ***instantaneous velocity*** vs. ***time***.

Please use graph paper, if possible.
Please draw your graph carefully & make it TO SCALE.

I) What is its **AVERAGE velocity** during the first TWO seconds of its trip?

Remember: the average velocity is NOT the average of a bunch of individual velocities.
Think about problem VI from Average Acceleration.
Use an EQUATION. Plug in things you know. Solve for things you don't.
Pay CAREFUL attention to variables! $\bar{V}$ and V_0 and V are all ***different***.

J) What is its ***AVERAGE velocity*** for the WHOLE 20-second trip? Same method as (I)

II. The First Second – Same method as (I) and (J) from problem I.

III. A Practice Proof

Given variables a, b, c, d, and z, and given that: $\boldsymbol{a + b = c}$
and that: $\boldsymbol{dc - da = z}$
show that: $\boldsymbol{db = z}$

This is just practice doing an ALGEBRAIC proof. It might look weird, but it's actually not too hard once you see how it works. You just need to use algebra to turn the first two equations into the third equation. There are a few ways to COMBINE two EQUATIONS, but one method is SUBSTITUTION. Another is ADDING them.

(Since this is ALGEBRA not PHYSICS, you can't really draw a picture of this problem.)