THE 100-METER DASH

Sara runs the **100**-meter dash for her school's track team. She can take off from the starting block at $8\,\frac{meters}{\sec}$.

She has an acceleration of $\frac{2}{5}\,\frac{meters/\sec}{\sec}$ so that during each second of the race, her speed increases by $\frac{2}{5}\,m/\sec$.

- What is Sara's race time for the **100**-meter dash? How fast is she running at the finish line?

1a) Sketch and label the two graphs for this problem. ***t*** is in seconds, ***s(t)*** is in meters, ***v(t)*** is in m/sec. Write the units!

b) Write the given, initial conditions. Find the equations as functions of time ***t***. Solve to find the answers.

c) Look at the graph of the **velocity function**. Find the **area** between the graph of the function and the **t-axis** by using a formula to calculate the **area** of the **geometric** shape ***and*** also by finding the **definite integral** of the function from ***t***=0 to ***t***=Sara's race time. Lightly shade in the area in the graph. Write the **unit** for this area.

d) Find the average function value, f_{av}, for the **velocity function *v(t)***.
When during the race does this value f_{av} occur on the graph of the velocity function?
What do you get when you multiply f_{av} by Sara's race time and what is the unit?

e) Look at the graph of the (signed) **distance function *s(t)***.
Draw a line segment on the graph that would indicate the **average velocity** for the entire race and find the average velocity.
When during the race does this **average velocity** occur on the graph of the distance function itself?
What is the product of this **average velocity** and Sara's race time? What is the unit?

f) Complete the table.

t	*s(t)*	*v(t)*	*a(t)*
0			
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			