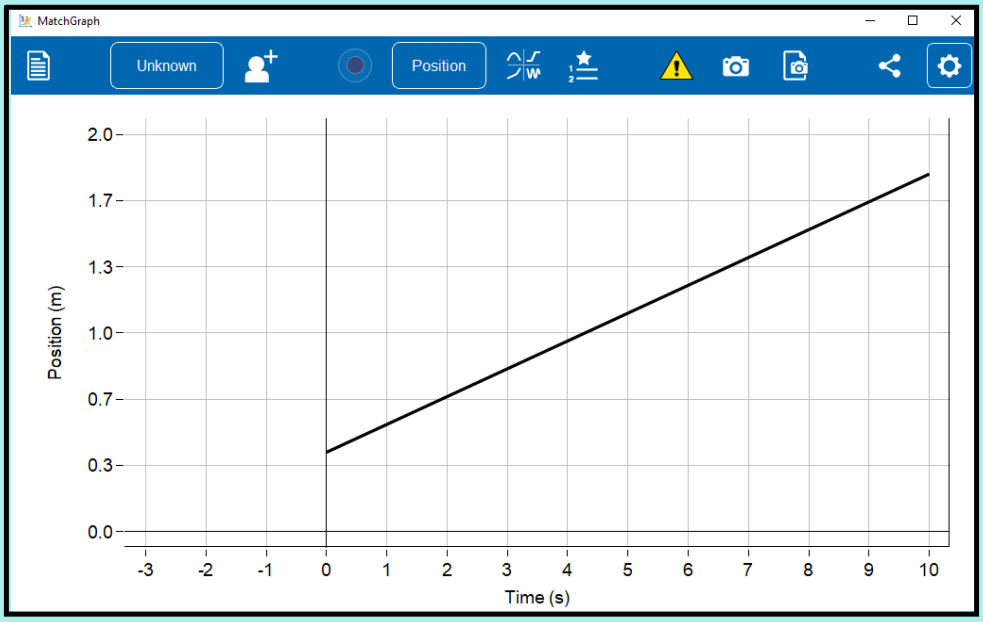
I can use graphs to show the connections between displacement, velocity, and time. ***325-2***

Graphing Uniform Motion



What are some things we can take away from what we just saw?

- What variable is on the x-axis?
- What variable is on the y-axis?
- What do you think the slope (line) represents?
- What is happening when the slope is flat? increasing? decreasing?
- When can we get negative displacement?

Plotting Uniform Motion

Let's examine the following table

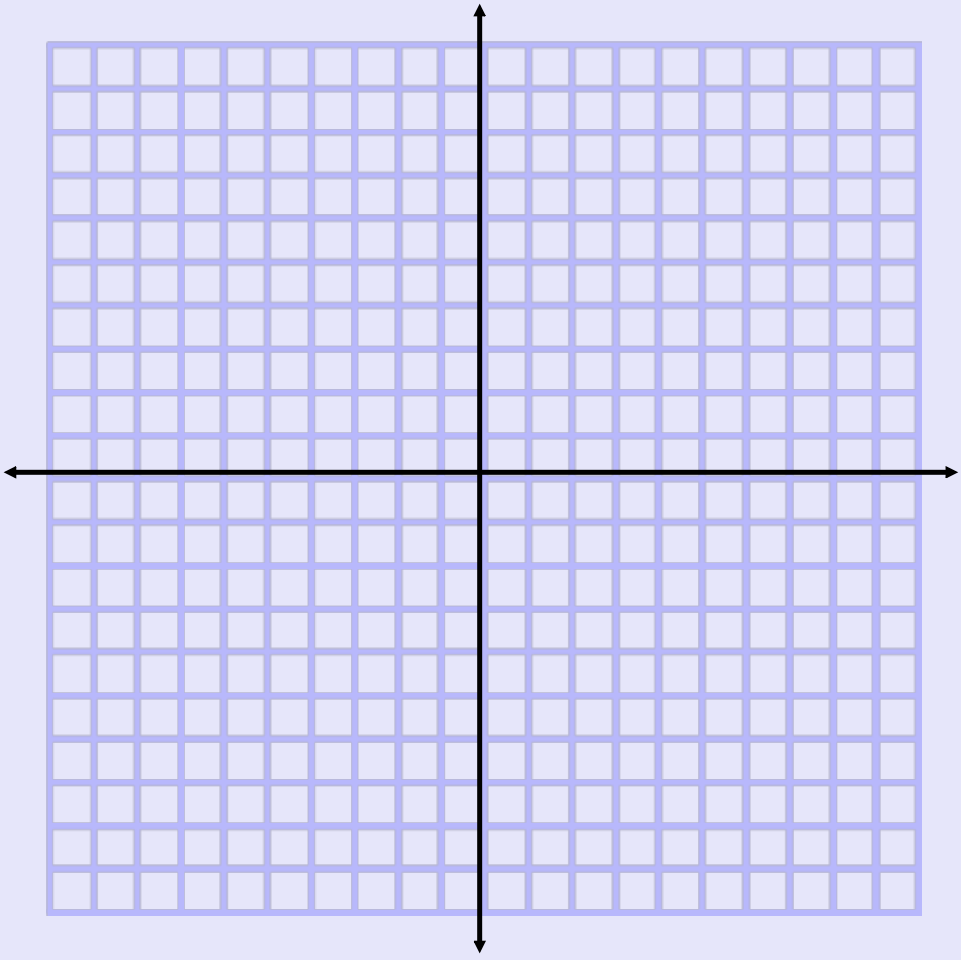
Time (s)	Displacement (m) [N]
0	0
1.0	12
2.0	24
3.0	36
4.0	48
5.0	60
6.0	72

a) What is the average velocity for this event? (V_{av}?)

b) What do you notice about the distances as time increases?

What does our event look like graphed out?

Time (s)	Displacement (m) [N]
0	0
1.0	12
2.0	24
3.0	36
4.0	48
5.0	60
6.0	72

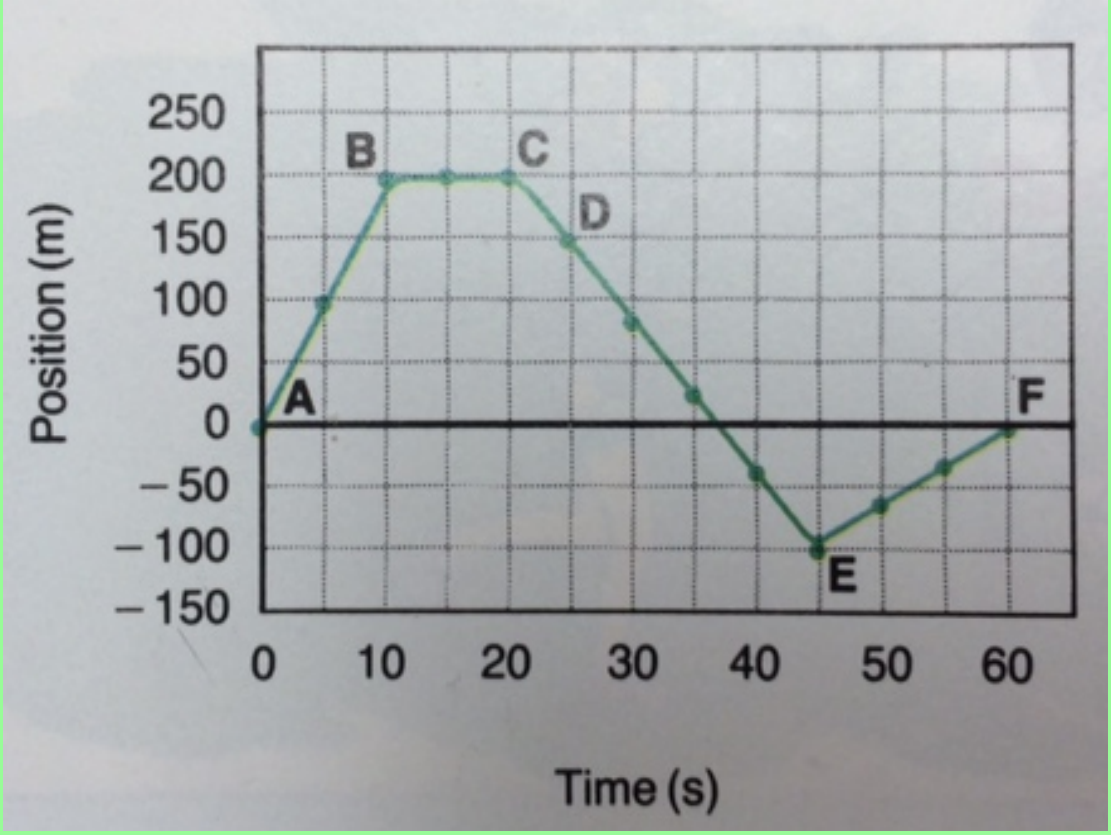


c) What is the slope of our graph?

d) What can you conclude about the slope of a displacement-time graph?

Example:

The graph below shows a position-time graph for a short car trip. Find the velocity of the car for each segment of the trip.



A⟶B: $\vec{V}_{av} = \frac{\Delta\vec{d}}{\Delta t} = \frac{d_f - d_i}{t_f - t_i}$

B⟶C:

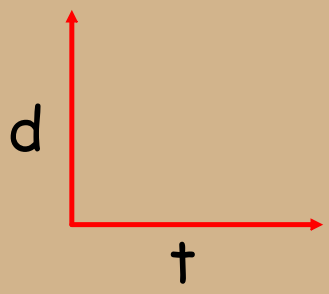
C⟶D:

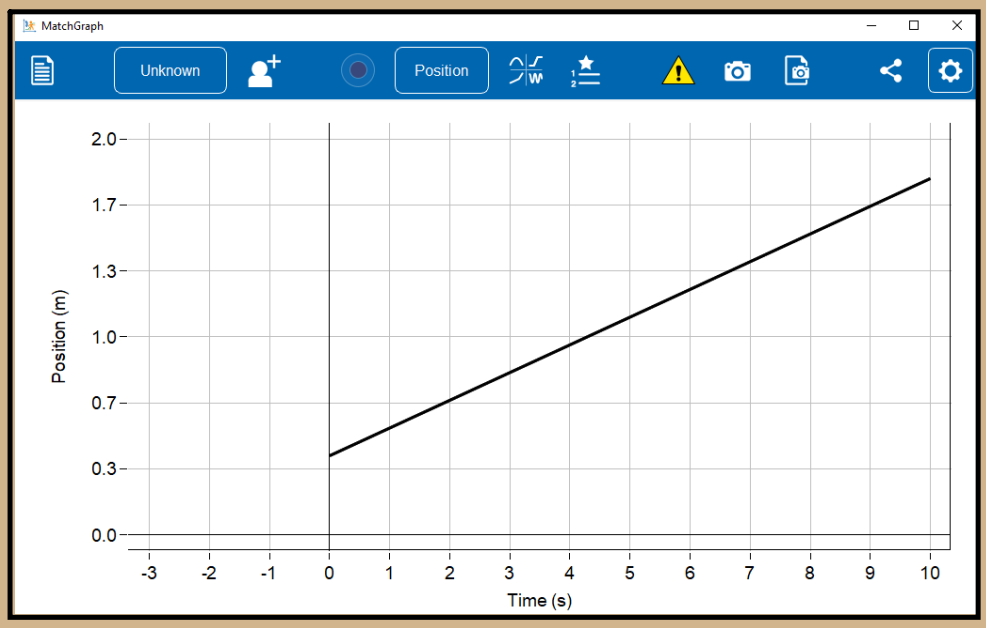
D⟶E:

E⟶F:

Velocity-Time Graphs

We can graph velocity-time graphs the same way we do displacement-time graphs.





What are some things we can take away from what we just saw?

- What variable is on the x-axis?
- What variable is on the y-axis?
- What do you think the slope (line) represents?
- What is happening when the slope is flat? increasing? decreasing?
- When can we get negative velocity?

Example:

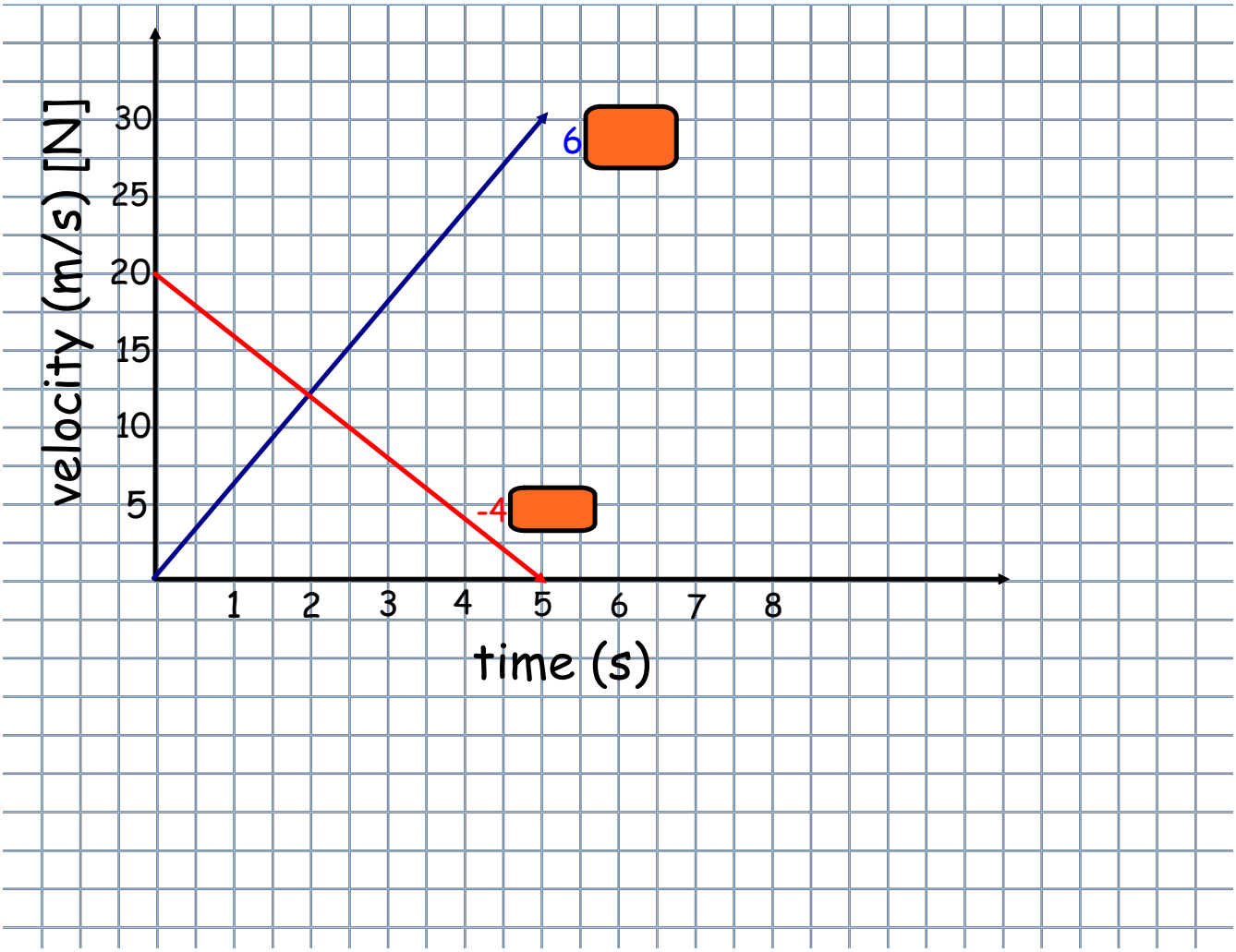
Use the tables to graph a velocity-time graph. Both lines can be drawn on one graph.

Line 1

time (s)	velocity (m/s) [N]
0.0	0
1.0	6
2.0	12
3.0	18
4.0	24
5.0	30

Line 2

time (s)	velocity (m/s) [N]
0.0	20
1.0	16
2.0	12
3.0	8
4.0	4
5.0	0


velocity (m/s) [N]
30
25
20
15
10
5
1
2
3
4
5
6
7
8
time (s)
6
-4

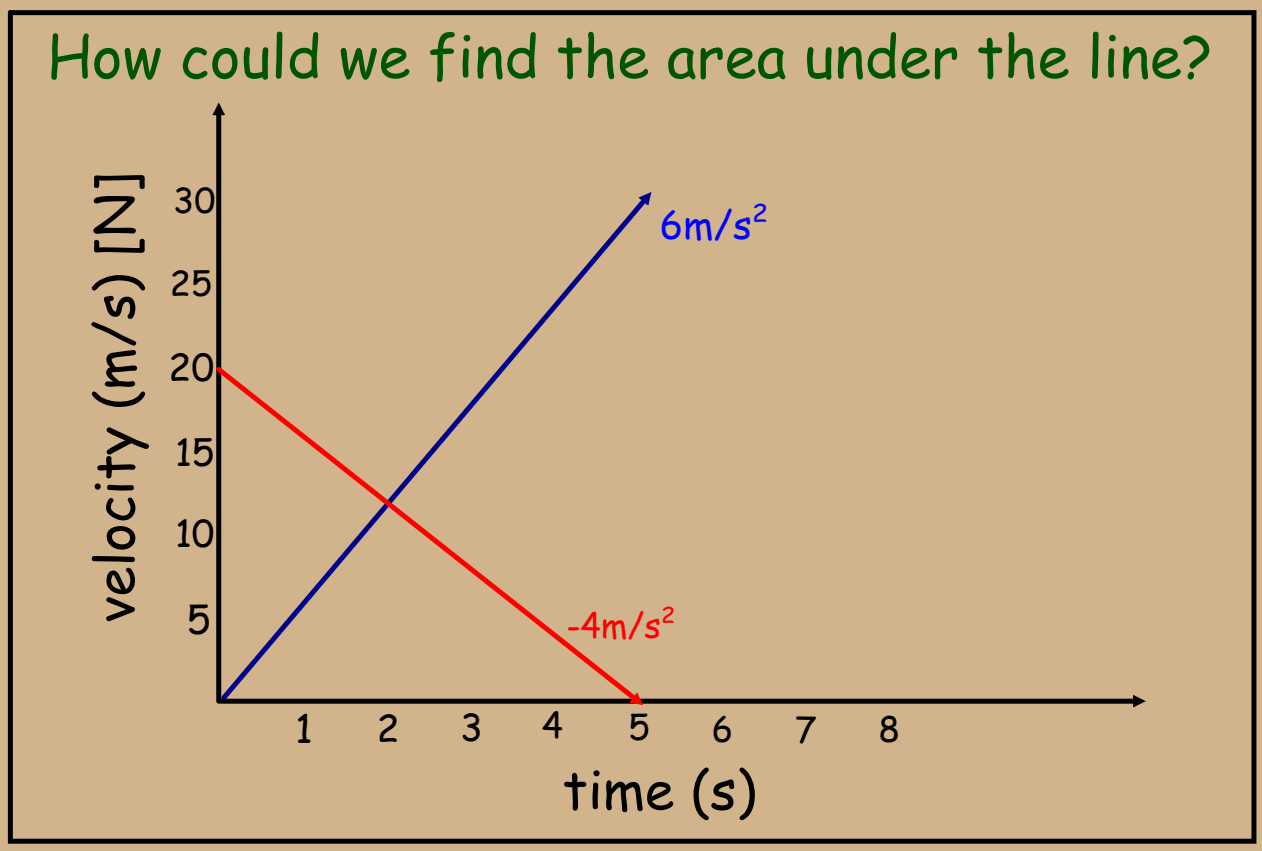
A positive slope indicates an object speeding up and a negative slope indicates an object slowing down.

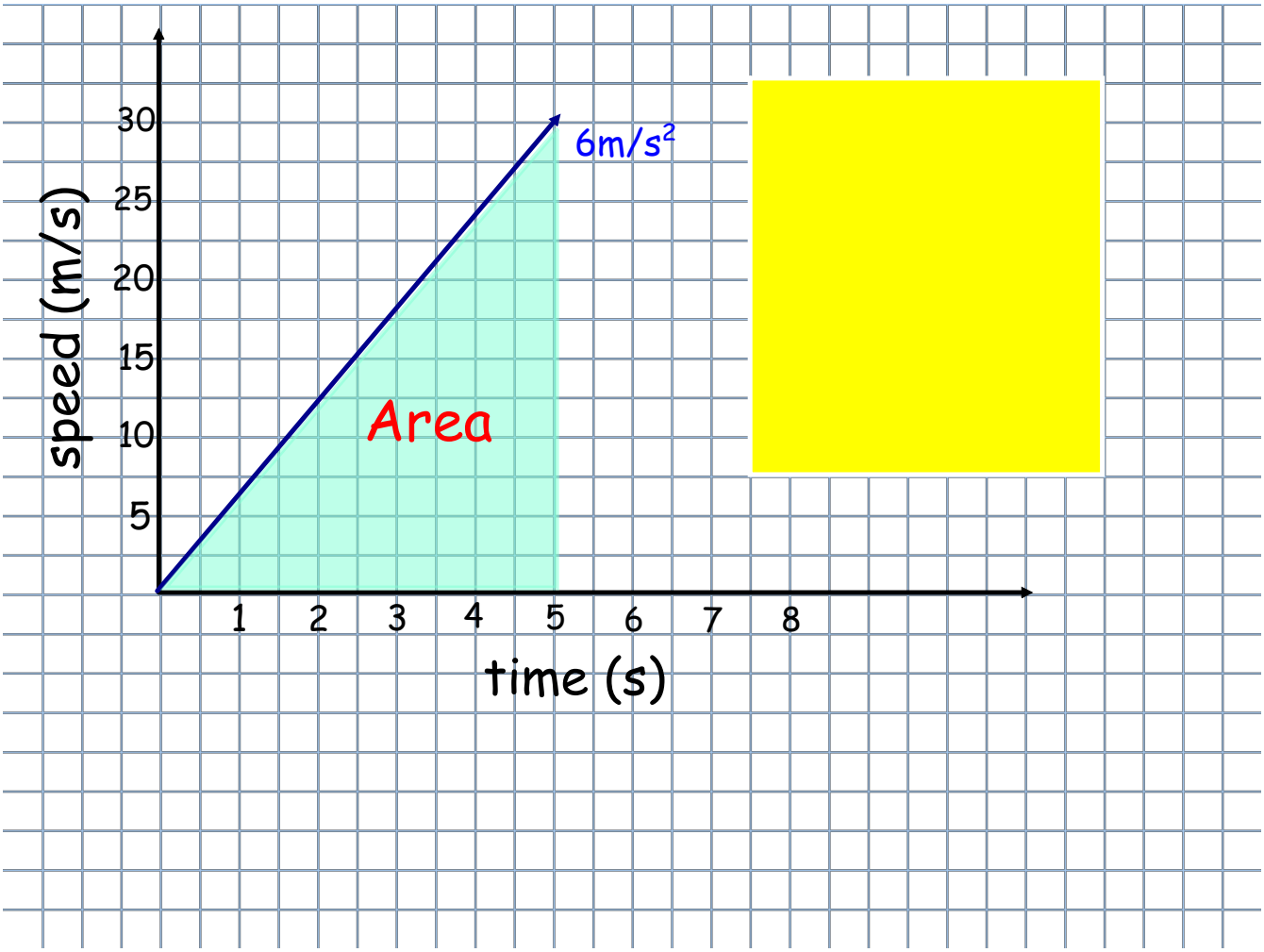
Finding Area on a Speed-Time Graph

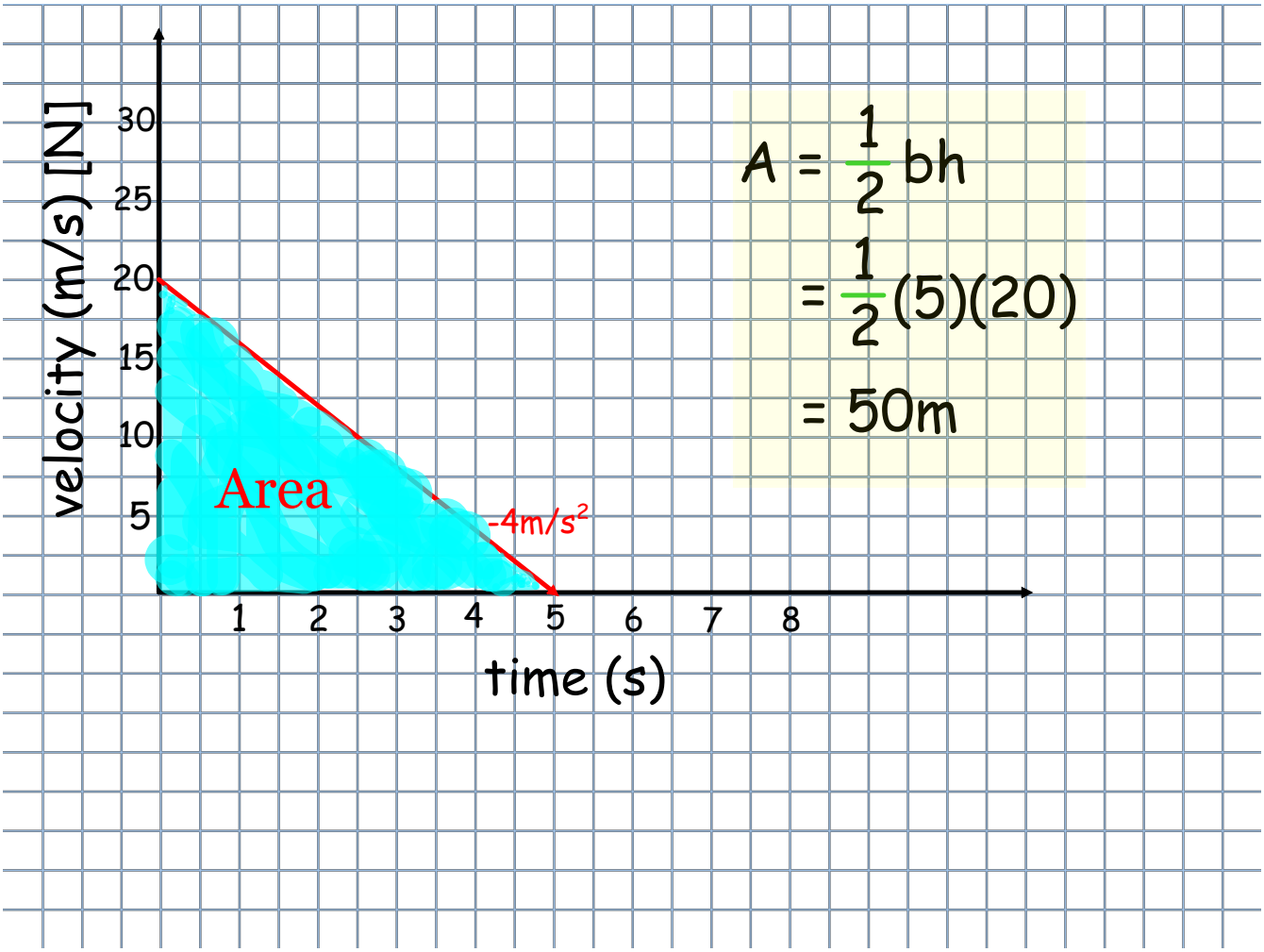
We can find the distance covered on a speed-time graph by looking at the area under the line.

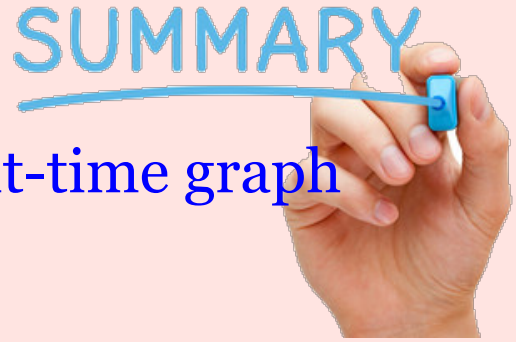
Taking a look at our example earlier from the first table.

How could we find the area under the line?

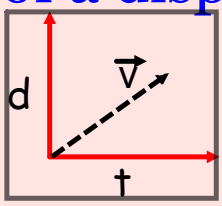



30
25
20
15
10
5
speed (m/s)
6m/s²
Area
1
2
3
4
5
6
7
8
time (s)


velocity (m/s) [N]
30
25
20
15
10
5
Area
-4m/s²
1
2
3
4
5
6
7
8
time (s)
A = 1/2 bh
= 1/2 (5)(20)
= 50m

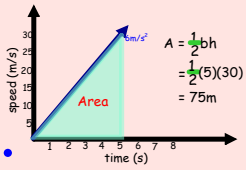


- The slope of a displacement-time graph is velocity.



- For uniform motion, velocity will always stay constant.

- The area under the line gives the displacement in a velocity-time graph.



- Displacement and velocity are both vector quantities and have both magnitude and direction. (Make sure to read the question carefully to find the proper direction.

Graphing Uniform Motion Worksheet