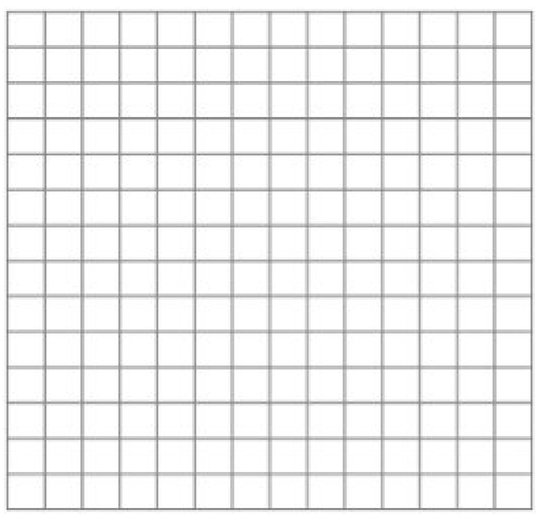
Name:________________________

Graphing Acceleration
SPH4C

<u>Question 1</u>:
Alison, starting from rest, accelerates at 3 m/s^2 [East] until her car is travelling at 15 m/s [East]. Complete the table below to determine her velocity at 1 s intervals.

Δt (s)	$v_2 = v_1 + a\Delta t$ (m/s)
0	
1	
2	
3	
4	
5	

Plot the data points on the table above on the grid below with time on the horizontal axis and velocity on the vertical axis. Label your axes!



How far did Alison travel during the entire time she was accelerating?
(The area under the graph is a triangle.)

Area = ½ *(base × height)* =

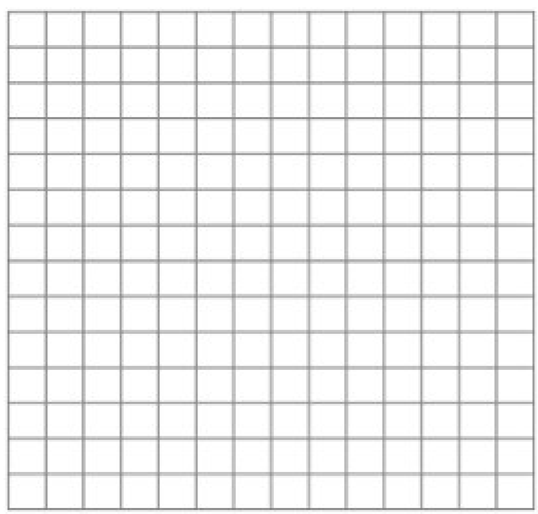
What *direction* did Alison travel while she was accelerating? ____________________

Use the graph to calculate the magnitude of Alison's displacement at 1-second intervals during the time she was accelerating (i.e., find the areas of each of the smaller triangles):

Examples: At 1 s, *Area* = ½ *(base × height)* = ½ (1 s × 3 m/s) = 1.5 m
At 2 s, *Area* = ½ *(base × height)* = ½ (2 s × 6 m/s) = 6 m

Δt (s)	Δd (m)
0	0
1	1.5
2	6
3	
4	
5	

Plot the data points on the table above on the grid below with time on the horizontal axis and velocity on the vertical axis. Label your axes!



Describe the shape of the graph: ____

Is the *slope* of the graph increasing (getting steeper) or decreasing (getting flatter)?

____

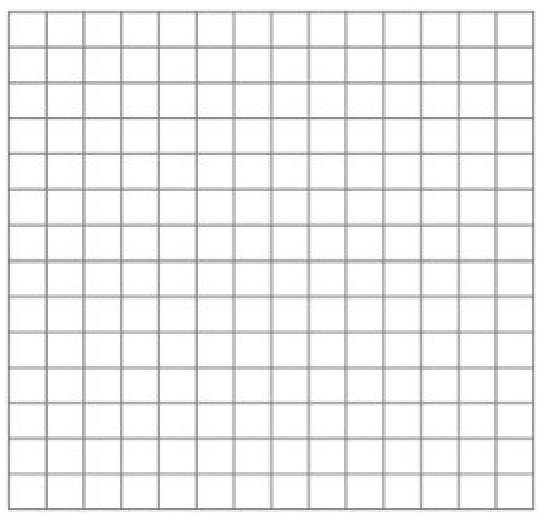
(Remember that the slope of the graph represents the speed!)

Question 2:

Spencer is driving a car at 25 m/s [North]. He hits the brakes and reduces his speed with an acceleration of 5 m/s^2 [South] until the car is at rest. Complete the table below to determine his velocity at 1 s intervals.

Δt (s)	$v_2 = v_1 + a\Delta t$ (m/s)
0	25
1	
2	
3	
4	
5	

Plot the data points on the table above on the grid below with time on the horizontal axis and velocity on the vertical axis. Label your axes!



How far did Spencer travel during the time he was braking?

Area = ½ *(base × height)* =

What *direction* did Spencer travel while he was braking? ____________________________

(Careful!)

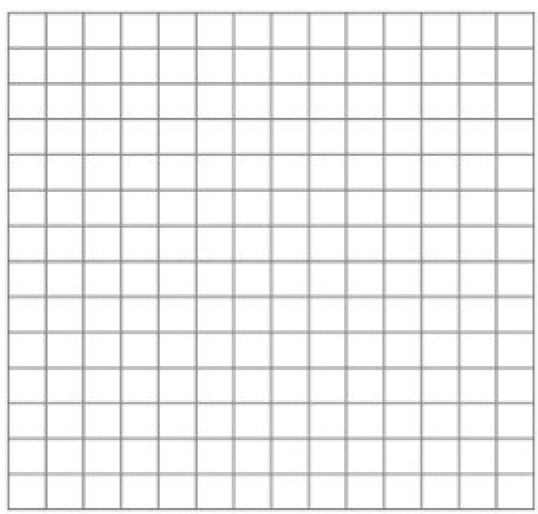
Calculate the magnitude of Spencer's displacement at 1-second intervals during the time he was braking. Note that the areas under the graph are trapezoids. The area of a trapezoid is the average of the heights multiplied by the base, or:

$$Area = \tfrac{1}{2}\,(height_1 + height_2) \times base = \tfrac{1}{2}\,(v_1 + v_2) \times \Delta t$$

<u>Examples</u>: At 1 s, $Area = \tfrac{1}{2}\,(v_1 + v_2) \times \Delta t = \tfrac{1}{2}$ (25 m/s + 20 m/s) × 1 s = 22.5 m
At 2 s, $Area = \tfrac{1}{2}\,(v_1 + v_2) \times \Delta t = \tfrac{1}{2}$ (25 m/s + 15 m/s) × 2 s = 40 m

Δt (s)	Δd (m)
0	0
1	22.5
2	40
3	
4	
5	

Plot the data points on the table above on the grid below with time on the horizontal axis and velocity on the vertical axis. Label your axes!



Describe the shape of the graph: ____

Is the *slope* of the graph increasing (getting steeper) or decreasing (getting flatter)?

____