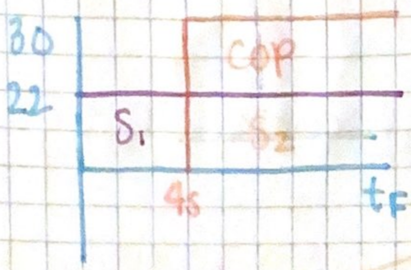
2/3/21 Constant velocity practice

Scenario: A speeder is traveling with a constant velocity of 22 m/s. The speeder passes a cop that is sitting still. Four seconds after the speeder passes the cop, the cop begins to travel at 30 m/s. How long till the cop catches the speeder and how far has the cop traveled when he catches the speeder?



$\Delta r_{cop} = \Delta r_{s\,total}$

speeder separated

G.S.: Area □ $S_1 = b_{S_1} \cdot h_{S_1}$

P.S. $\Delta position_{S_1} = (t_{final\,S_1} - t_{initial\,S_1})(velocity_{S_1})$

P.V.: $\Delta r_{S_1} = (t_{FS_1} - t_{int\,S_1})(V_{S_1})$

M.S: $\Delta r_{S_1} = (4_s - 0_s)(22 m/s)$

$\Delta r_{S_1} = (4_s)(22 m/s)$

$\Delta r_{S_1} = 88m$

G.S: Area □ $s_2 = b_{S_2} \cdot h_{S_2}$ (velo…

P.S: $\Delta position_{S_2} = (t_{final\,S_2} - t_{initial\,S_2})$

P.V: $\Delta r_{S_2} = (t_{FS_2} - t_{int\,S_2})(V_{S_2})$

M.S: $\Delta r_{S_2} = (t_{FS_2} - 4\,s)(22 m/s)$

Find cops

G.S. Area □ $c = b_c \cdot h_c$

P.S.: $\Delta position_c = (t_{final\,c} - t_{initial\,c})(velocity_c)$

P.V.: $\Delta r_c = (t_{Fc} - t_{int\,c})V_c)$

M.S: $\Delta r_c = (t_{Fc} - 4s)(30 m/s)$

We want to find when:

$\underbrace{\Delta r_c = \Delta r_{s\,total}}_{\text{cop and speeder same.}}$

$(t_F - 4s)(30 m/s) = (t_F - 4\,s)(22 m/s) + 88m$

$30 m/s \cdot t_F - 120m = 22 m/s \cdot t_F - \cancel{88m} + \cancel{88m}$

$8 m/s \cdot t_F - 120m = 0$

$\frac{8 m/s \cdot t_F}{8 m/s} = \frac{120m}{8 m/s}$

$t_F = 15_s$

$\Delta t_c = (t_{Fc} - t_{int\,c})$

$\Delta t_c = (15_s - 4_s)$

$\Delta t_c = 11s$

M.S. $\Delta r_c = (15_s - 4_s)(30 m/s)$

$\Delta r_c = (11s)(30 m/s)$

$\boxed{\Delta r_c = 330m}$

Check:

$\boxed{\Delta r_c} = \Delta r_{s\,total}$

$330_m = 88_m + (15_s - 4_s)(22 m/s)$

$330_m = 88m + (11s)(22 m/s)$

$330m = 88m + 242m$

$330m = 330m$ ✓

Answer: The cop traveled 11 seconds to catch the speeder at 330 meters.

Pre-thinking:

- The cop has a greater velocity.
- The speeder has already traveled 4 seconds.
- 3 different positions needed to be calculated.

Conclusion:

- By finding missing variables, we are able to conclude that the cop traveled 330 meters before reaching the speeder.
- Chasing the speeder took 11 seconds for the cop to catch him

me	group	class
I can continue to find their positions until the distance traveled matches	We can set up a math problem like: $22x + 88 = 30x$	We have to separate the 3 equations to find missing variable, so we can later substitute them.

Summary:

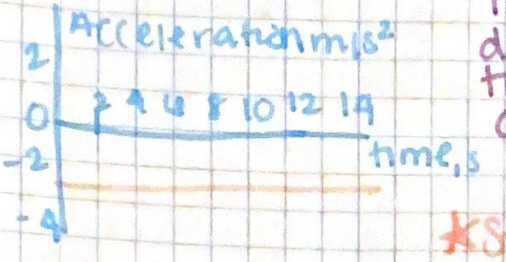
The speeder travels 4 seconds before the cop chases after them, therefore the first position must be established. The cop then chases after the speeder and eventually catches them because she's traveling at a greater velocity. So, three positions are to be solved for: the cop, the speeder before 4 seconds and the speeder after 4 seconds. After finding them all, we set the cop's position equal to the speeders total. That gives us 15 seconds but we have to solve for the cop so we subtract 4 seconds. We can then plug in the time and velocity to find how far traveled.

1-5: 4

Question: what if they were traveling towards one another?

2/8/21 Tipers Velocity & Acc.

Scenario 1:



"This motorcyclist was slowing down during the period up to 14 seconds because her acceleration was negative during this period"

*Statement is wrong!

Pre-thinking:

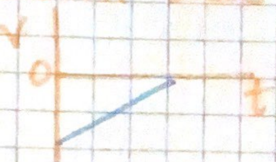
- Acceleration only determines slope of velocity.
- The graph does not tell us if the motorist is slowing down or speeding up.

conclusion:

- We cannot determine the velocity of the motorist.

me and class:

You can have a positive acceleration and still slow down.



Group:

moving slow would have the line closer to the time axis

Summary:

The acceleration graph cannot determine whether the motorist is slowing down or speeding up. For example, the motorist could be traveling in the negative direction slowing down and still the acceleration is positive. Therefore, acceleration tells us nothing other than the slope of the velocity graph. We can conclude that the statement cannot be determined with given information, but the reasoning is inaccurate.

1-5: 5 no questions.

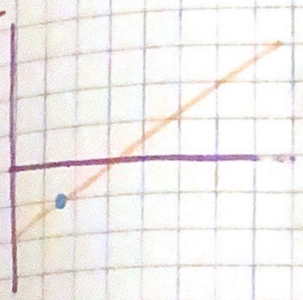
2|8|21

Reference page for scenarios 2-7

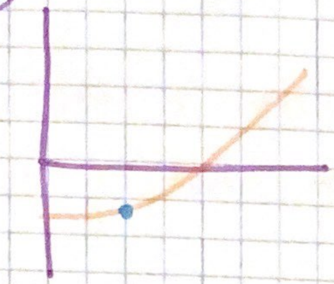
Graphs

★ position vs. time graphs

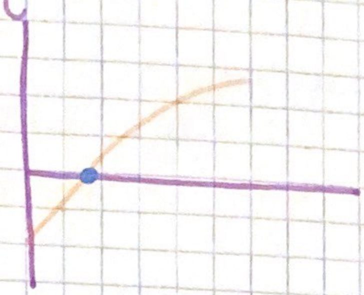
A



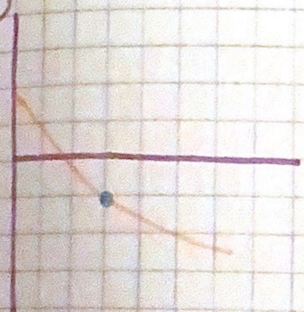
B



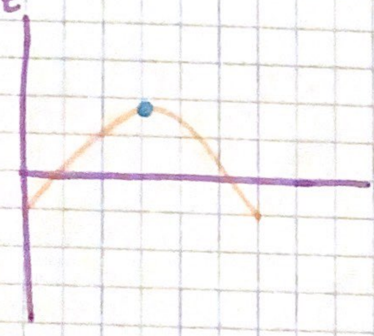
C



D

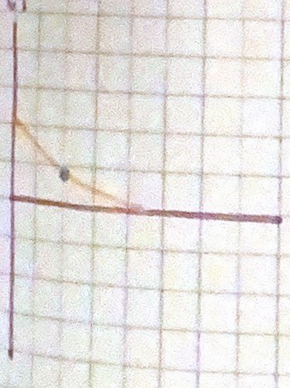


E

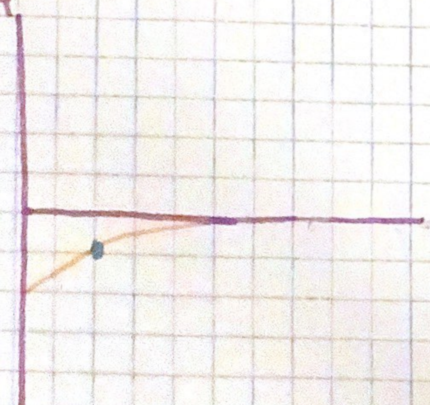


F

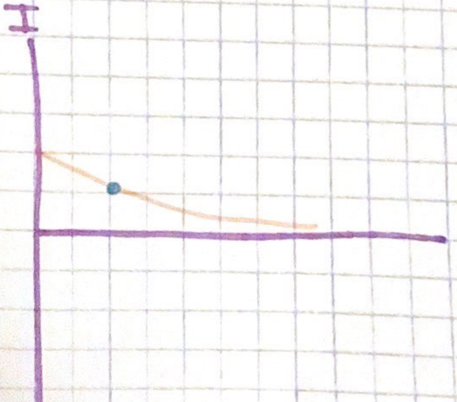
G



H



I



Scenario 2
Refer to page 23:

a.) For which of these, if any, is the position zero at the indicated point?

[Graph C]

Pre-thinking:
- We are looking at position-time graphs
- Indicated point must to on time axis.

Conclusion:
As agreed by the class, when looking at a position vs. time graph a point thats on the time-axis signifies a 0 position.

Summary:
Graph C is the only graph that has the indicated point on the time-axis. A point on the time-axis signifies that at the given time, there is a zero position. No other graphs show a point on the time-axis.

1-5: 5 No questions.

Scenario 3: Refer to Pg23

b. For which of these, if any, is the position negative at the indicated point?

Graphs A, B, D, F, H

Pre-thinking:
- searching for a negative position
- 0 position is on time-axis so negative must be below since above the time-axis is positive.

conclusion:
As agreed by the class, looking at the position vs time graph gives us the sign of the position. All points below the time-axis has a negative position.

summary:

Graphs A, B, D, F, and H have a negative position at the indicated point. A point below the time-axis signifies that at the given time, there is a negative position. The graphs listed were the only graph that had the indicated point below the time-axis.

1-5: 5 No questions

2/8/21

Refer to pg 23

Scenario 4:

c.) For which of these, if any, is the $\boxed{\text{velocity}}$ zero at the indicated point?

$\boxed{\text{Graph E}}$

pre-thinking:

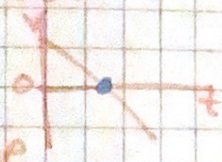
- Slope of the position vs. time graph must be zero.
- Imagine what a velocity vs. time graph would look like.

conclusion:

The position vs. time graph must have a slope of 0 at the indicated point in order to have a 0 velocity. Determined by class.

Summary:

In order to determine a velocity of 0, we have to imagine what a velocity vs. time graph would look like. The graph could look like:



In the example graph, the indicated point has a velocity of zero because the point is on the time-axis. As you can see in the graph, the graph has a change of direction. Like in position vs. time graph, you could search for a 0 velocity when the slope is about to change from negative to positive or vise-versa. No slope.

1-5: 5 NO questions

Refer to pg 23

Scenario 5:

d.) For which of these, if any, is the velocity negative at the indicated point?

Graphs D, F, G, I

Pre-thinking:

- The slope of the position vs time graph must be negative
- The velocity vs. time graph would be negative when an object travels in the negative direction

Conclusion:

As the class concluded, the position vs. time graph must have a negative slope at the indicated point in order to have a negative velocity.

Summary:

In order to determine a negative velocity we must search for a graph that has a negative slope on the position vs. time graph. A negative slope would mean that the object is moving in a negative direction, thus causing a negative velocity. The graphs that show that are graphs D, F, G, I.

1-5: 5 No questions

2/8/21

Refer to pg 23

Scenario 4:
For which of these, if any, is the acceleration zero at the indicated point

$\boxed{\text{Graph A}}$

Pre-thinking:
- What is a zero acceleration?
- Could you have a slope on the velocity graph?

Conclusion:
- A zero acceleration would mean that the position vs. time graph has a constant slope
- No slope would be on the velocity graph.
- The class would agree with statement 5.

Summary:
Graph A would be the only graph that has an acceleration of zero. In order for acceleration to be zero, the slope must be zero on the velocity vs. time graph. For a velocity vs. time graph to have no slope, the slope must be constant on the position vs. time graph, meaning there is no change in slope.

1-5: 5 No questions

Refer to pg 23

Scenario 7:

For which, if any, is acceleration negative at the indicated point?

$\boxed{\text{Graphs E, C, F, H}}$

Pre-thinking:

- How can one get a negative acceleration?
- Is there more than one possible way?

Conclusion:

The acceleration graph would have a negative acceleration when the slope on the velocity vs. time graph is negative.

Me and group	Class
We thought G and I was the answer due to a positive position and negative slope. We were a little mixed up.	The class determined the slope and how the slope changes is the determining factor.

Summary:

Graphs E, C, F, and H have a negative acceleration. A velocity vs. time graph would have to be going in a positive direction getting slower or the graph could be going in a negative direction getting faster. To determine that on the position vs. time graph, the graph would have a positive slope while the slope begins to lessen. On the other hand, the graph could have a negative slope with the slope getting greater.

1-5: 4, I understand but need to process some more.

No questions.