



Name: \_\_\_\_\_

09/07/10

Honor Statement: *I certify that all the work on this test is my own. I have not cheated, nor have I acted dishonorably in any way concerning the information on this test.*

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

### AP Physics 2 - 3-Weeks Test

1. Rosalie is running to the southwest at 7 m/s. Sara is standing directly east of her, 10 m away, holding a nerf dart gun with a muzzle-velocity of 25 m/s. At what angle should Sara aim the dart gun to hit Rosalie?

2. You are visiting the planet Mercury. You drop a ball from various heights in order to determine the acceleration due to gravity. You collect the following information:

Height (m)	Time of Fall (s)	
0.25	0.37	
0.5	0.52	
0.75	0.63	
1	0.73	
1.25	0.82	
1.5	0.9	
1.75	0.97	
2	1.04	
2.25	1.1	
2.5	1.16	

- a) Sketch a graph of the data:

- b) What variable(s) should be manipulated in order to obtain a straight line? Calculate the values of this manipulated variable, and add them to the table.

- c) Graph your data. Include appropriate units and labels.

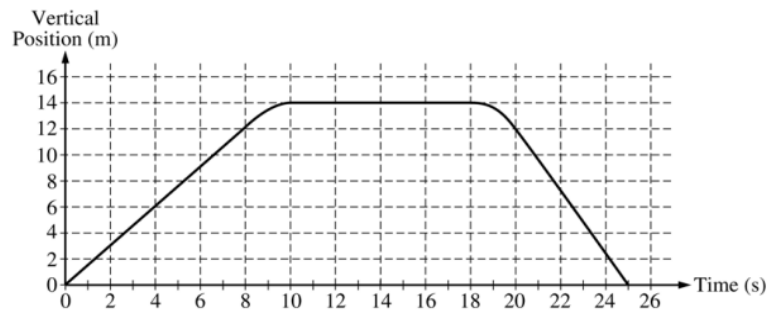

- d) Use the slope of this line to calculate acceleration due to gravity on Mercury.



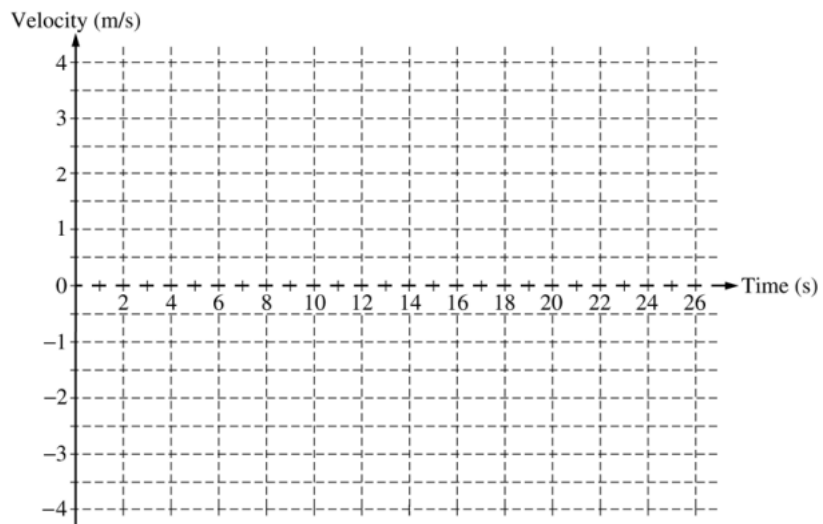
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3. The vertical position of an elevator is shown by the graph below:



a) On the grid below, graph the velocity of the elevator as a function of time:



b) Calculate the average acceleration for the time period  $t = 8\text{s}$  to  $t = 10\text{s}$

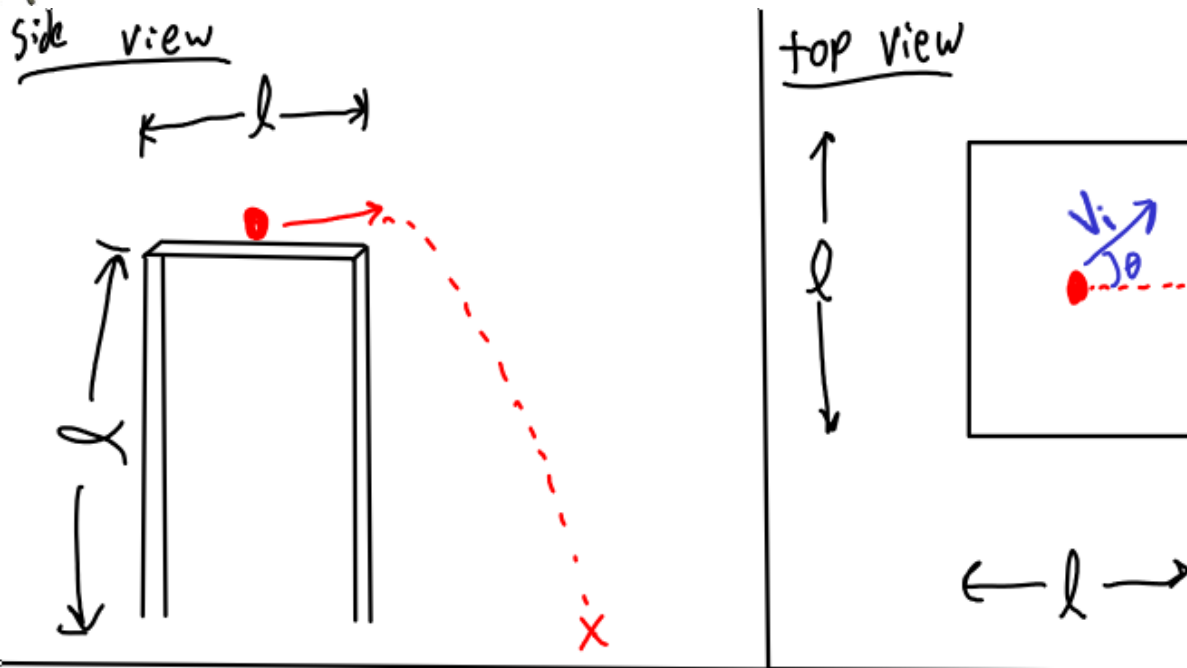
c) On the box below, draw an arrow to indicate the direction of this average acceleration.





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4. A ball is placed in the center of a table, with length, width, and height of  $l$ . It is given an initial velocity of  $v_i$  at an angle  $\theta$  north of east (where  $\theta < 45^\circ$ ).

a) Derive an expression for the time it takes for the ball to reach the edge of the table.

b) Derive an expression for the length of time that the ball is falling.

c) How far from the center of the table does the ball land?



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5. Billy-Bob is fixing the roof of his house, that is angled at 25 degrees to horizontal. He slips, and begins to slide off the roof.
- If Billy-Bob's roof is frictionless, what is the acceleration due to gravity that Billy-Bob experiences pulling him down the ramp?
  - Billy-Bob slides along the roof for 3 meters. What is his velocity at the edge of the roof?
  - Billy-Bob then goes off the roof, following a ballistic trajectory. The building is 10 meters high. Where does Billy-bob land?
  - Assuming Billy-Bob can withstand an impact with a velocity of 8 m/s without getting seriously hurt, will he have to go to the hospital?