Name: Key No:

Physics linear motion practice problems – (longer than test, lots of practice just for you because I like you so much!) Physics linear motion formulae

$v_{avg} = \frac{\Delta x}{\Delta t}$ $v_{avg} = \frac{v_f + v_i}{2}$ $a_{avg} = \frac{\Delta v}{\Delta t}$

a = const. $v_f = v_i + at$ $x_f = x_i + v\,t$ $v_f^2 = v_i^2 + 2a(x_f - x_i)$

60 mph = 27 m/s;

Word problems

Easy

1. Superman is off to visit Lois Lane. He sees he's late and increases his flying speed. I know he defies the laws of physics anyway, but let's pretend, okay? If our lead-phobic super hero accelerates uniformly from 1200 m/s to 1600 m/s in 0.40 seconds, then what is his rate of acceleration?
   1000 m/s^2
2. Scoobie runs after a Scoobie Snack® placed by Daphne 60 m away. Scooby averages 9 m/s. How long until the snack is in his mouth?
   6.7 s
3. Barney is walking with all his good friends. If he began walking away from Lucy 12 seconds ago at an average speed of 1.5 m/s and is now 25 m from Lucy, the how far from her was he when he began walking?
   7 m
4. Charlie rolls a basketball down a ramp. If ball velocity increases from 3 m/s south to 24 m/s south in 7 seconds, then what is the acceleration?
   3 m/s^2
5. Mary slept all during physics class in high school. She needs to know if her friend can jump across a pool. Her friend averages 9.0 m/s and can stay airborne for 0.80 seconds. I know we shouldn't feel sorry for Mary, but let's help her out anyway: How long of pool is the most her friend can possibly leap across?
   7.2 m

Medium

6. Mike lets his bike roll down a hill beginning from rest and accelerating uniformly. If he rolls 125 m in 25 s, then what was his rate of acceleration?
   0.4 m/s^2
7. A rabbit wakes up from a nap and begins chasing a turtle. If the rabbit runs at 6 m/s and the turtle runs at 0.5 m/s, then how long will it take our foolish bunny to catch the turtle if he has a 300 m lead?
   54.5 s
8. According to an article in Business Week, the 2008 Corvette can go from zero to 60 mph in just 4.2 seconds. Assuming acceleration is uniform, then how much track length did it take to accomplish this?
   56.7 m

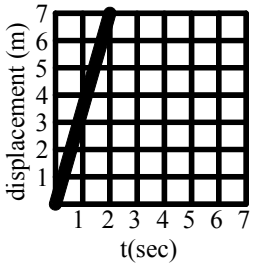
Hard

9. Madisen is fast, so she plays a shallow center field. If she begins 50 m from the ball and can run 9.0 m/s then how deep can she catch a ball hit at 30 ms in line with her (headed over her head)?
   71.4 m
10. A sled slides for 9 seconds down a 108 m hill accelerating constantly the whole time so as to reach a final speed of 20 m/s after being given a push to give it a small starting speed. How fast was the starting speed?
    4.0 m/s
11. If a 2008 Corvette can go from zero to 60 mph in 4.2 seconds, how fast would it be going at the end of 100 m assuming acceleration is constant?
    35.9 m/s

Sample multiple choice problems:

12. You buy and car and the odometer says it has 12,000 miles. What does your car odometer read?
    a. Speed
    b. Velocity
    c. Displacement
    d. <u>Distance</u>
13. You're pedaling your fancy bike and see the speedometer reads 10.5 mph. What does the speedometer reveal?
    a. Instantaneous velocity
    b. <u>Instantaneous speed</u>
    c. Average velocity
    d. Average acceleration
    e. Average distance
14. Which of the following is NOT a scalar?
    a. Speed
    b. <u>Displacement</u>
    c. Magnitude of acceleration
    d. They're all scalars!
15. What do you calculate when you find the slope of an acceleration-time graph?
    a. Velocity
    b. Acceleration
    c. Displacement
    d. <u>Nothing meaningful</u>
16. A horse (Mr. Ed) runs as fast as his poor little feet can carry him in a 1.5 mile complete circle around a track. What was Mr. Ed's displacement during the course of the race?
    a. 1.5 miles
    b. <u>0 miles</u>
    c. 0.75 miles
    d. 3.0miles
    e. -1.5 miles
17. The correct setting for the blue tracker arrow scale is:
    a. 1.0 m
    b. 1.8 m
    c. Zero m
    d. <u>The length of whatever object you know</u>
    e. Trick question: you NEVER change the scale setting!
18. The difference between a scalar and a vector can best be summarized by which of the following?
    a. Vectors are always longer than scalars
    b. Vectors are the "rate of change" of scalars
    c. Scalars are the "rate of change" of vectors
    d. Scalars and vectors are the same
    e. <u>Vectors include a direction</u>
19. Which of the following is NOT an example of linear motion?
    a. Dropping a ball
    b. Rolling a bowling ball without any special spin
    c. <u>Tom Brady throwing an interception (go Giants!)</u>
    d. Passing a hockey puck flat across the ice

(1)



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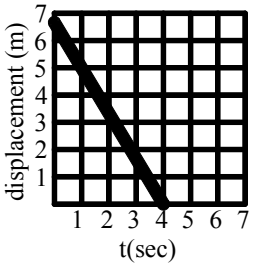

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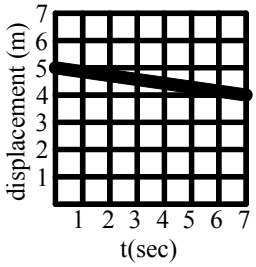

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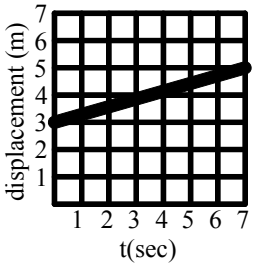

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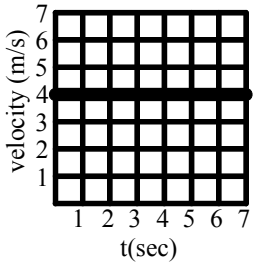

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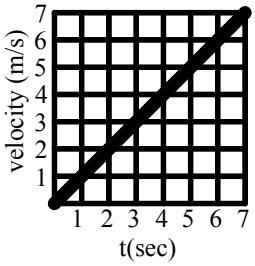

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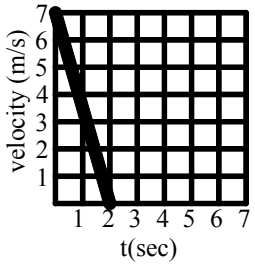

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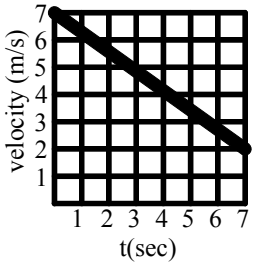

20. Which graph(s) represent constant (& non-zero) acceleration?
    a. 5
    b. 1,2,3,4,5
    c. <u>6,7,8,</u>
    d. All of these
21. In which graph is the highest speed depicted?
    a. 1
    b. 5
    c. 7
    d. 6
    e. <u>6,7,8</u>
22. Which graphs indicate backward motion?
    a. <u>2,3</u>
    b. 7,8
    c. 2,3,7,8
    d. 5
23. Which graph shoes a constant speed of 0.28 m/s?
    a. 1
    b. <u>4</u>
    c. 5
    d. 8

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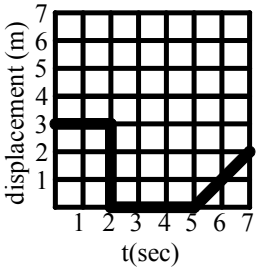

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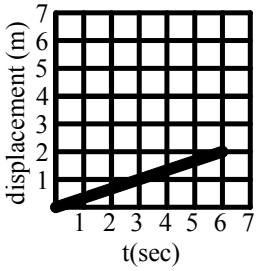

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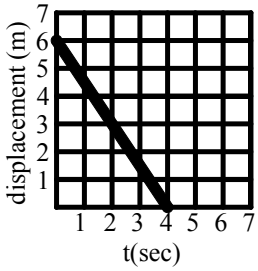

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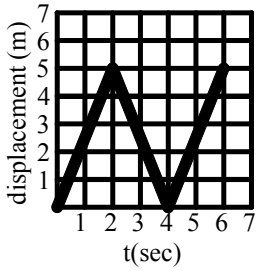

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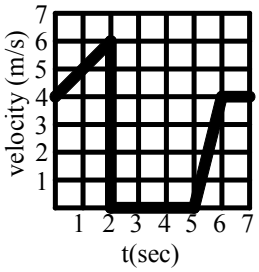

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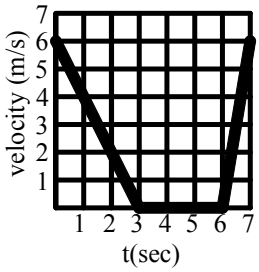

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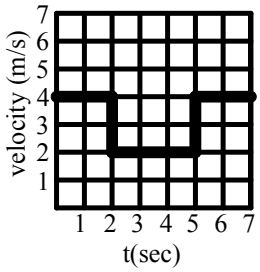

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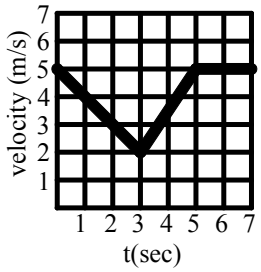
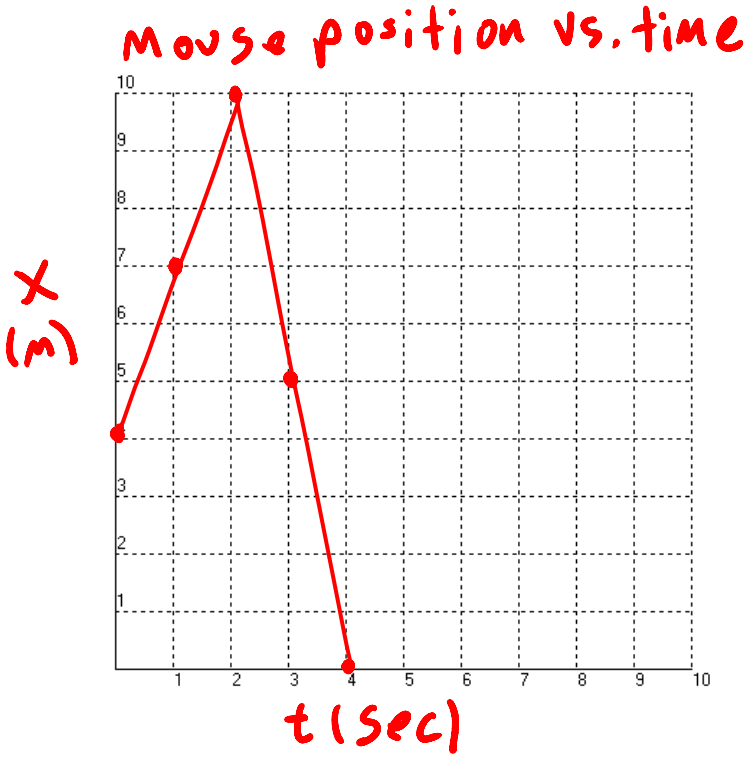
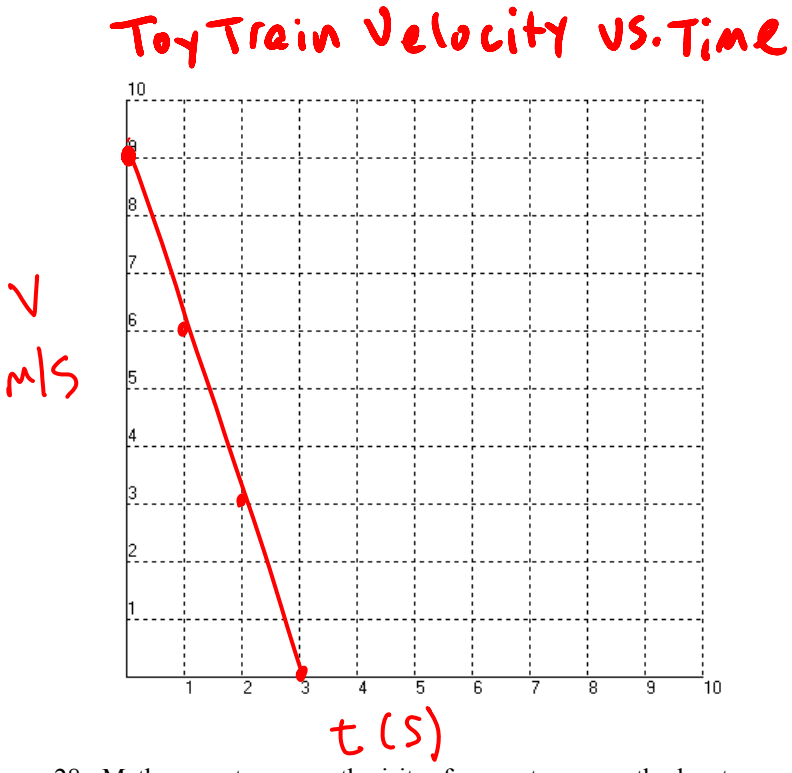


24. Which graph shows Sam jogging along and thinks a bee is there, so she speeds up for a couple seconds. Then she realizes it's only a mosquito, so she stops for a few seconds to kill it before returning to her jog.
    a. 1
    b. 4
    c. 5
    d. 6
    e. 7
25. Which graph shows Mark jogging slowing down to a walk to pant for a few seconds, then resumes his jog.
    a. 1
    b. 4
    c. 6
    d. 7
26. Which graph shows a student returning back to her desk?
    a. 2
    b. 3
    c. 4
    d. 7



27. Use the graph above to draw a mouse starting a x = 4 m from the cheese. He runs away from it for 2 seconds at 3 m/s because he sees spot, the cat. When he sees spot using the kitty litter he makes a mad dash for the cheese running toward to it at breakneck speed of 5 m/s. Draw the position graph above (labels count!)



28. Math man, strange math visitor from a strange math planets pays homage to HCHS physics by visiting physics class. He says "whoa dude, that's some righteous physics goin' on". He needs a velocity vs. time graph for a toy train accelerating at a constant -3 m/s^2 with an initial velocity of +9 m/s. Give him a good impression of earth by helping him out.