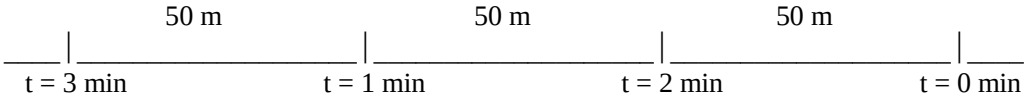
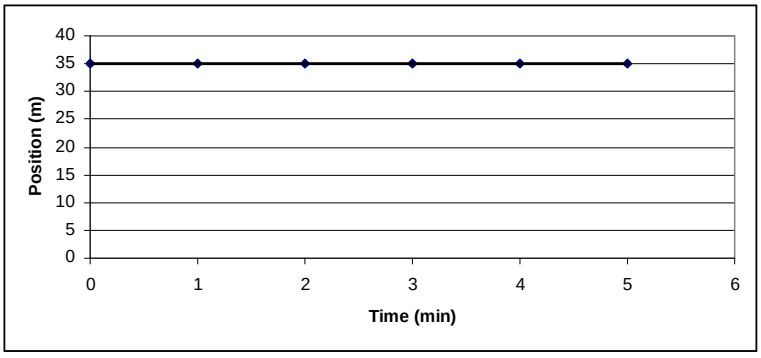
Kinematics Study Guide

***Mrs. Linden will hand out the graphs for #12-13, 19, and 26. You cannot do these without the graphs.*

1. Two students measure the speed of light. One obtains $(3.001 \pm 0.001)x10^8$ m/s; the other obtains $(2.999 \pm 0.006)x10^8$ m/s. The true value of the speed of light is $2.998x10^8$ m/s.
   a. Which is more precise? b. Which is more accurate?
2. According to #59 on p. 25 of your textbook, how long is the leaf? (Remember, you should only estimate one digit!)
3. The masses of two metal blocks are measured. Block A has a mass of 8.45 g and block B has a mass of 45.87 g.
   a. How many significant figures are expressed in these measurements?
   b. What is the total mass of block A plus block B?
4. Convert each of the following measurements to meters.
   a. 42.3 cm b. 21 km c. 214 μm
5. Convert 67.3 in to meters.
6. Solve the following problem: 15.5 cm x 12.17 cm
7. What is the difference between a scalar and a vector?
8. Below is a representation of a person pacing back and forth. Calculate the following:
   a. Distance traveled b. Displacement c. Velocity



9. A car travels 50 km, North with constant velocity of 85 km/hr. He stops for 15 minutes and then continues driving North with an average velocity of 80 km/hr for 50 minutes. Calculate the total displacement, total time of entire trip, and average velocity for entire trip. Show your work!! (Be sure to convert minutes to hours before beginning.)
10. What does the slope of a d-t graph measure?
11. A position-time graph for a bicycle is shown in the figure below.
    a. What is the position of the bicycle at 1.00 min?
    b. What is the position of the bicycle at 3.50 min?
    c. What is the displacement of the bicycle between the times 1.00 min and 5.00 min?
    d. Describe the motion of the bicycle.



12. Two cars head out in the same direction. Car A starts 1.0 min before car B. The position-time graphs for both cars are shown in a graph. (See the graphs that Mrs. Linden handed out in class.)
    a. How far apart are the two cars when car B starts out at t = 1.0 min?
    b. At what time do the cars meet?
    c. How far apart are the cars at time t = 3.0 min?
13. The position of an airplane as a function of time is shown in the figure. (See the graphs Mrs. Linden handed out in class.)
    a. What is the average velocity of the airplane?
    b. What is the average speed?
14. What does the slope of the tangent to the curve on a velocity-time graph measure?
15. Can a car traveling on an interstate highway have a negative velocity and a positive acceleration at the same time? Explain.
16. If an object's velocity-time graph is a straight line parallel to the t-axis, what can you conclude about the object's acceleration?
17. What quantity is represented by the area under a velocity-time graph?
18. Give some examples of falling objects for which air resistance cannot be ignored.
19. Explain how you would walk to produce the given d-t graph. (See the graphs Mrs. Linden handed out in class.)
20. Draw the corresponding d-t, v-t, and a-t graphs for the following situation which involves 5 motions:

(1) constant speed in the positive direction (2) slowing down in the positive direction
(3) stopping for a moment in time (4) speeding up in the negative direction
(5) constant speed in the negative direction

21. The value of g on the Moon is one-sixth of its value on Earth.
    a. Would a ball that is dropped by an astronaut hit the surface of the Mon with a greater, equal, or lesser speed than that of a ball dropped from the same height to Earth?
    b. Would it take the ball more, less, or equal time to fall?
22. A dragster starting from rest accelerates at 49 m/s^2. How fast is it going when it has traveled 325 m? Show your work!!
23. A stone that starts are rest is in free fall for 8.0 s. Shown your work when solving the following:
    a. Calculate the stone's velocity after 8.0 s.
    b. What is the stone's displacement during this time?
24. The velocity of a car changes over an 8.0-s time period, as shown in the Table below.
    a. Plot the v-t graph of the motion.
    b. Determine the displacement of the car during the first 2.0 s.
    c. What displacement does the car have during the first 4.0 s?
    d. What is the displacement of the car during the entire 8.0 s?
    e. Find the slope of the line between t = 0.0 s and t = 4.0 s. What does this slope represent?
    f. Find the slope of the line between t = 5.0 s and t = 7.0 s. What does this slope indicate?

Time (s)	Velocity (m/s)
0.0	0.0
1.0	4.0
2.0	8.0
3.0	12.0
4.0	16.0
5.0	20.0
6.0	20.0
7.0	20.0

25. The total distance a steel ball rolls down an incline at various times is given in the Table below.
    a. Draw a d-t graph of the motion of the ball.
    b. Calculate the slope of the line. Include units!
    c. Write the equation of the line in terms of d and t.
    d. Calculate the distance the ball has rolled at end of 2.2 s.

Time (s)	Distance (m)
0.0	0.0
1.0	2.0
2.0	4.0
3.0	6.0
4.0	8.0
5.0	10.0

26. Jason and his sister, Tara, are riding bicycles. Jason tries to catch up to Tara, who has a 10.0-s head start. (See the graphs that Mrs. Linden handed out in class.)
    a. What is Jason's acceleration? b. What is Tara's acceleration? c. At what time to they have the same velocity?
27. Suppose a car rolls down a 52.0-m-long inclined parking lot and is stopped by a fence. If it took the car 11.25 s to roll down the hill, what was the acceleration of the car before striking the fence? Show your work!
28. A hiker tosses a rock into a canyon. He hears it strike water 4.78 s later. How far down is the surface of the water? Solve this problem two ways:
    (1) Draw a v-t graph (2) Use an equation
29. Draw 4 velocity vectors and 4 acceleration vectors for the following motion: slowing down in the negative direction
30. Using the v-t graph, determine the displacement for the entire trip. (See the graphs Mrs. Linden handed out in class.)