Final Review Practice D

1. A ball is dropped from rest from a height of 180 meters.
a) What is the time it takes for the ball to hit the ground?

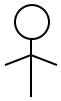
b) What is the speed of the ball when it hits the ground?

2. A ball is dropped from rest from a height of 180 meters on a planet where $g = 4\ m/sec^2$.
a) What is the time it takes for the ball to hit the ground?

b) What is the speed of the ball when it hits the ground?

3. A 2000-kg car experiences a braking force of 12000 N and skids to a stop in 8 seconds.
a) Draw a force diagram and motion diagram for the braking car.
b) What was the initial speed of the car?
c) What is the coefficient of friction between the tires and the road?

4. A 80-kg man is descending in an elevator at 10 m/sec. The elevator then comes to a stop over a time of 4 seconds.
a) Draw a motion diagram for the man including the acceleration vector.
b) Draw a force diagram including the net force. (Diagram at right.)
c) What is the normal force on the man?

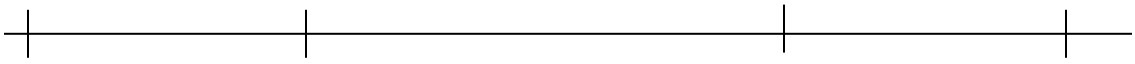


d) What apparent weight does the man feel?

5. A 50-kg box is on a smooth floor. The coefficients of friction between the box and the floor are $\mu_s = .7$ and $\mu_k = .5$.
a) How hard do you have to push the box to start it moving?
b) How hard do you have to push the box to accelerate it forward at a rate of 1.5 m/sec^2?

6. A car travels between two stoplights (point A and point D) separated by a distance of 1200 m. The car starts from rest at the first light, accelerates at 3 m/s/s to a constant cruising speed of 24 m/s, continues at constant speed for a certain distance, then decelerates at 4 m/s/s until it comes to a stop at the second light.
a) Draw a motion diagram showing the acceleration arrows for each of the three segments of the trip.

$t_A = 0$	$t_B =$	$t_C =$	$t_D =$
$x_A = 0$	$x_B =$	$x_C =$	$x_D = 1200$
$v_A = 0$	$v_B = 24$	$v_C =$	$v_D =$



b) Find the time and distance traveled for each of the three segments of the trip.
c) What is the time for the total trip from light to light (point A and point D)?
d) Fill in the rest of the values for *t*, *x*, and *v* in the chart above. All time and position values are cumulative.

7. A vehicle is traveling at a constant speed of 50 miles/hour. The vehicle then decelerates (slows down) at a rate 2.5 miles/hour/sec for a period of 8 seconds, then continues on at a new constant speed. **What is the new constant speed?**
(Note: You don't have to convert any units. You can leave the speeds as miles/hour.)

8. A rock initially at rest is dropped from a cliff which is 90 m above the ground.
a) How many seconds does it take for the rock to hit the ground?

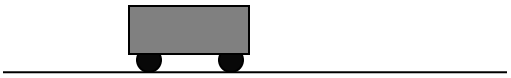
b) What is the speed of the rock when it hits the ground?

9. A ball is thrown upward from the ground on Mars and returns to the ground. The total trip up and down takes 12 seconds. The acceleration of gravity on the planet Mars is 4 m/sec^2.

a) What is the initial velocity of the ball? b) What height does the ball reach?

10. A 120-kg cart (initially at rest) is being pushed to the right with a push force of 420 N. There is a friction force against the cart with $\mu = .2$.

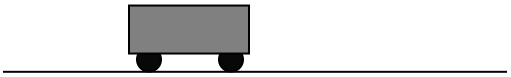
a) Draw a force diagram for the cart. Include the net force.



b) What is the speed of the cart after having been pushed for 6 seconds?

10 (cont.) After 6 seconds of pushing, the push force is removed and cart continues forward until it comes to a stop.

c) Draw a force diagram for the cart while it is slowing down to a stop.



d) What distance does the cart travel after the push force is removed?

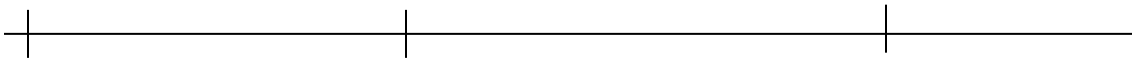
11. An object is shot upward from the ground with an initial speed of 70 m/s.

a) What is its speed 3 seconds later?

b) How high is the object above the ground 3 seconds after being shot upwards?

12. A car is competing in a 1200-meter (3/4-mile) drag race. The car accelerates from 0 to 90 m/sec in 10 sec, and then continues the rest of the race at a constant speed of 90 m/sec.
a) Draw a motion diagram for the whole trip. Include the acceleration arrows. Fill in the information you know about x, t, and v.

$t_A = 0$	$t_B =$	$t_C =$
$x_A = 0$	$x_B =$	$x_C = 1200$ m
$v_A = 0$	$v_B =$	$v_C =$



b) What is the <u>total</u> time for the car to travel the 1200 meters?