Honors Mid-Term Review Questions:

***Conversions/ Vectors***

1. Convert 25km/h to m/s

2. Add the following vectors to determine the resultant vector

 A = 3m @ 0 degrees ; B = 5.6m @ 30 degrees

3. Vector A is oriented at 0 degrees and has a length of 30m. Vector B is added to Vector A at 90 degrees and has a length of 45m. What is the resultant magnitude and direction

***Straight Line Motion / Free Fall***

1. A rabbit runs 35m with a velocity of 27m/s. How long does it take the rabbit to run this displacement?

2. A car travels 600m in 1minute, 450m in 45s, stops for 3 minutes, then travels in the opposite direction 900 m for 3 minutes. What is the car’s average speed and average velocity?

3. A car initially traveling 45m/s, slams on the brakes to avoid an accident. If the car decelerates at -5.4m/s2, what displacement did the car travel while coming to rest?

6. A ball is thrown straight into the air with a velocity of 25m/s. How high does the ball rise? How long will the ball be in the air?

7. If I toss the ball in number 6 with twice the original velocity how much higher will it go? 3x’s as fast?

8. A stone is dropped from the edge of a bridge and hits the water 7s later. How high is the bridge? With what velocity does it hit the water with?

9. A boat can travel at 20m/s in still water. It heads straight across a river that has a current moving perpendicular to the direction of the boat at 4.5m/s. If the width of the river is 1500m wide, how long does it take the boat to cross and how far down river does the boat end up?

10. If I run at 10m/s, and another runner in 20m in front of me is running 8m/s, how long will it take for me to catch them? How far will I have run?

11. Draw the graphs for D vs T, V vs T and A vs T for an object that is at rest? Moving with constant velocity? Moving with constant acceleration

12. If I was given a graph of Velocity vs time for an object and it looked like a diagonal line (see below)

 V How could we determine the acceleration?

 T

***Projectile Motion***

1. Maximum range occurs when a case II projectile is launched at what angle?

2. An object is launched from a cliff with a velocity of 20m/s horizontally, and lands 300m from the base of the cliff. How high is the cliff?

3. A projectile is launched from the ground with a velocity of 30m/s at an angle of 25 degrees. How long was the projectile in the air? What is its velocity at max height? What is the range of the projectile?

4. The Military launches missiles into the side of a deserted island’s mountain. If the missiles strike the side of the mountain 50m vertically from the ground, what was the initial velocity of the missile if it’s range was 3000m and launched at an angle of 45 degrees.

5. A soccer ball is kicked from the ground at an angle of 25 degrees. It lands some distance down the field 4 seconds later. What is the initial velocity of the ball?

***Newton’s Laws of motion***

1. Define Inertia

2. A mass is given a force of 25N to the right and accelerates at 3m/s2, what is the mass?

3. A mass slides down a frictionless incline of 30 degrees. What is the acceleration of the mass?

4. A Horizontal vertical system is set up such that the horizontal mass is 3kg, and the vertical mass is 1kg. Assuming no friction, what is the acceleration of the system

5. An Atwood Machine has a 10g mass and a 15g mass attached to it. What is the acceleration of the system.

6. A mass slides 3m horizontally before coming to rest. If the mass had an initial velocity of 10m/s, what is the coefficient of friction between the mass and the floor?

7. A bucket of water (mass = 20kg) is raised from a well by a force of 300N. What is the acceleration of the bucket?

8. A mass of 2kg is being pulled up an incline by a force of 30N. If the angle of the incline is 30 degrees and the coefficient of friction is .45, what is the acceleration of the mass?

9. A sign of mass 10kg is held by two cables that make the following angles: 30 degrees on the left and 60 degrees on the right. Calculate the Tension in each cable.

10. A sled is being pulled by a force of 25N by a rope that is angled at 30 degrees to the horizontal. If the mass of the sled is 3kg, what is the acceleration of the sled? (no friction)

11. In problem 10 if the coefficient of friction was .2, what would be the new acceleration?

12. An object is pulled with the following forces, calculate the net force on the object:

 F1 = 10N @ 35 degrees

 F2 = 23N @ 45 degrees

 F3 = 34N @ 180 degrees

***Circular Motion***

1. A tennis ball is attached to a string and twirled in a horizontal circle of radius 3m. If the mass of the ball is .2kg and the ball makes 20 rotations in 3.5s, what is the Tension in the rope?

2. A car is traveling around a flat roadway at 40m/s. If the coefficient of friction between the tires and the road is .6, what is the minimum radius the turn can have in order for the car to maintain contact with the road?

3. A rubber stopper is attached to a string of length .5m. If the velocity of the stopper is 7m/s at the bottom of the swing, and 3m/s at the top of the swing, what is the Tension in the string at each location? What is the minimum velocity the stopper needs at the top of the vertical circle in order to maintain its circular path?

4. A banked turn is set up in such a way that we can travel at 60m/s around it. If the radius of the turn is 90m, at what angle is the turn banked at?

5. What velocity must a satellite have in order to maintain an altitude of 300km above the surface of the earth?

***Newton’s Law of Gravitation – (Use notes/handouts)***