

**Part 1 Do any 12 problems**

**An airplane trip involves three legs with two stopovers. The first leg is due west for 620km; the second leg is 30° north of east for 440km; and the third leg is at 53° south of west for 550 km. The trip started at 3:15 PM and ended at 8:45 PM .**

1. Sketch 3 separate pictures showing each displacement
2. Copy and fill in the table showing the component of each vector. Include the calculation of the x and y components of the resultant vector(not magnitude and angle)

Vector	Magnitude	Angle	X-component	Y-component
D1				
D2				
D3				
Resultant				

**Convert, write in scientific notation and state number of “sig figs”**

3.  $35 \cdot 10^{-2}$  km into millimeters and then  
0.0560 cm<sup>3</sup> to mm<sup>3</sup>

**The distance required stopping a car traveling at 20m/s will be estimated. Assume the time between the driver first realizing the brakes should be applied and the actual application of the brakes (the reaction time) is 0.6s. Once the brakes are applied the car is subject to a constant acceleration of 7m/s<sup>2</sup>.**

4. Find the total distance required to stop the car

**A man lowers a 330kg piano down a 28° incline as shown. He pushes parallel to the plane and keeps the piano from moving too fast. The piano accelerates from rest to 3m/s while traveling 2.25m down the incline. The surface has a coefficient of kinetic friction of  $\mu_k = 0.2$**



5. Draw a FBD of the piano showing x and y components)
6. Calculate the change in the potential energy
7. Calculate the NET WORK

**A 50kg person stands on a scale placed in a elevator. As an elevator passes the 49<sup>th</sup> floor it is traveling at a speed of 6m/s. The elevator uniformly slows down at a rate of 1.125m/s<sup>2</sup> eventually stopping at the 55th floor..**

8. Find the reading of the scale

**A balloon rises at a constant speed of 10 m/s. At an altitude of 36.1 m a ball is thrown out of the balloon with a velocity of 20 m/s at an angle of 30 degrees above the horizontal. It strikes the ground a little time later.**

9. Determine the x and y components of the velocity and the acceleration at its maximum height

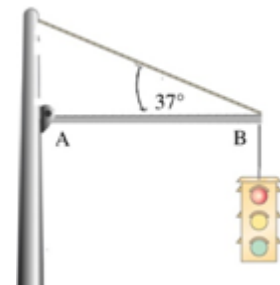
**A car uniformly accelerates from 10 m/s to 40m/s in a semicircular arc of 220m.**

10. Determine the tangential acceleration

**A 0.160 kg baseball is pitched at 38 m/s and hit on a horizontal line drive straight back toward the pitcher at 53m/s. The time of contact between the ball and the bat is 3ms.**

11. Find the change in the momentum of the ball

**A traffic light hangs from a pole as shown in the picture. The uniform aluminum pole AB is 7.50 m long . The tension in the guy wire is 500N**



12. Find the torque for the tension force if the hinge is used as the axis of rotation

**The blades of a 30cm radius fan slow down from 20 rpm to 10 rpm in 20 seconds.**

13. Determine the number of revolutions performed by the fan in slowing down

14. Determine the linear speed of the tip of the blade when it is moving at 10rpm

**An object of mass 10kg is completely immersed in a fluid of density  $\rho = 13.6 \text{ kg/m}^3$  and is floating.**

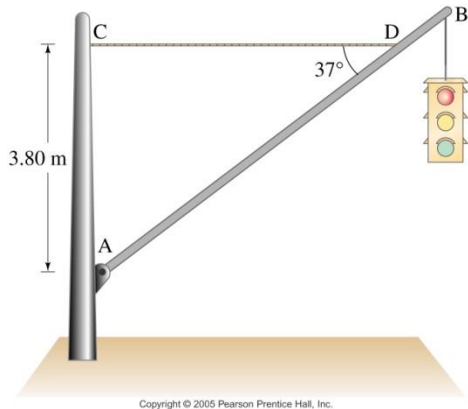
15. Find the volume of the floating object

**Part 2 Do any 3**

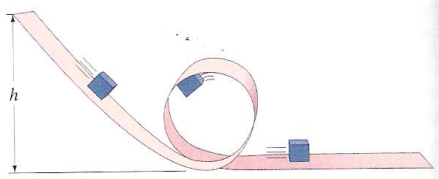
**Billiard ball “A” of mass  $m_a = 0.400\text{kg}$  moving with a speed  $V_a = 1.80\text{m/s}$  strikes ball “B”, initially at rest of mass  $m_b = 0.500\text{kg}$ . As a result of the collision, ball “A” is deflected of at an angle of  $30^\circ$  with a speed of  $V'_a = 1.10\text{m/s}$ .**

16. Find the speed and angle ball “B” is traveling in as a result of the collision

**A traffic light hangs from a pole as shown in the picture. The uniform aluminum pole AB is 7.50 m long and has a mass of 12.0 kg. The mass of the traffic light is 21.5 kg.**



17. Determine the tension in the horizontal massless cable CD, and the vertical and horizontal components of the force exerted by the pivot A on the aluminum pole.



**A 5kg block starts at a height of 10m above the ground and slides down a rough surfaced 30degree incline at constant speed. It reaches the bottom and enters a frictionless vertical loop of radius 2m. The block performs one revolution and exits the loop.**

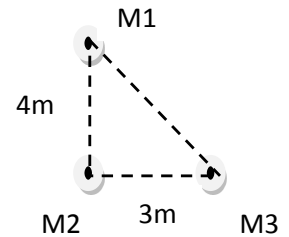
18. Determine the Normal force at the top of the hoop.

**A balloon rises at a constant speed of 10 m/s. At an altitude of 36.1 m a ball is thrown out of the balloon with a velocity of 20 m/s at an angle of 30 degrees above the horizontal. It strikes the ground a little time later.**

19. Determine the average velocity

**Three identical 3kg spheres are located on the vertices of a right triangle as shown in the picture.**

20. Find the total gravitational force, magnitude and direction, on M1 due to M2 and M3



**A car uniformly accelerates from 10 m/s to 40m/s in a semicircular arc of 220m.**

21. Determine the total acceleration halfway through the turn in magnitude and direction