WEEK 1: EQUATIONS OF MOTION/PROJECTILES

1. Grace is driving her sports car at 30 m/s when a ball rolls out into the street in front of her. Grace slams on the brakes and comes to a stop in 3s. What was the acceleration of Grace's car?

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2. King Kong carries Naomi Watts up the 321m tall Empire State Building. At the top of the skyscraper, Naomi's shoe falls from her foot. How fast will the shoe be moving when it hits the ground?

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3. In 1945, the *Enola Gay*, a B-29 bomber, dropped the atomic bomb from a height of 9450 m over Hiroshima. If the plane carrying the bomb were traveling with a horizontal velocity of 67m/s, how far horizontally would the bomb have traveled between the point of release and the point where it exploded 513 m above the ground? (To avoid being above the bomb when it exploded, the Enola Gay turned sharply away after the bomb's release.)

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WEEK 2: RELATIVE VELOCITY/EQUILIBRIUM

1. Rochelle is flying to New York for her big Broadway debut. If the plane heads out of Los Angeles with a velocity of 220m/s in a northeast direction, relative to the ground, and encounters a wind blowing head-on at 45m/s, what is the resultant velocity of the plane, relative to the ground?

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2. Flip, an exhausted gymnast, hangs from a bar by both arms in an effort to catch his breath. If Flip has a mass of 65kg, what is the tension in each of Flip's arms as he hangs in place?

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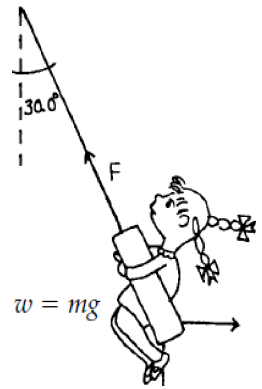
3. Jen likes to swing on a tire tied to a tree branch in her yard. If Jen & the tire have a combined mass of 82.5 kg, & Eric pulls Jen back far enough for her to make an angle of 30° with the vertical, what is the tension in the rope supporting Jen & the tire?



WEEK 3: MOMENTUM

1. Tiger Woods hits a 0.05kg golf ball, giving it a speed of 75m/s. What impulse does he impart to the ball?

2. Wayne hits a stationary 0.12kg hockey puck with a force that lasts for 0.01s and makes the puck shoot across the ice with a speed of 20m/s, scoring a goal for the team. With what force did Wayne hit the puck?

3. A tennis ball traveling at 10m/s is returned by Venus Williams. It leaves her racket with a speed of 36m/s in the opposite direction from which it came. a) What is the change in momentum of the tennis ball?

b) If the 0.06kg ball is in contact with the racket for 0.02s, with what average force has Venus hit the ball?

WEEK 4: CIRCULAR MOTION

1. After closing a deal with a client, Kent leans back in his swivel chair and spins around with a frequency of 0.5Hz. What is Kent's period of spin?

2. Missy's favorite ride at the Topsfield Fair is the rotor, which has a radius of 4m. The ride takes 2s to make one full revolution.
a) What is Missy's speed on the rotor?

b) What is Missy's centripetal acceleration on the rotor?

3. Earth turns on its axis once every 24 hours. The radius of Earth is 6.38×10^6 m.
a) If some astronomical catastrophe suddenly brought Earth to a screeching halt (a physical impossibility as far as we know), with what speed would Earth's inhabitants who live at the equator go flying off Earth's surface?