

Unit 07 – Vocabulary and Equations – Circular motion, gravitation, torque & simple machines

<p><u>Vocabulary:</u> previous vocabulary circulation motion simple machine efficiency, gravity, apparent weightlessness centripetal, centrifugal, period, frequency tangential speed, centripetal acceleration centripetal force, circumference g-force, black out, red out, klothoid loop torque, rotate, revolve, banked curve, geosynchronous orbit lever arm ($d \sin(\theta)$) center of mass, axis of rotation lever, inclined plane, pulley right-hand rule mechanical advantage (MA) ideal mechanical advantage (IMA) actual mechanical advantage (AMA)</p>	<p><u>Symbols:</u> a_c, v_t, F_c, τ</p> <p><u>Equations & constants:</u> You get these on test: $a = \Delta v / \Delta t \quad a_c = v^2 / r \quad F_c = ma_c \quad v = x / t$ $x = \text{circumference} = 2\pi r \quad \tau = Fd \sin(\Theta)$ $\tau_{\text{net}} = \Sigma \tau \quad W_{\text{in}} = W_{\text{out}} \quad MA = F_{\text{out}} / F_{\text{in}} = d_{\text{in}} / d_{\text{out}}$ $AMA = F_{\text{out}} / F_{\text{in}} \quad IMA = d_{\text{in}} / d_{\text{out}} \quad \text{Eff.} = W_{\text{out}} / W_{\text{in}}$ $F_g = \frac{G m_1 m_2}{r^2}$</p>
<p>Unit Objectives - Williams</p> <ol style="list-style-type: none"> 1. I understand all the vocabulary & math of this unit and all demos, videos, equations, and class assignments. 2. I remember objectives & vocabulary from previous units. 3. I understand that circular motion requires a center-directed force 4. I know what blackouts and red outs are and conceptually how coasters produce them and how klothoid loops are used to combat them 5. I can look at circular motion examples and identify the source of centripetal forces 6. I know the difference between centripetal force and centrifugal force (inertia) and which one is real 7. I can use basic geometry knowledge to help solve circular motion problems 8. I know the inverse square (gravity) and the inherent relationships therein and this law is common in physics 9. I know the important distance for gravity is the distance between centers of mass 10. I understand the law of gravitation and gravity is a relatively weak force, but is only capable of attraction 11. I know that a normal force is required to feel weight as experienced in elevators and by astronauts 12. I understand what torque is and can distinguish between torque and force 13. I understand that a lever arm is not the same as a length, but a kind of perpendicular length 14. I can describe how the length of a lever arm affects how much torque can be generated 15. I understand that torque is a factor and I can use the right-hand rule to determine its sign 16. I can compute torque, including sign, and find net torque when two or more forces are providing torque 17. I understand the fundamental principle of simple machines: trading force for distance 18. I can identify three kinds of simple machines: lever, inclined plane, and pulley 19. I know what mechanical advantage is and understand the difference between actual mechanical advantage and ideal mechanical advantage 20. I understand the concept of efficiency and how it relates to friction, AMA, IMA, F_{out} and F_{in} <p>DuPage ROE Objectives</p> <ol style="list-style-type: none"> 211. I can identify the direction of the velocity, acceleration, and net force on an object undergoing uniform circular motion. 	