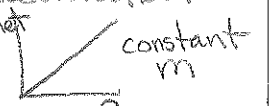
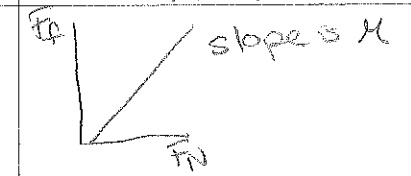
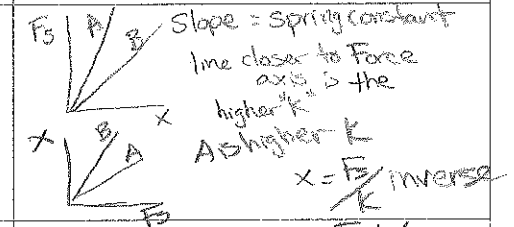
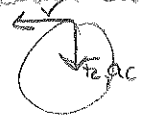
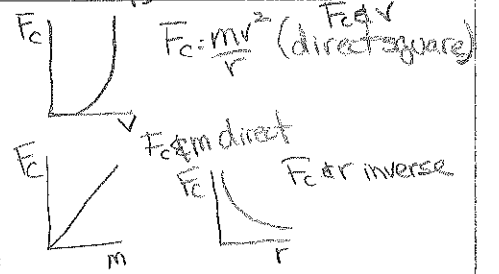
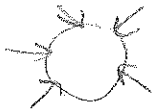
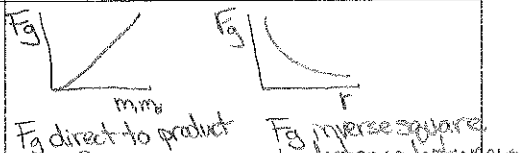
	Facts and Vocab	Equations	Relationships, Graphs and Units
Skill 20: Newton's Law's (Inertia, Impulse and Momentum)	-Inertia is mass, due to inertia objects stay in motion or stay at rest. (1st Law) -For every Force there exists an equal & opposite force (Newton's 3rd Law) -Net force is an unbalanced force, whatever is happening to the net force happens to acceleration ie No Net force (No unbalanced) means No acceleration No speeding up, slowing down or changing direction Constant net force (constant unbalanced force) means Constant acceleration An impulse(J) is required to change momentum(p) Fnet is the rate of change in momentum $F_{net}=\frac{\Delta p}{t}$	$F_{net}=ma$ $(\Sigma F=ma)$ $J=Ft=\Delta p$ $p=mv$ $J=F_{net}t=\Delta p=m\Delta v$ $F_{net}=\frac{\Delta p}{t}$	• Fnet and acceleration is direct  • mass and acceleration are inversely related $a=\frac{F_{net}}{m}$  • for a fixed change in momentum or Impulse Fnet is inverse to t $F_{net}=\frac{\Delta p}{t}$ or $F_{net}=\frac{J}{t}$ $\Delta p=J$ for any given collision
Skill 21: Resultants and Equilibrants	-The sum of 2 or more vectors is known as a resultant. The EQUILIBRANT is the force that balances the resultant equal in magnitude & opposite direction (180°) -As the angle between to vectors increases the resultant decreases & Vice Versa -0° is max resultant (and equilibrant) -180° is min resultant (and equilibrant)	$F_x=F\cos\theta$ $F_y=F\sin\theta$ $\theta=\tan^{-1}(F_y/F_x)$ $F=\sqrt{F_x^2+F_y^2}$	as θ increases Fx decreases and Fy increases $F_x=F_y$ at 45°
Skill 22: Horizontal, Vertical and Inclined Axis	When an object is moving at constant velocity (not speeding up, slowing down, changing direction) it has zero acceleration and no net force → Equilibrium (all force on an axis add to zero) IF it is experiencing a net force, (acceleration) all forces add to Fnet which equals ma Solve using 2 question: What axis? (Summarize the forces on axis) Is that equilibrium? Yes set forces equal to zero No set forces equal to ma Normal force - is the perpendicular force from a surface (Responds to weight) It is the apparent weight in an elevator	$F_g=mg$ $F_{g\parallel}=mg\sin\theta$ $F_N=mg\cos\theta$ $F_{g\perp}=F_N$ $F_{net}=ma$ A single force is also net Horizontal axis $F_{net_x}=F_{Ax}+F_f$ Vertical $F_{net_y}=F_N+F_g$ Incline $F_{net\parallel}=F_{g\parallel}+F_{et}F$ (Eliminate any term if the force is absent)	Forces - Newtons F_g: Weight (Newton's) m: mass (kilograms) as angle of ramp increases $F_{g\parallel}$ increase $F_{g\perp}$ decreases

	Facts and Vocab	Equations	Relationships, Graphs and Units
Skill 23: Coefficient of Friction	Coeffient of friction is a value for frictional interaction between 2 surfaces. The value depends on if the objects are in motion (kinetic) or at rest (static). Static is always greater than kinetic. The value of velocity does not matter to μ - Surface area is not a factor Friction always opposes motion	$F_f = \mu F_N$ $\mu = \frac{F_f}{F_N}$ $F_f = \mu(mg\cos\theta)$ μ has no units Force is measured in Newtons	 μ has no units
Skill 24: Spring Force	Spring constant is a measure of how much force (F_s) is required to stretch a spring by an amount When a mass is attached vertically $F_s = F_g = mg$	$F_s = kx$ For vertical $F_s = F_g$ so $kx = mg$ if given mass in kg must convert to F_g using $F_g = mg$	
Skill 25: Centripetal Motion	The speed of an object moving in a circle is found by $v = \frac{C}{t} = \frac{2\pi r}{T}$ In order for an object to move in a circular path it must experience a force toward the center, F_c a_c & F_c always go in the same direction Velocity is tangent 	$a_c = \frac{v^2}{r}$ $v = \frac{2\pi r}{T}$ $F_c = ma_c$ $\boxed{F_c = \frac{mv^2}{r}}$	
Skill 26: Universal Gravitation	Force between 2 masses is found by Universal Gravity Gravity is always attractive. The force between 2 masses is equal on both. Strength of gravity weakens with distance (r) and increases with mass 	$F_g = \frac{Gm_1m_2}{r^2}$ $G = 6.67 \times 10^{-11} \frac{Nm^2}{kg^2}$ See PRT for mass of planets radius etc.	
Skill 27: Conservation of [illegible]	Momentum of 2 objects in a collision are conserved $P_{before} = P_{after}$ Elastic collisions - 2 before & 2 after Inelastic collision - 2 before & 1 after Explosion/separation - Combined before 2 after recoil	$P_{before} = P_{after}$ $p_1 + p_2 = p_1' + p_2'$ } elastic $m_1v_1 + m_2v_2 = m_1v_1' + m_2v_2'$ $p_1 + p_2 = p_{1+2}$ $m_1v_1 + m_2v_2 = (m_1+m_2)v'$ } inelastic $0 = p_1 + p_2$ $0 = m_1v_1 + m_2v_2$ } explosion	If mass increases v decreases (combines)