Let me be clear about what I mean by "memorize": I mean you should have the equation memorized, know what it means and know when you can use it. This is a lot more than just being able to write down the equation.

The following equations are *not* on the Equation Sheet provided by the AP College Board for the AP Physics 1 exam:

- $\text{speed}_{\text{average}} = \frac{\text{distance}}{\text{time}};\ \vec{v}_{\text{average}} = \frac{\Delta\vec{x}}{\Delta t};\ \vec{a}_{\text{average}} = \frac{\Delta\vec{v}}{\Delta t}$
  - Please make sure you understand the differences between vectors and scalars, please.[1]
  - Also make sure you understand the differences between average and instantaneous.[2]
- $\Delta x = \frac{1}{2}(v_f + v_i)\Delta t$
  - This is another Uniformly Accelerated Motion (UAM) equation you should know.
- $F_{g_{\parallel}} = mg\sin\theta \ \&\ F_{g_{\perp}} = mg\cos\theta$
  - When an object is on an incline, we often need to sum the forces in the parallel and perpendicular directions, which necessitates resolving the force of gravity into its components in the parallel and perpendicular directions.
  - Note: Theta in this equation is the incline angle.
- Equations having to do with Mechanical Energy:
  - $ME_i = ME_f$: Conservation of Mechanical Energy can be used when there is no work done by the force of friction or the force applied.
  - $W_{F_f} = \Delta ME$: Can be used when there is no work done by the force applied.
  - $W_{\text{net}} = \Delta KE$: Is always true.
- $\sum\vec{p}_i = \sum\vec{p}_f$
  - Conservation of linear momentum is valid when the net external force acting on the system is zero, which is true during all collisions and explosions. $\sum\vec{F}_{\text{external}} = 0$
- $\vec{\omega}_{\text{average}} = \frac{\Delta\vec{\theta}}{\Delta t};\ \vec{\alpha}_{\text{average}} = \frac{\Delta\vec{\omega}}{\Delta t}$
  - Angular velocity and angular acceleration were, sadly, left off the equation sheet.
- $\Delta\theta = \frac{1}{2}(\omega_f + \omega_i)\Delta t$
  - This Uniformly Angularly Accelerated Motion (UαM) equation was also, sadly, left off the equation sheet.

[1] Yes, that's a double please.
[2] No please. I'm done with please.

- $s = r\Delta\theta$ & $v_t = r\omega$ & $a_t = r\alpha$
  - The arc length, tangential velocity, and tangential acceleration of a location on a rotating object.
- $\Delta x_{CM} = R\Delta\theta$ & $v_{CM} = R\omega$ & $a_{CM} = R\alpha$
  - The linear distance travelled by, velocity, and acceleration of the center of mass of an object rolling without slipping.
- $\sum \vec{F}_{in} = m\vec{a}_c$
  - The equation for the centripetal force acting on an object to keep it moving in a circle.
- $\sum \vec{L}_i = \sum \vec{L}_f$
  - Conservation of Angular Momentum, valid when the net external torque acting on the system is zero. $\sum \vec{\tau}_{external} = 0$
- $F_B = m_f g$ & $\rho = \frac{m}{V} \Rightarrow m_f = \rho_f V_f \Rightarrow F_B = \rho_f V_f g$
  - The equation for the buoyant force, starting from the fact that the buoyant force equals the weight of the fluid displaced by the object.
- $v_2 = \sqrt{2gh_1}$
  - Torricelli's Theorem: The speed of an ideal fluid exiting a large, open reservoir through a small hole. It is a straightforward derivation from Bernoulli's equation.

$$\cancel{P_1} + \cancel{\frac{1}{2}\rho v_1^2} + \rho g y_1 = \cancel{P_2} + \frac{1}{2}\rho v_2^2 + \cancel{\rho g y_2}$$

$$\Rightarrow \cancel{\rho} g h_1 = \frac{1}{2}\cancel{\rho} v_2^2 \Rightarrow g h_1 = \frac{1}{2} v_2^2 \Rightarrow v_2 = \sqrt{2gh_1}$$