Oscillations - 1

Spring Constant (1): $\kappa = m\,\omega^2$.

Spring Block Oscillation (2): Take derivatives of

$$x = x_{\mathsf{max}}\,\sin(\omega\,t)\,,$$

and use $\max[\sin(\omega\,t)] = 1$.

Mass on Spring (3). New equilibrium position: $M\,g = k\,x_0$ with x_0 amplitude. Lowest point in oscillation seen from starting point: $x_{\mathsf{min}} = 2\,x_0$. Frequency: $f = \omega/(2\pi)$ in units $1/s$ or Hz. Note: angular frequency ω in *rad* is not accepted.

Mass, Spring on Air Track (4):

$$x = x_{\mathsf{max}}\,\cos(\omega\,t) \quad \text{with} \quad x_{\mathsf{max}} \quad \text{and} \quad T$$

given.

Oscillations - 2

Spring Force (5): $$k = \frac{M_2\, g}{\triangle x} \quad \text{and} \quad \omega = \sqrt{\frac{k}{M_1}}\,.$$

Spring Height Motion (6):

$$x = \frac{M\, g}{k}\,.$$

Block and Spring (7). The contact time is half (!) a period

$$t = \frac{\pi}{\omega}\,, \quad \omega = ?\,. \qquad \text{Then} \quad \triangle x = v_0\, \omega\,.$$