The rock falling off a cliff:

Sound:

$s = \frac{d}{t_1}$

$d = ?$

$t_1 = ?$

$s = 340$

$340 = \frac{d}{t_1}$

$\frac{d}{340} = t_1$

Rock

$x - x_o = v_o t + \frac{1}{2} a t_2^2$

$x_o = 0$

$v_o = 0$

$x = d$

$t_2 = ?$

$a = -9.8$

$d = \frac{1}{2}(-9.8)t_2^2$

$d = -4.9t_2^2$

$\frac{d}{-4.9} = t_2^2$

Time

$3 = t_1 + t_2$

$3 - t_1 = t_2$

$(3 - t_1)^2 = t_2^2$

$$9 - 6t_1 + t_1^2 = t_2^2$$

Sub in:

$$\frac{d}{-4.9} = t_2^2 \ , \ \frac{d}{340} = t_1$$

$$9 - 6\left(\frac{d}{340}\right) + \left(\frac{d}{340}\right)^2 = \frac{d}{-4.9}$$

$$9 - \frac{6d}{340} + \frac{d^2}{340^2} = \frac{d}{-4.9}$$

$$9 - \frac{36d^2}{340^2} + \frac{d^2}{340^2} = \frac{d}{-4.9}$$

$$9 - \frac{37d^2}{340^2} = \frac{d}{-4.9}$$

$$9 - \frac{37d^2}{340^2} + \frac{d}{4.9} = 0$$

$$-\frac{37}{340^2}d^2 + \frac{1}{4.9}d + 9 = 0$$

Apply quadratic formula

$$d = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$a = -\frac{37}{340^2}$$

$$b = \frac{1}{4.9}$$

$$c = 9$$

$$d = \frac{-\left(\frac{1}{4.9}\right) \pm \sqrt{\left(\frac{1}{4.9}\right)^2 - 4\left(-\frac{37}{340^2}\right)(9)}}{2(9)}$$

$$d = \frac{\frac{-1}{4.9} \pm \sqrt{\frac{1}{4.9^2} - 4(-\frac{37}{115600})}}{18}$$

$$d = \frac{\frac{-1}{4.9} \pm \sqrt{\frac{1}{4.9^2} + \frac{333}{28900}}}{18}$$

$$d = \frac{\frac{-1}{4.9} \pm \sqrt{\frac{1}{4.9^2} + \frac{333}{28900}}}{18}$$

$$d = \frac{\frac{-1}{4.9} \pm \sqrt{\frac{3689533}{69388900}}}{18}$$

$$d = \frac{\frac{-1}{4.9} \pm 0.230}{18}$$

$$d = \frac{\frac{-1}{4.9} + 0.230}{18}$$

$$d = \frac{\frac{127}{4900}}{18}$$

$$d = \frac{\frac{127}{4900}}{18}$$

$d = 1.44 \times 10^{-3} m$ (way too small)

$$d = \frac{\frac{-1}{4.9} - 0.230}{18}$$

Cannot have negative distance