Quiz #0

Name _____

1. The velocity, *v*, of an object traveling with initial velocity, v_o, and constant acceleration, *a*, after traveling a distance, *d*, is given by

$$v = \sqrt{v_o^2 + 2ad}$$

and you have data for as follows:

$v_o = (150 \pm 1)$ m/s, $a = -(50 \pm 1)$ m/s^2, $d = (200 \pm 2)$ m.

a) Using step-by-step propagation of errors, find *v* (with uncertainty, of course) if

(Just fill in the blanks below!!)

When squaring a number, double the *fractional* uncertainty. (i.e. fractional uncertainty x the power)
When multiplying (or dividing) numbers, *add* the *fractional* uncertainties.

$v = \sqrt{(\quad \pm \quad) \text{ m}^2/\text{s}^2 - (\quad \pm \quad) \text{ m}^2/\text{s}^2}$

When adding (or subtracting) numbers, *add* the *absolute* uncertainties.

$= \sqrt{(\quad \pm \quad) \text{ m}^2/\text{s}^2}$

When taking the square root, halve the *fractional* uncertainty. (i.e., fractional uncertainty x the power)

$v = (\quad \pm \quad)$ m/s

b) Using the brute force method calculate the maximum and minimum possible values for v and use them to calculate a "best" value with uncertainty.

$v_{max} =$ _____ m/s, $v_{min} =$ _____ m/s

$v = (\quad \pm \quad)$ m/s

c) How do your uncertainties calculated these two different ways compare?

They are *very* similar ☐ *not* very similar ☐

2. Write the following in "proper format"—i.e.,
   1) common *units* factored out,
   2) common *power of ten* factored out leaving the basic value as a number between 1 and 10 *if* it is necessary (but use the metric prefixes whenever possible!),
   3) uncertainty rounded to 1 *significant digit*,
   4) basic value rounded to the same decimal *place* as the uncertainty.

For example: 51692.2 m/s ± 0.382 km/s ⇒ $(5.17 \pm 0.04) \times 10^4$ m/s or (51.7 ± 0.4) km/s

a) 34,512 g ± 276 g ⇒ _____

b) 0.000347182 s ± 0.000029s ⇒ _____

c) 4.354 x 10^3 cm/s ± 0.6 m/s ⇒ _____

d) (2.431 x 10^{-3} ± 0.00711) kg ⇒ _____

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