

EXP. NUMBER 1	EXPERIMENT/SUBJECT	DATE 23 JAN	01
NAME POWERS-LUHN	LAB PARTNER	LOCKER/DESK NO.	COURSE & SECTION NO. 550

C. Calculate uncertainty of random functions

1. $a_1 = 3.1 \pm 0.5$ $a_2 = 5.7 \pm 0.8$ $a_3 = 12 \pm 1$

1. $g = a_1 + a_2$ $S_g = \sqrt{\sum \left(\frac{\partial g}{\partial a_i} S_{a_i} \right)^2}$

$$= \sqrt{\left(\frac{\partial}{\partial a_1} [a_1 + a_2] S_{a_1} \right)^2 + \left(\frac{\partial}{\partial a_2} [a_1 + a_2] S_{a_2} \right)^2}$$

$$= \sqrt{S_{a_1}^2 + S_{a_2}^2}$$

$$= \sqrt{0.5^2 + 0.8^2}$$

$$= 0.9$$

$g = 8.8 \pm 0.9$

2. $g = a_1 * a_2$ $S_g = \sqrt{\left(\frac{\partial}{\partial a_1} [a_1 * a_2] S_{a_1} \right)^2 + \left(\frac{\partial}{\partial a_2} [a_1 * a_2] S_{a_2} \right)^2}$

$$= 3.1 * 5.7 + S_g = \sqrt{(a_2 S_{a_1})^2 + (a_1 S_{a_2})^2}$$

$$= 18 + S_g$$

$$= \sqrt{(5.7 * 0.8)^2 + (3.1 * 0.8)^2}$$

$$= 4$$

$g = 18 \pm 4$

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EXP. NUMBER 1	EXPERIMENT/SUBJECT	DATE 23 JAN	02
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C.

1.

3. $q = a_1 * a_2^2$

$q = 3.1 * (5.7)^2$

$= 100 \pm \delta q$

$$\delta q = \sqrt{\left(\frac{\partial}{\partial a_1} [a_1 a_2^2] \delta a_1\right)^2 + \left(\frac{\partial}{\partial a_2} [a_1 a_2^2] \delta a_2\right)^2}$$

$$= \sqrt{(a_2^2 \delta a_1)^2 + (2a_1 \delta a_2)^2}$$

$$= \sqrt{(3.1^2 * 0.8)^2 + (2 * 3.1 * 0.5)^2}$$

$$= 8$$

$q = 100 \pm 8$

4. $q = a_1 / a_2$

$q = 3.1 / 5.7$

$= 0.54 \pm \delta q$

$$\delta q = \sqrt{\left(\frac{\partial}{\partial a_1} [a_1 / a_2] \delta a_1\right)^2 + \left(\frac{\partial}{\partial a_2} [a_1 / a_2] \delta a_2\right)^2}$$

$$= \sqrt{\left(\frac{\delta a_1}{a_2}\right)^2 + \left(-\frac{a_1 \delta a_2}{a_2^2}\right)^2}$$

$$= 0.1$$

$q = 0.54 \pm 0.1$

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