STUDENT VERSION
LSD AND PROBLEM SOLVING

STATEMENT

In the 1960's there was quite a bit of interest in the drug lysergic acid diethylamide (LSD), *much* interest, from Timothy Leary [3], to government intelligence organizations [4], to scientists [5], to individuals, to reporters writing about the 60's scene. They say that if you can remember the 60's then you did not live the 60's, for if you could remember then you were not stoned enough on drugs and were pretty square. Well, I was square and did not even inhale [2], but I did not have an interest in academic papers in applied mathematics or LSD research back in the 60's for I was doing my graduate work in Noetherian rings and that kept me "clean." So I missed the papers described below and did not first come upon them until browsing in the late 70's.

One of the issues surrounding the use of LSD was what it did to mind performance—enhance, detract, alter? Thus, there were a number of studies conducted to measure the effects of LSD on mental processes. One study [5] attempted to see if there was a correlation between a subject's ability to perform simple arithmetic tasks and the concentration of LSD in the tissues of the body. In an earlier study [1] five normal male volunteer subjects, ages 21 to 25, were administered 2 mcg (ng) of LSD per kilogram of body mass doses of d-lysergic acid diethylamide (LSD-25) intravenously over a 1.5 minute period. Blood samples were then drawn at 5, 15, 30, 60, 120, 240, and 480 minutes and these were tested for concentration levels of LSD. "To obtain a crude index of performance, subjects were given one of a series of equivalent tests, consisting of simple addition problems, after each blood sample was drawn." [1, p. 612] This information is given in Table 1.

ACTIVITY

Build a mathematical model which will predict successfully the levels of LSD in the bloodstream and correlate these levels with the performance data on the arithmetic problems given to the subjects. Be sure to give crisp assumptions and define all variables, units, and relationships clearly and render a connected analysis. Then summarize your results.

	Time (hr)	0.0833	0.25	0.5	1.0	2.0	4.0	8.0
Subject 1	Plasma Conc (ng/ml)	11.1	7.4	6.3	6.9	5.	3.1	0.8
	Perform Score (%)	73	60	35	50	48	73	97
Subject 2	Plasma Conc (ng/ml)	10.6	7.6	7.	4.8	2.8	2.5	2.
	Perform Score (%)	72	55	74	81	79	89	106
Subject 3	Plasma Conc (ng/ml)	8.7	6.7	5.9	4.3	4.4	—-	0.3
	Perform Score (%)	60	23	6	0	27	69	81
Subject 4	Plasma Conc (ng/ml)	10.9	8.2	7.9	6.6	5.3	3.8	1.2
	Perform Score (%)	60	20	3	5	3	20	62
Subject 5	Plasma Conc (ng/ml)	6.4	6.3	5.1	4.3	3.4	1.9	0.7
	Perform Score (%)	78	65	27	30	35	43	51

Table 1. Summary of data collected [1, **?**] on 5 male volunteers who were administered LSD and then tested on performance (Perform Score (%)) on simple addition questions. Both performance Score and Plasma Concentrations of LSD were recorded at 5, 15, 30, 60, 120, 240, and 480 minutes after the initial infusion of LSD.

REFERENCES

[1] Aghajanian, G. K. and O. H. L. Bing. 1964. Persistence of lysergic acid diethylamide in the plasma of human subjects. *Clinical Pharmacology and Therapeutics*. 5: 611-614.

[2] Clinton, W. Bill Clinton Didn't Inhale. *http://www.hark.com/clips/hlysmfhbyc-bill-clinton-didnt-inhale*. Accessed 2 April 2012.

[3] Cloud, J. 2007. Was Timothy Leary Right? *Time Magazine*. 19 April 2007. `http://www.time.com/time/magazine/article/0,9171,1612717,00.html`. Accessed 2 April 2012.

[4] Project MKULTRA. 2012. `http://en.wikipedia.org/wiki/Project_MKULTRA`. Accessed 2 April 2012.

[5] Wagner, J. G., G. K. Aghajanian, and O. H. L. Bing. 1968. Correlation of performance test scores with "tissue concentration" of lysergic acid diethylamide in human subjects. *Clinical Pharmacology and Therapeutics*. 9(5) : 635-638.