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                Sociology

ABSTRACT
        The focus of this project was to determine the
relevance of the computer to the academic disciplines of business,
mathematics, physics, chemistry, economics, biology, and engineering
and to subsequently write computer programs that would provide
students with an additional learning tool. Over two hundred programs
were written, catalogued into a library by subject, and made
available to all faculty. That list is presented. Also included is
the report of the users for each discipline and a description of the
curriculum development for inclusion of the computer programs in
each. Some pages may reproduce illegibly due to poor copy.
(Author/JG)

COOPERATIVE VENTURE

IN

COLLEGE CURRICULUM DEVELOPMENT

NSF Grant
GJ 282

Principal Investigators Report

Henry Moughamian
May 1, 1970

City Colleges of Chicago

City Colleges of Chicago, founded in 1911, comprise a public, urban community college system. They are open-door educational institutions of higher learning which provide services needed by individuals and the community.

The City Colleges of Chicago, which are accredited by the North Central Association of Colleges and Secondary Schools, offer more than a hundred programs and other learning opportunities designed for the individual.

Many kinds of students with different motivations and objectives are blended within the City Colleges of Chicago, one of the largest community colleges in the nation. It has a full-time faculty cf 1,100, a student body of 36,000, and has plans for new campuses to serve the educational needs of 100,000 persons by the late 1970's. Its student body is composed mostly of residents of the city of Chicago.

In this atmosphere of learning, four major areas of educational progress are offered:

1. City Colleges of Chicago provide two years of higher education which may lead to the Associate in Arts Degree or Diploma and enable a student to attend a senior institution and earn additional degrees.

2. City Colleges of Chicago provide a student with up to two years of specialized education which may lead to an Associate in Applied Science Degree or Certificate and prepare him for immediate employment.

3. City Colleges of Chicago provide background courses
of study for the student who needs to increase his skills and
knowledge for college work as the initial step in boosting his
educational and employment opportunities.

4. City Colleges of Chicago provide a person with an
opportunity to update and upgrade himself in a program offering
community services and adult and continuing education.

The participating colleges include Southeast College
(2,100 students F.T.E.), Kennedy-King College (2,900 students
F.T.E.), and Amundsen-Mayfair College (2,075 students F.T.E.).
Of the 36,242 total students enrolled in the Fall, 1969, semester,
more than half are in the evening programs. Full time equivalency
of 36,242 students is 20,947.

The City Colleges of Chicago are continually striving to
improve their instructional programs. Provision for innovative
opportunities has been, and will continue to be, provided to CCC
faculty in the attempt to maximize learning. Before the present
NSF grant, the CCC computer in the educational area was used exclusively
for data processing education, e.e., for the training of operators
and programmers. Generally, the only experienced faculty in data
processing were those faculty members teaching data processing courses
to students. Even though experimentation in computer assisted
instruction and problem solving by computer were goals of the City
Colleges of Chicago, prior to this NSF grant, significant experience
was non-existent. The desire to utilize the computer in learning led

to our participation with I.I.T. It was felt that this experience would provide us with the necessary facts upon which to make a future decision regarding the continuation of this curriculum development in the City Colleges of Chicago.

Presently there are some 1100 full-time and 120 part-time faculty members. Project participating faculty members represent three major academic disciplines: Business, Mathematics, and Physics. Since it would take several pages to list the number of courses offered by discipline, we are including a copy of the 1969-1970 Catalog of the City Colleges of Chicago which lists courses offered by academic discipline. As a two-year community college, students do not seek "majors" or degrees by discipline.

II

				Yearly Estimate
3B	(1)	Teletypewriter, ASR 33 (3)		
		Data Set	(3)	$4,140
	(2)	Communication Costs		3,960
C		Real Cost estimated		
		Teletypewriter, ASR 33		
		Data Set		4,140
		Communication Costs		3,600
D		Amundsen/Mayfair		75%*
		Kennedy-King		50%*
		Southeast		50%*

*The utilization time was considerably less
during the Spring 1970 semester due to the
fact that the 1108 computer was not totally
accessible.

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III

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<u>Courses Serviced by Regional</u>

<u>Computing Activity</u>

College Algebra
Calculus I
Calculus II
Statistics
Computer Mathematics

The program library was used exclusively in courses other than primarily programming courses. One of the primary aims of using the computer was to allow the student a new experience. This experience cannot be underestimated. Each of the library programs was introduced to coincide with a classroom topic and was integrated as part of the course.

REGIONAL COMPUTING ACTIVITIES
REPORT OF USER CHARACTERISTICS

ITION AND ADDRESS	REGIONAL CENTER	PROJECT DIRECTOR/COORDINATOR	GRANT NUMBER
Southeast College 8600 South Anthony Ave. Chicago, Ill. 60617	Illinois Institute of Technology	Dr. Henry Moughamian	GJ 282

	REPORTING PERIOD	NO. OF TERMS IN ACADEMIC YEAR	DATE OF THIS REPORT
	1969-1970	2	May 1, 1970

IMPORTANT: *A separate report should be submitted for each participating college or secondary school. In addition, a summary report should be submitted for each category of users. Check appropriate block for this report.*

COLLEGE/UNIVERSITY: [X] INDIVIDUAL [ ] SUMMARY

SECONDARY SCHOOL: [ ] INDIVIDUAL [ ] SUMMARY

(1) ACADEMIC DISCIPLINE	(2) TOTAL NUMBER OF STUDENTS IN DISCIPLINE			(3) NUMBER OF STUDENTS IN REGIONAL COMPUTING ACTIVITY			(4) NUMBER OF FACULTY MEMBERS		(5) NUMBER OF RUNS	(5a)	(7) CPU Time in Hours	(7a)	(10) USE IN INSTRUCTION			
	College Lower Division	College Upper Division	Secondary School	College Lower Division	College Upper Division	Secondary School	Number in Discipline	Number in Regional Act.	IBM 360	IBM UNIV. 1108	IBM 360	IBM UNIV. 1108	Programming, Problem Solving in Computer Languages	Interactive, List Processing Languages	Data Base Processing	Simulations, Special Application Pkgs. and Language Development
Programming																
Computer Science																
Mathematical and Physical Science	2600			42			15	3	100	100	1.1	.9	60			40
Biological Science																
Social Science and Education																
Business																
Arts and Humanities																
Engineering, Forestry, and Agriculture																
Unstructured																

NSF Form 400 May 1969

IV Curriculum Development

Prior to the initiation of the regional project the department of mathematics at Southeast College was void of any computer or calculator concepts. During the past academic year the computer and the electric calculator have been a part of several courses. These courses were instructed not only by the participants of the regional project but also by several other faculty members. Plans are being made for the next academic year to broaden the areas and courses involving computer and electric calculators.

Program Library (FORTRAN)

Ordered pairs for linear functions $(Y = SX + B)$
Ordered pairs for quadratic functions $(Y = AX^2 + BX + C)$
Evaluation of two by two determinants
Evaluation of three by three determinants
Solution of two linear equations with two unknowns
Solution of three linear equations with three unknowns
Solution of second degree polynomials $(AX^2 + BX + C = O)$

Complete definition of the elements of a triangle given
(1) three sides, (2) any two sides and their included
angle or (3) any combination of two angles and a side
Ordered pairs for parametric equations

Determine the area of a triangle, given three points

Sum of "N" real numbers
Sum and mean of "N" real numbers
Sum, mean, and standard deviation of "N" real numbers
Coefficient of correlation and slope of regression line
  for "N" ordered pairs (x, y)

Partial sums and terms of an arithmetic series

Partial sums and terms of a geometric series

Graphing of some trigonometric functions

Ordered pairs for trigonometric functions

Ordered pairs for parametric equations

Solution of "N" problems of the distance between two points

V Problem Areas

The non-availability of the computer. The inaccessibility of teletypes. If these two main obstacles were removed then the computer and computer concepts would be able to play an important and fundamental part in the learning process.

Significant Successes

The development of a starter program library which should grow and may play a fundamental part in interesting other faculty members. The stir of interest shown by other faculty members. The coming use of the City Colleges of Chicago computer in many new areas. The coming faculty awareness of other electronic devices or aids in the educational process.

Special Development

The introduction of a computer mathematics course. The use of computers and electronic calculators in the teaching of technical and vocational mathematics. The shift of emphasis in classroom and homework. This is very marked in the study of statistics.

Noteworthy Cooperative Activities

The time and energy spent by the City Colleges of Chicago in the attempt to extend to all eight campuses the ideas and directions gained by four participating members.

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Courses Serviced by Regional

Computing Activity

General Physics 231 - Mechanics and Wave Motion

Physics 235   - Engineering Physics I -
                          Mechanics and Wave Motion

REGIONAL COMPUTING ACTIVITIES
REPORT OF USER CHARACTERISTICS

REGIONAL CENTER	Illinois Institute of Technology
PROJECT DIRECTOR/COORDINATOR	Dr. Henry Moughamian
GRANT NUMBER	GJ 282
DATE OF THIS REPORT	May 1, 1970
REPORTING PERIOD	1969-1970
NO. OF TERMS IN ACADEMIC YEAR	2

INSTITUTION AND ADDRESS

Kennedy-King College
7047 S. Stewart Avenue
Chicago, Illinois 60621

IMPORTANT: A separate report should be submitted for each participating college or secondary school. In addition, a summary report should be submitted for each category of users. Check appropriate block for this report.

- [ ] SUMMARY [X] INDIVIDUAL
- [ ] SUMMARY [ ] INDIVIDUAL

COLLEGE/UNIVERSITY: [X] INDIVIDUAL
SECONDARY SCHOOL: [ ] INDIVIDUAL

(1) ACADEMIC DISCIPLINE	(2) TOTAL NUMBER OF STUDENTS IN DISCIPLINE — College Lower Division	College Upper Division	Secondary School	(3) NUMBER OF STUDENTS IN REGIONAL COMPUTING ACTIVITY — College Lower Division	College Upper Division	Secondary School	(4) NUMBER OF FACULTY MEMBERS — Number in Discipline	Number in Regional Act.	(5) NUMBER OF RUNS — IBM 360	(5a) IBM UNIV. 1108	(7) CPU Time in Hours — IBM 360	(7a) IBM UNIV. 1108	(10) USE IN INSTRUCTION — Programming, Problem Solving in Compiler Languages	Interactive, List Processing Languages	Data Base Processing	Simulations, Special Application Pkgs. and Language Development
Programming																
Computer Science																
Mathematical and Physical Science	50			50			2	2	280	35	3	½	100%			
Biological Science																
Social Science and Education																
Business																
Arts and Humanities																
Engineering, Forestry, and Agriculture																
Unstructured																

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IV Curriculum Development

Our approach to the use of the computer has been on an overall philosophy that the student should first gain a working ability in a programming language and the use of the terminal. Hence the first two laboratory sessions are designed to get the student personally involved with the programming of two problem sets and the preparation of punched tapes for transmission. The computer output from his tapes is returned to him and he actually operates independently with only advice and guidance from the instructor until his programs have successfully run to completion.

The computer interaction for the remainder of the laboratory sessions then becomes an information processing system for experiments where it is logical to use the computer. Criteria for its use include not only whether many tedious calculations need to be made but whether the application has pedagogical value.

The programs presently developed and in use include:

1. Limit - This program is designed to demonstrate, particularly to students who have not studied calculus, the concept of a mathematical limit. An arbitrary function of position and time is used to show that as the time interval decreases, the numerical value of the ratio of displacement to time approaches a limiting value. The derivative of the function is also taken and compared to the limiting value.

2. Gravitational Acceleration - This program calculates the acceleration of a freely falling body, displacement measurements are made on a tape that has been produced on a conventional spark

timed free fall device. Calculations of the average acceleration in each interval is performed by the computer and tabulated as well. The probable error is calculated and a best fit curve of a second order quadratic equation is made in the least squares sense. The coefficients of the quadratic equation are printed and compared to the theoretical values. The experimental and the best fit curves are then plotted for final comparison by the student.

3. <u>Newton's Second Law</u> - This program calculates the acceleration of a cart on a track accelerated by a hanging mass. Variations are made on the hanging mass keeping the total mass constant. As in the free fall experiment the accelerations are calculated and analyzed.

4. <u>Projectile Motion</u> - The program illustrates the motion of a projectile acted upon by a gravitational force. It provides values for the velocity and position of a projectile as a function of time. The student chooses the initial velocity, angle of projection, time interval between calculations, and the number of calculations. A listing of the projectile position without gravity is also provided.

V Case Studies, etc.

       The biggest problem encountered has been the less than fully
operational status of the computer during a large fraction of Spring
1970. Whereas in the first (3) weeks in January 1970 we had a
personal record of 113 runs on the computer, only a small fraction
of this was accomplished thereafter due in a large part to problems
with the new computer. The dependable operation of the terminal
and the computer is absolutely necessary to maintain student
confidence as well as increased faculty participation. This is
probably the key to success until the computer input function is
vastly improved by future technology.

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<u>Courses Serviced by Regional</u>

<u>Computing Activity</u>

Data Processing 101 - An introduction to
                       business data processing
                       offered by Business Dept.

NATIONAL SCIENCE FOUNDATION
OFFICE OF COMPUTING ACTIVITIES
Washington, D. C. 20550

REGIONAL COMPUTING ACTIVITIES
REPORT OF USER CHARACTERISTICS

REGIONAL CENTER	PROJECT DIRECTOR/COORDINATOR	GRANT NUMBER
Illinois Institute of Technology	Dr. Henry Moughamian	GJ 282
	REPORTING PERIOD 1969-1970	DATE OF THIS REPORT May 1, 1970

INSTITUTION AND ADDRESS
Kennedy-King College
7047 S. Stewart Avenue
Chicago, Ill. 60621

NO. OF TERMS IN ACADEMIC YEAR: 2

IMPORTANT: A separate report should be submitted for each participating college or secondary school. In addition, a summary report should be submitted for each category of users. Check appropriate block for this report.

COLLEGE/UNIVERSITY: [X] INDIVIDUAL [ ] SUMMARY
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(1) ACADEMIC DISCIPLINE	(2) TOTAL NUMBER OF STUDENTS IN DISCIPLINE — College Lower Division	College Upper Division	Secondary School	(3) NUMBER OF STUDENTS IN REGIONAL COMPUTING ACTIVITY — College Lower Division	College Upper Division	Secondary School	(4) NUMBER OF FACULTY MEMBERS — Number in Discipline	Number in Regional Act.	(5) NUMBER OF RUNS IBM 360	(5a) UNIV. 1108	(7) CPU Time in Hours IBM 360	(7a) UNIV. 1108	(10) USE IN INSTRUCTION — Programming, Problem Solving in Compiler Languages	Interactive, List Processing Languages	Data Base Processing	Simulations, Special Application Pkgs. and Language Development
Programming																
Computer Science																
Mathematical and Physical Science																
Biological Science																
Social Science and Education																
Business	180			95			11	1	400	10	2½	0	90%			10%
Arts and Humanities																
Engineering, Forestry, and Agriculture																
Unstructured																

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IV

(1)

Business Game - A Business simulation model; Econ. (Macro and Micro 1), simulations involving G.N.P. and price theory analysis; Linear Prog. - solves for optimum solution. All programs above are in FORTRAN.

In addition, three programs have been developed which require the student to analyze accounting transactions and process them via the computer. The computer prints a final trial balance, an analysis of all student errors, and a grade for the problem. The basic program will analyze any transaction involving a given chart of accounts. The "grding" subroutine can be interchanged to coincide with a change in the transactions. These programs are in IITRAN.

(2)

Data Processing 101 - 3 sections

(3)

Basically programming; programs listed in (1) above were not used last year.

III

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Courses Serviced by Regional

Computing Activity

Data Processing 101

Business 141 - Business Math

Business 203 - Cost Accounting

Business 101 - Fundamentals of Accounting

Business 111 - Intro. to Business Management

NATIONAL SCIENCE FOUNDATION
OFFICE OF COMPUTING ACTIVITIES
Washington, D. C. 20550

Budget Bureau No. 99-NO256
Approval Expires 5/31/72

REGIONAL COMPUTING ACTIVITIES
REPORT OF USER CHARACTERISTICS

INSTITUTION AND ADDRESS
Amundsen-Mayfair College
4626 N. Knox Avenue
Chicago, Ill. 60630

REGIONAL CENTER
Illinois Institute of Technology

PROJECT DIRECTOR/COORDINATOR
Dr. Henry Moughamian

GRANT NUMBER
GJ 282

DATE OF THIS REPORT
May 1, 1970

REPORTING PERIOD
1969-1970

NO. OF TERMS IN ACADEMIC YEAR
2

IMPORTANT: A separate report should be submitted for each participating college or secondary school. In addition, a summary report should be submitted for each category of users. Check appropriate block for this report.

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(1) ACADEMIC DISCIPLINE	(2) TOTAL NUMBER OF STUDENTS IN DISCIPLINE Secondary School	College Lower Division	College Upper Division	(3) NUMBER OF STUDENTS IN REGIONAL COMPUTING ACTIVITY Secondary School	College Lower Division	College Upper Division	(4) NUMBER OF FACULTY MEMBERS Number in Discipline	Number in Regional Act.	(5) NUMBER OF RUNS IBM 360	(5a) UNIV. 1108	(7) CPU Time in Hours IBM 360	(7a) UNIV. 1108	(10) USE IN INSTRUCTION Programming, Problem Solving in Compiler Languages	Interactive, List Processing Languages	Data Base Processing	Simulations, Special Application Pkgs. and Language Development
Programming																
Computer Science																
Mathematical and Physical Science																
Biological Science																
Social Science and Education																
Business		2192			565		10	6	284	0	5.5	0			50%	50%
Arts and Humanities																
Engineering, Forestry, and Agriculture																
Unstructured																

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IV Curriculum Development

1. Stored programs: Prepared programs are being utilized in the

    following areas:

Business Mathematics (Business 141)

       Programmed package supplies input/output statements and
problem identification. Student supplies the FORTRAN assignment
statements used for problem-solving. Written in FORTRAN IV.

Cost Accounting

       A package for processing job lot costs interlocked with a
general accounting system.

       Student input consists of one-line entries each of which
represents his analysis of an accounting transaction. The stored
program, written in COBOL, provides: Schedules of subsidiary
ledgers - A/Receivable, A/Payable, Factory Ledgers, General
Ledger Trial Balance, Job Cost Analysis by Job of jobs in process
at the beginning and end of the accounting period and of jobs
completed. All balances are tested for correct values, errors are
asterisked and correct balances indicated.

Fundamentals of Accounting

       A package similar to Cost Accounting, without job cost
analysis.

Business Game

       A simulation in which teams represent businesses competing
within an industry and make decisions as to allocation of resources.

Biology

       Experimenting with use of FOXRAB, a prey-predator ecology
model demonstrating interaction of population curves.

IV 2. Courses utilizing computer facilities (other than for programming)

Introduction to Data Processing (Data Proc. 101)

Use limited to two exercises to demonstrate use of stored data base and to acquaint students with use of teletype terminal and paper tape as input media.

Business Mathematics (Business 141)

Used as problem solving tool.

Cost Accounting (Business 203)

Used to record and summarize transaction analyses.

Fundamentals of Accounting (Business 101)

Used to record and summarize transaction analyses.

Marketing (Business 231)
Introduction to Business Management (Business 111)

Management teams supply decisions on resource allocation to achieve some long-range objective (generally to maximize profits).

Biology 112

Use of ecology model FOXRAB to study population interactions as variables change.

3. Relevance of computer use to academic discipline

Business Mathematics

Programming knowledge required of students is limited to ability to construct a FORTRAN assignment statement. Student decides what mathematical manipulations are necessary to solve a particular problem. The computer is utilized as a tool to perform the mathematical calculations relieving the student of repetitive tasks and freeing his time for attention to more problem solving activity.

The packaged program available to the student in this
in this application includes system control instructions and input/
output routines.

Cost Accounting

Job lot cost with interlocking general ledger controls.

An extensive exercise, coordinated with the students'
accounting text, supplies accounting transactions to be analyzed.
The cost accounting has had practice in the recording and
summarizing of business transactions in previous accounting course
work. This computerized application reduces the amount of clerical
work the student performs to record his analysis. Input forms
have been designed to permit recording of the student's decision
in the form of one-line entries consisting of approximately 12
digits.

A stored computer program is utilized to do the recording
and summarizing of transaction. Decision making becomes the task
of the accounting student; the clerical tasks are assigned to the
computer. Preparation of financial statements is left to the
student by this application so that he may learn to handle the
accounting related to the manufacturing type of business. The
accounting student (not the computer programmer, in this case)
needs the practice in preparation of financial statements.

Fundamentals of Accounting

Approach similar to the above utilized. By the time the
student is ready for this extended exercise, analyzing transactions
coordinated with textbook assignments, he has had an opportunity
to have mastered the techniques of recording and summarizing

transactions and can now profitably spend more time on the decisions necessary to transaction analysis. Again, the clerical tasks are assigned to the computer enabling the student to spend more time on transaction analysis.

Marketing
Introduction to Business Management

In playing at decision making, in using the Business Game simulation, the student becomes aware of some of the potential assistance which can be rendered by the computer in decision-making. He can begin to realize the need for complete and up-to-date information which should be the basis for his decision making. He can also become aware of the limitations of models and the value of judgment in utilizing what information is available in the making of decisions. Because of the limitations of the model and the "make believe" nature of the game, it is doubtful that skill in decision making is developed.

Biology 112

Use of FOXRAB prey-predator model was in the experimental stages, with more extensive use planned for the second semester. FOXRAB was unavailable on the system during the second semester. Experimentation to this point has been done primarily by classroom professors familiarizing themselves with the model and its use before incorporating this material as part of the regular course content.

It is the intent of this application to permit students to analyze the adequacy of the model, to experiment with changing the variables (birth rate of the prey, birth rate of the predator, death from natural causes, etc.) to observe the interaction of the population curves and to try to make interpretations from the

results observed.

It was not possible to utilize this material sufficiently to evaluate its usefulness nor its acceptance by students.

V Faculty in various disciplines are becoming aware of the potential made available through use of the computer. Meaningful classroom applications cannot develop without handling of two problem areas:

1. Developing of economical, accurate, and rapid input devices readily available to students.

2. Readily available access to a computer (via perhaps terminal communication devices) with a reliable and fairly rapid turnaround time.

Measurement tools and experimental design used in other classroom situations to measure learning can be applied to this area (i.e., control class vs. experimental class). Cannot be meaningful until access becomes routine.

COOPERATIVE PROGRAM EXCHANGE SERVICE

PHYSICS INDEX

Number	Name	Type	Author	Language
1	Add Waves	Abstract	Cook&Weinstock	FORTRAN
2	Eigenvalues of 1-Dim Sq. Well	Abstract	Cook&Weinstock	CALCTRAN
3	Simple Harmonic Motion	CETU	Hrasky	FORTRAN
4	Simple Harmonic Motion	Abstract	Pikell	IITRAN
5	Orbit Analysis	CETU	Hrasky	FORTRAN
6	Orbit Analysis	Abstract	Pikell	IITRAN
7	Satellite Velocity and Acceleration	Abstract	Pikell	IITRAN
8	Addendum to Introductory Computer Based Mechanics, Student Manual	Review	Cook&Weinstock	
9	Projectile Motion	Abstract	Akin	IITRAN
10	Limit	Abstract	Akin	IITRAN
11	Gravitational Acceleration	Abstract	Akin	IITRAN
12	Newton's Second Law	Abstract	Akin	IITRAN
13	Add Waves - CALCTRAN	Abstract	Cook&Weinstock	CALCTRAN
14	Add Waves - IITRAN	Abstract	Cook&Weinstock	IITRAN
15	Radioactive Decay	Abstract	Cook&Weinstock	CALCTRAN
16	Fresnel Diffraction	Abstract	Cook&Weinstock	FORTRAN
17	Fraunhofer Diffraction	Abstract	Cook&Weinstock	FORTRAN
18	Average	Abstract	Broshar	IITRAN
19	Propogation of Errors	Abstract	Broshar	IITRAN
20	Least Square Fit of Free-Fall Data	Abstract	Broshar	IITRAN
21	Dice Model of Radioactive Decay Series	CETU	Weinstock	CALCTRAN
22	Lunar Landing Simulator	CETU	Venhaus	CALCTRAN
23	Data Reduction	Review	Weinstock	BASIC
24	Harmonic Motion	Review	Weinstock	BASIC
25	Two Experiments: Conservation of Momentum and Simple Harmonic Motion	Review	Weinstock	FORTRAN
26	Relativistic Two-Body Collisions	Review	Weinstock	FORTRAN
27	A Simulated Accelerator Laboratory	Review	Weinstock	FORTRAN
28	Mass Spectrometer Simulation	Review	Weinstock	FORTRAN
29	Randomness and Radioactive Decay	Review	Weinstock	FORTRAN
30	Ballistics	Review	Weinstock	FORTRAN
31	Opening the Other End	Review	Weinstock	BASIC
32	MOON2: Moon Landing Simulation	Abstract	Dewar	CALCTRAN
33	Error.Analysis.One (ERl)	Abstract	C.L. Wiley	IITRAN

COOPERATIVE PROGRAM EXCHANGE SERVICE

CHEMISTRY INDEX

Number	Name	Type	Author	Language
1	QOLS (Qualitative Organic Library Research)	Abstract	Weidenbaum	IITRAN
2	pH of Solutions of Monobasic Acids	Abstract	Weidenbaum	CALCTRAN
3	Correlation Coefficient	Abstract	Weidenbaum	CALCTRAN
4	Least Squares Best Line	Abstract	Weidenbaum	CALCTRAN
5	Total Press (Gas Pressure Van der Waal's Law)	Abstract	Seiders	IITRAN
6	GASVOL (Gas Volume Ideal Law)	Abstract	Stone	IITRAN
7	Light Series	Abstract	Seiders	IITRAN
8	ERGS (Binding Energy)	Abstract	Belke	IITRAN
9	Linear Least Squares (Filecode: LS1, LS2)	Abstract	Reed	IITRAN
10	ORG.ANAL1 (Organic Qualitative Analysis)	Abstract	Gasser&Emmons	IITRAN
11	ORG.ANAL2 (Organic Qualitative Analysis)	Abstract	Gasser&Emmons	IITRAN
12	VAN.DER.PL (Plot of the Van der Waal Model of a Gas)	Abstract	Dougherty	IITRAN
13	GEN.PL. (General Point Plotter)	Abstract	Dougherty	IITRAN
14	TITRATION (Potentiometric Titration Graphs)	Abstract	Dougherty	IITRAN
15	MAXWELL.PLOT (The Maxwell Distribution of Velocities)	Abstract	Dougherty	IITRAN
16	MIAC (The Mean Ionic Activity Coefficient)	Abstract	Dougherty	IITRAN
17	EUTECTIC.PLOT	Abstract	Dougherty	IITRAN
18	H.E.A.S.	Abstract	Dougherty	IITRAN
19	Theoretical Flame Temperature	Abstract	Pollnow	FORTRAN
20	Simultaneous First Order Differential Equations	Abstract	Pollnow	FORTRAN
21	Least Squared Exponential Clausius-Clapeyron	Abstract	Pollnow	FORTRAN
22	Fraction of Molecules with Energy > E	Abstract	Pollnow	FORTRAN
23	Energy Levels of an Asymmetric Rigid Rotor	Abstract	Pollnow	FORTRAN
24	VOL.CYL.INT (Monte Carlo Integration)	Abstract	Jameson	IITRAN
25	HYD.MOL.ION (H_2^+ molecule ion)	Abstract	Jameson	IITRAN
26	LIST.ORD (Sorting)	Abstract	Jameson	IITRAN
27	RATEK (Second Order Rate Constant)	Abstract	McCluskey	IITRAN
28	FORATEK (First Order Rate Constant)	Abstract	McCluskey	IITRAN
29	FCONSTANT (Force Constant)	Abstract	McCluskey	IITRAN
30	VDWMD (Solution of Van Der Waal's Equation for Volume)	Abstract	McCluskey	IITRAN
31	A Molecular Orbital Eigenvalue & Eigenvector Program	Abstract	Beineke-Alms	IITRAN
32	General Point Plotter II	Abstract	Dougherty/Reed	IITRAN
33	CURVF IT1	Abstract	Igielski	IITRAN
34	Carbonate-Bicarbonate Analysis	Abstract	Weidenbaum	CALCTRAN
35	TITRE	Abstract	Weidenbaum	IITRAN
36	ENTROPY	Abstract	Igielski	IITRAN

COOPERATIVE PROGRAM EXCHANGE SERVICE

GENERAL INDEX

Number	Name	Type	Author	Language
1	Average and Standard Deviation	Abstract	Weidenbaum	CALCTRAN
2	Average and Average Mean Deviation	Abstract	Weidenbaum	CALCTRAN
3	Perpetual Calendar	Abstract	Weidenbaum	CALCTRAN
4	Discriminating Grade Averageing	Abstract	Weidenbaum	CALCTRAN
5	Linear Regression	Abstract	Pikell	IITRAN
6	Analysis of Variance	Abstract	Pikell	IITRAN
7	Correlation Coefficient	Abstract	Pikell	IITRAN
8	Plot Subroutine	Systems Program	IPC staff	FORTRAN
9	Fourier series plotter	Abstract	John Wechter	CALCTRAN

Name	Type	Author	Language
GIGO (Statistics Package for Students)	Systems Program	Kerster	FORTRAN

COOPERATIVE PROGRAM EXCHANGE SERVICE

BUSINESS INDEX

Number	Name	Type	Author	Language
1	Business Math Application	Abstract	Sutherland	FORTRAN
2	Job Lot Cost Accounting	Abstract	Sutherland	COBOL
3	Business Game	Systems Program	Stiff	FORTRAN
4	Keynesian Macroeconomic Model (MACRO 5)	CETU	Graves	FORTRAN
5	MICRO I	CETU	Graves	FORTRAN
6	Linear Programming Model (LP563)	CETU	Graves	FORTRAN

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MATHEMATICS INDEX

Name	Type	Author	Language
Series Summation (Filecode: C103)	Abstract	Petosa	IITRAN
Difference Between Means (Filecode: S8.6)	CETU	Petosa	IITRAN
Integration by Simpson's Rule (Filecode: SIMP)	CETU	Driscoll	IITRAN
Plotting Program (Filecode: PLOT.A, PLOT.B)	Abstract	Petosa	IITRAN
Fourth Order Runge-Kutta Method (System of Equation) (RK4S)	Abstract	Driscoll	IITRAN
Fourth Order Runge-Kutta Method (Single First Order Equations) (Filecode: RK4)	Abstract	Driscoll	IITRAN
Difference Between Means (Small Sample) (Filecode: S9.4)	Abstract	Petosa	IITRAN
Frequency Distribution (Filecode: S3.1)	Abstract	Petosa	IITRAN
Difference Between Binomial Parameters (Filecode: S8.8)	CETU	Petosa	IITRAN
Linear Programming (Filecode: FM35)	Abstract	Petosa	IITRAN
Variance Test (Filecode: S9.6)	Abstract	Petosa	IITRAN
Mean and Standard Deviation (Filecode: S3.8)	CETU	Petosa	IITRAN
Paired Difference Test for Small Sample (Filecode: S9.5)	Abstract	Petosa	IITRAN
Phenotypic Ratios (Filecode: PHENO)	Abstract	Hayes&Petosa	IITRAN
Chi Square Test (Filecode: S11.3)	CETU	Petosa	IITRAN
Contingency Tables (Filecode: S11.4)	CETU	Petosa	IITRAN
Integration by Trapezoidal Rule (Filecode: TRAP)	Abstract	Driscoll	IITRAN
Double Integration (Filecode: C102A, C102B)	Abstract	Dorner&Petosa	IITRAN
Gauss Elimination for Solving Linear Equations (C100)	Abstract	Petosa	IITRAN
Tablemaker (Filecode: C14A, C14B)	CETU	Petosa	IITRAN
Evaluation of "N" 2 x 2 Determinants	CETU	Patricelli	FORTRAN
Evaluation of "N" 3 x 3 Determinants	CETU	Patricelli	FORTRAN
Solution of "N" Problems of the Form Two Linear Equations in Two Unknowns	CETU	Patricelli	FORTRAN
Ordered Pairs for "N" Linear Functions in the Form Y=AX+B	CETU	Patricelli	FORTRAN
Ordered Pairs for "N" Quadratic Functions in the Form $Y=AX^2+BX+C$	CETU	Patricelli	FORTRAN
Solution of "N" Second Degree Polynomials of the Form $AX^2+BX+C=0$	CETU	Patricelli	FORTRAN
Partial Sums and Terms of an Arithmetic Series	Abstract	Patricelli	FORTRAN
Graphing of Some Trigonometric Functions	Abstract	Patricelli	FORTRAN
Ordered Pairs for Trigonometric Functions	Abstract	Patricelli	FORTRAN
Ordered Pairs for Parametric Equations	Abstract	Patricelli	FORTRAN
Solution of "N" Problems of the Distance Between Two Points	Abstract	Patricelli	FORTRAN
Determine the Area of a Triangle Given Three Points	Abstract	Patricelli	FORTRAN
Systems of Simultaneous Linear Equations	CETU	Chiarulli	IITRAN
Lagrange Interpolation (A)	Abstract	Dentzman	IITRAN

COOPERATIVE PROGRAM EXCHANGE SERVICE

MATHEMATICS INDEX

Name	Type	Author	Language
Lagrange Interpolation (B)	Abstract	Dentzman	IITRAN
Fermat Factorization	Abstract	Bordewick	IITRAN
Fermat Factorization to Primes	Abstract	Bordewick	IITRAN
Function Limit	Abstract	Dentzman	IITRAN
Derivative Definition	Abstract	Dentzman	IITRAN
Polynomial Zeroes	Abstract	Dentzman	IITRAN
Newton-Raphson Polynomial Zeroes	Abstract	Dentzman	IITRAN
Integrals and Derivatives	Abstract	Dentzman	FORTRAN
Systems of Simultaneous Linear Equations	CETU	Chiarulli	IITRAN
Numerical Integration	CETU	Chiarulli	IITRAN
Function Plotter	CETU	Chiarulli	IITRAN
Function Plotter with Automatic Scaling	CETU	Chiarulli	IITRAN
Function and Derivative Plotter	CETU	Chiarulli	IITRAN
Function and Derivative Plotter with Automatic Scaling	CETU	Chiarulli	FORTRAN
Numerical Integration	CETU	Chiarulli	IITRAN
Matrix Operations	CETU	Dentzman	IITRAN
Matrix Product	CETU	Dentzman	IITRAN
Limit of Indeterminate Forms	CETU	Dentzman	IITRAN
Linear Systems by Matrix Inversion	CETU	Dentzman	IITRAN
Factorial	CETU	Dentzman	IITRAN
Combinations	CETU	Dentzman	IITRAN
Binomial	CETU	Dentzman	IITRAN
Binomial Series	CETU	Dentzman	IITRAN
Crap Game	CETU	Dentzman	IITRAN
Solid of Revolution-Disc	CETU	Dentzman	IITRAN
Solid of Revolution- Shell	CETU	Dentzman	IITRAN
Riemann Sums-Area	CETU	Dentzman	IITRAN
Taylor Polynomial	CETU	Dentzman	IITRAN
Matrix Inversion	Systems Program	Venhaus	FORTRAN
Digit Translator	CETU	Chiarulli	IITRAN
Gauss Elimination	CETU	Chiarulli	IITRAN
Triangle Constructions			
Solutions of First Order Initial-Value Problems by the Euler Method	CETU	Failon	IITRAN
Solutions of First Order Initial-Value Problems by the Modified Euler Method	CETU	Failon	IITRAN
Solutions of First Order Initial-Value Problems by the Runge-Kutta Method and Continuing with the Milne Method	CETU	Failon	IITRAN
Subroutine for FORTRAN Free Form Input	Systems Program	Venhaus	FORTRAN

Name	Type	Author	Language
G.C.D. and L.C.M. By Euclid's Algorithm	CETU	Dentzman	IITRAN
DIOPHANTINE EQUATIONS	CETU	Dentzman	IITRAN
SYMBOLOG (Truth Table Maker)	CETU	Vandevelde, S.J.	IITRAN/360
VALIDITY (Logical argument validity checker)	CETU	Vandevelde	IITRAN/360
Curve fittings			
Random number table generator	CETU	Petosa	IITRAN/360
Distribution of Dice Rolls			
Pythagarean triplets			
Mean of a fixed sample on randomly generator population	Abstract	K. Weidenbaum	IITRAN
CIRCLE.DET			

Name	Type	Author	Language
Population-Projection (Filecode: IPOPPROJ)	Abstract	Pomes	IITRAN
Makeham's Graduation (Filecode: FMAKEHAM)	Abstract	Pomes	FORTRAN
Reed-Merrell (Filecode: FREEDMER)	Abstract	Pomes	FORTRAN
Logistic Fit to Population Data (Filecode: FLOGSTIC)	Abstract	Pomes	FORTRAN
Population Projection (Filecode: FPOPPROJ)	Abstract	Pomes	FORTRAN
Logistic Fit to Population Data (Filecode: ILOGSTIC)	Abstract	Pomes	IITRAN
Makeham's Graduation (Filecode: IMAKEHAM)	Abstract	Pomes	IITRAN
Sex Ratio (Filecode: FSEXRATO)	Abstract	Pomes	FORTRAN
Sex Ratio (Filecode: ISEXRATO)	Abstract	Pomes	IITRAN
Volterra's Phase Trajectory (Filecode: IVOLTERA)	Abstract	Pomes	IITRAN
Volterra's Phase Trajectory (Filecode: FVOLTERA)	Abstract	Pomes	FORTRAN
Three Man Dominance (Filecode: FDOM)	CETU	Garside	FORTRAN
Homans' Human Exchange Simulator (Filecode: FHOMSIM)	CETU	Garside	FORTRAN
Index of Dissimilarity (Filecode: FDISSIM)	Abstract	Pomes	FORTRAN
Total Displacement (Filecode: FTOTDISP)	Abstract	Pomes	FORTRAN
Population Doubling (Filecode: FPOPDOB)	Abstract	Garside	FORTRAN
Population Doubling (Filecode: IPOPDOB)	Abstract	Garside	IITRAN
Social Area Analysis (Filecode: FSOCANAL)	Abstract	Garside	FORTRAN
Reed-Merrell (IREEDMER)	Abstract	Pomes	IITRAN
Births Projection (FBIRTH)	Abstract	Garside	FORTRAN
Kolmogorov-Smirnov One Sample Test (FKOLMO)	Abstract	Pomes	FORTRAN
Kolmogorov-Smirnov Two Sample Test (FKOLM2)	Abstract	Pomes	FORTRAN
Kolmogorov-Smirnov Statistic (FSMIRN)	Abstract	Garside	FORTRAN
Chi-Square (FCHISQ)	Abstract	Garside	IITRAN
Kendall Rank Correlation Coefficient (FKRANK)	Abstract	Pomes	FORTRAN
Wilcoxon Matched-Pairs Signed-Ranks Test (FMPAIR)	Abstract	Pomes	FORTRAN
Cochran Q-Test Statistic (FQTEST)	Abstract	Pomes	FORTRAN
Ranking (FRANK)	Abstract	Pomes	FORTRAN
Sign Test (FSIGNT)	Abstract	Pomes	FORTRAN
Spearman Rank Correlation Coefficient (FSRANK)	Abstract	Pomes	FORTRAN
Correction Factor Due to Ties in Ranking (FTIE)	Abstract	Pomes	FORTRAN
Friedman Two-Way Analysis of Variance Statistic (FTWOAV)	Abstract	Pomes	FORTRAN
Mann-Whitney U-Test (FUTEST)	Abstract	Pomes	FORTRAN
Kendall Coefficient of Concordance (FWTEST)	Abstract	Pomes	FORTRAN
Normal Distribution (NDTR)	Abstract	Pomes	FORTRAN
Matrix Printer (MATPRT)	Abstract	Pomes	FORTRAN
NONPARAS	Abstract	Pomes	FORTRAN
Population Pyramid (FPOPPYR)	Abstract	Garside	FORTRAN
Yule's Q (FYULEQ)	Abstract	Garside	FORTRAN
Yule's Q (IYULEQ)	Abstract	Garside	IITRAN

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COOPERATIVE PROGRAM EXCHANGE SERVICE

SOCIOLOGY INDEX

Number	Name	Type	Author	Language
11	Chi-Square while you wait	Abstract	Garside	CALCTRAN
42	Difference between Means while you wait	Abstract	Garside	CALCTRAN
43	Mean and Standard Deviation while you wait	Abstract	Garside	CALCTRAN
14	Small Scale Cross Tabulation.	Abstract	Garside	FORTRAN IV
15	Four Variable Yules Q Statistic (Yule16)	Abstract	Garside	IITRAN
16	Three Variable Yules Q Statistic (Yule8)	Abstract	Garside	IITRAN
17	NORC DATA DECK	Abstract	Garside	INTEGERS 0-9
18	Small Scale 3 Variable cross tabs (3TABS)	Abstract	Garside	FORTRAN IV
19	Survey Percent Distributions (Percent)	Abstract	Garside	FORTRAN IV
30	Population Dynamics I	Abstract	Pomes	FORTRAN IV
31	Table Printer for Population Dynamics I	Abstract	Pomes	FORTRAN IV
32	RECODER	Abstract	Pomes	FORTRAN IV
33	SUBROUTINE PUNTAP (Output for a vector or matrix of values)	Abstract	Pomes	FORTRAN IV

COOPERATIVE PROGRAM EXCHANGE SERVICE

PSYCHOLOGY INDEX

Number	Name	Type	Author	Language
1	ANTXSIDES (Analysis of Variance)	Abstract	Ross	IITRAN
2	CORCOF (Pearson Product Moment Correlation Coefficient)	Abstract	Ross	IITRAN
3	LEASTSQ	Abstract	Ross	IITRAN
4	FACANZXZ (Factorial Analysis of Variance)	Abstract	Ross	IITRAN
5				
6	:Pattern Noise	Abstract	Pomes & Pitts	FORTRAN
7	Elementary Parametric Statistics Package	Abstract	Pitts	FORTRAN
8	Basic: Measures and Pitts Central Tendancy	Abstract	Pomes & Pitts	FORTRAN
9	Select: Creation of subsets from original data	Abstract	Pomes & Pitts	FORTRAN
10	Tests for normal distribution	Abstract	Pomes & Pitts	FORTRAN
11	Histogram	Abstract	Ebeling	FORTRAN
12	Correlation	Abstract	Pomes & Pitts	FORTRAN
13	Regression	Abstract	Pomes & Pitts	FORTRAN
14	Scattergram	Abstract	Pomes & Pitts	FORTRAN
15	t-test	Abstract	Pomes & Pitts	FORTRAN
16	Line plot	Abstract	Pomes & Pitts	FORTRAN
17	Matrix printer	Abstract	Pomes & Pitts	FORTRAN

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EDUCATION INDEX

Number	Name	Type	Arthur	Language
1	Teachers Grading Program	Abstract	Ebeling	FORTRAN
2	Measures of Central Tendency: Teachers Grading Program	Abstract	Ebeling	FORTRAN
3	Standardized Scores: Teachers Grading Program	Abstract	Ebeling	FORTRAN
4	Histogram: Teachers Grading Program	Abstract	Ebeling	FORTRAN
5	Item Analysis by Quartile Ranking: Teachers Grading Program	Abstract	Ebeling	FORTRAN
6	Individual Student Analysis by Item Categorization: Teachers Grading Program	Abstract	Ebeling	FORTRAN

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NATIONAL SCIENCE FOUNDATION
OFFICE OF COMPUTING ACTIVITIES
Washington, D. C. 20550

REGIONAL COMPUTING ACTIVITIES
REPORT OF USER CHARACTERISTICS

INSTITUTION AND ADDRESS
City Colleges of Chicago

REGIONAL CENTER
Illinois Institute of Technology

PROJECT DIRECTOR/COORDINATOR
Dr. Henry Moughamian

GRANT NUMBER
GJ 282

DATE OF THIS REPORT
May 1, 1970

REPORTING PERIOD
1969-1970

NO. OF TERMS IN ACADEMIC YEAR
2

COLLEGE/UNIVERSITY: [ ] INDIVIDUAL [X] SUMMARY
SECONDARY SCHOOL: [ ] INDIVIDUAL [ ] SUMMARY

IMPORTANT: A separate report should be submitted for each participating college or secondary school. In addition, a summary report should be submitted for each category of users. Check appropriate block for this report.

(1) ACADEMIC DISCIPLINE	(2) TOTAL NUMBER OF STUDENTS IN DISCIPLINE — College Lower Division	Upper Division	Secondary School	(3) NUMBER OF STUDENTS IN REGIONAL COMPUTING ACTIVITY — College Lower Division	Upper Division	Secondary School	(4) NUMBER OF FACULTY MEMBERS — Number in Discipline	Number in Regional Act.	(5) NUMBER OF RUNS IBM 360	(5a) UNIV. 1108	(7) CPU Time in Hours IBM 360	(7a) UNIV. 1108	(10) USE IN INSTRUCTION — Programming, Problem Solving in Compiler Languages	Interactive, List Processing Languages	Data Base Processing	Simulations, Special Application Pkgs. and Language Development
Programming																
Computer Science																
Mathematical and Physical Science	2,650			92			17	5	380	135	4.1	1.4	80			20
Biological Science																
Social Science and Education																
Business	2,280			660			21	7	684	10	8.0	0	70		10	20
Arts and Humanities																
Engineering, Forestry, and Agriculture																
Unstructured																

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