

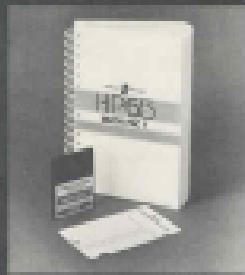
J. Lewis

PRE-RECORDED PROGRAM
CARDS CHANGE YOUR
PERSONAL "COMPUTER" INTO
A *SPECIALIZED CALCULATOR*

They turn your complex, lengthy or
repetitive calculations into a few simple
steps anyone can do quickly.



Choose the Application Pacs you need from the constantly increasing Hewlett-Packard selection



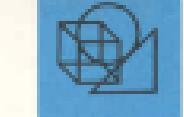
To extend the versatility of the HP 49g+—or to concentrate its capabilities in your field of interest—you can select from an ever-expanding collection of pre-processed program carts, packaged in Application Pacs.

Each Pac contains up to 40 programs, a detailed manual on the Pac, plus a set of 28 printed instruction cards.

These Pacs are already available in the following categories: Mathematics, Statistics, Chemistry, Medical Technology, and Technical Electronics Engineering.

Pacs in other scientific and technical disciplines will be introduced shortly.

As an example of the types of programs each Application Pac contains, the programs of Math Pac are listed in detail...



Math Pac I

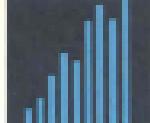
1. **HYPERBOLIC FUNCTIONS.** This program computes the hyperbolic functions ... sinh, cosh, tanh, coth, sech, and csch.
2. **FIRST ORDER DIFFERENTIAL EQUATION.** This program may be used to solve a wide variety of first order differential equations numerically, using the Runge-Kutta method.
3. **SOLUTION OF AN EQUATION.** (Given A, B, C, D, E, F) Given the three initial, or test values and their included angles, this program finds the remaining unknown values.
4. **2 X 2 MATRIX INVERSION.** This program, in conjunction with program 20, finds the inverse of a given 2 X 2 matrix.
5. **FIFTH ORDER POLYNOMIAL EQUATION.** Finds one real root of a fifth degree polynomial equation with real coefficients, then reduces the equation to a fourth degree polynomial equation, which may be solved by program 13.
6. **FRACTION OF AN INTEGER.** This program finds all prime factors of a positive integer and, therefore, determines if the number is a prime. Factor.
7. **CONTINUOUS CONVERGENCE TEST PROGRAM.** (PART I) Computes the greatest common divisor (GCD) and the least common multiple (LCM) for two given integers. A, B. Also finds integral coefficients, I and T such that $BCD(A, B) = IA + TB$.
8. **AN EQUITY AND INVESTMENT PROGRAM.** Provides options to (1) calculate the terms of an annuity, (2) find a payment in terms of an advance or payment, (3) find the terms of an ordinary annuity, (4) display the terms of a business program.
9. **GEOMETRIC PROGRAM.** Can be used to (1) display the terms of a geometric progression, (2) find the value of a particular term of a geometric progression, (3) find the sum of the first n terms of a geometric progression, (4) find the ratio of the sum of a geometric progression. If the ratio of two successive terms has an absolute value less than one.
10. **FUNCTIONS OF A POLY.** Can be used to find (1) a relation to find a power of a polynomial in a of a degree, (2) convert an integer, (3) coefficients of a polynomial in a of a degree, (4) a degree part of a polynomial, (5) a prime factorization of a polynomial, (6) a sum of a constant times a of a term, (7) a sum of a constant times a of a term, (8) a degree of a polynomial.
11. **NUMERICAL DIFFERENTIATION.** Finds the cyclic (first and second) differences of a quadratic equation.
12. **CUBIC EQUATION.** Solves a real root from the cubic equation, reducing it to a quadratic equation. (This was program 11.)
13. **FOURTH DEGREE POLYNOMIAL EQUATION.** Can be used in conjunction with programs 10 and 11. To find the real root and all imaginary of a fourth degree polynomial equation with real coefficients.
14. **LINEAR EQUATIONS IN TWO UNKNOWN.** Finds the solution for two simultaneous linear equations in two unknowns.
15. **LINEAR EQUATIONS IN THREE UNKNOWN.** Finds the solution for three simultaneous linear equations in three unknowns.
16. **SYNTHETIC DIVISION.** Performs synthetic division on a polynomial of degree less than or less than two coefficients.
17. **RECTANGULAR SPHERICAL CONVERSION.** Converts rectangular coordinates to spherical coordinates, and vice versa.
18. **TRANSLATION AND ROTATION OF COORDINATE AXES.** Finds the new coordinates for a point whose coordinates given with respect to the original, translation or rotation.
19. **UNITS CONVERSION.** Converts an angle in one angular unit to another angular unit. Angles can be expressed in degrees, radians, grads or mils.
20. **SECONDARY VALUES OF SIN⁻¹, COS⁻¹ and TAN⁻¹.** Computes secondary values of sine, cosine and arc tangent. Angles can be in degrees, radians or grads.
21. **TRIGONOMETRIC FUNCTIONS.** Provides options to compute the values of cosecant, secant or cotangent, and their inverses.
22. **INVERSE TRIGONOMETRIC FUNCTIONS.** Computes the inverse of sine, cosine, secant, and cotangent.
23. **ROTATION OF A TRIANGLE.** Given A, B, C, D, E, F. Given point A plus the opposite angle and an adjacent angle, in other words left and right adjacent angles, this program finds the remaining angles and points of an adjacent triangle.
24. **ROTATION OF A TRIANGLE.** Given A, B, C, D. Given an angle, and two points, A and an adjacent angle, this program finds the remaining angle and points of an adjacent triangle.
25. **PERIMETER, AREA & VOLUME.** Given the two base and their included angle, or three sides, this program finds the remaining unknowns.
26. **AREA OF A TRIANGLE.** Finds the area of a triangle, given either (1) three sides, (2) two sides and their included angle, (3) one side and its included angle, or (4) the coordinates of the vertices.
27. **AREA OF A POLYGON.** Finds the area of a polygon (assumes no concave), given the coordinates of the vertices.
28. **CIRCLE DETERMINED BY THREE POINTS.** Finds the radius and center point of a circle drawn through three distinct points.
29. **INVERSE SPACED POINTS ON A CIRCLE.** Given the radius, the center point and the initial angle, this program yields the coordinates of n-spaced points on a circle in a given positive number.
30. **POLYGRAPH PROGRAM AND CALCULATOR.** (PART I) Given the number of sides of a regular polygon inscribed in a circle of radius, and the area of a sector, this program finds the lengths of the sides and the area of the polygon.
31. **DEGREE CONVERSION.** $\pi \rightarrow 180^\circ \rightarrow \pi$, $180^\circ \rightarrow \pi$, $\pi \rightarrow 180^\circ$. Perform and conversions between (1) Radians and degrees, (2) feet, inches, and feet, and (3) pounds and kilograms.
32. **DEGREE CONVERSION.** $\pi \rightarrow 180^\circ \rightarrow \pi$, $180^\circ \rightarrow \pi$, $\pi \rightarrow 180^\circ$. Perform and conversions between (1) miles and kilometers, (2) gallons and liters, (3) pounds and meters, and (4) acres and square feet.
33. **POLYNOMIAL EVALUATION.** (Part I) Evaluates polynomials with real coefficients. The degree of the polynomial must be equal to or less than eight.
34. **LINEAR AND LAGRANGE INTERPOLATION.** (Part I) An Lagrange interpolation formula is used to data points in the region of tabulated data.
35. **POINT PREDICTION INTERPOLATION.** Interpolates for data points in the region of tabulated data for uniformly spaced abscissas, with a specified reading. The equation used is the backward interpolation formula of Gauss, which uses pairs of data points and sets up the cubic equation for interpolation.
36. **INTEGRAL APPROXIMATION (Simpson's Rule).** Approximates definite integrals by the trapezoidal rule, or by Simpson's Rule. The values of the function at several locations are all that must be known.
37. **INTERPOLATION FOR NUMERICAL INTEGRATION.** Approximates definite integrals by Simpson's Rule.
38. **ROOTS OF 1000 = 10 IN THE INTERVAL.** Uses the principle of successive approximation to find the roots of an equation in a closed interval. The equation may be algebraic, rational or transcendental.
39. **DETERMINANT AND CHARACTERISTIC EQUATION OF A 3 X 3 MATRIX.** Finds the determinant and coefficients of the characteristic equation of a 3 X 3 matrix.
40. **2 X 2 MATRIX OPERATIONS.** Performs addition, subtraction and multiplication of 2 X 2 matrices.



Math Page

The PDE describes a variety of advanced mathematical functions, including

1. BASE CONVERSION. This program converts positive decimal numbers to equivalent numbers in another base. It also converts positive numbers of base 8 to decimal numbers. The base may be up to 16 integers from 2 through 16.
2. LEAST COMMON MULTIPLE (LCM). This program performs addition, subtraction, division and multiplication of integers.
3. GAUSSIAN ELIMINATION FOR 3x3 EQUATIONS. For a series range between 1 and 10, this program computes the integral of the single-variable function $y = \sin(x)$ on the open interval $[0, \pi]$ using Simpson's formula.
4. BISECT FUNCTION (BIF). Computes the value of the Bisection Function (BIF) of first magnitude on integer order-1.
5. COMPUTE INFINITE INTEGRAL. Computes the generalized complex definite integral of the specified function. Special cases include the complex definite integral of the first kind.
6. COMPLEX ADDITION. Performs addition, subtraction, multiplication and division of complex numbers.
- Other programs are:
 7. DECIMAL ARITHMETIC.
 8. ENTROPY BASE CONVERSION.
 9. COMPLEX FUNCTIONS (CF).
 10. COMPLEX FUNCTIONS (CF2).
 11. COMPLEX FUNCTIONS (CF3).
 12. COMPLEX HYPERGEOMETRIC AND HYPERBOLIC FUNCTIONS (Three magnetic cards).
 13. COMPLEX INVERSE (Hyperbolic) and HYPERBOLIC FUNCTIONS (Three magnetic cards).
 14. POLYNOMIAL EVALUATION (Complex).
 15. INTERSECTION OF A LINE AND A CONIC SECTION (One magnetic card).
 16. VECTOR PRODUCTS AND ANGLES BETWEEN VECTORS.
 17. PARTIAL SUM AND PRODUCT.
 18. GAUSSIAN QUADRATURE FOR y^n up to 10.
 19. MILLION FUNCTIONS.
 20. FIBONACCI FUNCTION.
 21. GREEN FOREST (One magnetic card).
 22. INCOMPLETE GAMMA FUNCTION.
 23. ERNST SIEGMUND AND COMPLEX LEFT ERROR FUNCTION.
 24. COMPLEX HYPERGEOMETRIC FUNCTION.
 25. GAUSSIAN HYPERGEOMETRIC FUNCTION.
 26. CHEBYSHEV POLYNOMIAL.
 27. LEGENDRE POLYNOMIAL.
 28. HODGE (1) FOR POLYNOMIAL.
 29. LAGRANGE POLYNOMIAL.
 30. SINE INTEGRAL.
 31. COSEIN INTEGRAL.
 32. EXPONENTIAL INTEGRAL.
 33. FREUD, INTEGRALS.



Stat Roc I

Provides basic and advanced functions required for statistical calculations, such as: σ .



Survey Page

Provide the most recent version of information needed in the field, such as:

- 1. FIELD DATA TABULATOR.** This program will accept angular inputs, linear inputs, coordinates inputs and distance inputs, as well as horizontal or vertical distances. The coordinates of four input point are calculated, just point in input from first and second are required upon completion of the program.
- 2. HORIZONTAL SURVEY LINES.** Given the survey station, the point of intersection station and the distance and angle, this program computes the line angles from the horizontal and shows lengths from the point of intersection.
- 3. HORIZONTAL DISTANCE INTERSECT.** This program calculates the coordinates of the point of intersection line of two lines—one of which having through lines connected to the other of known length from a point of known coordinates. Both solutions are computed.
- 4. STATION DETERMINATION.** This program computes the elevation of an horizontal distance in passing from an instrument station using grade methods. Required inputs are the height of instrument, and the zenith angle, the rod reading, and the rod staff length.
- 5. VOLUME OF CUT AND FILL AREA (CUT AND FILL).** This program computes area and volume for any station, volume from previous planim, and accumulated volume to the present position. Inputs for the elevation and distances from the center line for all points of a cross section and the length from the previous planim.
- Other programs are:**
 6. BEARING TRANSFER.
 7. CONVERGE TWO STATION AND BEARING TRANSFER.
 8. DIVISION FROM COORDINATES.
 9. ELEV. UNIT.
 10. ELEVATION & TRANSFORMATION.
 11. EXPRESSION LINE ASSESSMENT.
 12. FAULT LINE ASSESSMENT.
 13. TWO INSTRUMENT ELEVATION SURVEY.
 14. CURVE EQUATION (Given A, B or C, D, E).
 15. CURVE EQUATION (Given B, C or D, E).
 16. CURVE EQUATION (Given A, B or C, D, E).
 17. ELEVATION ALONG A VERTICAL LINE.
 18. FAULTING (Given A, B, C, D, E, F, G, H).
 19. FORMULA EQUATION (Given A, B, C).
 20. TRIGONIC EQUATION (Given A, B, C).
 21. (MAGNET) BURNING OF IRON.
 22. HORIZONTAL-DISTANCE INTERSECT.
 23. DISTANCE FROM A POINT TO A LINE.
 24. TAPER (CONSTRUCTION).
 25. HOW SLOPE DETERMINATION (Given Slope Angle).
 26. HOW SLOPE DETERMINATION (Given A, Direction).
 27. ALIGNMENT ON THE SURF.
 28. THREE LINE LEVELING.
 29. SLOPE TAKING (Given Horizontal Station Distances).
 30. SLOPE TAKING (Given Centerline Dist. & F).
 31. PREDICTION OF A LINE.
 32. PREDICTION OF A LINE (Line Through a Point).
 33. PREDICTION OF A LINE (Line From Point).
 34. VOLUME OF IRREGULAR PT.



Medical Pac I

Allows for the rapid calculation of more than seven dozen medical problems, such as:

1. **BALD VITAL CAPACITIES.** This program accepts the height and age of a male subject along with measured pulmonary function values and calculates the percent of the predicted values for the person. The input values are: (1) vital capacity, (2) forced expiratory volume at 1 second, and (3) mean expiratory flow rates over 200 to 1000 cc per second. Other programs in the Pac calculate other pulmonary functions.
2. **BALD'S BODY SURFACE AREA.** This program calculates the body surface area in square meters from the patient's height and weight using the Bald's Formula. Additionally, given the random subject, the cardiac index is calculated.
3. **BALD'S BODY CARDIAC OUTPUT.** This program allows calculation of cardiac output from vital statistics.
4. **BODEN'S SATURATION AND CONTENT (Oxygen Saturation).** This program utilizes the arterial oxygen tension and calculates the percentage saturation from the hemoglobin dissociation curves, and given the hemoglobin content, calculates the oxygen content of the blood. This can be defined as arterial or venous blood values or an arterial oxygen bar taken out by other programs.
5. **BODY SURFACE AREA CONVERSION.** This program allows conversion between the most commonly used metric and English units of height, weight, and temperature. The metric units used are centimeters, kilograms, and degrees centigrade. The English units to which these can be converted are feet, inches, pounds (imperial), and degrees Fahrenheit.

Other programs are:

6. **HEIGHT CONVERSION.** (Three magnetic cards).
7. **LENGTH ENERGY CONVERSION.** (Two magnetic cards).
8. **ROUND CONVERSION.** (Three magnetic cards).
9. **RECTILINEAR INTENSIFFY (Anatom).**
10. **RECTILINEAR SETUP CONNECTIONS.**
11. **PULSE RESPIRATION.**
12. **BOY'S BODY SURFACE AREA.**
13. **WRIGHT, PO.**
14. **BLOOD GAS BASE EXCESS.**
15. **BASE SPARE FRACTION.**
16. **BEST DIFFERENCE.**
17. **PHYSIOLOGIC SHUNT AND FER.**
18. **WAKE AREA.**
19. **PICK CARDIAC OUTPUT.**
20. **MALE MHR, BPI, TLC, AND FRC.**
21. **MALE FORCED EXPIRATORY FLOW.**
22. **MALE VITAL CAPACITY.**
23. **MALE MHR, BPI, TLC, AND FRC.**
24. **MALE FORCED EXPIRATORY FLOW.**
25. **PATIENT IDENTIFICATION.**
26. **LUNG DIFFUSION.**
27. **SATURATED WATER VAPOR PRESSURE.**
28. **RESPIRATORY GAS CONVERSION.**
29. **ANATOMIC BREATH.**
30. **STROKE INDEX.**
31. **ANABOLIC PO₂ AND pH CHANGE.**
32. **ANABOLIC PO₂ CHANGE.**
33. **CONTRACTILITY.**



EE Pac I

This pac provides a variety of functions for use in electronic and electrical engineering projects.

1. **LOGIC STATE CHART.** This program determines the missing value in the relation

$$1 = 2 \times 10^6$$

given by one of the three relations.

2. **IMPEDANCE OF LADDER NETWORK.** This program computes the input impedance of an arbitrary long ladder network containing series or shunt (R, L, and C).

3. **TRANSMISSION LINE, REFLECTION TRANSFORMER.**

This program computes the input impedance of a length L transmission line of characteristic impedance Z_0 , terminated in Z_L .

This problem is commonly solved graphically on a Smith Chart.

4. **2-PORT PARAMETER CONVERSION.** (Two magnetic cards) This program converts complex two-port parameters to π -parameters and vice versa.

5. **FOURIER SERIES.** This program computes the Fourier coefficients given a finite enough number of samples of a periodic function.

Other programs are:

6. **RECT-RECT ANODIZED CIRCUIT.**
7. **PARALLEL RESISTANT CIRCUIT.**
8. **T-ITERATOR.**
9. **P-ITERATOR.**
10. **PRODUCTS OF SEQUENTIAL TRANSFORMERS.** (Two magnetic cards)
11. **MINIMUM LOSS PASS FILTERS.**
12. **PI NETWORK IMPEDANCE MATCHING.**
13. **BAUD PASS FILTER.** (One magnetic card)
14. **ACTIVE FILTER-LOW PASS.**
15. **ACTIVE FILTER-HIGH PASS.**
16. **BUTTERWORTH FILTER DESIGN.**
17. **CHEBYSHEV FILTER DESIGN.** (Two magnetic cards)
18. **IMPACTANCE OF PARALLEL PLATES.**
19. **SELF INDUCTANCES OF STRAIGHT ROUND WIRE.**
20. **INDUCTANCE OF A SINGLE-LAYER COILED-WIRE COIL.**
21. **IRON EFFECT MAG-100, Q.**
22. **TRANSFORMER DESIGN.**
23. **IRON RELAY DESIGN.** (Two magnetic cards)
24. **IMPEDANCE OF TRANSMISSION LINE.**
25. **RESONANT TRANSMISSION LINE.**
26. **POWER SUPPLY RELAYLESS CIRCUITS.**
27. **CONTINUOUS RELAYLESS CIRCUITS.**
28. **INTERFERED CIRCUIT CURRENT SOURCE.**
29. **TRANSISTOR BIAS.**
30. **BJT BIAS AND TRANSCONDUCTANCE.**
31. **FAIR-Lock LOOP.**
32. **DC-DC CONVERSION.**
33. **FILTERS TO 1000.**
34. **WAVE TABLES A & BINARY-1600.**
35. **HEAT SINK.**

Each Application Pac contains up to 40 pre-recorded program cards, to save you hundreds of hours of calculating time!

Here's how easy it is to load a pre-recorded program card into the HP-65



Simply insert the card into the HP-65 magnetic card reader, and in less than two seconds . . .



... the card's entire program is duplicated in the HP-65's program memory. Then the card exits for further use whenever you need it again.



Although each card is less than one-half inch by three inches in size, it contains a complete program (up to 180 steps long) directing the HP-65 to perform a predesigned routine, to solve a specific problem or series of problems. The HP-65 incorporates a magnetic card reader to duplicate the program on the magnetic card into the HP-65's program memory.

All you need to do is run a pre-recorded program card through the HP-65 (a two-second operation), then key in your known data and run the program as described by the instructions furnished for the program. In seconds, your complex problems are solved, with extreme accuracy. And each card can be used thousands of times.

A particular program can be a relatively simple or intricate sequence of steps. Because the program card has all of the steps pre-recorded, you only have to feed in the known data—the HP-65 will do the work!

Each Application Pac contains up to 40 pre-recorded program cards. In addition, each Pac includes a manual which gives program descriptions, user instructions and program listings. Also included are a set of 20 two-sided Pocket Instruction Cards, each of which holds two program cards and space for listing their program instructions.



The HP-48
Fully Programmable
Pocket Calculator comes
complete with the

Standard Poc

This Pd, not only demonstrates the versatility of the EP-88 packed "computer," but provides two routes for diagnosing working functions, and a route for clearing the read program from buffer memory. The Standard Pd consists of the following sections:

1. **PERSONAL INVESTMENT:** Used to forecast long-term plan's future financial investments, returns, deposit, withdrawal and interest for specified time periods.

2. **MEAN, STANDARD DEVIATION, STANDARD ERROR:** Computes the mean, standard deviation and standard error when given a set of data.

3. **GREAT CIRCLE NAVIGATION:** Given given the coordinates of two points on the globe, calculates the great circle distance between them and the initial bearing.

4. **PILOTAGE BASE CONVERSION:** Changes an image of one base to an equivalent image of a second base. (Both bases must be integers in the range 2 to 16).

5. **ROPE BODY SURFACE AREA:** Calculates the body surface area when given a person's height and weight. With additional data of certain subset, also calculates the surface area ratio of blood pumped per unit of body surface area.

6. **P-TEST FOR TWO INDEPENDENT SAMPLES:** Computes relevant values for a two-sample t -test given desired level and output significance, t , and E , standard error, t , and quality factor R .

7. **THE SHORT RUN COSTS - EQUATION:** Computes short distance to technical efficiency of the independent production, after considering the shift's correction.

8. **TEMPERATURE CONVERSION:** This program converts temperatures between Fahrenheit, degrees Fahrenheit, degrees Celsius, and degrees Kelvin.

9. **WEIGHT-MASS CONVERSION:** This program converts information between grams, kilograms, tonnes, tonnes and mill.

10. **VEHICLE CONVERSION:** This program converts liters/gallons between 10 U.S. gallons, Imperial gallons, water meters, liters/centimeters and liters.

11. **EMPLOYEE BENEFITS:** Given three of the following four-related, number of years, present value and future value - the program computes the fourth.

12. **LOAN REPAYMENT:** Given the interest rate and the number of payment periods, this program calculates the present value given a payment, or a payment given a present value.

13. **ALGEBRAIC EQUATION SOLVER:** This program can be used as an aid in learning a class topic against a book solution.

14. **ITERATIVE SOLUTION OF EQUATION:** This program finds the roots for equations of the form $f(x) = 0$ by choosing better and better approximations.

15. **DIAGONALIZATION:** This program finds, either real or complex roots of quadratic equations.

16. **AREA AND VOLUME OF RIGHT TRIANGLE:** The areas of triangle, square, rectangle, and triangles and combinations of these geometry objects can be calculated. The third side of a right triangle, given the two legs, can also be found.

17. **NUMBER:** It gives a logic which the user can play against the computer.

18. **DIAGONAL:** It used to check the condition of various 10x10 handwritten digits, relational operators, document and crop an image, matting and transform. Display your 10 handwritten digits are operating independently.

19. **DIAGONAL:** Similar to above, but distinguishes the four arithmetic functions, the "L", "Inverted L" and "T" functions on 0-9 and decimal point, regardless 0 and 10. The Change Image and Digit Recognition functions, the Run and Run+L are added.

20. **ROAD CLEANING CAR:** An algorithm based automated road cleaning device to clean the road-prone road. (Road infrastructure).

21. Most materials cards are also included.

33 Most diagnostic words are also the best

HEWLETT-Packard

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