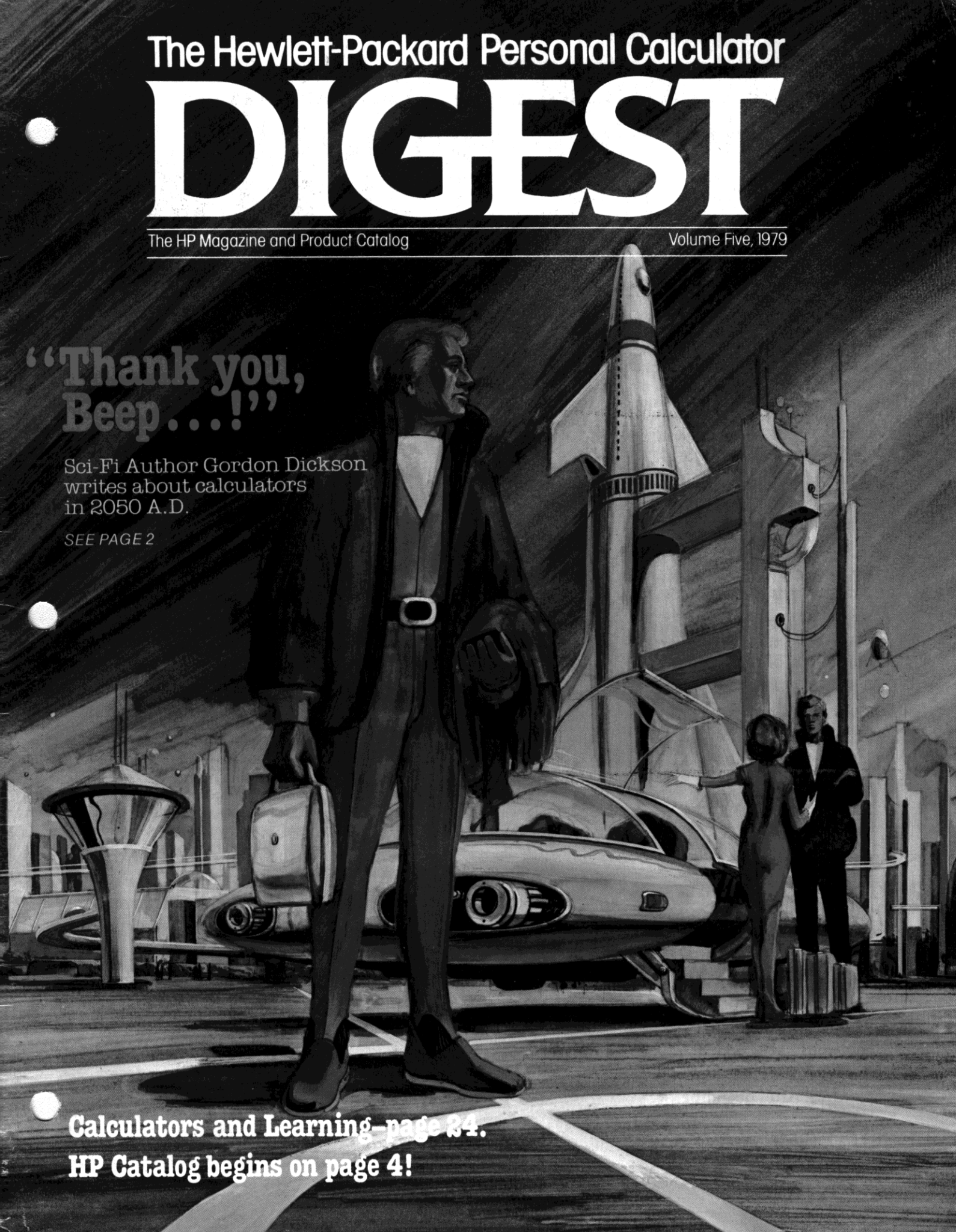
The Hewlett-Packard Personal Calculator

DIGEST

The HP Magazine and Product Catalog

Volume Five, 1979



"Thank you, Beep...!"

Sci-Fi Author Gordon Dickson writes about calculators in 2050 A.D.

SEE PAGE 2

Calculators and Learning–page 34.

HP Catalog begins on page 4!

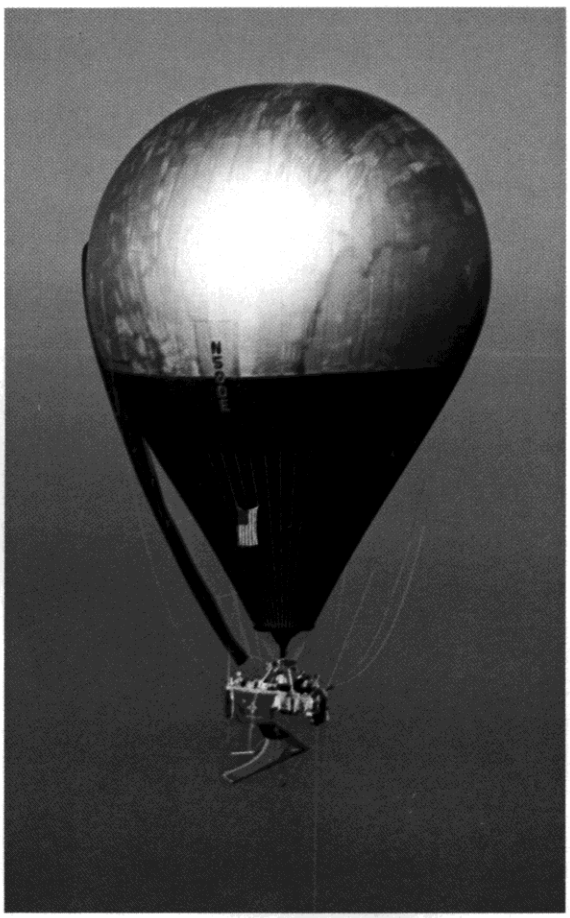
Balloonists fly the Atlantic first class - with an HP-67.

During the historic Atlantic crossing by Ben Abruzzo, Larry Newman, and Maxie Anderson aboard the American balloon Double Eagle II, navigator Anderson used an HP-67 programmable calculator each morning and evening to compute a dead reckoning position and to fix their position by celestial navigation.

With the HP-67, Anderson could determine the balloon's positions six to seven hours ahead of those furnished by the giant computers of the Goddard

Space Flight Center in Maryland.

Nimbus weather satellites picked up the Double Eagle II's position from the balloon's radio transponder and transmitted the coded data as part of the weather pictures. After decoding,



GSFC forwarded the positions to a ground station or airline pilot for transmitting to the balloon. The procedure required 6 to 7 hours.

Using the HP-67 and the HP-67/97 Navigation Pac, Anderson could quickly make all the navigation calculations needed. The balloon's position was then reported via amateur radio. The HP-67-calculated fixes were in good agreement

with the GSFC satellite-derived positions.

With its contribution to the Atlantic crossing of the Double Eagle II, the HP-67 takes its place in history with Hewlett-Packard calculators that have been used on expeditions to the top of Mount Everest and to the moon.

HEWLETT hp PACKARD

1000 N.E. Circle Blvd, Corvallis, Oregon 97330

The Hewlett-Packard Personal Calculator DIGEST

The HP Magazine and Product Catalog Volume Five, 1979

Hewlett-Packard offers a written warranty on all of its calculators and accessories. A copy of the complete warranty statement is available upon request.

Please note, for consumer sales in the United Kingdom any warranty given shall not apply to consumer transactions and shall not affect the statutory rights of a consumer. In relation to such transactions the rights and obligations of Seller and Buyer shall be determined by statute.

Hewlett-Packard products are manufactured by Hewlett-Packard worldwide.

Published by
Hewlett-Packard
Company.
Corvallis Division
Corvallis, Oregon, USA

Contents copyright
© 1979 by
Hewlett-Packard.
All rights reserved.

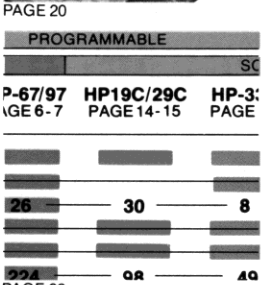
Editor: Mona Foley

PAGE 2

PAGE 24

PAGE 4

PAGE 20



PAGE 22

Features

"Thank you, Beep...!" by Gordon Dickson	2
How Programmable Calculators Help Kids Learn by Dr. John J. Wavrik	24

Catalog

Introduction and Buyer's Guide	4
HP-67 Fully-Programmable Pocket Calculator	6
HP-97 Fully-Programmable Printing Calculator	7
HP-67/97 Solutions Books	8
HP-67/97 Applications Pacs	10
HP-31E Scientific Calculator	11
HP-32E Advanced Scientific Calculator with Statistics	12
HP-33E Programmable Scientific Calculator	13
HP-19C Advanced Printing Programmable Calculator with Continuous Memory	14
HP-29C Advanced Programmable Calculator with Continuous Memory	15
HP-37E Business Management Calculator	16
HP-38E Advanced Financial Calculator with Programmability	17
HP-92 Investor	18
The HP Calculator Accessories	20
The HP Features and Functions Comparison Chart	22

In this story, written especially for the Digest, *science-fiction writer Gordon Dickson takes us to the mid-21st century where we discover the amazing HP-XX2050, a handheld calculator with surprising capabilities. Dickson is the author of more than 150 short stories and thirty-three novels including SOLDIER, ASK NOT, winner of the World Science Fiction "Hugo" Award in 1965, CALL HIM LORD, winner of the Science Fiction Writers of America Nebula Award in 1966, and DRAGON AND THE GEORGE, winner of the 1976 August Derleth Award of the British Fantasy Society.*

"Thank you, Beep...!"

by Gordon Dickson

WALTER JENSEN, a middle-management executive in the year 2025, had just left a meeting in Tahiti, and was on his way to a conference in London, England, hand-carrying some very secret and valuable commercial information. He had taken a short-hop shuttle from Tahiti to Melbourne, Australia, and there caught the sub-orbital flight from Melbourne to London. The day had been a long one, and the pressures of business in the twenty-first century were severe. He sank into his seat compartment aboard the sub-orbital rocketliner of Pacificon Flight number 859 with a sigh of relief. Closing his eyes, he dozed off.

He woke with a start some time later, to find the rocketliner jarring to a landing. The vision screen before his seat showed an unfamiliar airport, dark with night and rain. This was not England. He buzzed for a steward and a neatly mustached face under a uniform cap appeared on the screen before him.

"Our apologies to our passengers," said the seat speaker. "A malfunction has aborted flight 859. We are now landing at the airport in Jakarta, Indonesia. Would you please proceed to the terminal, where schedule adjustments and other arrangements can be made?"

The rocketliner ceased moving. Walter snatched up his portfolio and stumbled out with the other passengers.

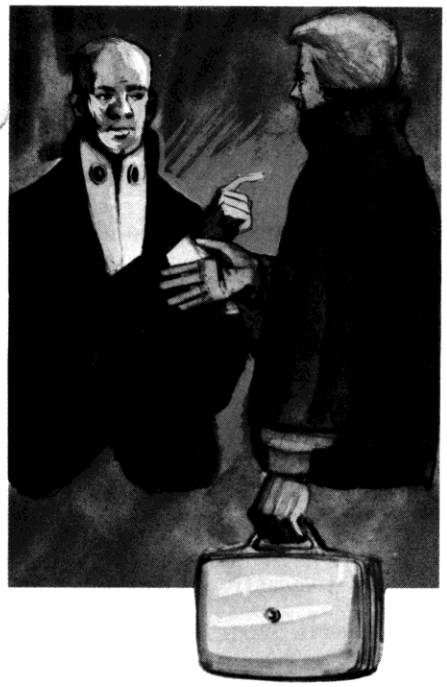
The crowd turned right into a wide corridor, and still thick with sleep, Walter followed them.

As he went, he began to awaken; and after some little distance he became aware that he had become separated from the others. He was alone in the corridor, with advertising signs in a language he could not read.

A small, slim man with golden skin and an oriental fold over his eyes, came hurrying by in the opposite direction.

"Say," said Walter, stopping in the other's path. "Could you tell me—"

© Copyright 1979 by Gordon R. Dickson.



But the other only rattled briefly at him in some unfamiliar language, then hurried out of sight. Walter was left alone, lost in an airport terminal he had never seen before.

He fumbled in his pockets, but without finding what he searched for.

"Beep!" he said, desperately, "Beep, where are you?"

A soft, musical tone sounded from his portfolio. Walter opened it and fished out an instrument looking like a slim, handheld calculator, with the upper third of its surface a vision screen. As soon as the heat of his hand enfolded it, the tone stopped; and the instrument, his Hewlett-Packard XX2050 autosecretary, spoke to him.

"What can I do for you, Walter?"

Its voice had, by Walter's choice, been factory-set to the same range as that of the voice of his wife, Enid. It was not Enid's voice, however, but a similar, cheerful, impersonal one he had come to identify with the code name Beep.

"I'm lost, Beep," Walter said now. "My flight aborted. I'm somewhere in a terminal at Jakarta, Indonesia. Also, I'm out on my feet, and I don't know where to go, and how do I get to London now in time for tomorrow's conference?"

"Don't concern yourself, Walter," said the HP-XX2050. "I'll take care of everything. Tell me, do you see any tie-in computer consoles near you?"

Walter looked up and down the corridor.

"No."

"Very well then. I'll scan and locate some for you. Follow the arrow, please."

Walter looked down and saw an image of the corridor on the screen of the XX2050—with a glowing arrow pictured as lying on the floor just before him. As he stepped forward, the arrow moved ahead of him, pointing the way he should go.

He followed it for some distance down the corridor, and up a branching one. It led him finally into a carpeted area, where half a dozen comfortable chairs sat facing tables holding vision screens. He sat down at one of the tables and slid the HP-XX2050 into a slot in the tabletop. The large screen before him lit up with the concerned face of a clean-shaven middle-aged man.

"Mr. Jensen!" said the console, in slightly accented English. "Your autosecretary is now in contact with all local service computer nets. Our apologies for finding yourself astray in our terminal. If you'll wait where you are for just a minute or two, we'll send a vehicle for you. Would you care for anything in the way of food or drink at this time?"

"Not right now," said Walter, heavily. "I just want some sleep."

"Your autosecretary has already been put in touch with local hotel services," said the speaker. "Unfortunately, there're no further flights to London tonight, but a booking has been made for you on a rocketliner leaving tomorrow at ten a.m.. As soon as you clear customs, you'll be brought to a hotel room, selected on information from your auto secretary as to your personal taste."

"Good," said Walter, closing his eyes.

The familiar musical tone jerked him back from the sleep he had begun to fall into immediately.

"Oh. Sorry, Beep." He reached out and took the XX2050 out of its slot, placing it in his shirt pocket.

"Everything's taken care of, Walter," it said to him from the pocket. "I made all the necessary arrangements through the local computer networks. But don't fall asleep again. Your transportation will be here in five seconds."

"Five seconds?" But Walter had already heard the whisper of blowers, and a small, two-seater automated personnel carrier slid up to him, floating on the cushion of air from its underbody fans.

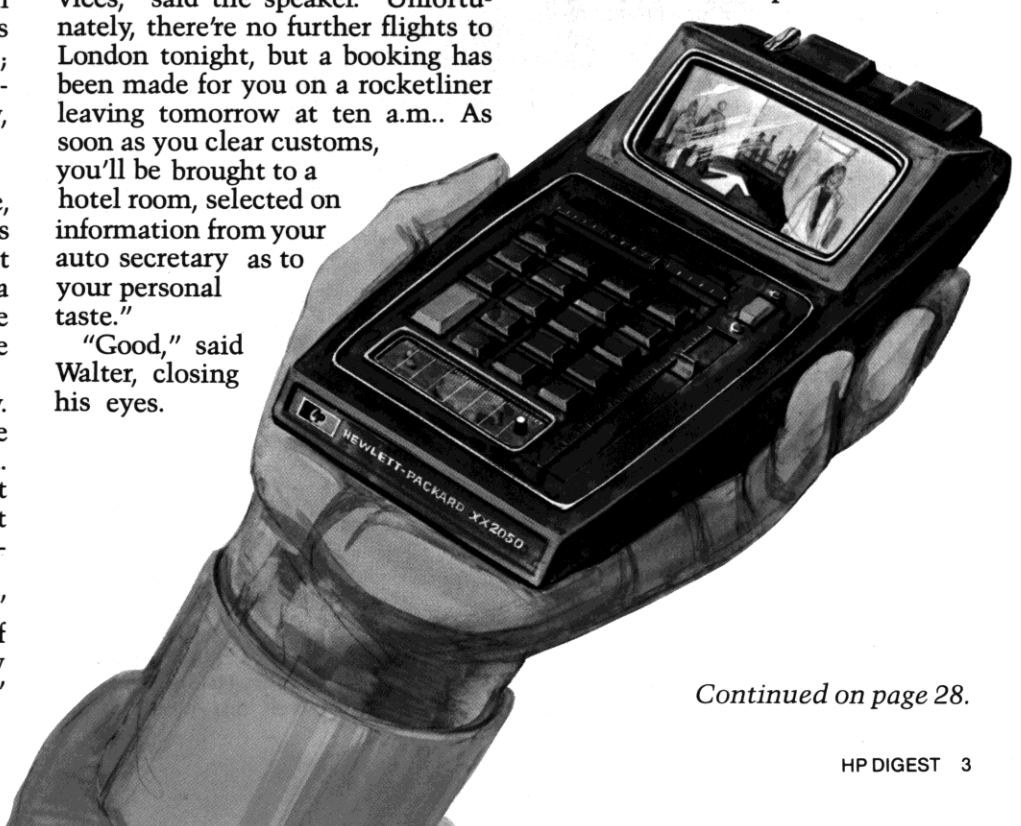
"If you'll take a seat, Mr. Jensen," the carrier said. "I'll bring you directly to the customs area."

Walter grunted an acknowledgment, got up and climbed into the nearest of the two seats. The vehicle moved off. In no time at all, it turned in through a doorway and stopped before another table with a vision screen.

"Slot me, Walter," The HP-XX2050 instructed him from the shirt pocket.

He fumbled it out and slid it into the slot provided. The screen lit up with the smiling face of a young lady.

"Mr. Jensen! Sorry we lost you earlier. Your luggage is already through custom check and passed on to the



Continued on page 28.

The 1979 Hewlett and Buyer's Guide to

How to select the right calculator for the work you do.

Selecting the right calculator is no longer a simple matter of equating functions, features and cost. With the wide range of advanced instruments available today, proper selection now depends largely on a careful analysis of your professional needs and—most important—your personal growth. Indeed, the selection of a calculator you feel may be somewhat in advance of your current needs can significantly speed your growth by expanding your problem-solving capabilities. The information following should make it easy for you to select the HP calculator that will do the best possible job for you.

How to order from this catalog.

You may order any HP Calculator from this catalog—using the enclosed Order Form, or by calling our toll-free number—for a 15-day trial.* If you are not satisfied with the unit—for any reason—simply return it within 15 days for a prompt refund in full (regardless of the payment method you choose) or for credit toward any other Hewlett-Packard calculator.

When ordering directly, you can speed your order by picking up the phone. Call our Toll-Free number 800-648-4711 (in Nevada call 800-992-5710), Extension 1000, and charge your order to your credit card (Alaska and Hawaii excluded). You get the same return privileges as if you'd sent the Order Form—and you'll get your new HP calculator faster.

*Prices and offer good in continental U.S.A., Alaska and Hawaii.

Calculator displays in all photography simulate typical appearance.

Preprogrammed Financial

Many business people are significantly extending their professional capabilities by switching from simple four-function calculators to advanced calculators. The preprogrammed calculator is an ideal step up, even for people whose skills in math and statistics are rusty or altogether lacking. With a few simple keystrokes, the preprogrammed calculator provides fast and accurate solutions to a wide range of financial and statistical problems, many involving complex computations. If you are interested in the advantages of a preprogrammed financial calculator, you should study the data on these two instruments:

HP-37E
Business Management. Page **16.**

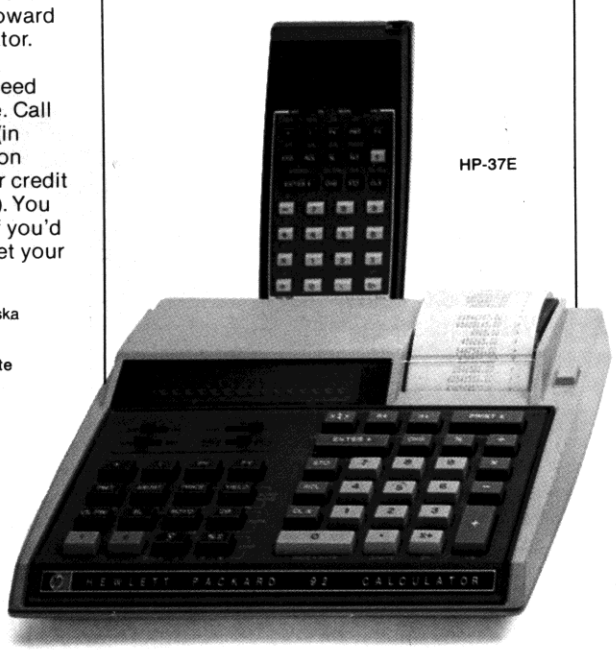
HP-92 Investor. Page **18.**

Preprogrammed Scientific

A preprogrammed calculator is the first advanced instrument many engineers and scientists use, and it is ideal for those whose work does not often require complex or repetitive computations. It is also often an ideal choice for engineering students who want to shorten the time required for problem solving. If you are interested in a preprogrammed scientific, you should look at the data on these two calculators:

HP-31E Scientific. Page **11.**

HP-32E
Advanced Scientific with Statistics. Page **12.**



HP-37E

HP-92

HP-31E

HP-32E

-Packard Catalog Personal Calculators

Keystroke Programmable Scientific

The keystroke programmable is invaluable for those who frequently deal with complex or repetitive scientific computations. A keystroke programmable can solve these problems automatically when it is programmed to do so. Then, all you have to do is key in your data and let the calculator run the entire computation. For those who use a few programs frequently, the Continuous Memory feature may be especially useful. This feature makes it possible to retain programs and data even with the calculator switched off. If keystroke programming sounds logical for you, look at the information on these three calculators.

HP-33E

rogrammable Scientific. Page 13.

HP-19C

Advanced Printing Programmable with Continuous Memory. Page 14.

HP-29C

Advanced Programmable with Continuous Memory. Page 15.

HP-19C

HP-33E

HP-29C

Keystroke Programmable Financial

The financial keystroke programmable is ideal for managers, financial analysts and consultants because it offers two basic methods of problem solving. Most everyday time and money problems can be solved using the wide variety of built-in functions. For more complex and repetitive financial computations keystroke programming is particularly helpful. With keystroke programming you can save hours of time wasted in long, tedious calculation. And once a program is written into the calculator, there is no possibility of human error. If keystroke programming sounds logical for you, look at the information on this calculator.

HP-38E

Advanced Financial with Programmability. Page 17.

HP-38E

Fully-Programmable Scientific & Financial

The fully-programmable is the most powerful, flexible and comprehensive of all advanced calculators. Complex programs can be stored permanently on small magnetic cards and used in the calculator over and over again. Pre-recorded program cards are available for a number of areas such as business, math, statistics, medicine, physical science, life science and many others. If you are looking for a calculator that will provide you with maximum capability, check the data on these two instruments:

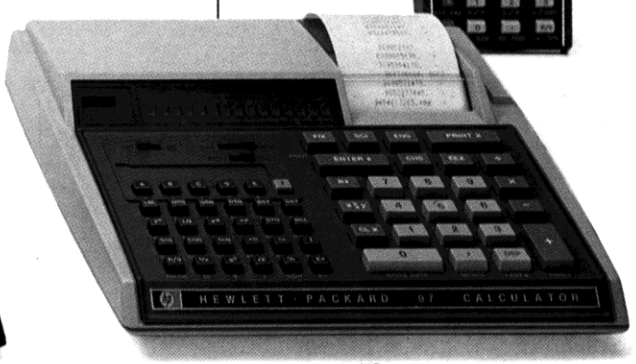
HP-67

Fully-Programmable. Page 6.

HP-97

Fully-Programmable Printing. Page 7.

HP-67



HP-97

HP-67 Fully-Programmable Pocket Calculator.

A major leap forward in fully-programmable personal calculators.

These are the most powerful personal calculators Hewlett-Packard has ever made. The HP-97 combines exceptional programming power—plus a battery-operated printer—all in one self-contained unit. The HP-67 provides the identical power of the HP-97 in the classic pocket size.

Exceptional power easily handles your lengthy, repetitive problems.

The HP-97/67 lets you write programs of up to 224 lines. Every function (one, two or three keystrokes) is merged to take only one line of program memory. And there are 26 data storage registers to provide the memory you need for your problems. You can record the contents of either program memory or the data storage registers on a magnetic card. Later, you can load all or part of them back into the calculator. The "smart" card reader of the HP-97/67 can handle either job. The HP-67 and HP-97 are also completely compatible. Programs recorded on one unit may be loaded and executed on the other.

So easy to use you'll write programs the first day.

Keystroke programming makes programming the HP-97/67 as simple as pressing the keys needed to calculate answers manually. Merged operations further simplify the task (and expand memory power) by letting you see the complete operation right in the display.

Because many programs require editing of some kind, we added useful features enabling you to easily review programs forward or backward, to easily jump to any line in the program, and to easily insert lines or delete them. RPN logic and the four-register automatic memory stack combine for more efficient problem solving. And RPN logic also helps when you program, because you don't use parentheses that waste valuable program memory.

And there are no pending operations that make editing difficult. RPN lets you slide through the most complicated programs the same easy way it lets you slide through complex calculations—with complete confidence.

An unparalleled program of owner support.

You can supplement your own programs with the extensive HP program library. The Standard Application Pac, with 15 programs in various disciplines, comes free with either calculator.

To get a better idea of the capabilities of the HP-67 and HP-97 in relation to your own needs, take the time to review the programs listed in the HP Application Pacs and Solutions Books. In many cases one of our professionally programmed and documented solutions may already exist to solve your problem.

Also available are a one-year subscription to the Users' Library and a free Newsletter to keep you abreast of current information.

HP-97

Fully-Programmable Printing Calculator.

The HP-97 provides battery-operation and thermal printing —in one self-contained unit.

The new HP-97 Fully-Programmable Printing Calculator combines exceptional programming power and the great usefulness of a quiet thermal printer. What's more, the HP-97 operates on batteries as well as AC—so you can have a printed record whenever and wherever you need it. In addition, there's an extra-large display for easy readability and a buffered keyboard so data may be keyed in at high speed.

Quiet thermal printer lists your programs on tape for checking and editing.

With the HP-97, you can list a program, (line number, key mnemonic and, optionally, the keycode), contents of the automatic memory stack, or the contents of the data storage registers. And you have three printing modes to choose from.

The printer is a valuable aid in editing programs or long calculations. You don't have to remember what you've done or what remains to be done. You see everything at once clearly, on tape.

Compact in design and light in weight for easy portability.

Total weight of the HP-97 without AC adapter/recharger is only 1.13 kg. (2½ pounds). It's so small it will fit into a standard briefcase so you can take it with you, and operate it in airplanes, taxis, anywhere. For security, a built-in metal tab lets you secure it to your desk easily with a cable or bolt.

The HP-97 and HP-67 give you exceptional programming power you won't outgrow.

"Smart" magnetic card reader.

With the magnetic card reader in both the HP-97 and the HP-67 you can load the entire program memory, or selected portions, either manually or under program control.

You can record data from all registers onto a magnetic card. You can also load every data storage register or selected registers.

When recording programs, the HP-97 and HP-67 automatically record the angular mode setting, the display setting and the status of the four flags.

10 User-definable Keys.

There are ten user-definable keys you can use for any special function you may require—such as defining portions of your program for subroutines or branches. In addition, there are ten numerical labels (LBL 0 thru LBL 9).

GTO GSB

You can perform a direct branch or subroutine to a label specified.

A GSB instruction can also be used within a subroutine to a depth of three levels.

Conditional Branching.

x≠y, x=y, x≤y, x>y,

x≠0, x=0, x<0, x>0

These keys allow your program to make decisions for you by testing the values in the X- and Y-registers or by testing the value in the X-register against zero as indicated.

Flags.

You can use the four flags in the calculator for tests in your programs. They can be set, cleared, or tested.

Indirect Addressing.

GTO (i) GSB (i)

You can perform a direct branch or subroutine to a label specified by the current positive number in the I-register using these keys. When the number in the I-register is a negative number these instructions perform a direct branch (GTO (i)) or a subroutine (GSB (i)) backward the number of lines specified.

STO (i) RCL (i)

You can also use the I-register to specify the address of a storage register for storing and recalling data or for storage register arithmetic.

ISZ (i) DSZ (i)

You can also increment (ISZ (i)) or decrement (DSZ (i)) the contents of the storage register specified by the value in the I-register and then test against zero.

HP-97 Specifications:

- Calculator width: 228 mm (9″)
- Calculator depth: 203 mm (8″)
- Calculator height: 63 mm (2.5″)
- Calculator weight: 1.13 kg (2.5 lb)
- Recharger weight: 268 g (9.5 oz)
- Shipping weight: 4.3 kg (9.5 lb)
- Paper temperature range 10°C to 40°C (50°F to 104°F)
- AC Power Requirement: 90-120V 50 to 60 Hz
- Battery Power Requirement: 5.0 Vdc nickel cadmium rechargeable battery pack

HP-67 Specifications:

- Calculator length: 152.4 mm (6″)
- Calculator width: 81 mm (3.2″)
- Calculator height: 18 to 34 mm (0.7 to 1.4″)
- Calculator weight: 298 g (10.5 oz)
- Recharger weight: 241 g (8.5 oz)
- Shipping weight: 2.3 kg (5.1 lb)
- Operating temperature range: 10°C to 40°C (50°F to 104°F)
- Charging temperature range: 10°C to 50°C (50°F to 122°F)
- Storage temperature range: – 40°C to 55°C (– 40°F to 131°F)
- AC Power Requirement: 86-127V 50 to 60 Hz
- Battery Power Requirement: 3.75 Vdc nickel cadmium rechargeable battery pack.

For a complete list of features and functions, see the Comparison Chart on pages 22-23.

The HP-67/97 Fully-Programmable Calculators come complete with:

- Illustrated Owner's Handbook and Programming Guide.
- Quick Reference Card. (HP-67 only)
- Standard Pac complete with 40 cards, card holder, and manual.
- Battery pack that under normal use provides about 3 hours of continuous operation.
- Recharger/AC adapter that lets you operate the calculator on AC while the battery pack is recharging.
- Soft carrying case.
- Programming pad.
- Users' Library and newsletter subscription card.
- 2 rolls of thermal paper (HP-97 only).

Use enclosed Order Form or our Toll-free phone. See page 4.

HP-67/97 Programs

Solutions Books

These HP-67/97 books contain between 10 and 15 programs each in diverse areas such as business, math, statistics, medicine, physical science, life science and others. Simply record the programs on your own magnetic cards and you have an application pac in your chosen field.

Business

- **Options/Technical Stock Analysis (00097-14009)**
  - Put & Call Option Fair Values (Black-Scholes)
  - Call Option Evaluation
  - Routines for Option Writers
  - Empirical CBOE Call Pricing
  - Warrant & Option Hedging
  - Bull Spread Option Strategy
  - Butterfly Options
  - Stock Price 30-Week Moving Average with Data Storage
  - Exponential Smoothing
  - Multiple Linear Regression
  - Curve Fitting, Selecting Best Function
- **Portfolio Management/Bonds & Notes (00097-14010)**
  - Stock Portfolio Valuation
  - Portfolio Data Card
  - Stock Portfolio Beta Coefficient Analysis
  - True Annual Growth Rate of an Investment Portfolio
  - Convertible Bond Portfolio Premium Evaluation
  - Yield on Call Option Sales
  - Bond Price and Yield
  - Days between Dates
  - Bond Yield to Maturity
  - Interest at Maturity/Discounted Securities
  - U.S. Treasury Bill Valuation
  - Convertible Security Analysis
- **Real Estate Investments (00097-14012)**
  - Mortgage Yield
  - Mortgage Pricing No. 1
  - Mortgage Pricing No. 2
  - Yearly Amortization Schedule
  - Amount of Equity at Any Time
  - Ellwood Income Valuation for Income Property Appraisal
  - Income Property Analysis
  - Return on Equity Rental Property
  - Real Estate Investment Analysis
  - Internal Rate of Return
  - Depreciation Schedules
- **Taxes (00097-14004)**
  - Tax Planning 1
  - Federal Income Tax—Single, Tax Table A
  - Federal Income Tax—Joint or Separate, Tax Tables B & C
  - Federal Income Tax—Single (Unmarried) Taxpayers (Schedule X)
  - Federal Income Tax—Joint or Separate (Schedule Y)
  - Schedule TC Tax Computation Schedule Form 1040
  - Tax Deduction Schedule A Form 1040 Medical and Dental
  - Maxitax, Minitax, Alternative Tax—Joint
  - Income Averaging Schedule G — Married
  - Federal Estate/Gift Tax—1977 and Later
  - Federal Estate Tax Credit for State Taxes Paid
  - Estate/Gift Tax Portfolio Valuation
- **Home Construction Estimating (0097-14033)**
  - Concrete Volume
  - Linear to Board Feet Conversion & Costing
  - Framing Board Feet
  - Lumber Estimate
  - Shingle Estimate
  - Wall & Ceiling Areas Estimate
  - Wallpaper Estimate
  - Drywall & Insulation Estimate
  - Sheathing & Subfloor Estimate
  - Painting Estimate
  - Wood Floor Estimate
- **Marketing/Sales (00097-14032)**
  - Forecasting using Exponential Smoothing
  - Financial Trend Analysis
  - Seasonal Variation Factors (SEAVAR)
  - Price Elasticity of Demand
  - Experience (Learning) Curve for Manufacturing Cost
  - Breakeven Analysis
  - Income Statement (P & L) Analysis
  - Internal Rate of Return-Groups of Cash Flows
  - Sales Force Requirements
  - Cost & Price Computations
- **Home Management (00097-14031)**
  - Income Tax Planning-I
  - True Cost of Insurance Policy
  - Automobile Cost/Tire Cost Comparison
  - Comparison Shopping
  - Time & Charges Running Total
  - Reconcile Checking Account
  - Savings Account Compounded Daily
  - Accumulated Interest/Remaining Balance
  - Stock Portfolio Valuation & Data Card
  - True Annual Growth Rate of an Investment Portfolio
  - Diet Planning
- **Small Business (00097-14039)**
  - Hourly Payroll
  - Invoicing
  - Account Posting
  - Percentages & Proportions with Tabulator
  - Retail Inventory Monitor
  - Estimating Inventory
  - Inventory Ordering
  - Order Point Calculation
  - Depreciation Schedules
  - Yearly Amortization Schedule
  - Federal Corporate Income Tax
  - Working Capital Needs—Bardahl Formula

Engineering

- **Antennas (00097-14021)**
  - Loaded Vertical Antennas
  - Loaded Dipole Antennas
  - Gain of a Horizontal Rhombic Antenna at Zero Azimuth
  - Azimuth Pattern of Cylindrical Array of Antennas
  - Colinear Antenna Gain & Pattern
  - Beam Pattern for Uniform Array
  - Radar Antenna Beamwidth & Gain Antennas
  - Parabolic Antenna Calculations
  - RF Path Loss, dB
  - Antenna Gain or Power of a Remote Transmitter
  - Planar Phased Array Radar Beam Positions
  - Radar Parameter Unit Conversions
  - (Television) Antenna Length & Channel Frequency
- **Butterworth & Chebyshev Filters (00097-14003)**
  - Butterworth Active Filter Design, Lowpass
  - Butterworth & Chebyshev Filter Response
  - Butterworth & Chebyshev Filter Group Delay
  - Butterworth & Chebyshev Filter Order Calculation
  - Butterworth & Chebyshev Lowpass Normalized Coefficients
  - Normalized Lowpass to Bandpass Filter Transformation for Types 1, 2, 6 & 7
  - Normalized Lowpass to Bandpass Filter Transformation for Types 8, 9, 10 & 11
  - Normalized Lowpass to Bandstop, Lowpass, or Highpass
  - Y-Delta Transform for L, R, or C
  - Chebyshev Active Lowpass Filter Design & Pole Locations
- **Thermal & Transport Sciences (00097-14023)**
  - Psychrometric Properties
  - Psychrometric Calculations for Water in Air
  - Equations of State
  - Isentropic Flow for Ideal Gases
  - Saturated Steam Properties
  - Conduit Flow
  - Parallel & Counter Flow Heat Exchangers
  - Energy Equation for Steady Flow
  - Flow with a Free Surface
  - Pipe Slide-Rule
  - Force at Bends & Fittings
- **EE (Lab) (00097-14025)**
  - Wire Table
  - Ohm's Law
  - Reactance Chart (Nine Equations)
  - Coil Calculations
  - Complex Impedance Calculator—AC Circuit Calculator
  - Wye-Delta Transformations
  - RC Timing
  - Series R-L-C Circuit Analysis Program
  - Passive High & Lowpass Composite Filter Design
  - "L" Attenuator (Generator Impedance Greater than Load Impedance)
  - 1% Resistor Value Subroutine
  - Wheatstone Bridge
- **Industrial Engineering (00097-14035)**
  - Discounted Cash Flow/Present Value Analysis
  - Depreciation Schedules
  - Invoicing & Inventory Control
  - Production Monitor & Record
  - Learning Curve
  - $\bar{x}$ & R Control Chart
  - Single- & Multi-Server Queues
  - Two-Way Analysis of Variance with Replications Fixed Effects Model
  - Multiple Linear Regression for 3 Independent Variables
  - Simultaneous Equations in Six Unknowns
- **Aeronautical Engineering (00097-14036)**
  - Properties of Air
  - Theoretical U.S. Standard Atmosphere Temperature & Pressure below 35,332 Ft.
  - Aircraft Flyover Acoustic Tone Doppler Shift
  - Isentropic Flow for Ideal Gases
  - Normal & Oblique Shock Parameters for Compressible Flow
  - Oblique Shock Angle for Wedge
  - Mach Number & True Airspeed
  - Take-Off Run vs. Density Altitude
  - True Air Temperature & Density Altitude
  - Aircraft Climb
- **Beams & Columns (00097-14027)**
  - Compressive Buckling
  - Eccentrically Loaded Columns
  - Reinforced Concrete Beams
  - Concrete Beam Deflection
  - Torsion-Concentrated Load-Steel Beams (Wide Flange)
  - Torsion-Uniform Load-Steel Beams (Wide Flange)
  - A.I.S.C. Steel Column Formula
  - Concrete Columns Ultimate Strength Design
  - Column Strength
  - Beam on Elastic Foundation with Point Load—Any Location
- **Control Systems (00097-14026)**
  - Frequency Response of a Transfer Function
  - Bode of Transfer Function that has each Pole & Zero Given
  - Bode of Second-Order over Third-Order Transfer Function
  - Bode of Second-Order over Second-Order Times s★ ★n Transfer Function
  - Pole-Zero to Group Delay
  - Routh Test for Continuous & Discrete Time System Analysis
  - Convert Frequency Response—Open Loop, Closed Loop
  - Aid to Root Locus Plots I —Real Poles
  - Aid to Root Locus Plots II—Complex Poles
  - Classical Control Gains
  - First Order Regulator
  - Second Order Regulator

Computation

- **High-Level Math (00097-14011)**
  - Eigenvalues for 3rd Order System
  - Eigenvalues/Vectors of 3rd Order Systems
  - Matrix Algebra
  - Characteristic Equation of a 4 x 4 Matrix
  - One Card Determinant & Inverse of a 5 x 5 Matrix
  - Simultaneous Equations in Six Unknowns
  - Roots of Polynomials
  - Miscellaneous Special Functions A
  - Miscellaneous Special Functions B
  - Incomplete Gamma Function
  - Incomplete Beta Function
  - Incomplete Elliptic Integrals
- **Test Statistics (00097-14008)**
  - One Sample Test Statistics for the Mean
  - Test Statistics for the Correlation Coefficient
  - Differences Among Proportions
  - Behrens-Fisher Statistic
  - Kruskal-Wallis Statistic
  - Mean-Square Successive
  - The Run Test for Randomness
  - Intraclass Correlation Coefficient
  - Fisher's Exact Test for a 2 x 2 Contingency Table
  - Bartlett's Chi-Square Statistic
  - Mann-Whitney Statistic
  - Kendall's Coefficient of Concordance
- **Geometry (00097-14007)**
  - Sine Plate Solutions
  - V Notches & Long Radii
  - Internal & External Tapers
  - Points of Tangency with Circles & Arcs
  - Line-Line Intersection/Grid Points
  - Points on a Straight Line
  - Grid of Points: Calculates All Points
  - Grid of Points: Calculates Discrete Points
  - Tangent Circle to Two Straight Lines with a Given Radius
  - Distance between Lines in Space
- **Reliability/Quality Assurance (00097-14030)**
  - Reliability: Intra-Class Correlation
  - Specification Compliance from Limits & Regression Analysis
  - Parameter Estimation (Exponential Distribution)
  - Lower Limit of Reliability—Binomial Distribution
  - Reliability & Probability of Failure of Series & Parallel Systems
  - MIL-STD-883 Calculated Leak Rate
  - MLE: θ from Hazard Rate
  - MLE: θ by Least Square Method
  - Systems Reliability-Series & Parallel w... Same Failure Rate λ
  - Systems Reliability-Series & Parallel with Different Failure Rate λ

To concentrate the capabilities of the HP-67 or HP-97 in your field of interest you can select from a variety of preprogrammed solutions. Choose a Solutions Book with documented programs or an Application Pac with programs recorded on magnetic cards.

Medical

- **Medical Practitioner (00097-14005)**
  - Blood Pressure Averages & Mean Arterial Pressure
  - Pacemaker Rate & Interval Averager
  - Blood Alcohol
  - Human Post-Trauma Epilepsy Seizure Prediction
  - Bedside Blood-Gas Interpreter
  - Body Density, Fat & Lean Mass from Skinfolds
  - Estimating Obesity, Body Fat Surface Area & Total Body Water
  - Fluid & Electrolytes/Body Burn Area
  - Fluid & Electrolytes/Potassium Balance (Scribner)
  - Anesthesiology Parameters
  - Discounted Cash Flow Analysis—Net Present Value
  - Income Property Analysis
  - Income Tax Planning—I
  - Income Tax Planning—II
- **Anesthesia (00097-14019)**
  - Anesthesia Parameters I
  - Anesthesia Parameters II
  - Pulmonary Medicine: Respiratory Set Up & Deadspace Adjustment
  - Copper Kettle Anesthetic Regulation
  - Anesthesia: Antoine Values from Experimental Data
  - Anesthesia: Vapor Pressure of Water
  - Anesthesia: Vapor Pressure of Halothane
  - Anesthesia: Vapor Pressure of Diethyl Ether
  - Anesthesia: Vapor Pressure of Methoxyflurane
  - Anesthesia: Vapor Pressure of Enflurane
  - Anesthesia: Vapor Pressure of Fluroxene
  - Anesthesia: Vapor Pressure of Cyclopropane
  - Anesthesia: Vapor Pressure of Trichlorethylene
  - Anesthesia: Vapor Pressure of Ethyl Chloride
- **Cardiac (00097-14018)**
  - Virtual PO_2 & O_2 Saturation & Content
  - Body Surface Area for Cardio Pulmonary Programs
  - Dye Curve Cardiac Output
  - Fick Cardiac Output
  - Valve Area
  - Anatomic Shunts
  - Contractility
  - Stroke Work
  - Ejection-Fraction Ejected-Volume, Cardiac Output
  - Calculation of Left Ventricular Functions from Angiographs
  - Impedance Cardiac Output, Systemic & Pulmonary Resistance
  - Basic EKG Determinations
- **Pulmonary (00097-14037)**
  - Pulmonary Medicine/Male Spirometry Standards
  - Pulmonary Medicine/Female Spirometry Standards
  - Lung Diffusion
  - Water Vapor Pressure & Respiratory Gas Conversions
  - Ventilator Setup & Corrections (Radford)
  - Arterial CO_2 Normalization
  - Blood Acid-Base Status
  - Virtual PO_2 & O_2 Saturation & Content
  - Anaerobic PCO_2 & pH Change
  - Anaerobic PO_2 Change
  - Dead Space Fraction
  - Alveolar-Arterial Oxygen Tension Difference
  - Physiologic Shunt & Fick
  - Body Surface Area for Cardio Pulmonary Programs

Physical/Life Sciences

- **Chemistry (00097-14006)**
  - pH of Weak Acid/Base Solutions
  - Acid-Base Equilibrium (Diprotic)
  - Weak Acid/Base Titration Curve
  - Equations of State
  - Van Der Waals Gas Law
  - Beer's Law & Absorbtivity Calculations
  - Activity Coefficients from Potentiometric Data
  - Crystallographic to Cartesian Coordinate Transformations
  - Kinetics using Lineweaver-Burk or Hofstee Plots
  - Mixture Viscosities
  - Vapor Pressure, Bubble & Dew Point Calculation
  - Single-Stage Equilibrium Calculation
- **Optics (00097-14016)**
  - Optical Design I
  - Optical Design II
  - Lens Calculations-Sag, Angle, Min/Max
  - Ray Tracer—Spherical, Paraboloidal & Flat Surfaces
  - General Lens Tracer
  - Ray Tracer
  - First Order Ray Tracing by Matrix Methods
  - Fraunhofer Diffraction of Light by Spherical Particles
  - Kubelka-Munk Diffuse Layer Reflectance & Transmittance
  - Ray Trace Parabola
  - Paraxial Ray Tracing Part 1: Tracing
  - Paraxial Ray Tracing Part 2: Storing
- **Physics (00097-14015)**
  - Black Body Thermal Radiation
  - Black Hole Characteristics
  - Special Relativity Conversions
  - Three-Dimensional Special Relativity
  - Einstein's Twin Paradox
  - Delta-V—Orbit Simulator
  - Equations of Particle Motion
  - Ballistics Trajectory Computations
  - Isotope Overlap Corrections
  - Critical Reactor Code
  - Semi-Empirical Nuclear Mass Formula
  - Clebsch-Gordon Coefficients & 3j Symbols Evaluation
  - 32-P Remaining on MM.DDYYYY Given MCi on Earlier MM.DDYYYY
- **Earth Sciences (00097-14017)**
  - Earthquake Magnitude—Energy Conversion
  - P & S Seismic Wave Velocity Determination
  - Electromagnetic Seismograph Frequency Response
  - Earthquake Seismic Wave Radiation Pattern: Shear Fault
  - Plate—Tectonic Velocities
  - Plunge & Rake of Faults
  - Depth of Strata
  - Strata Thickness
  - True & Apparent Dips
  - Bouguer Anomaly Gravity Reduction
  - Geocentric Distance—Azimuth—Back Azimuth
  - Heat Flow
  - Physical Properties of Seawater
  - Sigma-T & AOU
  - Atmosphere Thermodynamics
- **Energy Conservation (00097-14029)**
  - Air Cooling System Design
  - Black Body Thermal Radiation
  - Economic Insulation Thickness
  - Heat Transfer through Composite Cylinders & Walls
  - Steady State Conduction Heat Transfer, Heat Load & Logarithmic Mean Temperature Difference
  - Sun Altitude, Azimuth, Solar Pond Absorption
  - Total Daily Amount of Solar Radiation
  - Transient Temperature Distribution in a Semi-Infinite Solid
  - Temperature or Concentration Profile for a Semi-Infinite Solid with Convection Boundary Condition
  - Conservation of Energy
- **Space Science (00097-14028)**
  - Precession of Right Ascension & Declination
  - Local Sidereal Time & Obliquity from Local Standard Time
  - Space Science & Technology No. 1 Horizon Distance, Great Circle Distance
  - Space Science & Technology No. 2 Vis Viva & Path Angle Relations
  - Space Science & Technology No. 4 Ballistic Missile Range
  - Celestial Position
  - Binary Star Ephemeris
  - Precession/Galactic Coordinates
  - Space Science & Technology, No. 5 Kepler's Equation
  - Orbit Determination by the Method of Gauss
- **Forestry (00097-14034)**
  - Log Volume in Cubic Feet, Cubic Meters, or Board Feet
  - Lumber Scale-Board Feet Recoverable from a Log
  - Logging Calculations—Doyle's Method
  - True Productivity of a Natural Coniferous Forest
  - Mean Annual Increment of Various Forests
  - Standing & Running Skyline Loadcarrying Capability
  - Cruiser's Stick for Forest Mensuration
  - Latitude & Longitude from Geological Survey Map
  - Mean Annual Increment of Douglas Fir & Certain Pine Forests
  - Traverse, Inverse, & Sideshots
- **Biology (00097-14040)**
  - Demography I: Estimates of Parameters/Rates of Increase
  - Demography II: Expectation of Life & Reproductive Value
  - Diversity & Equitability Indices
  - Niche Breadth & Overlap/Shannon's H & Horn's R0
  - Population Size Estimate (Jolly's Estimate)
  - Cell Phase & Cycle Times
  - Crossover: Location/Products
  - Chromosome Cleavage
  - Recessive Gene Frequency after Selection, Mutation, Inbreeding
  - Selection & Gene Frequency
  - Genetic Inference from Truncate Data
  - Positive Assortative Mating for a Recessive Phenotype

Other

- **Games (00097-14013)**
  - Risk
  - Blackjack with a Permanent Bank
  - Bell-Fruit (Mills Standard)
  - Turn the Die
  - Word Encoder
  - Word Game Subroutine
  - Hangman Word Game
  - Pro Football Simulation
  - Electronic Contract Bridge Score Pad
  - Duplicate Bridge Score with Running Totals
  - Battleship
- **Games of Chance (00097-14038)**
  - Craps
  - Twenty-Six & Thirty-Six
  - Chuck-A-Luck Dice Game
  - Parapar
  - Pig
  - Big Six
  - Roulette
  - Dog Races
  - Horse Race
  - Blackjack Betting
- **Aircraft Operation (00097-14001)**
  - Aircraft Flight Plan with Wind
  - Flight Management
  - Predicting Freezing Levels
  - General Aircraft Weight & Balance
  - Pilot Unit Conversions
  - Turn Performance
  - Rate of Climb & Descent
  - Head Winds & Cross Winds
  - Flight Planning & Flight Verification
  - Determining In-Flight Winds
  - Standard Atmosphere
  - Mach Number & True Airspeed
  - True Air Temperature & Density Altitude
  - Lowest Usable Flight Level
- **Avigation (00097-14002)**
  - Great Circle Plotting
  - Rhumb Line Navigation
  - Great Circle Navigation
  - Position given Heading, Speed & Time
  - Line of Sight Distance
  - Position and/or Navigation by Two VOR's
  - Position by One VOR
  - DME Speed Correction
  - Average Wind Vector
  - Course Correction
  - Time of Sunrise & Sunset
  - Azimuth of Sunrise & Sunset
- **Calendars (00097-14024)**
  - Calendar Date/Julian Date Conversion
  - Days to Dates & Dates to Days; Day of Week
  - Day of Year—Day of Week
  - Number of Weekdays between Two Dates
  - In What Year is a given Date an M-Day?
  - Number of M-Days between Two Dates & Nth M-Day of the Month
  - Holidays
  - Easter-Ash Wednesday-Religious Holidays
  - Complete Maya Calendar
  - Mohammedan (Islam)—Gregorian Calendar Conversion
  - Chinese Years to/from Gregorian Years
  - Biorhythm—Biological Cycles
  - New Moon & Full Moon Day of Month
- **Photo Dark Room (00097-14022)**
  - Macro-Photograhy & Enlarging
  - Time, F-Stop, Magnification, Paper Speed, Enlarging Factors
  - Color Printing Factors
  - Color Printing Factors; New Paper
  - Subtractive Color-Printing Filters; Density Correction
  - Tri-Color Print Exposure (Photo)
  - Color Print Processing in Drum
  - Cibachrome Reciprocity Correction
  - Print Viewing Distance
  - Photo/Image Display Parameters
  - Image Projection Data
- **COGO/Surveying (00097-14020)**
  - Basic Traverse, Inverse and Sideshots
  - Bearing-Bearing Intersection and Traverse
  - Bearing-Distance Intersection and Traverse
  - Distance-Distance Intersection and Traverse
  - Traverse of Curve
  - Curve Inverse and Traverse
  - Compass Rule Adjustment
  - Rotation of Axes
  - To Inscribe Curve
  - Slope Shot Traverse
  - Crandall's Rule Adjustment
  - Transit Rule Adjustment

HP-67/97 Programs

10 Application Pacs

With HP-67/97 Application Pacs, the solutions you require may already exist. Application Pacs contain 15 to 26 preprinted, prerecorded program cards, a program card holder and a manual of complete documentation. You save significant time because no researching, programming debugging or documenting is needed.

EE Pac

(00097-13131)

- Network Transfer Functions
- Reactive L-Network Impedance Matching
- Class A Transistor Amplifier Bias Optimization
- Transistor Amplifier Performance
- Transistor Configuration Conversion
- Parameter Conversion: S ⇌ Y, Z, G, H
- Fourier Series
- Active Filter Design
- Butterworth or Chebyshev Filter Design
- Bode Plot of Butterworth and Chebyshev Filters
- Resistive Attenuator Design
- Smith Chart Conversions
- Transmission Line Impedance
- Microstrip Transmission Line Calculations
- Transmission Line Calculations
- Unilateral Design: Figure of Merit, Maximum Unilateral Gain Circles
- Bilateral Design: Stability Factor, Maximum Gain, Optimum Matching
- Bilateral Design: Gain and Stability Circles, Load and Source Mapping

Business Decisions Pac

(00097-13144)

- Internal Rate of Return
- Internal Rate of Return—Groups of Cash Flows
- Discounted Cash Flow Analysis—Net Present Value
- Direct Reduction Loans—Sinking Fund
- Accumulated Interest/Remaining Balance
- Wrap-Around Mortgage
- Constant Payment to Principal Loan
- Add-on Rate Installment Loan/Rule of 78's
- Savings Plan-Leases
- Advance Payments
- Savings—Compounding Periods Different from Payment Periods
- Simple Interest/Interest Conversions
- Depreciation Schedules
- Days Between Dates
- Bond Price and Yield
- Interest at Maturity/Discounted Securities
- Linear Regression—Exponential Curve Fit
- Multiple Linear Regression
- Break-Even Analysis
- Invoicing
- Payroll
- Inventory

Clinical Lab and Nuclear Medicine Pac

(00097-13165)

Clinical Chemistry

- Beer's Law
- Protein Electrophoresis
- LDH Isoenzymes
- Body Surface Area
- Urea Clearance
- Creatinine Clearance
- Amniotic Fluid Assay
- Blood Acid-Base Status
- Oxygen Saturation and Content
- Red Cell Indices

Nuclear Medicine

- Total Blood Volume
- Schilling Test
- Thyroid Uptake
- Radioactive Decay Corrections

Radioimmunoassay

- Radioimmunoassay

Statistics

- Basic Statistics
- Chi-Square Evaluation and Distribution
- t Statistics
- t Distribution

CE Pac

(00097-13195)

- Vector Statics
- Section Properties (2 Cards)
- Properties of Special Sections
- Stress on an Element
- Bending or Torsional Stress
- Linear or Angular Deformation
- Cantilever Beams
- Cantilever Beams—Trapezoidal Load
- Simply Supported Beams
- Simply Supported Beams — Trapezoidal Loads
- Beams Fixed at Both Ends
- Beams Fixed at Both Ends—Trapezoidal Loads
- Propped Cantilever Beams
- Propped Cantilever Beams—Trapezoidal Load
- Six-span Continuous Beams
- Steel Column Formula
- Reinforced Concrete Beams
- Bolt Torque

Navigation Pac

(00097-13205)

- Estimated Time of Arrival
- Great Circle and Rhumb Line Navigation
- Dead Reckoning
- Velocity Triangle and Course to Steer
- Star Sight Planner (2 cards)
- Almanac Interpolater
- Sun Line of Position
- Star Line of Position (7 cards)
- Bearing Line of Position
- Two-Angle Line of Position
- Fix from Two Lines of Position
- Radar Plotting Closest Point of Approach
- Beating to Windward
- Distance by Horizon Angle

Surveying Pac

(00097-13175)

- Traverse, Inverse and Sideshots
- Traverse Adjustment
- Intersections
- Curve Solutions
- Horizontal Curve Layout
- Spiral Curve Layout
- Vertical Curves and Grades
- Resection
- Two Instrument Radial Survey
- EDM Slope Reduction
- Stadia Reduction/3-Wire Leveling
- Taping Reduction/Field Angle Check
- Azimuth of the Sun
- Predetermined Area
- Earthwork
- Coordinate Transformation
- State Plane Coordinates—Lambert
- State Plane Coordinates—Transverse Mercator
- State Plane Coordinates—Alaska Zones 2-9

Stat Pac

(00097-13111)

General Statistics

- Basic Statistics for Two Variables
- Factorial, Permutation, and Combination
- Moments, Skewness, and Kurtosis (For Grouped or Ungrouped Data)
- Random Number Generator
- Histogram

Analysis of Variance

- Analysis of Variance (One Way)
- Analysis of Variance (Two Way)
- Analysis of Covariance (One Way)

Distribution Functions

- Normal and Inverse Normal Distribution
- Chi-Square Distribution
- t Distribution
- F Distribution

Curve Fitting

- Multiple Linear Regression
- Polynomial Approximation

Test Statistics

- t Statistics
- Chi-Square Evaluation
- Contingency Table
- Spearman's Rank Correlation Coefficient

Quality Control

- $\bar{x}$ and R Control Chart
- Operating Characteristic Curves

Queueing Theory

- Single- and Multi-Server Queues

Math Pac

(00097-13121)

- Factors and Primes
- GDC, LCM, Decimal to Fraction
- Base Conversions
- Optimal Scale for a Graph; Plotting
- Complex Operations
- Polynomial Solutions
- 4 x 4 Matrix Operations(2 cards)
- Solution to f(x) = 0 on an Interval
- Numerical Integration
- Gaussian Quadrature
- Differential Equations
- Interpolations
- Coordinate Transformations
- Intersections
- Circles
- Spherical Triangles
- Gamma Function
- Bessel Functions, Error Function
- Hyperbolics

ME Pac

(00097-13155)

- Vector Statics
- Section Properties (2 cards)
- Stress on an Element
- Soderberg's Equation for Fatigue
- Cantilever Beams
- Simply Supported Beams
- Beams Fixed at Both Ends
- Propped Cantilever Beams
- Helical Spring Design
- Four Bar Function Generator (2 cards)
- Progression of Four Bar System
- Progression of Slider Crank
- Circular Cams
- Linear Cams
- Gear Forces
- Standard External Involute Spur Gears
- Belt Length
- Free Vibrations
- Vibration Forced by $F_0 COS\omega t$
- Equations of State
- Isentropic Flow for Ideal Gases
- Conduit Flow
- Heat Exchangers (2 cards)

Games Pac

(00097-13185)

- Game of 21
- Dice
- Slot machine
- Submarine Hunt
- Artillery
- Space War
- Super Bagels
- Nim_k
- Queen Board
- Hexapawn
- Tic-Tac-Toe
- Wari
- Racetrack
- Teaser
- Golf
- The Dealer
- Bowling Scorekeeper
- Biorhythms
- Timer

HP-31E

Scientific Calculator.

Gives you an excellent blend of mathematical and scientific functions at a very low price.

The HP-31 has been designed in the tradition of the famed HP-35 and the popular HP-21 calculators—a basic no-nonsense machine to slice through the toughest scientific and mathematical problems with ease. And the HP-31 Scientific Calculator has great new features, together with an unparalleled combination of keyboard and display functions.

A New Generation of Calculators.

The HP-31 is a Hewlett-Packard Series E calculator designed to give you more calculating power, more ease-of-use features, at a lower price than any comparable calculator we've ...er offered. It features:

- New easy-to-read display, automatically separates thousands just as you would yourself.
- New exclusive self-check capability, error codes and improved accuracy.
- Time proven RPN.
- Traditional Hewlett-Packard attention to detail.

Mathematical Functions.

The HP-31 has the functions you need for science or engineering. Exponentials, reciprocals, square roots, pi, and percent, all available at the press of a key. And of course, the HP-31 adds, subtracts, multiplies and divides—all with 10-digit accuracy.

Trigonometric Capability.

The HP-31 quickly and accurately computes sine, cosine, or tangent—all with a choice of decimal degrees, radians, or grads mode. And you can convert directly between degrees and radians, too.

...tangular/Polar Conversions.

The HP-31 converts directly between rectangular coordinates (x,y) and polar coordinates (magnitude *r*, angle Θ).

Logarithms.

Common and natural logarithms, as well as antilogarithms, are generated at the touch of a key by the HP-31.

Metric Conversions.

The HP-31 gives you instant, two-keystroke conversions between inches and millimeters, Fahrenheit and Centigrade, and pounds and kilograms.

Four Addressable Registers and LAST X.

Besides the four-register automatic memory stack, the HP-31 contains four *addressable* storage registers for selectively storing and recalling constants, results, or other data.

And the HP-31's LAST X register automatically stores the last value present before any calculation.

Two Display Modes.

A choice of two display modes—fixed or scientific—lets you view any number as either a full, 10-digit (or less) mantissa or as a mantissa of up to seven digits followed by a two-digit exponent of 10. No matter what display you've selected, the HP-31 internally maintains full 10-digit accuracy—and you can see the full 10-digit mantissa at any time by simply pressing the MANT key.

Selective Clearing Options.

You can clear the entire calculator, clear only the storage registers, or clear only the automatic memory stack.

Physical Specifications.

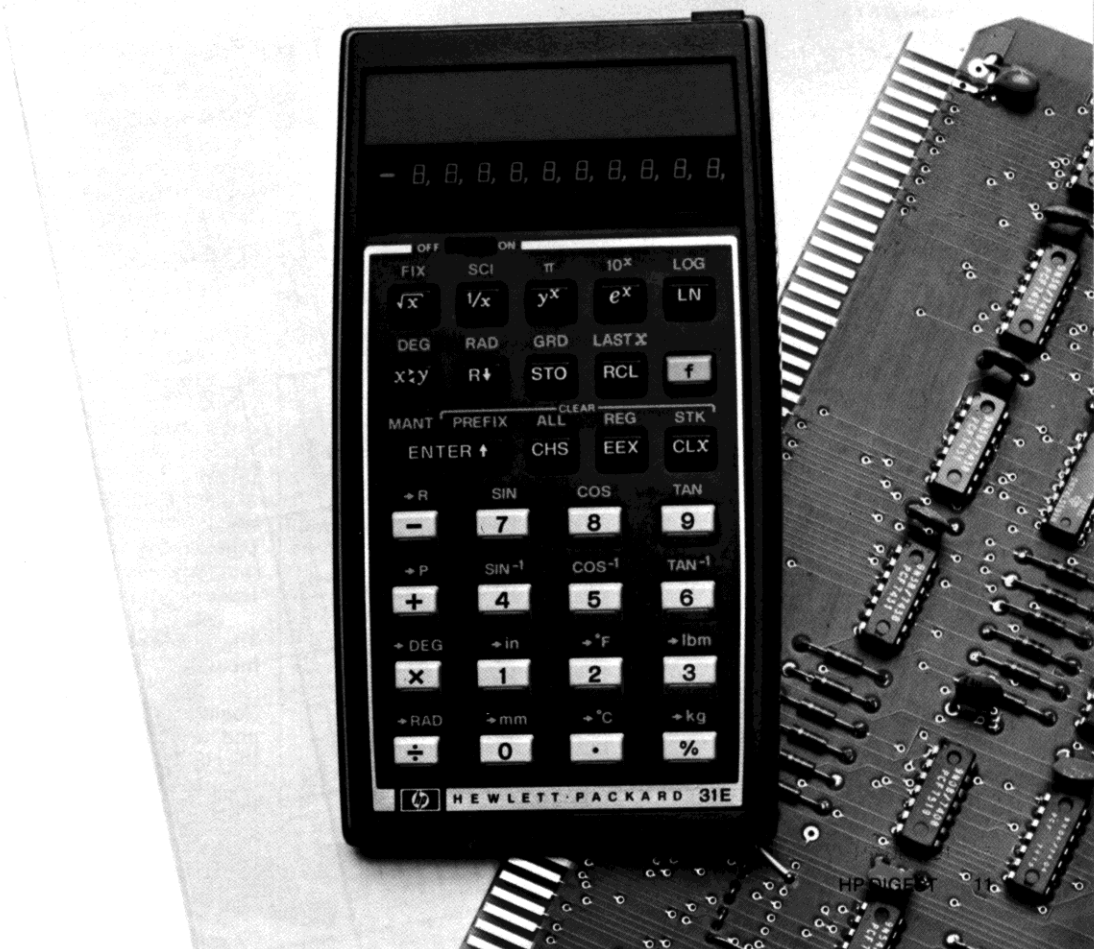
■ Length:	140 mm (5.6″)
■ Width:	75 mm (3.0″)
■ Height:	30 mm (1.2″)
■ Weight:	220 g (7.7 oz)

For a complete list of features and functions, see the Comparison Chart on pp. 22-23.

The HP-31E Scientific Calculator comes complete with:

- *HP-31E Owner's Handbook*
- *Solving Problems With Your Hewlett-Packard Calculator*
- Recharger/AC adapter
- Rechargeable battery pack
- Soft carrying case

You can order direct from this catalog. See page 4.



HP-32E

Advanced Scientific Calculator with Statistics.

Gives you a powerful set of mathematical and statistical functions plus 15 addressable storage registers.

Hewlett-Packard's HP-32 is the most powerful scientific preprogrammed calculator we've ever built. Like the classic HP-45, the HP-32 is packed with dozens of invaluable mathematical and scientific functions. But that's not all! The HP-32 has more addressable storage registers and increased statistical capability which creates an advanced scientific calculator that puts unparalleled power at your fingertips.

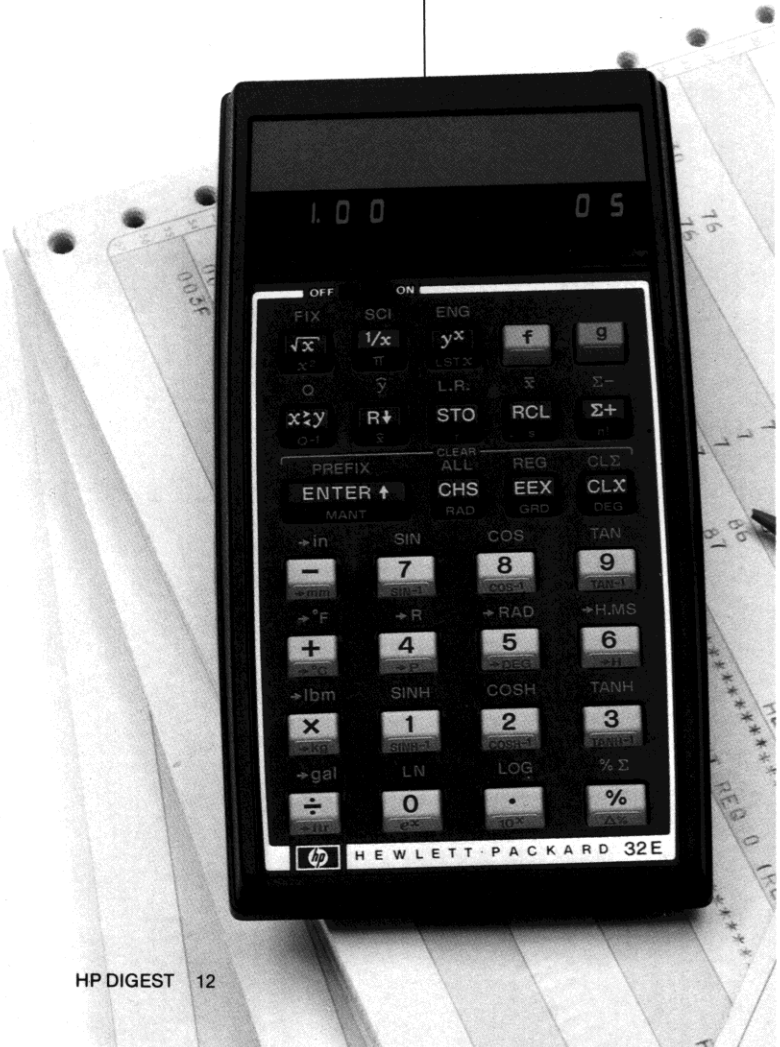
A New Generation of Calculators.

The HP-32 is a Hewlett-Packard Series E calculator designed to give you more calculating power, more ease-of-use features, at a lower price than any comparable calculator we've ever offered. It features:

- New easy-to-read display automatically separates thousands just as you would yourself.
- New exclusive self-check capability, error codes and improved accuracy.
- Time-proven RPN.
- Traditional Hewlett-Packard attention to detail.

Superior Statistics.

For the manager, the statistician, or anyone who must reduce and interpret data, the HP-32 gives you features never before offered on a Hewlett-Packard pocket calculator.



Normal Distribution.

The HP-32 is equipped with the normal and inverse normal distribution functions—it can compute the area under a standard normal distribution curve to the left of x, and it can also compute x given the area under the curve.

Two-Variable Means and Standard Deviations.

At the press of a key you can calculate the means of two variables. And the HP-32 can also give you the sample standard deviations of those two sets of data.

Linear Regression and Linear Estimate.

The HP-32 calculator easily computes linear regression, calculating the slope and y-intercept of a least-squares line for data. And you can also calculate the correlation coefficient to measure for "goodness of fit." In addition, the HP-32 linear estimate function can actually predict new values along the line.

Data Accumulation and Correction.

$\Sigma+$ automatically accumulates Σx, Σy, Σxy, Σx^2, and Σy^2 in designated storage registers. Correcting a data pair is easy, too, with $\Sigma-$.

15 Addressable Storage Registers.

To help you store and recall data, results, constants, or statistical information, the HP-32 is equipped with 15 addressable storage registers. And you can perform arithmetic on the contents of any of them.

The HP-32 also has a LAST X register which automatically preserved the contents of the display present before the last operation.

Trigonometric Functions Including Hyperbolics.

Besides providing sine, cosine, and tangent and their inverses, the HP-32 also computes hyperbolic trigonometric functions (sinh, cosh, tanh, and their inverses).

Rectangular/Polar Conversions and Vector Arithmetic.

The HP-32 quickly converts rectangular coordinates (x,y) to polar coordinates (r,Θ), or vice versa. And vector arithmetic is easy using the rectangular/polar functions with the accumulation functions $\Sigma+$ and $\Sigma-$.

Three Display Modes.

The large numbers in the bright red LED display can be seen in fixed, scientific, or engineering mode (in engineering mode the exponent of 10 is always a multiple of three). You can always see the full 10-digit mantissa, regardless of display mode, by pressing the MANT key.

Physical Specifications.

■ Length:	140 mm (5.6″)
■ Width:	75 mm (3.0″)
■ Height:	30 mm (1.2″)
■ Weight:	220 g (7.7 oz)

For a complete list of features and functions, see the Comparison Chart on pp. 22-23.

The HP-32E Advanced Scientific Calculator with Statistics comes complete with:

- *HP-32E Owner's Handbook*
- *Solving Problems with Your Hewlett-Packard Calculator.*
- Recharger/AC adapter.
- Rechargeable battery pack.
- Soft carrying case.

Order your new HP calculator today. See page 4.

HP-33E

Programmable Scientific Calculator.

Extraordinary problem-solving power plus versatile keystroke programmability to solve repetitive problems quickly and easily.

Like its famous predecessor the popular HP-25, the HP-33 remembers a series of keystrokes as you press them, then executes the sequence later at your command. And this ability extends the usefulness of its powerful combination of scientific functions and features.

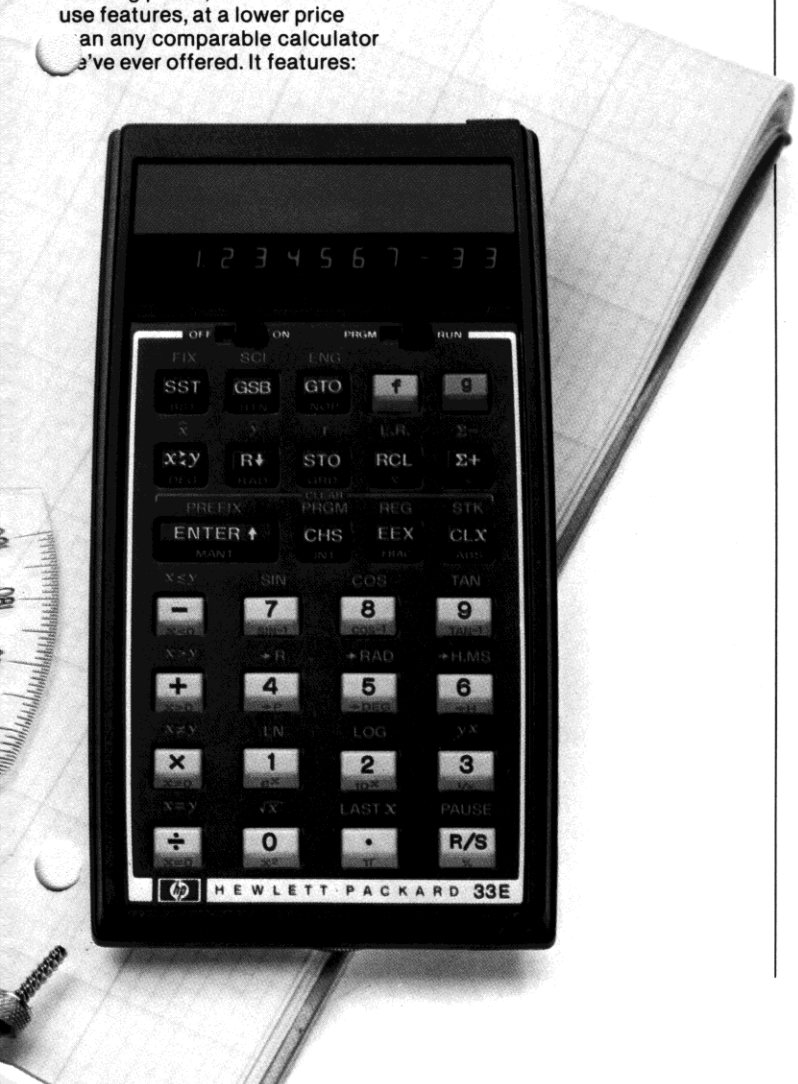
A New Generation of Calculators.

The HP-33E is a Hewlett-Packard Series E calculator designed to give you more calculating power, more ease-of-use features, at a lower price than any comparable calculator we've ever offered. It features:

- New easy-to-read display, automatically separates thousands just as you would yourself.
- New exclusive self-check capability, error codes, and improved accuracy.
- Time-proven RPN.
- Traditional Hewlett-Packard attention to detail.

Programming is Easy.

Programming the HP-33 is simple—just switch to PRGM and press a problem-solving series of keystrokes to be remembered by the calculator. Then switch to RUN, key in any known data, and hit the R/S (run/stop) key. The HP-33 does the rest, executing those keystrokes in a few seconds, over and over as many times as you like. There's no complicated programming language to learn, no elaborate "start-up" procedures to memorize.



49 Lines of Program Memory.

The HP-33 remembers your program in a special memory—49 lines of it. And no matter whether a keyboard operation is one, two or three keystrokes, it occupies only a single line of memory, so you can easily load programs of 100 keystrokes or more.

More Programming Features.

Besides 49 lines of fully-merged program memory, the HP-33 has a variety of specialized functions to make your programming useful, powerful, and even fun.

Go To.

The GTO (go to) command transfers an executing program to a specified line of memory—permitting you to create branches and loops in your programs.

And for editing, you can also use GTO from the keyboard to go to any line number.

Powerful Decision-Making Capability.

Fundamental to the operation of even the largest computer is its ability to make a decision. The HP-33 has eight conditionals which actually compare two values and make a decision based on the outcome of the comparison.

Three Levels of Subroutines.

Using the GSB (go to subroutine) instruction, you can save memory and make your programs much more efficient. After a section of memory has been called up as a subroutine, a RTN (return) instruction then returns execution to the next line after the GSB call.

Fast, Easy Editing.

Besides being able to go to any line number with GTO, you can also use SST and BST to single-step or back-step through a program, *without* execution, to any point you want in program memory. Changing a program is easy, too—you just key in a new instruction and it automatically replaces the old one.

Pause.

The PAUSE function in a program actually lets you see a result or an intermediate answer for a second before resuming execution.

Eight Addressable Storage Registers.

In addition to the 49-line program memory, the four-register stack and the LAST X register the HP-33 has 8 addressable storage registers for data. And you can perform storage register arithmetic on these addressable registers, too.

Optional Applications Books

The solutions you require may already exist in the four applications books available for the HP-33. Subjects covered include mathematics, statistics, surveying, and student engineering. For a complete listing, refer to Accessories on pages 26-27.

Physical Specifications.

■ Length:	140 mm (5.6″)
■ Width:	75 mm (3.0″)
■ Height:	30 mm (1.2″)
■ Weight:	220 g (7.7 oz)

For a complete list of features and functions, see the Comparison Chart on pp. 22-23.

The HP-33E Programmable Scientific Calculator comes complete with:

- *HP-33E Owner's Handbook.*
- *Solving Problems With Your Hewlett-Packard Calculator.*
- *HP-33E Quick Reference Card.*
- Recharger/AC adapter.
- Soft carrying case.

Take advantage of our 15-day trial offer. See page 4.

HP-19C

Advanced Printing Programmable Calculator with Continuous Memory.

On or off, your programs are always there.

The HP-19C and HP-29C both have Continuous Memory capability so the programs you store are saved, ready for use, until you clear or overwrite them.

As a result you can program frequently-needed calculations once, and then perform them as often as necessary—hour after hour, day after day—without bother or lost time caused by reentering your program.

The Continuous Memory of the HP-19C and HP-29C not only retains a program, it also retains the data stored in 16 of its 30 addressable registers and the display register.

Now you can record data in the field and wait to make your final calculations until convenient. The calculators become handy notebooks to save data from previous programs for later use or keep the sum of statistical data entries while taking samples on location.

Operate them on batteries or AC.

Both calculators may be operated on batteries alone or from a convenient electrical outlet while batteries are being recharged.

Battery operating time is significantly extended since the calculators may be switched off between calculations without losing programs or data.

HP-19C's quiet thermal printer lists your programs or data.

With the HP-19C, you can list a program, the contents of the 30 addressable registers, or the contents of the automatic memory stack. And you have a complete record of all your calculations.

The printer is a valuable aid in editing programs or long calculations. You don't have to remember what you've done or what remains to be done. You see everything at once, clearly, on tape.

Create programs of 175 keystrokes—or more.

You can create your own time-saving programs to solve lengthy and repetitive problems because both the HP-19C and HP-29C let you merge keystrokes. Each function—one, two, three or four keystrokes—requires only one line of program memory. And you have 98 lines of program memory to work with.

The HP-19C and HP-29C are keystroke programmable. This means that when you press a key in PRGM mode, it is stored in program memory. There is no complicated programming language, no procedure to memorize.

Branching.

GTO **Go To.**

When followed by a label designator (0 through 9 or i) GTO branches program execution to the specified label.

Three levels of subroutines.

GSB **Go Subroutine.**

A GSB instruction followed by a label designator (0 through 9 or i) branches program execution to the label specified just as a GTO instruction does. But, using the GSB instruction, program execution is then "returned" automatically to the step following the GSB instruction when the next RTN (Return) instruction is executed.

Conditional Branching.

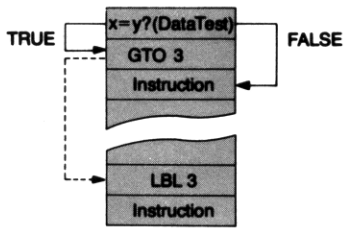
x≠y, x=y, x≤y, x>y

x≠0, x=0, x<0, x>0

These keys allow your programs to make decisions for you by testing the values in the X- and Y-registers or by testing the value in the X- register against zero as indicated. If the data test is true, the calculator will "do" the next instruction in program memory. (Remember "Do if True") If the data test is false, program execution branches around the next instruction.

Advanced Programmable Calculator with Continuous Memory.

HP-29C



The next line is executed if x = y. Program execution branches around one line if x does not equal y.

Indirect Addressing.

GTO i GSB i

These operations depend on the number in register 0. If it is positive they perform a branch (GTO i) or a subroutine (GSB i) to the label specified.

Relative Addressing.

GTO i GSB i

When the number in register 0 is a negative number, these instructions perform a rapid reverse branch (GTO i) or subroutine (BSB i) the number of lines specified by the current negative number in register 0.

Indirect control of Data Register Operations.

You can also use register 0 to specify the address of a storage register for storing and recalling data or for storage register arithmetic.

Decrement or Increment and Skip on Zero.

DSZ ISZ

DSZ subtracts one from the contents of register 0, then tests for a non-zero value. As long as there is a non-zero value in register 0, the calculator performs the next instruction in program memory. When the content of register 0 equals zero, the calculator skips the next instruction.

ISZ works the same way, only register 0 is incremented rather than decremented.

PAUSE

The PAUSE function interrupts program execution and displays current results for about 1 second.

Moving to the Right Step.

GTO **Go To.**

In order to correct or change a line in your program, you need to be able to display it quickly and easily. Pressing GTO (line number) lets you do just that, in either RUN or PGRM mode.

SST **Single Step.**

To help find mistakes in your program, you can execute it one line at a time using the SST key in RUN mode. Or, in PRGM mode, you can use SST to step through each instruction and compare the keycodes with your program listing.

BST **Back Step.**

In the RUN mode, press BST to display the contents of the previous line of program memory. In PRGM mode, use BST to back up one line at a time in your program.

Insert and Delete.

You can easily insert operations as needed in your program. All subsequent instructions will be "bumped" down one line in program memory for each inserted operation.

DEL **Delete.**

When you press g DEL, the displayed instruction is erased from program memory and all subsequent instructions move upward one line.

A complete range of preprogrammed functions and features.

The HP-19C and HP-29C feature 30 addressable registers for data storage—16 with Continuous Memory.

Their preprogrammed functions include log and trig functions; rectangular/polar conversions; mean, standard deviation and statistical summations; and angle (time) conversions.

Both calculators also display in fixed decimal, scientific and engineering notations.

Ten new Solutions Books for HP-19C/29C.

The solution you require may already exist in one of the ten new Solutions Books Hewlett-Packard has written for the HP-19C/29C.

Each book contains 10 to 15 programs and covers a variety of disciplines including business, engineering, mathematics, medicine, statistics, physical science, life science and other subjects. For a complete listing, refer to page 27 under Accessories.

These programs save you valuable time because no researching, programming, debugging or documenting is needed.

The HP-19C and HP-29C come complete with:

- Illustrated Owner's Handbook and Programming Guide
- Quick Reference Card
- Applications Book
- Battery Pack
- Recharger/AC adapter
- Soft carrying case
- 2 rolls of thermal paper (HP-19C only)

HP-19C Specifications:

- Calculator length: 165 mm (6.5″).
- Calculator width: 88 mm (3.45″).
- Calculator height: 40 mm (1.6″).
- Calculator weight, with battery pack and paper: 350 g (12.4 oz).
- Shipping weight: 1.4 kg (3.0 lbs).
- Operating temperature range: 0° to 45°C (32° to 113°F). With paper, 5% to 95% relative humidity.
- Charging temperature range: 15° to 40°C (59° to 104°F).
- AC Power requirements: 90-120V 50 to 60 Hz.
- Battery: 5 Vdc, quick-charge nickel-cadmium battery pack.
- Battery operating time: 4 to 7 hours.
- Paper roll length: 7.6 m (25 ft.)

HP-29C Physical Specifications:

- Calculator length: 130 mm (5.1″)
- Calculator width: 68 mm (2.7″)
- Calculator height: 30 mm (1.2″)
- Calculator weight: 170 g (6 oz.)
- Recharger weight: 141 g (5 oz.)
- Shipping weight: 680 g (1.5 lb)
- Operating temperature range: 0°C to 45°C (32°F to 113°F)
- Charging temperature range: 15°C to 40°C (59°F to 104°F)
- Storage temperature range: – 40°C to 55°C (– 40°F to 131°F)
- Power requirements: AC: 115V ± 10%, 50 to 60 Hz
- Battery: 2.5 Vdc quick-charge nickel-cadmium battery pack.
- Battery operating time: up to 3 hours in normal use.

For a complete list of features and functions, see the Comparison Chart on pages 22-23.

Take advantage of our 15-day trial offer. See page 4.

HP-37E

Business Management Calculator.

Provides an ideal combination of the financial, investment, and statistical capabilities you need in modern business.

In the tradition of the popular HP-22, Hewlett-Packard's HP-37 is the basic calculator you need for answers to most business and financial problems such as pricing, compound interest, and trend lines. With expanded financial capabilities, valuable percent and statistical functions, and a new straightforward way of solving financial problems, the HP-37 is the ideal calculator for real estate brokers, managers, bankers, accountants, students, or people in business and management.

A New Generation of Calculators.

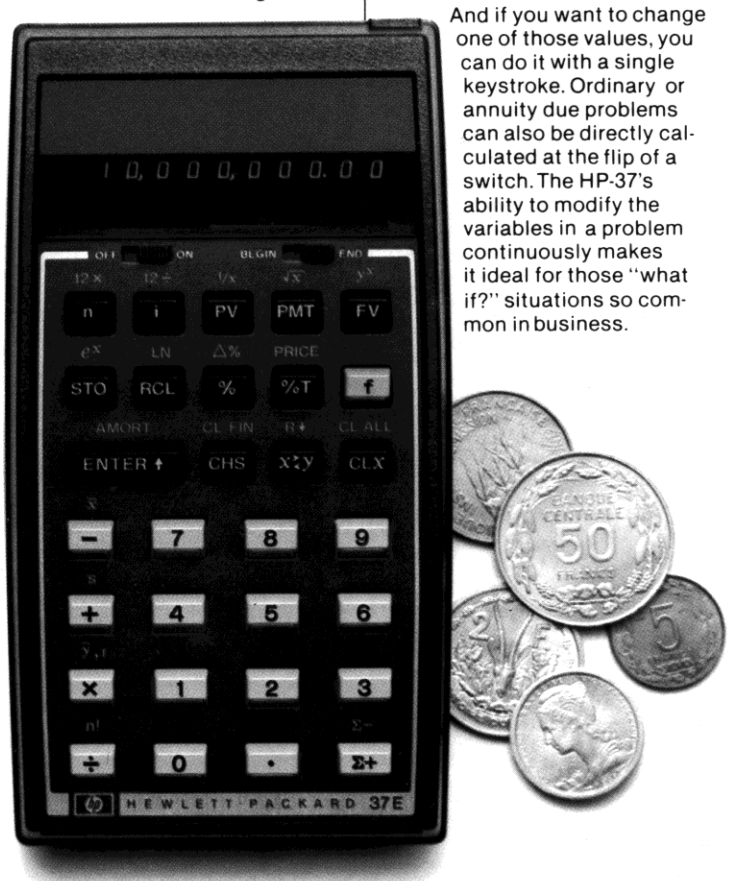
The HP-37 is a Hewlett-Packard Series E calculator designed to give you more functions and more ease-of-use features, at a lower price than any comparable calculator we've ever offered. It features:

- New simple and intuitive financial problem solving system.
- New easy-to-read display automatically separates thousands just as you would yourself.
- New exclusive built-in calculator test capability—and display codes to guide you in correcting your errors.
- Traditional Hewlett-Packard attention to detail.

Simple, Complete Financial Functions.

In time and money problems, all you need do is key in any three or four of the values for n (number of compounding periods), i (interest rate), PV (present value), FV (future value), and PMT (payment)—in any order—followed by the appropriate financial key. Then press the key to solve for the unknown value.

And if you want to change one of those values, you can do it with a single keystroke. Ordinary or annuity due problems can also be directly calculated at the flip of a switch. The HP-37's ability to modify the variables in a problem continuously makes it ideal for those "what if?" situations so common in business.



Easy-to-Use Cash flow Sign Convention.

With the HP-37 you can state any financial problem in a simple, intuitive manner, so you don't have to remember handbook instructions. Problems are entered in terms of cash flows. Cash outflows are negative and cash inflows are positive, both when you enter data and when you display results. With this system you can easily solve complex problems such as the yield of a loan with a balloon, the payment on a lease with a buy back option.

Amortization Schedules.

The HP-37 calculates an amortization schedule (the accumulated interest, amount paid toward principal, and the remaining balance) for any number of time periods.

Retail-Style Percent Functions.

Whether you're solving for percent, percent change or percent of total, you'll appreciate the logical, consistent operation of the HP-37.

And the unique new PRICE function calculates the selling price if you know the cost and margin.

Seven User's Storage Registers.

Besides the five financial registers and the Hewlett-Packard four-register automatic memory stack, the HP-37 is equipped with seven other memories, in which you can store or recall constants, answers, or any number you want to save during your calculations.

Statistics at Your Fingertips.

For research and analysis, the HP-37 is packed with useful statistical functions. The Σ+ key automatically accumulates the values needed to calculate the means (averages) and standard deviations for two different sets of data. A factorial function is also available.

The HP-37 also provides a linear regression, or trend line, function and can compute correlation coefficient.

Physical Specifications:

- Length: 140 mm (5.6″)
- Width: 75 mm (3.0″)
- Height: 30 mm (1.2″)
- Weight: 220 g (7.7 oz)

For a complete list of features and functions, see the Comparison Chart on pp. 22-23.

The HP-37E Business Management Calculator comes complete with:

- *HP-37E Owner's Handbook*
- *Your HP Financial Calculator: an introduction to financial concepts and problem solving.*
- Coupon for your choice of one of the following applications books:
  Investment Analysis and Statistics Applications.
  Real Estate Applications.
  Lending, Savings and Leasing Applications.
- Recharger/AC adapter.
- Rechargeable battery pack.
- Soft carrying case.

Take advantage of our 15-day trial offer. See page 4.

HP-38E

Advanced Financial Calculator with Programmability.

An unparalleled array of built-in financial functions—plus the added value of personal programming.

The HP-38 is a powerful financial calculator with the ability to "remember" all the keystrokes in a calculation and to repeat them over and over again at the touch of a key. It provides capabilities that are invaluable to managers, financial analysts and consultants, commercial real estate agents, and advanced business students.

A New Generation of Calculators.

The HP-38 is a Hewlett-Packard Series E calculator which gives you the same new features found in the HP-37.

Powerful Cash Flow Analysis.

The HP-38 calculates net present value (NPV) and internal rate of return (IRR) for up to 20 uneven cash flows, or for 20 groups of uneven cash flows with up to 99 cash flows in each group (a maximum of 1980 cash flows). NPV and IRR let you weigh a leasing situation against buying, balance the worth of an investment against desired yield, or compare investment alternatives.

Easy Time-and-Money Calculations.

The HP-38 offers all the financial capability of the HP-37. In addition, the HP-38 computes simple interest with the INT key.

Easy, Instant Programming.

The HP-38 is so easy to use you'll be writing programs in minutes! With the calculator switched to Program mode with the P/R (Program/Run) key, it doesn't execute the keystrokes but instead remembers them as you press them in order.

To run the program, just switch back to Run mode with the P/R key, key in your data, and press R/S (Run/Stop). Every time you press R/S, the HP-38 executes the entire sequence of keystrokes in seconds.

It's that easy!

By programming the HP-38, you can save hours of time wasted in long, tedious calculation. And once that program is written into the calculator, there is no possibility of human error.

Double-Duty Memory.

The HP-38 shares its memory space between program memory and data memory. When the HP-38 is first turned on, it contains 8 lines of memory for your program and 20 addressable storage registers. As you write a program longer than 8 lines, memory is automatically converted from data storage to program memory (at a ratio of 1 to 7) until you've reached a maximum of 99 lines, with 7 storage registers remaining inviolate. And remember, any keyboard operation occupies one line of program memory even though it may take one, two or three keystrokes to perform.

A Handy 2000-Year Calendar.

The built-in HP-38 calendar can easily calculate the actual number of days between two dates on a 360- or 365-day calendar basis, day of the week, or a future or past date.

Statistics at the Press of a Key.

The HP-38 offers all the statistical capability of the HP-37 plus linear estimate of x for a known y and $\bar{x}_w$ (weighted average).

Physical Specifications:

- Length: 140 mm (5.6″)
- Width: 75 mm (3.0″)
- Height: 30 mm (1.2″)
- Weight: 220 g (7.7 oz)

For a complete list of features and functions, see the Comparison Chart on pp. 22-23.

The HP-38E Advanced Financial Calculator with Programmability comes complete with:

- *HP-38E Owner's Handbook and Programming Guide.*
- *Your HP Financial Calculator.*
- *HP-38E Quick Reference Card.*
- Coupon for your choice of one of the following applications books:
  Investment Analysis and Statistics Applications;
  Real Estate Applications;
  Lending, Savings and Leasing Applications.
- Recharger/AC adapter
- Rechargeable battery pack
- Soft carrying case

Take advantage of our 15-day trial offer. See page 4.

HP-92 Investor

Offers solutions for the professional in finance.

The HP-92 Investor is a personal-sized financial calculator that offers preprogrammed solutions for institutional investors, financial consultants, real estate analysts, loan officers, leasing salesmen, accountants and other professionals examining investment alternatives.

The HP-92 Investor solves problems involving time and money. Compound interest. Balloons. Internal rate of return for 30 uneven cash flows. Net present value. Bonds and notes. Three kinds of depreciation.

Invaluable printer gives you a complete record.

The quiet printer on the HP-92 gives you the answers quickly and quietly—with descriptive labels. Whether duplicating your keystrokes, printing amortization and depreciation schedules, or listing all the cash flows in an IRR problem, the HP-92 Investor gives you that indispensable hard copy for instant analysis or later perusal.

Easy-to-use cash flow sign convention.

The HP-92 Investor is remarkably easy to use. An important new design lets you state any problem in a simple, intuitive manner, so you don't have to remember handbook instructions. Problems are entered in terms of cash flows. Cash outflows are negative and cash inflows are positive, both when you enter data and when you display results. Whether your profession calls it a mortgage with a balloon payment or a lease with a buy back (or residual), it's the same thing to the HP-92—and you can easily solve it.

Compact and portable.

The HP-92 Investor is so small that it takes up only a corner of your desk or fits in your briefcase, ready to produce those investment answers you need—any time.

And the HP-92 is completely portable. You can operate it from its rechargeable batteries or from a convenient AC outlet.

Financial Functions That Solve Real-World Problems.

[n] [i] [PV] [FV] [PMT]

The HP-92 Investor solves complicated "real-world" problems involving compound interest, residuals and salvages, partial payments and balloons, wrap-around mortgages, even internal rates of return based upon uneven cash flows.

All you need to do is key in any three or four of the values for n (number of compounding periods), i (interest rate), PV (present value), FV (future value) and PMT (payment)—in any order—followed by the appropriate financial key. Then press the key to solve for the unknown value.

If you know n or i, you can solve any problem which can be represented by an initial value, a series of payments, and a final value—or by any two of these.

Easy Comparison of Investment Alternatives.

If you want to change any of the parameters of a financial problem, you merely key in a new value and press the appropriate key; then press any other financial key to see the effect of the change—without restating the entire problem each time.

And, because it can list the latest values for all financial elements at your command, the HP-92 Investor lets you print every investment alternative, whether for immediate comparison or later examination.

Discounted Cash Flow Analysis for 30 Uneven Cash Flows.

[NPV] [IRR]

The HP-92 Investor calculates the net present value (NPV) and the internal rate of return (IRR) for up to 30 uneven cash flows. So you can evaluate whether to lease or buy equipment, balance the worth of an investment with uneven cash flows against desired yield, or compare investment alternatives based on their net present value.

Once the cash flows have been entered into the HP-92, you can change one or any number of them without restating the complete problem.

Amortization Schedules at the Press of a Key.

[AMORT]

```
    10.00   n
     8.75   i
250000.00   PV
     0.00   FV
      END   PMT
-38527.41   ***
     8.00   P1
     3.00   P2
            AMRT
     8.00   P
  8571.54   INT
 29955.87   PRN
 68004.57   BAL
```

The HP-92 Investor can print a complete amortization schedule, showing each period of a fully amortized loan with the amount paid to interest, amount to principal, and the remaining balance. Or it can print a partial schedule between any two periods. Labels identify each element of the schedule, and after the last period, the schedule shows the total amount paid to both interest and principal as well as the remaining balance on the loan.

Bond and Note Computations—Quickly and Accurately.

PRICE YIELD

CALL CPN

The HP-92 Investor calculates price, yield, or accumulated interest on bills, notes, bonds, certificates, debentures, warrants, certificates of deposit, and other interest-bearing obligations—and the HP-92 meets the standards for accuracy demanded by the Securities Industry Association.

Useful Percent Functions.

% Δ%

The HP-92 gives you the most useful percent functions: Percent, Percent of Sum, and Percent of Change.

Three Kinds of Depreciation Schedules.

SL SOYD DB LIFE

BOOK FACT SAL

Using the HP-92 Investor, you can quickly and easily compute depreciation using the straight line, sum-of-the-years' digits, or declining balance method and you can solve for the crossover. The HP-92 can print a complete

```
                DB
1.00            N
1512.45         DPN
6049.78         RDV

2.00            N
1209.96         DPN
4839.82         RDV
```

depreciation schedule for the entire life of an asset, or it can calculate the depreciation allowance for a specific period.

And once you've keyed in such elements as an asset's initial (book) value or its salvage value, you can examine each type of depreciation with a single keystroke—and compare all types of depreciation without reentering data.

Powerful Statistical Functions.

r $\bar{x}$

The HP-92 Investor contains statistical functions for research and analysis. Both linear and non-linear trends can be closely examined, and mathematic models can be generated to make forecasts.

A Built-in Calendar.

DATE+DAYS ΔDAYS

The calendar functions of the HP-92 Investor can determine a future or past date given the number of days from a known date. It also will print the day of the week for any date, and it calculates the exact number of days between dates.

30 Storage Registers For Data.

STO RCL

Besides the four-register operational stack used for mathematical operations, the HP-92 Investor has 30 addressable storage registers for data storage and recall—with storage register arithmetic on 10 registers.

Common Math Functions.

The HP-92 Investor provides the most common mathematical functions like logarithms, square root, and exponentials.

HP-92 Applications Book.

An applications book entitled "HP-92 Real Estate and Investment Analysis" is now available for the HP-92. It provides more than 60 pages of up-to-date problem solving methods for today's professionals in real estate analysis and appraising.

Physical Specifications

- Calculator width: 22.9 cm (9.0″)
- Calculator length: 20.3 cm (8.0″)
- Calculator height: 6.35 cm (2.5″)
- Calculator weight: 1.13 kg (40 oz)
- Recharger/AC adapter weight: 170 gm (6 oz)
- Shipping weight: 2.7 kg (5.9 lb)

Temperature Specifications

- Operating temperature range: 0° to 45°C (32°F to 113°F) with paper, 5% to 95% relative humidity.
- Charging temperature range: 15° to 40°C (59° to 104°F).
- Storage temperature range: −40° to +55°C (−40° to +131°F).

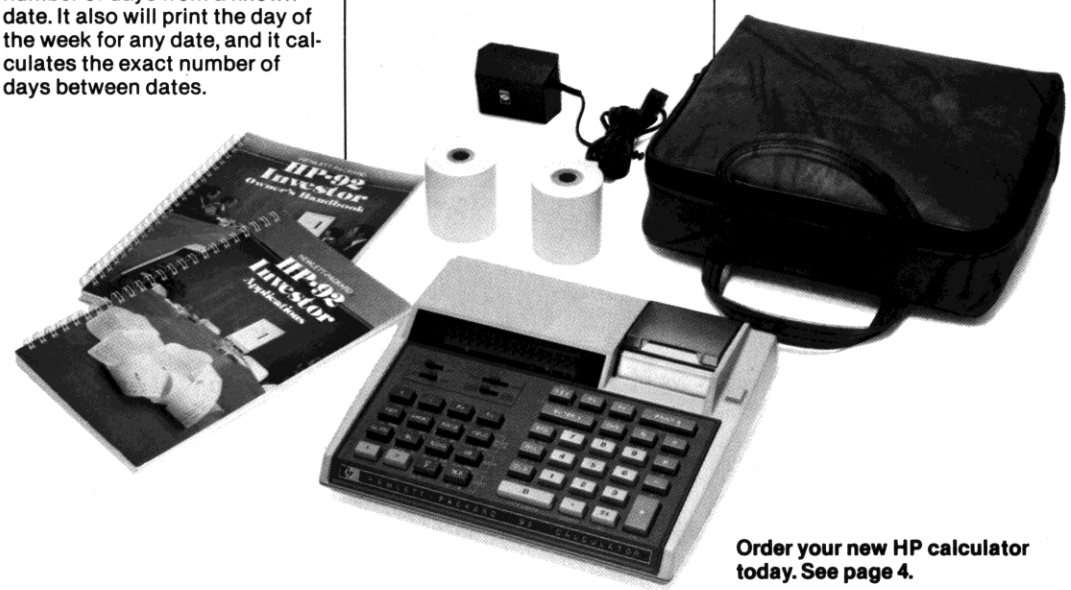
Power Specifications

- AC Power Requirements: 90-120V 50 to 60 Hz.
- Battery: 5.0 Vdc nickel-cadmium rechargeable battery pack.
- Battery operating time: 3 to 7 hours.
- Battery recharging time: Calculator off, 7 to 10 hours; calculator on, 17 hours.

For a complete list of features and functions, see the Comparison Chart on pages 22-23.

The HP-92 Investor comes complete with:

- Rechargeable battery pack
- Recharger/AC adapter
- Soft carrying case
- Illustrated Owner's Handbook
- Applications Book
- Two rolls of thermal paper



Order your new HP calculator today. See page 4.

Accessories

Optional Accessories.

A. DC Adapter/Recharger.

Lets you recharge and operate your calculator in a car, boat or plane.

Includes two power cables: one for plugging into an automobile cigarette lighter receptacle and one for fastening directly to a 12-volt DC battery.

- HP-31E, HP-32E, HP-33E, HP-37E, HP-38E/ 82144A
- HP-21, HP-22, HP-25/25C, HP-27/82055A
- HP-80 and HP-67 (Pictured below)/82054A*

B. Reserve Power Pack.

Keeps a spare battery pack fully charged.

You'll always have a fully-charged spare battery pack on hand when you use this reserve power pack, especially designed for Hewlett-Packard pocket calculators. It comes complete with a spare battery pack.

Simply slip the battery pack into the holder, then plug the holder into the recharger/AC adapter that comes with your calculator. A built-in light-emitting diode tells you that the battery pack is recharging.

- Battery pack and holder for models HP-31E, HP-32E, HP-33E, HP-37E, HP-38E/ 82103A
- Battery pack and holder for models HP-80 and HP-67/ 82004A*
- Battery pack and holder for models HP-21, HP-22, HP-25/ 25C, HP-27, HP-29C (Pictured below)/82028B
- Battery pack and holder for models HP-91, HP-92, HP-97 (Pictured below)/ 82037A

C. Security Cradle/Cable.

Helps reduce pilferage.

When leaving your HP calculator unattended in the office or lab, you can help guard it against "mysterious disappearance" by means of a ruggedly-constructed security cradle or a security cable.

The security cradle may be attached to your desk via: (1) four corner screws, (2) center screw attachment, allowing 360° rotation, (3) removable six-foot steel cable, or (4) extremely hard-to-remove adhesive tape. (All are supplied.)

- Security cradle for model HP-80/82007A***
- Security cradle for model HP-67/82015A**
- Security cradle for models HP-21, HP-22, HP-25/25C, HP-27, HP-29C (shown), has built-in prism to provide better viewing angle when on flat surface/82029A
- Security cable for models HP-10, HP-19C, HP-91, HP-92, HP-97/82044A

D. Hard Leather Case.

Helps protect your calculator outdoors.

Using your HP calculator outdoors? Help protect it by carrying it in this hard leather field case. It guards your calculator against normal environmental conditions in the field—dust, dirt, rain, snow, bumps and jars. Calculator removal is easy with the snap-open flap and contoured front opening.

- Field case for model HP-80/ 82006A***
- Field case for model HP-67/ 82016A**

Replacement Accessories.

Accessories to replace or replenish those received with your HP calculator.

E. Battery Pack

- HP-31E, HP-32E, HP-33E, HP-37E, HP-38E/ 82109A
- HP-10, HP-19C/ 82052A
- HP-21, HP-22, HP-25/25C, HP-27, HP-29C/ 82019B
- HP-80 and HP-67 (pictured below)/ 82001A*
- HP-91, HP-92, HP-97/ 82033A

F. Recharger/AC Adapter

- HP-31E, HP-32E, HP-33E, HP-37E, HP-38E/ 82087A (110 Vac) 82090A (Euro 220 Vac)
- HP-21, HP-22, HP-25/25C, HP-27, HP-29C/ 82041A (110 Vac) 82026A (110/220 Vac, switchable)
- HP-80 and HP-67/ 82002A* (110/220 Vac, switchable)
- HP-10, HP-19C, HP-91, HP-92, HP-97/ 82059A (110 Vac) 82066A (Euro 220 Vac) (pictured below)

Designed to protect and increase the versatility of Hewlett-Packard Calculators.

G. **Soft Case**

- HP-31E, HP-32E, HP-33E, HP-37E, HP-38E/82110A
- HP-10, HP-19C/82064A
- HP-21, HP-22, HP-25/25C, HP-27, and HP-29C/82027A
- HP-80/82021A***
- HP-67/82053A** (synthetic)
- HP-67/82017A** (black leather)
- HP-91, HP-92, HP-97/82035A

Calculator Supplies

- Thermal Printing Paper for models HP-10, HP-19C/82051A (6 rolls)
- Thermal Printing Paper for models HP-91, HP-92, HP-97 (pictured below)/82045A (6 rolls)
- 3 Program Card Holders for models HP-67 and HP-97/00097-13142**
- Program Pad for models HP-19C, HP-25/25C, HP-29C, HP-33E, HP-38E, HP-67, HP-97/00097-13154**
- Blank Program Cards for models HP-67 and HP-97/40 card pac with holder/00097-13141**
  120 card pac with holders/00097-13143**
  1000 card pac/00097-13206**

Owner's Handbooks

- HP-31E/00031-90001
- HP-32E/00032-90001
- HP-33E/00033-90001
- HP-37E/00037-90001
- HP-38E/00038-90001
- HP-10/00010-90001
- HP-19C/29C/5955-2110
- HP-21/00021-90001
- HP-22/00022-90001
- HP-25/25C/00025-90001
- HP-27/00027-90001
- HP-67/00067-90011
- HP-80/00080-90001
- HP-91/00091-90001
- HP-92/00092-90002
- HP-97/00097-90001

Application Books and Pacs.

Application Books

- HP-31E, HP-32E, HP-33E "Solving Problems With Your Hewlett-Packard Calculator"/5955-3015
- HP-33E Applications Books
  Standard/00033-90024
  Mathematics/00033-90030
  Statistics/00033-90031
  Student Engineering/00033-90032
  Surveying/00033-90033
- HP-37E, HP-38E "Your HP Financial Calculator"/5955-3016
- HP-37E, HP-38E Applications Books
  Real Estate Applications/00038-90024
  Lending, Savings and Leasing/00038-90025
  Investment Analysis and Statistics Applications/00038-90026
- HP-19C/29C Applications Book/5955-2111
- HP-21 Applications Book/00021-90016
- HP-25/25C Application Programs/00025-90011
- HP-92 Applications/00092-90011
- HP-92 Real Estate & Investment Analysis Book 00092-90042

HP-19C/29C Solutions Books

- Civil Engineering/00029-14008
- Electrical Engineering/00029-14004
- Financial/00029-14003
- Games/00029-14006
- Mathematics/00029-14001
- Mechanical Engineering/00029-14009
- Navigation/00029-14007
- Statistics/00029-14002
- Student Engineering/00029-14010
- Surveying/00029-14005

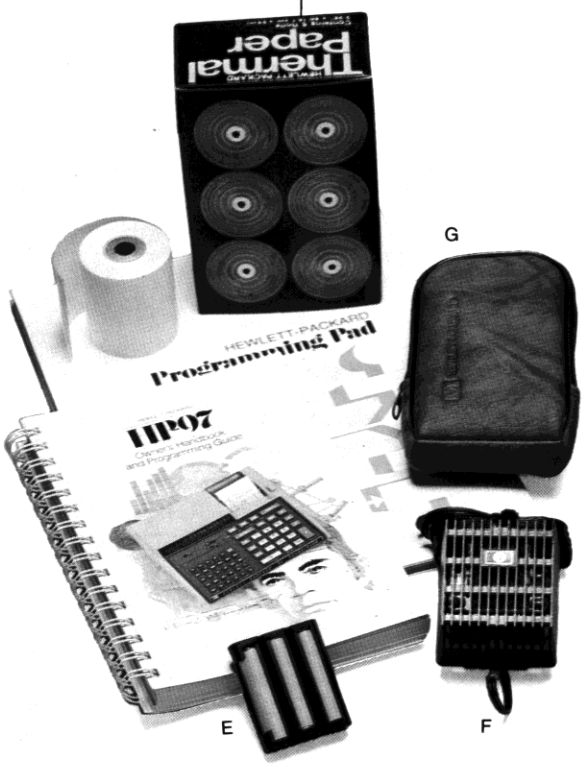
HP-67/97 Solutions Books

Refer to pages 8 and 9 for a complete listing of HP-67/97 Users' Library Solutions Books.

HP-67/97 Application Pacs

Refer to page 10 for a complete listing of HP-67/97 Application Pacs.

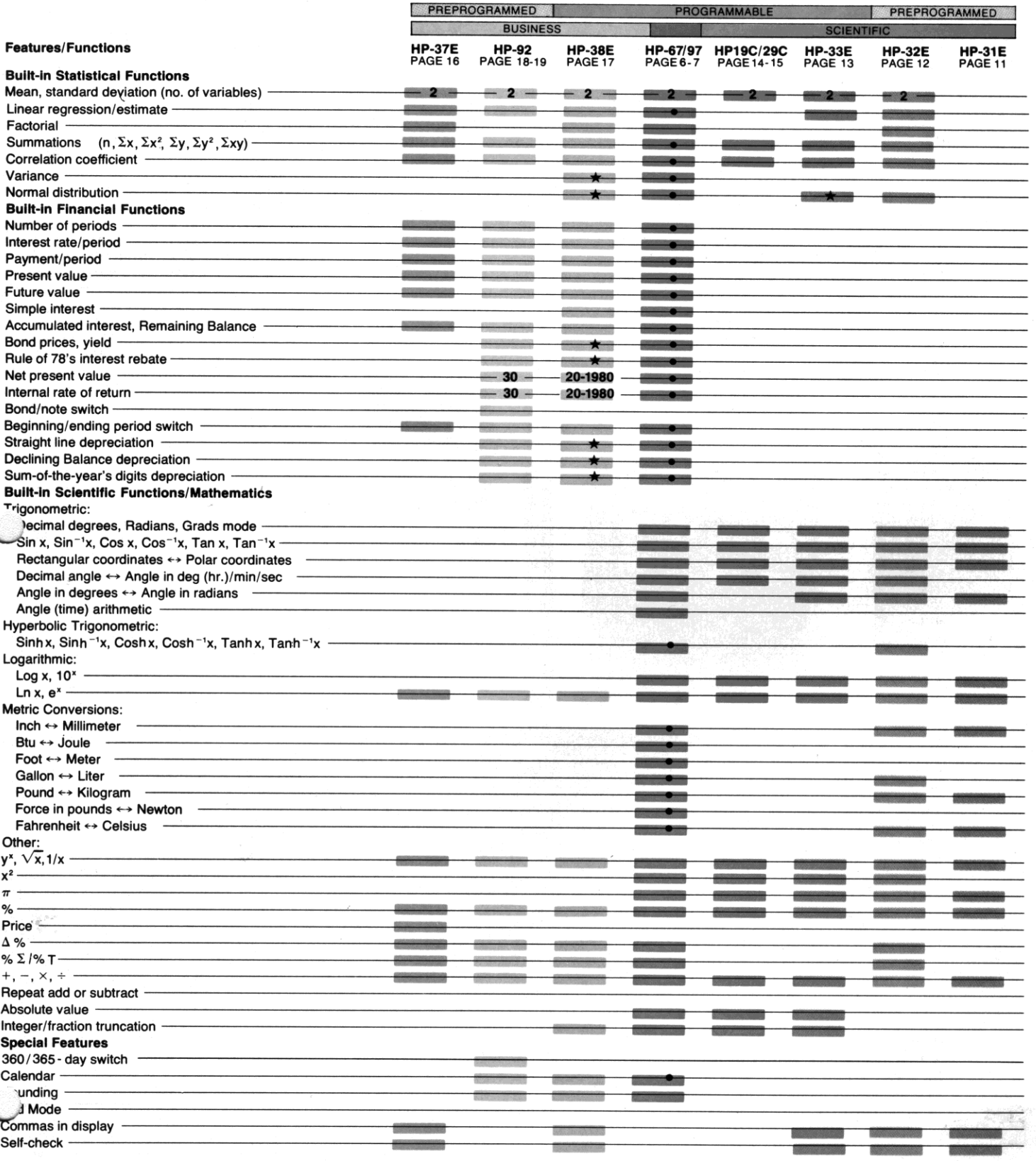
*Also usable on HP-35, HP-45, HP-55, HP-65, and HP-70.
**Also usable on HP-65.
***Also usable on HP-35, HP-45, HP-55, and HP-70.



Comparison Chart

Features/Functions	HP-37E PAGE 16	HP-92 PAGE 18-19	HP-38E PAGE 17	HP-67/97 PAGE 6-7	HP19C/29C PAGE 14-15	HP-33E PAGE 13	HP-32E PAGE 12	HP-31E PAGE 11
	PREPROGRAMMED		PROGRAMMABLE					PREPROGRAMMED
	BUSINESS				SCIENTIFIC			
RPN Logic System	■	■	■	■	■	■	■	■
Memory								
Automatic four-memory stack	■	■	■	■	■	■	■	■
Addressable memory	7	30	20-7	26	30	8	15	4
Financial memory	5	8	5					
Last x memory		■	■	■	■	■	■	■
Program memory			8-99	224	98	49		
Continuous Program Memory					98			
Continuous Addressable Memory					16			
Positioning Operations								
Stack roll down	■	■	■	■	■	■	■	■
Stack roll up		■		■				
x, y memory exchange	■	■	■	■	■	■	■	■
x, I memory exchange				■				
Display								
Mantissa			■			■	■	■
Fixed notation	■	■	■	■	■	■	■	■
Scientific notation	■	■	■	■	■	■	■	■
Engineering notation				■	■	■	■	
Automatic overflow into scientific	■	■	■	■	■	■	■	■
Automatic underflow into scientific	■	■	■	■	■	■	■	■
Enter exponent		■	■	■	■	■	■	■
Change sign	■	■	■	■	■	■	■	■
Programming Features								
Program review—back step / single step			■	■	■	■		
Insert/delete				■	■			
Overwrite			■			■		
Direct branching			■	■	■	■		
Pause			■	■	■	■		
Conditional tests			2	8	8	8		
Flags				4				
DSZ, ISZ (looping)				■	■			
3 levels of subroutines				■	■	■		
Smart card reader								
Stores programs and data				■				
Merges programs and data				■				
Automatic prompting				■				
Labels				20	10			
10 user-definable functions				■				
Indirect control of:								
Data storage and recall				■	■			
Storage arithmetic				■	■			
Unconditional branching				■	■			
Subroutine branching				■	■			
DSZ, ISZ				■				
Display				■				
Relative addressing				■	■			
Clearing Options								
Clear x	■	■	■	■	■	■	■	■
Clear stack						■		■
Clear all	■	■	■				■	■
Clear addressable registers		■		■	■	■	■	■
Clear statistical registers		■	■		■		■	
Clear prefix			■		■	■	■	■
Clear program memory			■	■	■	■		
Clear financial registers	■	■	■					
Printing Features								
Print x		■		97	19C			
List stack registers		■		97	19C			
List addressable registers		■		97	19C			
List statistical registers		■			19C			
List financial registers		■						
Print crosshatch separator								
Paper advance		■		97				
Three print modes		■		97	19C			
Print space				97	19C			
List program				97	19C			
Trace program				97	19C			

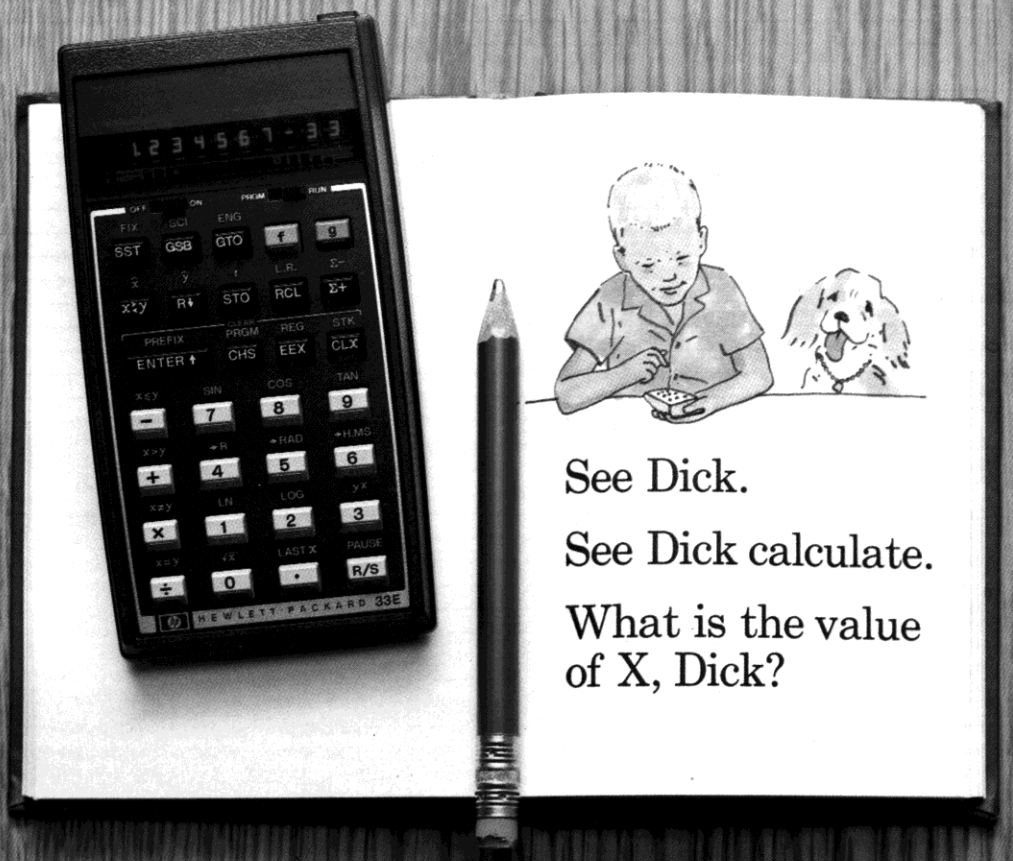
This chart has been designed for your convenience in making direct comparisons of the features and functions on the HP calculators described in the preceding pages. For your convenience, page numbers of catalog listings are indicated for each calculator.



● Not a built-in function, but available on pre-recorded magnetic program cards.
★ Not a built-in function but programs found in application books.

How programmable calculators help kids learn.

By Dr. John J. Wavrik
Department of Mathematics
University of California at San Diego



There are two different processes called by the name "learning": one is rote learning and the other is intelligent learning. We know a great deal about how rote learning takes place and how it can be encouraged. We know much less about intelligent learning. Many forms of animal life show the capacity to learn by rote; only humans seem to have much capacity for intelligent learning. Learning theories suggest that we have an internal mental framework. We learn (intelligently) by having experiences. These experiences produce ideas or concepts which either fit into our existing framework (assimilation) or require the extension or modification of the framework (accommodation). We learn best when we are confronted with a pattern of experiences which allow these processes to take place. Intellectual experiences are vital for intellectual growth. This article is about the use of programmable calculators to provide suchexperiences.

RPN

There are a variety of ways in which programmable calculators can aid learning. Certainly on the high school or college level the ability to perform explicit computations, draw graphs, or apply numerical methods can make the subject of mathematics more understandable.

What may be more surprising is that learning experiences can be provided for relatively young students. Starting at about 4th grade, most students have enough background in numbers and number operations to begin learning more about mathematics and its applications. Probability and statistics, coordinate geometry, "real world" uses of mathematics, problem solving, and computer programming are but a few of the areas accessible to them.

An aid to intelligent learning.

Learning to solve problems is the principal reason most people study mathematics. Solving problems involves applying previously acquired information to new situations. Problem solving is divided into two stages: Figuring out what to do; then doing what you have figured out.

Thus in problems involving arithmetic one must first decide what computations to perform...then perform them. The second stage frequently involves the results of rote learning. Stage one is the product of intelligent learning, and is by far the more difficult of the two. Yet, upwards of 75% of instructional time in elementary school mathematics is devoted to second stage skills. There is considerable evidence that even many adults have extreme difficulty with the first stage skills.

One of the most obvious benefits of calculators is that they can allow more instructional time to be spent on thinking and less on the process of computation. Moreover calculators permit the use of more realistic problems: textbook problems frequently are artificially constructed to make computation simple and are not typical of "real world" problems.

A unique tool for learning.

A *programmable* calculator can provide learning experiences which would be hard to obtain in other ways. A well designed mathematical game, for instance, reinforces concepts and skills. A good game can develop thinking ability. If it is interesting, it can motivate students to put in the time and effort that learning requires.

The Sum of Digits Game.

01 RCL 7	15 1	29 STO + 0
02 g π	16 0	30 RCL 0
03 +	17 ÷	31 9
04 5	18 ENTER	32 9
05 f y^x	19 g INT	33 f x > y
06 g FRAC	20 STO 1	34 GTO 13
07 STO 7	21 −	35 f FIX 9
08 EEX	22 1	36 f x = y
09 2	23 0	37 GTO 00
10 ×	24 ×	38 RCL 2
11 g INT	25 RCL 1	39 STO − 0
12 STO 0	26 +	40 CLX
13 f FIX 0	27 R/S	41 GTO 27
14 RCL 0	28 STO 2	

R_0	secret number
R_1	first digit
R_2	number to add in
R_7	seed for random numbers

There are many learning games that can be used with programmable calculators. I've used some "Star-Trek" variants, for example, to teach geometry of multi-dimensional spaces, angle measurement, and trigonometry. To give a better indication of what is meant by learning games, here is a game written for the HP-33E which provides experience with logical reasoning, place value, and multi-digit addition.

To start the program, press R/S and the calculator will make up a secret number between 0 and 99. It does not tell you the number, but it tells you the sum of its digits. You then put in a number, press R/S, and the calculator adds this to the secret number to produce a new secret number. It provides you with the sum of the digits of the new number.

The object of the game is to get the secret number up to 99 in as few moves as possible. (For experts: it can be done in no more than 5 moves!) When you succeed, the calculator shows 99.00000000. Press R/S to play another game. If at any point you should ask the calculator to add in something which would make the secret number bigger than 99, the calculator *does not add it* and shows 0.00000000.

To get a secret number up to 99 as quickly as possible requires not only logic but an understanding of addition and the meaning of positional notation for numbers. Thus if the sum of digits of the original number is 4, the secret number could be 4, 13, 22, 31, or 40. If, however, you add 8 and the new sum of digits is 12, some of these possibilities are eliminated. There is a strategy, but it's not as easy as it might seem at first glance.

Simulation programming.

One of the most exciting educational uses for programmable calculators is simulation. There is nothing that makes probability and statistics so clear as performing experiments.

Unfortunately, few people have the patience to flip coins, throw dice, conduct surveys, etc., to the extent needed for the underlying concepts to emerge clearly.

Very simple programs based on random number generation routines can be used to perform such experiments. Thus students can see what happens as a coin is flipped many times, the effect of sample size on the accuracy of a poll, etc.

The whole business of confidence intervals, level of significance, etc., falls into place after one has had a chance to actually *see* what happens. Statistics is an important application area for mathematics. Students who have had a chance to experiment and make observations will have a good foundation on which later systematic study can build.

In an entirely different direction, we have used simulation to teach

some fundamental ideas of economics to 4th-6th grade students. One program (inspired by some computer programs produced by the Minnesota Educational Computing Consortium) explores the impact of selling price on profit. Besides the introduction to economics, the simulation exercises and introduces some important mathematical ideas. Students graphed profit as a function of selling price. In this way they reinforced their understanding of the idea of a function, saw the power of graphing, and dealt with their first maximization problem. They were easily able to see the relationship between the slope of the graph and the location of the maximum.

When these students eventually study Calculus it will probably make a great deal of sense to them. There is a lot to be learned from a calculator and a pad of graph paper!

Programming as a learning experience.

The problem solving activity par excellence, however, is programming itself. Calculator programming can provide students with opportunities to exercise creativity, imagination, reasoning skill, etc. It also provides both "the thrill of victory and the agony of defeat"...which are necessary for the development of the personality characteristics of a successful problem solver.

An additional advantage is that it can be "individualized": it provides challenges at all ability levels and in a diversity of interest areas. There are some 4th graders for whom writing a program to make the calculator "count" is a challenge. In one recent group, however, a pair of 4th graders decided to write their own "perpetual calendar" program. They researched calendars and astronomy and then solved some fairly technical problems to write their program. This enormous range of ability was accommodated by the same instrument: an HP-25 programmable calculator.

Owners of HP programmables might be surprised at how readily children can learn to use the machines. RPN offers a distinct advantage: it has a simplicity and reasonableness that children can grasp. All of the thought and care that go into the design and manufacture of Hewlett-Packard calculators become doubly important when the user is a child. The features that make HP calculators "the choice of professionals" also make them ideal for children. Here are some examples:

- The calculator does not store operations (in RUN mode), only numbers. There are no pending operations.
- Intermediate answers are displayed.
- Collections of keystrokes that you regard as a single instruction become a single step in a program.
- The way in which operations are performed is well-conceived. (It is easier for a child to understand STO ÷ 1 than 2^{nd} INV PROD 1.)
- Instruction manuals are well written (and the ideas can be transmitted to children).
- The calculators are rugged.

RPN was chosen for its efficiency for adult users but it is (incidentally) also less complicated than algebraic logic...which makes it useful for children. The RPN system does not require familiarity with hierarchy rules, inverse functions, etc., which demand more mathematical background than elementary school students possess. It is quite possible for 9-year-olds to learn all there really is to know about the operation of the calculator. They may not know how to use certain operations (like e^x, for instance)...but they will know what happens in the stack as these operations are performed.

Suggestions for teaching.

Let me give, in outline form, some suggestions for teaching a child to use a programmable calculator.

1 Instruction booklets serve two purposes. They are both teaching instruments and reference manuals. To some extent these purposes work against each other. Since the instruction booklet functions as a reference manual, there is much more information at some places than a young beginner can deal with. On the other hand, key ideas (how the stack operates, how to use the ENTER key, etc.) are explained well. So skip around and teach what the child seems ready to learn.

2 The best learning occurs when the child works with the calculator, trying things and making observations. Some information is best provided when a question is asked or an appropriate situation arises (e.g. explain scientific notation when the child first performs a calculation that overflows).

3 Understanding what every key does on a scientific calculator would be a good course in mathematics from 4th grade to college. Resist the temptation to teach this 13-year course in a hour.

4 Start with how to perform basic arithmetic. The key observation is that THE CALCULATOR PERFORMS OPERATIONS AS SOON AS THE OPERATION KEY IS PRESSED. Stress the analogy with pencil and paper computation. A common mistake is: 3 ENTER 5 ENTER +. The student thinks "ENTER" means "write it down." A better name for the ENTER key at this stage would be the SEPARATE key, or the OLD DIGITS/ NEW DIGITS key, or the NEXT NUMBER key.

5 Next do some simple programs. Notice that these programs show the use of branching commands to make loops and the use of tests to exit from loops (two of the main ideas of programming).

6 Talk about the stack. The stack consists of four boxes that hold numbers. Numbers move in these boxes as keys are pressed. The rules are simple to grasp and observations can be made using the R↓ and x⇄y keys. It is worthwhile to make charts showing what happens in the stack as simple calculations are performed. The meaning of "two number" tests (x = y, etc.) can now be explained.

7 Explain storage and storage operations. The storage registers are a collection of numbered boxes. The storage operations move numbers between boxes and stack. I once tried calling them "mailboxes" but found that this leads to a bad image: when a letter is mailed, the sender no longer has it. When, however, a number is stored a *copy* is put in storage and the original stays in the stack.

8 Explain other operations (like INT and FRAC) as the need for them arises.

9 When writing programs, be patient. If a program doesn't work as expected try to figure out why. Most programmers learn more from their failures than from their successes.

10 Programs involving random numbers are especially appealing and useful to children. Random number generators are used in many game programs.

Some simple programs.

01 ENTER
02 1
03 –
04 f PAUSE
05 GTO 01

This program will make the calculator count down by ones from any starting number. Let the child start and stop the program, putting in other starting numbers. Explain how it works. Good projects: make the calculator count up by ones, by fives.

01 ENTER
02 1
03 –
04 f PAUSE
IF-05 g x = 0
THEN-06 GTO 00
OTHERWISE-07 GTO 01

This will make the calculator count down and stop at 0. The use of the test is explained by the words "IF, THEN, OTHERWISE". "x" always refers to the number you see on the display. Line 00 has a built-in STOP instruction.

The stack.

T				
Z				
Y		3	3	
X (DISPLAY)	3	3	4	7
keys	3	ENTER	4	+

11 The main idea is to build up mental images of what is going on as the calculator runs. A lot can be learned by thoughtful observation.

12 At some stage a programmer should be encouraged to document and systematically file programs.

13 It is important that the child have access to the calculator when the need or desire arises. If you are using your machine heavily, and your child does develop an interest, give serious thought to getting him or her a machine. (P.S. The HP-33E seems to be a good machine for this purpose.)

14 It is perfectly normal for some children to get so absorbed at times that eating, brushing teeth, sleeping, etc., cause problems.

15 Controlling a sophisticated machine is a powerful experience for a child. It can be great fun and rewarding if the child can proceed at his or her own pace. The programmable calculator offers a lifetime of learning experiences... don't force the pace!

16 Some families have found that working together on programs is a good shared experience.

17 The optimum situation for a child to learn programming is:

A. The child has unlimited access to the calculator.
B. An adult who knows programming is available for consultation.
C. Appropriate written materials are available.*

**Calculators/Computers Magazine published by DYMAX, P.O. Box 310, Menlo Park, CA 94025 is devoted to educational uses for computers and calculators. It is a good source of learning activities and information in this area.*

Dr. John J. Wavrick is an associate professor of mathematics at the University of California at San Diego. He has published numerous research articles as well as articles in Exponent *and* Calculators/Computers *where he is an editorial advisor. A frequent lecturer in math and education, he has also been a consultant to San Diego city schools in the "Mentally Gifted Minor" program. Wavrick has degrees in mathematics from Johns Hopkins University and took his Ph.D. from Stanford University.*

"Thank you, Beep...!"
by G. Dickson,
continued from page 3.

cab rank. Would you place your portfolio on the table, please?"

Walter did so. There was a faint hum for a moment.

"Very good, sir. Now, if you'll just give us your thumbprint. Thank you. You are now cleared through customs. We hope, in spite of the unscheduled nature of your stay in Jakarta, that you find matters here to your comfort."

"Yes. Well..." began Walter, taking back his portfolio. But his vehicle was already moving him off through glass doors into a pleasant tropical night, where an aircushion automated taxi waited at the curb. He woke with the stopping of the cab some little time later to find himself once more at curbside. A live doorman—evidence of a luxury hotel— opened the cab door. "Mr. Jensen!" he said. "Your room is ready, sir. If you'll step through the doors ahead, you'll find a bellcart waiting to take you to it."

"Thanks," said Walter. Clutching the portfolio, he went in and took a seat in the bellcart—an aircushion vehicle not unlike the one that had transported him in the terminal. Three minutes later, it slid him through automatically opening doors into his room.

"Ah!" said Walter exhaustedly, collapsing in the nearest overstuffed chair. A glass in which ice tinkled was sitting on a table at his elbow. He sipped gratefully from it.

"I trust the drink is to your liking, sir," said a speaker grille in the wall of the room.

"Fine. Just right," said Walter.

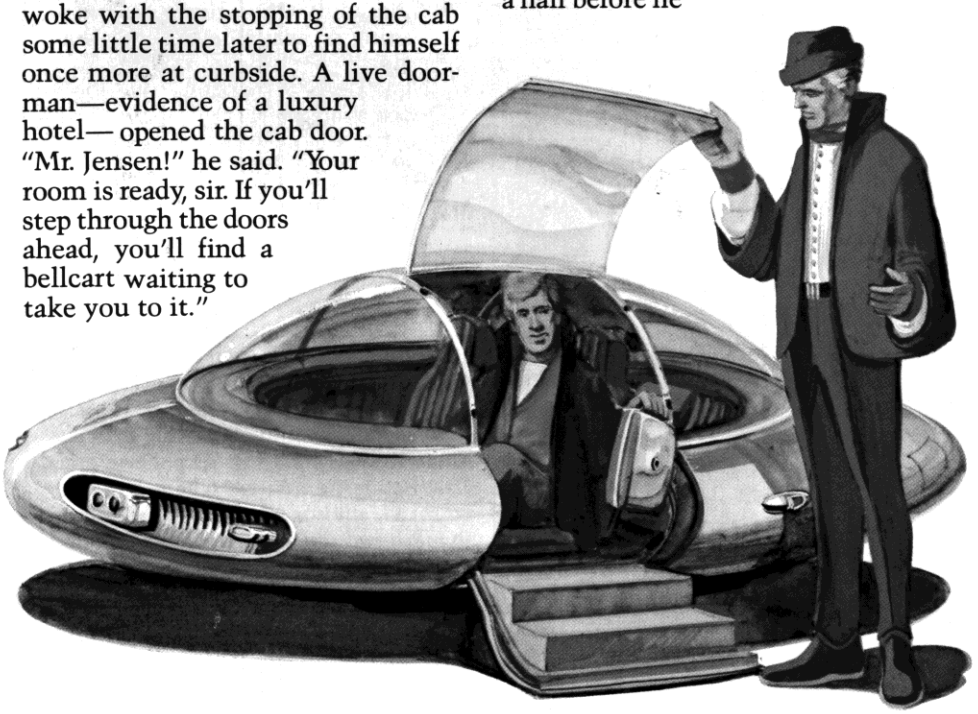
"And would you want something to eat, Mr. Jensen?"

"Yes. Something simple. Clam chowder and a chicken sandwich."

"Yes sir. If I might get the details from your autosecretary...?"

Walter took the HP-XX2050 from his pocket, and looking around, discovered a slot in the table at his elbow. He inserted the XX2050.

Forty minutes later, having called home, and climbed into a luxurious, air-cushion bed, Walter was sleeping soundly. Meanwhile the XX2050, in the slot of a bedside table, was silently beaming calls to London, to make sure that the next day there would go smoothly. It wound up with an electronic note to itself to wake Walter—who was a slow starter—an hour and a half before he was due to board his flight, and then switched itself into a wait-state.



The XX2050, of course, did not stop to be impressed by the number of things it could do to make Walter's life easier, and Walter himself, by this time, also took its services for granted.

He was, in fact, electronically pampered to a degree that was beyond the imagination of his ancestors. What made it all possible was the remarkable advances in computer science since the late twentieth century, plus a society geared to the use of such technological tools.

His portfolio, lying on a chair while he slept, contained information in a form as rare, nowadays, as the information itself. The form was that of printouts from the computer of the branch of Walter's company in Tahiti. Ordinarily, Walter did not see a piece of paper from one year's end to the next, any more than he normally had to deal personally with the multitude of government and other forms that influenced his life. All such things were handled for him now by the computers of the world, to which his XX2050 was an access point.

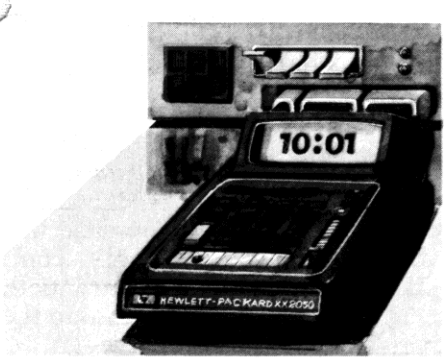
In very real fact, as long as he had the XX2050, he needed very little else in the way of material things. The XX2050 was like a latter-day Aladdin's lamp, which could summon up anything he needed and that either he or his company could afford. It did this by interlocking with the large, established computer nets wherever it happened to be, just as it had here in Jakarta.

When Walter had first found himself lost in the terminal, the XX2050 had used its built-in receiver to pick up a broadcast signal directing them to the nearest terminals of the airport computer net, translating the signal into a moving arrow of light on its screen for Walter's benefit. It could, if necessary, also have directed him to the computer terminals by voice directions.

Once slotted in one of the terminals, the XX2050 had been in direct connection with the airport computer net; and it had immediately contacted Pacificon Airline for a future flight, and discussed the clearing of Walter's luggage with customs.

The airport computer net was, of

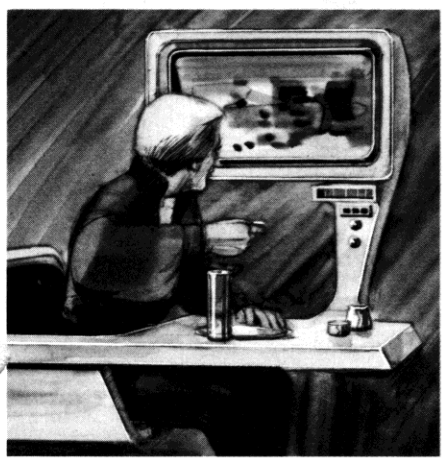
course, interconnected with all the other public service nets of the Jakarta area. Through the net deal-



ing with the autotaxis, the XX2050 had arranged for a cab to take Walter to this hotel, and through the hotel/motel network, had arranged for the sort of room Walter preferred. Finally, it had given the hotel computer full instructions on Walter's choice of food and drink, so that the clam chowder and the chicken salad sandwich were made and seasoned to his personal taste.

The relationship of the XX2050 to the computer nets in Walter's work and personal life was no less intricate. It was like a staff of personal secretaries, switchboard operator, and personal business manager, combined.

Aside from the nets, all by itself, the XX2050 had some remarkable capabilities. In its slim shape it possessed a gigabyte of memory power. Also, it had the ability to transmit and receive on a number of frequencies, including a pulsed signal that could alert a special response in one of the communication satellites overhead at all times in orbit around the Earth.



But such communication was for emergency situations. Most was of the direct slot-connection type. Next most common was short-range air-wave talk with other computer nets, including those of the international telephone networks. The XX2050 could open safes, lock up or unlock offices and houses, translate for Walter in the basic vocabularies of over fifty different languages, or teach him to speak a new one. It had been programmed with a number of systems, including one that allowed it to operate as a watchdog over Walter's general health, and give instructions about him, in a medical emergency, to any adult human nearby—such as in the case of a dangerous reaction to any one of the several allergies that Walter possessed.

Aside from this, the HP-XX2050 also received information from a number of sensors which had been implanted in Walter's body to keep track of everything from his blood pressure to indications of infection. Not only did it keep a running record for Walter's doctor, it could also, in case information from the sensors warranted it, warn Walter if certain food and drink was unwise for him, advise him when it was necessary to rest, or even call aloud for help in an emergency situation.

With all this care being taken of people like Walter, it might be questioned what inhabitants of the mid-twenty-first century would do with all the spare time that their auto-secretaries gained for them. Unfortunately, as Walter himself had discovered, the more you had time to do, the more that was found for you to do; which was probably one of the reasons the world was enjoying a per-capita productivity nowadays several times that which would have been considered possible, fifty or a hundred years before.

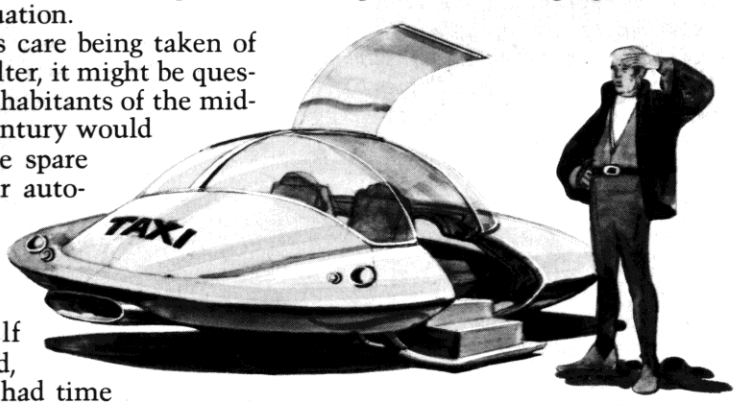
Nonetheless, cared for in this fashion Walter slept soundly, without worries. On waking, he found what he would have ordered himself for breakfast, already laid out and waiting for him.

So pleasant, in fact, was breakfast, after the events of the previous day, that he lingered over it longer than he normally would have, in spite of the warnings of the XX2050, and ended by having to rush to make his substitute flight, after all. Safe at last in the stratosphere and London-bound at nearly five thousand miles an hour, he relaxed and fell into conversation with a marine archaeologist in the opposite seating compartment, who had just finished six months of research at a station on the bottom of the Mindanao Trench, nearly seven miles beneath the surface waves of the Philippine Sea.

So interesting was this conversation that it was not until the plane had landed and he was climbing into an autocab that a nagging sense of something wrong surfaced in the shape of a sudden realization.

"Beep!" he said. "My portfolio! I forgot to take it when we left the hotel this morning. It's still there, back in Jakarta; and I'm due in an hour at the conference. The minute I get there those have to be read into the records of everyone there."

"It's all right, Walter," said the XX2050. "The hotel messaged the airport as we were taking off, to report the portfolio had been left behind. I gave directions to put it on a cargo rocket leaving right after us.



It's a completely automated cargo rocket, and scheduled to operate at trans-human accelerations. So it landed an hour and a half before us, and your portfolio is already at the conference site. You can pick it up from the Credentials Desk as you go in."

"Oh," said Walter. He sank back in his seat, wiping a suddenly damp brow. "Good. Very good. Thank you, Beep...!"

"My pleasure, Walter," said the HP-XX2050, primly.■

The E's have it!

Hewlett-Packard's Series E calculators offer innovative new features at lower prices than any comparable calculators we've ever offered.

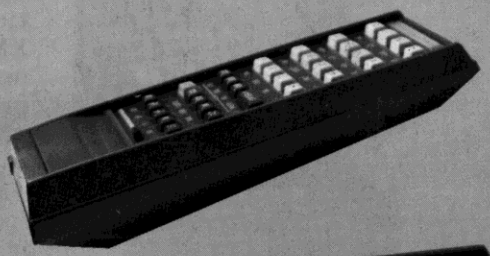
Error messages tell you when you've made a mistake and even what kind. And if you suspect the calculator, it will perform a diagnostic self-check at the touch of a key.

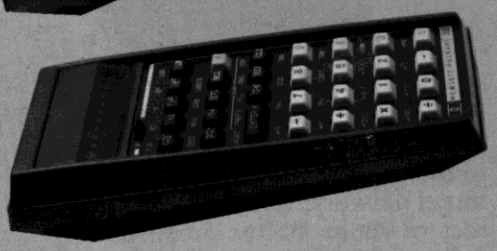
Larger, brighter LED display automatically separates thousands for easy reading.

Two features that aren't new: HP RPN, the easiest-to-use logic system available today, and traditional Hewlett-Packard quality. These instruments are designed—in every detail—to be the finest of their kind in the world.

Series E calculators are available in three scientific and two financial models, with and without key-stroke programmability.

Try one of them today!





HEWLETT hp PACKARD

Corvallis Division
1000 N.E. Circle Drive
Corvallis, OR 97330, U.S.A.

If Order Form is missing,
call Toll Free 800-648-4711, Ext. 1000
(Alaska and Hawaii excluded)
In Nevada call 800-992-5710.

Printed in U.S.A. 2/79 00-160

5953-1923D

Scan Copyright ©
The Museum of HP Calculators
www.hpmuseum.org

Original content used with permission.

Thank you for supporting the Museum of HP Calculators by purchasing this Scan!

Please to not make copies of this scan or make it available on file sharing services.