

CHOTKEH

1793 Riverside Dr. Suite 3H
New York, NY 10034
Tel: (212)942-5077
Fax: (212)942-8105

Dear Fellow Engineer:

I am pleased to provide you with the following guidelines to assist you in choosing an efficient way of beginning work with the HP48GX/SX calculator and the PE-ME Application Card.

1. Begin by reading the Frequently Asked Questions sheet.
2. Carefully read pages 1 through 5 of CHOTKEH's Manual. Plug in the card, locate the keys, menus, and demonstrate the features.
3. Practice the attached two (2) page SAMPLES OF NUMERIC KEYBOARD CALCULATIONS. An important step towards building a friendly relationship with your calculator.
4. Also, follow the procedure and practice the enclosed STAR-UP examples.
5. Additionally, practice the attached SELECTED BUILT-IN FUNCTIONS. These are valuable features, which are quite useful and truly worthy of your attention.
6. Further, spend as much time as needed to review the CHOTKEH's Manual to learn more about the subjects and equations which are programmed in the Application Card. This is an important step for you to identify the materials available to you. Also practice the examples in Air, Steam, Psychometric tables/chart, in Sections 14 and 15.
7. Finally, practice the solved problems in the Problems and Solution Book. This is a 200 hour study material and the most important part of your preparation which, if properly performed and fully understood, provides you a broad knowledge of the engineering fundamentals as well as the ability to utilize the calculator's valuable features. This upgraded version contains problems and solutions in SI too.

NOTE: Over 90% of equations can be used for both English (ENG) and SI systems. Conversion values are listed in the Variable Identification part of each section. Other equations containing numerical coefficients, are identified by ENG or SI symbols.

ATTENTION: While solving the problems, if you get the error message or losing any variable(s) of the current equation, to avoid the repetition and to correct the situation, refer to CHOTKEH's Manual, page 5, NOTES 2 and 3.

Remember, please do not move to another part before you feel comfortable with the one under study.

Please sign for technical support, by filling and sending the enclosed registration form. Facsimile your questions. Your constructive comments and recommendations are highly appreciated.

Sincerely yours,
Ali Badakhshan, P.E.

FREQUENTLY ASKED QUESTIONS

The screen is too dark/light, how do I adjust it?

Press the ON key and hold. Push the (+) or (-) key to adjust the shade of the screen.

How often do I have to change the battery in the application card?

CHOTKEH's application cards are not battery operated.

How do I plug in the card?

- Turn the calculator off and hold it with the back side facing you;
- Take the upper cap off. You should see two (2) slots, Port 1 and Port 2;
- The card can be placed in either port (Except for **PE-ME**, version **6.0** which should be placed in port 2) . Recommend not to use any other cards, while using CHOTKEH card.
- Hold the card with the written side facing you. Insert into the slot. The card will go in about 90%, then you need to push it down until it sits firm and the edge of the card aligns with the two light bulbs.
- Turn the calculator on and select the Library. The screen menu should display the subjects Directory names. If not, check to ensure the card is inserted properly. When done, put the cap back.

How do I turn the calculator's beeper off?

HP48 GX: Press the (right-shift) and MODES keys. Scroll to BEEP and take the check mark off.

HP48 SX: Press the (left-shift) and MODES keys. Press the screen menu (white) key under the BEEP.

How can I see the entire current equation?

Press the alpha key and hold, type EQ, release alpha key and press ENTER. Current equation will appear on the screen.

While using the card, what should I do if I notice the loss of a variable on the menu or getting error message?

Refer to CHOTKEH's Manual, page v (5), NOTES 2 and 3 for answer. Then correct the condition as follows:

- a. Purge the variable: key in ' type **variable's name** press **PURG(E)**. If did not work:
- b. Press **VAR** press **α** twice type **CLVAR** press **ENTER**. This process will purge all variables in the before the directory. If did not work:
- c. Press **ON A F** keys simultaneously and release. Press soft key under NO. This will re-set the calculator and clears the entire memory. If you have any equation or Directory you want to hold. This is not a right approach.

If I purchase a RAM card, will it improve the performance of CHOTKEH card?

You do not need additional RAM card when using CHOTKEH's application card.

Am I allowed to use the HP48GX/SX with the application card in the examination site?

For permissibility, contact the State Board where you are registered to take the examination.

Can I erase or change the data on the card?

CHOTKEH's application cards are ROM (Read-Only-Memory) cards. You can not change or erase the programmed data.

What is the return policy for CHOTKEH products?

If not satisfied, call (212)942-8105, within 30 days of receipt. The return and refund will be arranged. Shipment cost is not refundable.

How do I obtain technical support for CHOTKEH product?

Upon the receipt of the package, fill out the Registration form and mail/facsimile to CHOTKEH. There is 120 days of free technical support for registered users. Facsimile your questions to (212)942-8105.

Thank you for purchasing CHOTKEH products.

SAMPLES OF HP48 NUMERIC KEYBOARD CALCULATIONS

The ' mark at the left side of the expressions on second column, represents the key above the SIN key. Press ' key, type the expression and press EVAL key to get the answer.

HP Reverse Polish Notation (RPN)	Algebraic
1. Calculate 13×96	
13 SPC 96 x Answer: <u>1248</u>	' 13 x 96 EVAL Answer: <u>1248</u>
2. Calculate $\frac{24}{1.5}$	
24 SPC 1.5 ÷ Answer: <u>16</u>	' 24 ÷ 1.5 EVAL Answer: <u>16</u>
3. Calculate $13 \times 96 + 12$	
13 SPC 96 x 12 + Answer: <u>1260</u>	' 13 x 96 + 12 EVAL Answer: <u>1260</u>
4. Calculate 2.5^4	
2.5 SPC 4 y^x Answer: <u>39.0625</u>	' 2.5 y^x 4 EVAL Answer: <u>39.0625</u>
5. Calculate 3.6^{-4}	
3.6 SPC 4 +/- y^x Answer: <u>5.9537E-3</u>	' 3.6 y^x -4 EVAL Answer: <u>5.9537E-3</u>
6. Calculate $1/25$	
25 1/x Answer: <u>.04</u>	' 1 ÷ 25 EVAL Answer: <u>.04</u>
7. Calculate $\sqrt{75} + \frac{1}{2.5^2}$	
75 √x 2.5 x² 1/x + Answer: <u>8.82</u>	' √x 75 + 1 ÷ 2.5 y^x 2 EVAL Answer: <u>8.82</u>

SAMPLES OF HP48 NUMERIC KEYBOARD CALCULATIONS

HP Reverse Polish Notation (RPN)	Algebraic
8. Calculate $\sqrt{17^3 - 16^{2.5}}$	
17 SPC 3 y^x 16 SPC 2.5 y^x - √x Answer: <u>62.36</u>	' √x () 17 y^x 3 - 16 y^x 2.5 EVAL Answer: <u>62.36</u>
9. Calculate $\sqrt{\frac{13^2 - 16^{1.5}}{(2.5+2)^2}}$	
13 SPC 2 y^x 16 SPC 1.5 y^x - 2.5 SPC 2 + 2 y^x + √x Answer: <u>2.28</u>	' √x () () 13 y^x 2 - 16 y^x 1.5 ► + () 2.5 + 2 ► y^x 2 EVAL Answer: <u>2.28</u>
10. Given a voltage (210 , Δ0) and current (11 , Δ15) calculate the complex impedance.	
At POLAR () 210 Δ 0 ► SPC () 11 Δ 15 + Answer: <u>(19.09 , Δ-15)</u>	At POLAR ' () 210 , Δ 0 ► + () 11 , Δ 15 EVAL Answer: <u>(19.09 , Δ-15)</u>
11. Calculate the Rectangular and Polar equivalent of two (2) impedances , (15 +4 j) and (12 , Δ-5) , in parallel. $Z_e = 1/(1/Z_1 + 1/Z_2)$	
Get off the POLAR () 15 SPC 4 1/x () 12 Δ 5 +/- 1/x + 1/x Answer: <u>(6.86, 0.44)</u> At POLAR Answer: <u>(6.87 , Δ3.68)</u>	Get off the POLAR ' 1 ÷ () 15 , 4 ► + 1 ÷ () 12 , Δ 5 +/- EVAL 1/x Answer: <u>(6.86, 0.44)</u> At POLAR Answer: <u>(6.87 , Δ3.68)</u>

START UP

ME SOLVED PROBLEMS (Version 6.0) **HP48GX**

Before practicing, please read pages 1 through 5 of CHOTKEH's Manual.

GENERAL NOTE: The entire program is stored in the calculator's library, therefore, first get to the library by pressing $\rightarrow$ **LIBRARY** for **GX** and $\leftarrow$ **LIBRARY** for **SX**.

1. A car was bought for \$20,000 including \$4,000 down payment. If the balance to be paid in five (5) equal annual installments of \$3,900, the annual interest rate is nearly:

- (A) 6.6%
- (B) 7.0%
- (C) 7.2%
- (D) 7.5%
- (E) 8.0%

Solution:

Refer to ENGINEERING ECONOMIC SECTION, ENEC, Page 4-4.

The ID **NAME** for calculating the installment of mortgage is equation (30) **INSTL** (ENEC/MORT):

Select **LIBRARY**, Press ENEC NXT MORT INSTL

Enter **3900** for **INSTL**, **5** for **N**, $20000 - 4000 = 16000$ for **LOAN**

Press $\leftarrow$ **I**

Answer: **I** = .0698 = **6.98%** (B)

2. The full load current for a three (3) phase, 440 V, 60 hp electric motor with 87% efficiency and .89 power factor is nearly:

- (A) 63 amps.
- (B) 71 amps.
- (C) 76 amps.
- (D) 81 amps.
- (E) 83 amps.

Solution:

Refer to ELECTRICITY SECTION, ELEC, Page 3-3.

The ID **NAME** for calculating the 3 phase current, with the power given in hp, is equation (33) **HP3 ϕ** (ELEC/MOTR/POWR):

Select **LIBRARY**, Press ELEC MOTR POWR **HP3 ϕ**

Enter **60** for **hp**, **440** for **V**, **.89** for **PF**, **.87** for **η**

Press $\leftarrow$ **I**

Answer: **I** = **75.82** amps (C)

GENERAL NOTE: The program is stored in the calculator's library, therefore, first, get to the library by pressing $\rightarrow$ LIBRARY for GX and $\leftarrow$ LIBRARY for SX.

3. The amount of air for perfect combustion of one (1) pound of solid fuel; containing 86% carbon, 12.5% hydrogen, 0.5% nitrogen, and 1% sulfur is most nearly:

- (A) 11.6 lb
- (B) 12.3 lb
- (C) 13.7 lb
- (D) 14.2 lb
- (E) 14.8 lb

Solution:

Refer to COMBUSTION SECTION, CMBS, Page 1-1.

The ID NAME for calculating the air mass for solid fuel is equation (02) **SOLID** (CMBS/AIR/MASS)

Select LIBRARY, Press CMBS AIR MASS SOLID

Enter: 1 for mf; .86 for W.C, .125 for W.H2, 0 for W.O2, .01 for W.S2, NXT, 0 for XAIR (no excess air)

NXT

Press $\leftarrow$ MA

Answer: ma=14.18 lb (D)

4. The equivalent diameter of a 14"x20" rectangular duct, with the equal friction loss, is most nearly:

- (A) 15"
- (B) 16"
- (C) 17"
- (D) 18"
- (E) 19"

Solution:

Refer to DUCTS SECTION, DUCT, Page 2-1.

The ID NAME for calculating the equivalent diameter is equation (07) **D** (DUCT/EQL.F)

Select LIBRARY, Press DUCT EQL.F D

Enter 14 for a (smaller side), 20 for b (larger side)

Press $\leftarrow$ D

Answer: D=18.2" (D)

GENERAL NOTE: The program is stored in the calculator's library, therefore, first, get to the library by pressing $\rightarrow$ LIBRARY for GX and $\leftarrow$ LIBRARY for SX.

5. A fan with the flow rate of 12,500 cfm and 3.4 inH₂O static pressure, runs at 840 rpm. The brake horsepower is measured as 8.2 hp. If the fan's speed changed to 1,300 rpm, the new brake horsepower is nearly:

- (A) 13 hp
- (B) 19 hp
- (C) 21 hp
- (D) 27 hp
- (E) 30 hp

Solution:

Refer to FANS SECTION, FANS, Page 5-3.

The ID NAME for calculating the new horsepower due to change in the rpm, under the fans law, is equation (25) **RPM** (FANS/LAW/ ΔHP):

Select LIBRARY, Press FANS LAW ΔHP RPM

Enter 8.2 for hp1, 840 for n1, 1300 for n2

Press $\leftarrow$ HP2

Answer: hp2=30.4 hp (E)

6. Two straight bevel gears have a velocity ratio of 2 to 1. If the gears are transmitting 12 horsepower at pinion's 240 rpm, the torque on the gear is nearly:

- (A) 5900 in-lbf
- (B) 6100 in-lbf
- (C) 6300 in-lbf
- (D) 6350 in-lbf
- (E) 6700 in-lbf

Solution:

Refer to GEARS SECTION, GEAR, Page 6-2.

The ID NAME for calculating the torque under general equations, is equation (19) **TORQ** (GEAR/GNRL):

Select LIBRARY, Press GEAR GNRL TORQ

Enter 12 for hp, 240/2 = 120 (gear's rpm) for n

Press $\leftarrow$ T

Answer: T=6302.5 in-lbf (C)

GENERAL NOTE: The program is stored in the calculator's library, therefore, first get to the library by pressing $\rightarrow$ LIBRARY for GX and $\leftarrow$ LIBRARY for SX.

7. A 5 m by 4 m wall consist of a 10 cm brick and 1 cm plaster. The inside/outside temperature difference is 20 Oc. Assuming $K = .66 \text{ W/m.K}$ for brick, $K = .52 \text{ W/m.K}$ for plaster, and indoor/outdoor air film coefficients are $9.4 \text{ W/m}^2.\text{K}$ and $34 \text{ W/m}^2.\text{K}$ respectively, the heat loss through the wall is nearly:

- (A) 1200 W
- (B) 1250 W
- (C) 1275 W
- (D) 1300 W
- (E) 1330 W

Solution:

Refer to HEAT TRANSFER SECTION, HIT.TR, Page 7-4.

The ID NAME for calculating the heat flow thru a composite slab of 2K & 2h, is equation (39) **2K2H** (HIT.TR/HIT.FL/SLAB):

Select LIBRARY, Press NXT HIT.TR HIT.FL SLAB NXT 2K2H

Enter: 20 for A, 20 for Δt , 9.4 for h_1 , .1 for L_1 , .66 for K_1 , NXT, .01 for L_2 , .52 for K_2 , 34 for h_2 ,
NXT

Press $\leftarrow$ Q

Answer: $q = 1304.9 \text{ W (D)}$

8. For an air conditioning system with the designed room temperature of 78 Of and supply air temperature of 67 Of, if the total sensible cooling load is equal to 25,000 BTU/h, the flow rate of the supply fan is most nearly:

- (A) 1900 cfm
- (B) 1950 cfm
- (C) 2000 cfm
- (D) 2050 cfm
- (E) 2100 cfm

Solution:

Refer to HVAC SECTION, HVAC, Page 8-1.

The ID NAME for calculating the fan flow rate in English system is equation (10) **FAN** (HVAC/AIR/FLOW/ENG)

Select LIBRARY, Press NXT HVAC AIR FLOW ENG FAN

Enter 25000 for q_s , 78 for t_r , 67 for t_s

Press $\leftarrow$ CFMF

Answer: $\text{cfmF} = 2104 \text{ cfm (E)}$

GENERAL NOTE: The program is stored in the calculator's library, therefore, first, get to the library by pressing $\rightarrow$ LIBRARY for GX and $\leftarrow$ LIBRARY for SX.

9. For an air conditioning system the fresh air with 35 Oc temperature and .89 m³/kg specific volume is mixed with returned air with 25 Oc temperature and .86 m³/kg specific volume. If the flow rate of the fresh and returned air are 1650 L/s and 7,000 L/s respectively, the temperature of mixed air entering the cooling coil is nearly:

- (A) 26 Oc
- (B) 27 Oc
- (C) 28 Oc
- (D) 29 Oc
- (E) 30 Oc

Solution:

Refer to HVAC SECTION, HVAC, Page 8-2.

The ID NAME for calculating the temperature of mixed air, with the flow rate by volume, is equation (16) **TEMP** (HVAC/AIR/MIXTR/VOLM)

Select LIBRARY, Press NXT HVAC AIR MIXTR VOLM TEMP

Enter 1650 for Q1, .86 for v2, 35 for t1, 7000 for Q2, .89 for v1, NXT, 25 for t2, NXT

Press $\leftarrow$ TMIX

Answer: tmix=26.9 Oc (B)

10. A 35 m long 100 mm inside diameter pipe is carrying water, at the flow rate of 21 L/s. If the friction factor assumed to be 0.02, the friction head through the pipe is nearly:

- (A) 1.9 m
- (B) 2.2 m
- (C) 2.4 m
- (D) 2.6 m
- (E) 2.7 m

Solution:

Refer to HYDRAULIC MACHINES SECTION, HYDM, Page 9-2.

The ID NAME for calculating the friction head, Darcy equation, with the flow in L/s (SI system) is equation (18) **LPS** (HYDM/FRIC.H/DARCY/SI)

Select LIBRARY, Press NXT HYDM FRIC.H DARCY SI LPS

Enter .02 for f, 35 for Le, 21 for lps, 9.81 for g, .1 for D

Press $\leftarrow$ HF

Answer: hf=2.55 m (D)

GENERAL NOTE: The program is stored in the calculator's library, therefore, first get to the library by pressing $\rightarrow$ LIBRARY for GX and $\leftarrow$ LIBRARY for SX.

11. A pump is operating at 650 gpm and 52 ft head. If the fluid's specific gravity is 0.87 and pump's efficiency is equal to 78%, the brake horsepower is nearly:

- (A) 12.5 hp
- (B) 11.6 hp
- (C) 10.4 hp
- (D) 10.0 hp
- (E) 9.5 hp

Solution:

Refer to HYDRAULIC MACHINES SECTION, HYDM, Page 9-4.

The ID NAME for calculating the pump's horsepower, with the flow in gpm (ENG system), is equation (53) **GPM** (HYDM/PUMP/HP/ENG)

Select LIBRARY, Press NXT HYDM NXT PUMP HP ENG GPM

Enter **52** for **Ha**, **650** for **gpm**, key in ' .87*62.4 EVAL=**54.3** for **ρ** , **.78** for **η**

Press $\leftarrow$ HP

Answer: **hp=9.53 hp (E)**

12. A steam power plant generates 400 MW electric power. If the condensate load is 2EE9 BTU/h and the other required power for auxiliary equipment is neglected, the system's efficiency is nearly:

- (A) 38.5%
- (B) 39%
- (C) 40%
- (D) 40.5%
- (E) 41%

Solution:

Refer to POWER CYCLE SECTION, PCYCL, Page 10-4.

The ID NAME for calculating the system's efficiency, with the given output heat in English system, is equation (35) **QOUT** (PCYCL/EFFI/SYST/ENG)

Select LIBRARY, Press NXT PCYCL EFFI SYST ENG QOUT

Enter **400000** for **Kw**, **0** for **kWin**, **2EE9** for **qout**

Press $\leftarrow$ **η_{SYS}**

Answer: **η_{SYS} = .406=40.6% (D)**

SELECTED BUILT-IN FUNCTIONS
HP48G & HP48GX

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BINARY ARITHMETIC

Example (1): Convert Hexadecimal 56AB to Decimal base.

Press **[MTH]** **[BASE]** **[HEX]**

Press **[→]** **[#]** 56 **[α]** **[A]** **[α]** **[B]** **[ENTER]**

Press **[DEC]**

Answer: # 22187d

Example (2): Display the same in Octal base

Press **[OCT]**

Answer : # 53253o

Example (3): Display the same in Binary base

Press **[BIN]**

Answer: # 101011010101011b

Example (4): Divide the above answer by 10101b

Press **[→]** **[#]** 10101 **[÷]**

Answer: # 10000100000b

COMBINATION

Example: Find combination (arrangement without order) (5,4)

Press **[MTH]** **[NXT]** **[PROB]**

Type 5 **[ENTER]** 4 **[COMB]**

Answer: 5

COMPLEX NUMBER

Example: Solve $\frac{(9+4i) + (-4+3i)}{(3+i)}$

Press $\boxed{0} \boxed{\leftarrow} \boxed{() \leftarrow ()} 9 \boxed{\leftarrow} \boxed{,} 4 \boxed{\rightarrow} \boxed{+} \boxed{\leftarrow} \boxed{() \leftarrow ()} 4 \boxed{\pm} \boxed{\leftarrow} \boxed{,} 3 \boxed{\rightarrow} \boxed{\rightarrow}$
 $\boxed{\div} \boxed{\leftarrow} \boxed{() \leftarrow ()} 3 \boxed{\leftarrow} \boxed{,} 1$

Press $\boxed{\text{EVAL}}$

Answer: (2.2,1.6) or 2.2+1.6i

DETERMINANT

Example: Solve

$$\begin{vmatrix} 1 & -1 & 4 \\ 2 & 11 & -3 \\ 6 & -7 & 10 \end{vmatrix}$$

Press $\boxed{\leftarrow} \boxed{[] \leftarrow []} 1 \boxed{\text{SPC}} 1 \boxed{\pm} \boxed{\text{SPC}} 4 \boxed{\rightarrow} \boxed{\leftarrow} \boxed{[] \leftarrow []} 2 \boxed{\text{SPC}} 11 \boxed{\text{SPC}}$
 $3 \boxed{\pm} \boxed{\rightarrow} \boxed{\leftarrow} \boxed{[] \leftarrow []} 6 \boxed{\text{SPC}} 7 \boxed{\pm} \boxed{\text{SPC}} 10$

Press $\boxed{\text{MTH}} \boxed{\text{MATR}} \boxed{\text{NORM}} \boxed{\text{NXT}} \boxed{\text{DET}}$

Answer: -193

ELECTRIC CIRCUITS

Example: For a voltage of (10, $\angle$ 0) and a current (2, $\angle$ 30), calculate complex impedance.

$\boxed{\rightarrow} \boxed{\text{POLAR}}$

$\boxed{0} \boxed{\leftarrow} \boxed{() \leftarrow ()} 10 \boxed{\leftarrow} \boxed{,} \boxed{\rightarrow} \boxed{\angle} 0 \boxed{\rightarrow} \boxed{\div} \boxed{\leftarrow} \boxed{() \leftarrow ()} 2 \boxed{\leftarrow} \boxed{,} \boxed{\rightarrow} \boxed{\angle} 30$

Press $\boxed{\text{EVAL}}$

Answer: (5, $\angle$ -30)

To find rectangular coordinate:

$\boxed{\rightarrow} \boxed{\text{POLAR}}$

Answer: (4.33, -2.5)

EXPRESSION

Example: Solve $2^{(1.1 \times 1.6)} + \text{LOG} 22 + 2.5\sqrt{7} * \text{SIN} 50$

Press $\boxed{2} \boxed{y^x} \boxed{\leftarrow} \boxed{(} \boxed{1.1} \boxed{\times} \boxed{1.6} \boxed{\rightarrow} \boxed{+} \boxed{\rightarrow} \boxed{\text{LOG}} \boxed{22} \boxed{\rightarrow} \boxed{+} \boxed{\rightarrow} \boxed{\sqrt{y}} \boxed{2.5} \boxed{\leftarrow} \boxed{,} \boxed{7} \boxed{\rightarrow} \boxed{\times} \boxed{\text{SIN}} \boxed{50} \boxed{\text{ENTER}} \boxed{\text{EVAL}}$ Answer: 6.3978

FACTORIAL

Example: Solve 5!

Press $\boxed{\text{MTH}} \boxed{\text{NXT}} \boxed{\text{PROB}} \boxed{5} \boxed{!}$ Answer: 120

LINEAR (SIMULTANEOUS) EQUATIONS

Example: Solve
$$\begin{cases} 2x + 4y + z = 9 \\ -x - 3y - z = -8 \\ 3x - y + z = -2 \end{cases} \quad \text{for } x, y, z$$

Press $\boxed{\leftarrow} \boxed{9} \boxed{\text{SPC}} \boxed{8} \boxed{\pm} \boxed{\text{SPC}} \boxed{2} \boxed{\pm} \boxed{\text{ENTER}}$

Press $\boxed{\leftarrow} \boxed{2} \boxed{\text{SPC}} \boxed{4} \boxed{\text{SPC}} \boxed{1} \boxed{\rightarrow}$

Press $\boxed{\leftarrow} \boxed{1} \boxed{\pm} \boxed{\text{SPC}} \boxed{3} \boxed{\pm} \boxed{\text{SPC}} \boxed{1} \boxed{\pm} \boxed{\rightarrow}$

Press $\boxed{\leftarrow} \boxed{3} \boxed{\text{SPC}} \boxed{1} \boxed{\pm} \boxed{\text{SPC}} \boxed{1} \boxed{\text{ENTER}}$

Press $\boxed{\div}$

Answer: x=-1, y=2, z=3

PERMUTATION

Example: Find Permutation (arrangement with order) (5,4)

Press **[MTH]** **[NXT]** **[PROB]**

Type 5 **[ENTER]** 4 **[PERM]**

Answer: 120

PLOTTING

Example: Plot $x^2 - 2x - 3$ and find the roots

Press **[→]** **[PLOT]**

Press **[α]** **[X]** **[y^x]** 2 - 2 x **[α]** **[X]** -3 **[ENTER]**

Select **[AUTOSCALE]**, press **[✓CHK]** **[ERASE]** **[DRAW]**

To find the roots, use cursor movers **[▶]**, locate the (+) sign close to the right side of X axis intersection, press **[FCN]** **[ROOT]**

Answer: Root: 3

Locate the (+) sign close to left side intersection

Press any soft key and **[ROOT]**

Answer: Root: -1

Press **[ON]** **[ON]** to get back to calculation mode.

QUADRATIC EQUATION

Example: Solve $2x^2 + 5x - 12 = 0$

Note: It is assumed that variable X does not exist in this directory. To purge:

Press **[1]** **[α]** **[X]** **[←]** **[PURG]**. Continue to solve the problem as follows:

Press **[1]** 2 x **[α]** **[X]** **[y^x]** 2 + 5 x **[α]** **[X]** -12 **[ENTER]**

Press **[1]** **[α]** **[X]** **[ENTER]**

Press **[←]** **[SYMBOLIC]** **[QUAD]** **[ENTER]**

Type 1 **[1]** **[α]** **[←]** **[s]** 1 **[STO]** **[EVAL]**

Answer: x=1.5

Type 1 **[±]** **[1]** **[α]** **[←]** **[s]** 1 **[STO]**

Press **[←]** **[SWAP]** **[EVAL]**

Answer: x=-4

STATISTICAL ANALYSIS

Example: The following table represents 40 examinee's score frequency distribution:

Grade	55	57	59	61	63	66	70	73	77	79	81	83	85
Frequency	1	3	2	3	2	4	7	5	4	3	3	1	2

1. Plot frequency Histogram

Press $\leftarrow$ [STAT] [DATA] [CL $\bar{x}$]

Press $\leftarrow$ [] 55 [SPC] 1 [$\bar{x}$ +] 57 [SPC] 3 [$\bar{x}$ +] 59 [SPC] 2 [$\bar{x}$ +] 61 [SPC] 3
 [$\bar{x}$ +] 63 [SPC] 2 [$\bar{x}$ +] 66 [SPC] 4 [$\bar{x}$ +] 70 [SPC] 7 [$\bar{x}$ +] 73 [SPC] 5 [$\bar{x}$ +] 77
 [SPC] 4 [$\bar{x}$ +] 79 [SPC] 3 [$\bar{x}$ +] 81 [SPC] 3 [$\bar{x}$ +] 83 [SPC] 1 [$\bar{x}$ +] 85 [SPC] 2
 [$\bar{x}$ +] [STAT] [PLOT] [BARPL]

Answer: Bar plot will appear

Press [CANCEL] or [ON] to get off the graphic mode.

2. Calculate the Arithmetic Mean and Standard Deviation

Press $\leftarrow$ [STAT] [DATA] [CL $\bar{x}$]

Type 55 [$\bar{x}$ +] 57 [$\bar{x}$ +] 57 [$\bar{x}$ +] 57 [$\bar{x}$ +] 59 [$\bar{x}$ +] 59 [$\bar{x}$ +] 83 [$\bar{x}$ +]
 85 [$\bar{x}$ +] 85 [$\bar{x}$ +] [STAT]

Note: Number of entries for very score is equal to number of frequencies.

Press [1VAR] [MEAN]

Answer: Mean=70.33

Press [SDEV]

Answer: St. Deviation=8.53

3. Calculate what percent scored between 70 & 85

Press [MTH] [NXT] [PROB] [NXT] 70.33 [ENTER] 8.53 $\leftarrow$ [x²] 70 [UTPN]

Press $\rightarrow$ [ARG] $\leftarrow$ [DROP] 85 [UTPN]

Press [=]

Answer: 0.47 or 47%

TIME ARITHMETIC

Example (1): Determine the date 49 days after 7/9/94

Press $\leftarrow$ [TIME] [NXT] 7.091994 [ENTER]

Type 49 [DATE+]]

Answer: 08.271994 or 8/27/94

Example (2): Calculate number of days between 7/9/94 and 8/27/94

Press $\leftarrow$ [TIME] [NXT] 7.091994 [ENTER]

Type 8.271994 [DDAYS]

Answer: 49

UNIT CONVERSION

Following is the UNITS catalog menu which converts to built-in units. To reach to any group:

Press $\rightarrow$ [UNITS] [LEGN] [AREA] [VOL] [TIME] [SPEED] [MASS]
[NXT] [FORCE] [ENRG] [POWR] [PRESS] [TEMP] [ELEC]
[NXT] [ANGL] [LIGHT] [RAD] [VISC]

Example (1): Find equivalent of 8 gallon in cubic feet

Press $\rightarrow$ [UNITS] [VOL] [NXT] 8 [GAL] $\leftarrow$ [PREV]

Press $\leftarrow$ [FT^3]

Answer: 1.069 ft^3

Example (2): Calculate 1.5 yards + 2.5 feet + 3 inches

Press $\rightarrow$ [UNITS] [LENG] 1.5 [YD] 2.5 [FT] 3 [IN]

Press [+]

Answer (1): 87-in

Press $\leftarrow$ [FT]

Answer (2): 7.25-ft

Press $\leftarrow$ [YD]

Answer (3): 2.42-yd