SONIN®

InchMate® 2000

Reference Guide

Professional
Foot / Inch / Fraction
Construction Calculator

Model DT220 CE

SONIN INC.
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CONTENTS

INTRODUCTION 3
- Key Pad Information 3-11
  - General Purpose Keys 3-4
  - Memory Keys 4-5
  - Other Functions Keys 5-6
  - Liquid Keys 6-7
  - Weight Keys 7
  - Dimension Keys 7-9
  - Triangle Keys 9-11

GETTING STARTED 12-19
- Working with Dimensions and Units 12-13
  - Addition 12
  - Subtract 13
  - Multiply 13
  - Divide 13
- Default Settings 14-15
  - Reduced Fraction Mode 14
  - Weight/Volume 14
  - Construction Settings 15
- Conversions 15-17
  - Linear Conversions 15-16
  - Area Conversions 16
  - Volume Conversions 17
  - Weight Conversions 17
  - Liquid Conversions 17
  - Temperature Conversion 17
- Paperless Tape Review 18-19

EXAMPLE PROBLEMS 20-35
- Complex Area 20
- Carpentry Rough Opening 21
- Carpentry – Joist Numbers 21

CONTENTS

- Costing a Concrete Walkway 22
- Squaring a Foundation 23
- Stair – Run Known 23-24
- Stairs with Unconventional Risers & Treads 25-26
- Raked Wall – Stud Lengths 27
- Board Feet Lumber 28
- Circle Solutions 28
- Simple Concrete Footings 28-29
- Concrete Weight/Volume 30
- Roof Rise 31
- Roof Pitch – Given Rise & Run 32
- Regular Hip/Valley & Jack Rafter 32-33
- Irregular Hip/Valley & Jack Rafter 34-35

REFERENCE 36-37
- Chaining 36
- Error/Overflow 36
- Auto-Range 36
- Care 37
- Battery 37
- Resetting Your Calculator 37

APPENDIX 38-42
- Conversion Tables 38
- Area Formulas 39
- Volume Formulas 40
- Lumber Sizes 41
- FCC Statement 42

WARRANTY & REGISTRATION 43-45
- Warranty Information 43
- Customer Service 44
- Warranty Registration 45

INTRODUCTION

If you build or design things you know the importance of working with accurate dimensions. The most frustrating and costly construction headaches can usually be traced to dimensional errors.

The INCH[MATE] 2000 is part of the new generation of Sonin Feet-Inch-fraction Calculators… helping people who work with dimensions to simplify difficult and tedious calculations.

KEY PAD INFORMATION

General Purpose Keys

Note: The key to be pressed appears between the left and right brackets, e.g., **[+]** except when referring to numerals.

[On/Off] Turns calculator ON and OFF.
To save the battery, calculator will turn off automatically after approximately 10 - 12 minutes of inactivity at which time the displayed value and memory content will be cleared.

[CE/CLR] Press this key once clears the current entry. Pressing it twice clears display to "0". Memory register & default setting are not affected.

[0] to **[9]** Enters the numbers 0 thru 9 into the display.

KEY PAD INFORMATION

[+] [−] [×] [÷] Performs arithmetic operation.

[=] Completes all previously entered arithmetic operations and displays the result.

[.] Enters a decimal point.

[2ND] Activates the 2ND Function for designated keys. 2ND function is indicated above keys.

[%] **Percent** is used to find a given percentage of a number.

[2ND] [6] X^2 is used to take the square (quantity multiplied by itself) of the number on the display. No operation is performed if the square of an area or cubic dimensioned number is taken, Error will be displayed.

[2ND] [9] Square Root - $\sqrt{\ }$ takes the square root of a number. Error will display if you try to take square root of a linear or volume value.

Memory Keys

[M+] If memory is clear, enters displayed quantity into memory. If a value is already stored in memory this will add displayed quantity to memory.

KEY PAD INFORMATION

[2ND] [M+] **Subtracts** displayed quantity from memory. The result is then placed in memory.

[RCL] **Memory Recall** retrieves data from selected memory & displays it.
NOTE: To display & keep in memory press **[RCL] [M+]** . To display and remove from memory press **[RCL] [RCL]**.

[2ND] [RCL] **CLEARS MEMORY** without displaying it.

Other Functions Keys

[Cost] **Cost** is used when calculating the cost of items.

[2ND] [%] **Restore Defaults** allows the calculator to restore ALL changed default values (NOTE: effects Wt/Vol., fraction, stair, rake, jack & hip/valley settings).

[2ND] [3] π is used to insert the value of Pi (3.141592) onto the display for use in subsequent calculations, or for use as part of a mathematical process.

[2ND] [0] **English/Metric Mode** changes the first function Imperial unit keys to their corresponding metric unit functions. It allows the user to enter a series of

KEY PAD INFORMATION

metric values without having to use the second function key. The **Metric** icon is active when the metric mode has been selected. To return back to English mode press **[2ND] [0]** again.

2ND **=** **Paperless Tape Review** Access.

2ND **·** **Paperless Tape Review** Exit.

2ND **5** **Weight Per Volume** displays and enters a weight per volume (density) to be used in calculating weight. (see Default Values)

2ND **8** **Weight** is used to calculate the total weight of a volume of material.

2ND **—** **+/- Change Sign** changes the sign of displayed value between positive and negative.

2ND **÷** **Inverse** 1/X divides the number 1 by the number on the display

Liquid Keys

Gal **Gal** Use to enter and convert gallons.

Fl Oz **Fl Oz** Use to enter and convert fluid Ounces.

KEY PAD INFORMATION

2ND **Gal** **Liter** Use to enter and convert Liters.

2ND **Fl Oz** **ml** Use to enter and convert milliliters.

Weight Keys

Ton **Ton** Use to enter and convert Tons.

2ND **Ton** **M Ton** Use to enter and convert Metric Tons.

lbs **lbs** Use to enter and convert pounds.

2ND **lbs** **kg** Use to enter and convert kilograms.

DryOz **Dry Oz** use to enter and convert Dry Ounces.

2ND **DryOz** **grams** Use to enter and convert grams.

Dimension Keys

Mile **Mile** Use for entering or converting miles, displayed in decimal units.

Yard **Yards** Use for entering or converting yards.

Feet **Feet** Use for entering or converting feet. You may stop entry after feet or continue by entering inches and fractions.

KEY PAD INFORMATION

Inch **Inch** Use for entering inches. You may continue by entering fractions. Or press twice for decimal inches.

/ 2 **/ 4** **/ 8** **/ 16** **/ 32** **/ 64** **Fraction of an Inch Denominator keys-** They complete your fraction entries. Only fraction inches are defined.

2ND **Mile** **km** Use for entering or converting kilometers.

2ND **Yard** **m** Use for entering or converting meters.

2ND **Feet** **cm** Use for entering or converting centimeters.

2ND **Inch** **mm** Use for entering or converting millimeters.

Sq **Square** Use for entering square units. Press the **[Sq]** key before the units key. Example: Enter **5 [Sq] [Feet]**

2ND **Sq** **Cube** Use for entering cubic units. Press **[2ND] [Sq]** before the entering units key. Example: Enter **5 [2ND] [Sq] [Feet]**

2ND **1** **Bd Ft** Use for entering or converting board feet.

KEY PAD INFORMATION

2ND 7 — **Circle** is used to find the circumference and area of a known diameter of a circle.

2ND 4 — **Arc** is used to find the length of an arc after diameter and angle are entered.

2ND 2 / 2 ⋮ / 64 — **Fixed Fraction** mode is used to select a desired fraction result.

Triangle Keys

Pitch — **Pitch** is used to calculate the pitch (slope) of a right triangle. Once pitch entered continued pressing of pitch key will cycle through Angle, Rise and Ratio.

Run — **Run** is used to enter or calculate. To calculate the run, you must enter any two of the following: rise, pitch, diagonal (length).

Rise — **Rise** is used to enter or calculate. To calculate the rise, you must enter any two of the following: run, pitch diagonal (length)

KEY PAD INFORMATION

Diag — **Diagonal**/Length is used to enter or calculate. To calculate the diagonal/length, you must enter any two of the following: Rise, Run, Pitch.

2ND Diag — **Raked Wall** is used to figure stud lengths in a raked wall. Given pitch, rise and/or run continuous pressing of Rake function will show descending stud lengths.

H/V — **Hip/Valley** is used to find the lengths of regular or irregular hip/valley rafters. When used alone it shows the regular hip/valley length. If an irregular pitch **[2ND] [H/V]** is entered first, then the irregular hip/valley will be shown.

2ND H/V — **Irregular Pitch** is used to change the regular pitch value for determining lengths of irregular hip/valley and jack rafters. To recall press **[2ND] [H/V]**

Jack — **Jack** is used once the length of the Hip (or valley) is found. Continuous entry will display the descending sizes of the jack rafters until “0” is displayed. These calculations will use a standard on center stud spacing of 16" unless otherwise specified. To change the OC default enter desired dimension prior to pressing **[Jack]**.

KEY PAD INFORMATION

2ND Jack — **Irregular Jack** is used once the length of the Hip(or valley) rafter is found. Entry of **[2ND] [Jack]** followed by successive entry of **[Jack]** will display the descending sizes of the irregular hip (or valley) until “0” is displayed. Continuing to press **[Jack]** will show the display the regular jack rafters.

2ND Rise — **Stair** is used to calculate the number or risers, actual riser heights, riser under/overage, number of treads, tread overage/underage, stringer/carriage and inclination angle-Rise and/or Run is required. The default riser height of 71/2" can be changed by pressing desired height followed by **[2ND] [Rise] .**

2ND Run — **Tread** is used to calculate the width of the tread. The default tread width of 10" can be changed by pressing desired width followed by **[2ND] [Run]** .

To activate battery, carefully remove plastic tab from battery compartment.

Your calculator utilizes chaining logic allowing you to carry our successive intermediate operations using the **[=]** key to finalize operations. See page 34 for Chaining

3 + 5 =	8.
9 − 5 =	4.
4 × 7 =	28.
7 2 ÷ 9 =	8.

Working with Dimensions and Units

When entering dimensional values, you must always enter the largest dimension first. When entering fractions, enter the numerator followed by the dedicated denominator key (**[/2] ... [/64]**). If an operation is performed with mixed units, your calculator will automatically convert the result to the units of first entry.

Addition:

Enter 5 Feet 7 Inch +
6 Feet 9 Inch 1 / 16 =

12 Ft - 4 1/16 INCH

Enter 5 · 7 Feet +
6 · 6 Feet =

12.3 Ft

Subtract:

Enter 9 Feet 1 1 Inch −
3 Feet 4 Inch 1 / 4 =

6 Ft - 6 3/4 INCH

Enter 2 0 Feet −
6 · 7 5 Feet =

13 Ft - 3 INCH

Multiply:

Enter 1 8 Feet ×
1 · 2 Feet =

21.6 SQ Ft

Enter 1 8 Inch × 3 =

54 INCH

Divide:

Enter 3 6 Inch ÷ 3 =

12 INCH

Enter 1 4 Feet 3 / 32 ÷ 2 =

7 Ft - 0 3/64 INCH

Enter 5 Inch ÷ 2 Inch =

2.5

DEFAULT SETTINGS

Reduced Fraction Mode

Your calculator is set to Reduced Fraction mode which give the most accurate result (to the /64th). To change your results to a Fixed Fraction you must press **[2ND] [2]** and desired denominator. The FIX icon will blink. To confirm your selection press **[2ND]** again.

Example: To change to /8th fixed fraction:
Press 2ND 2 / 8 2ND. Your calculations will now result to the nearest /8th.

To Restore back to Reduced Fraction Mode press **[2ND] [2]**

Weight/Volume

The density default values are 1.5 Tons/Cu Yd, 3000 lb/Cu Yd, and 1779.829 kg/Cu M. The density is used in calculating weight. When using English units, the density is entered as tons per cubic yard or pounds per cubic yard; when using metric units, the density is entered as kilograms per cubic meter.

You can recall the density by entering **[2ND] [5]**. Continuing to press 5 causes the calculator to cycle through the various units: Tons/Cu Yd, LB/Cu Yd and kg/Cu M. You can set a new density by entering the weight followed by **[2ND] [5]**.

Example: To change and work in a density of 4000 LB/CuYd.
Enter: 4 0 0 0
2ND 5 5
Display : **4000 LB/Cu Yd**

GETTING STARTED

To store and proceed press **[CE/CLR]**. Your Wt/Vol. is now set at 4000 Lb/CuYD

Construction Settings

This unit contains a set of default values that are used during various construction calculations. These values can be changed as required.

Setting	English	Metric
Stair Riser Height	7 1/2"	18.5 cm
Stair Tread Width	10"	250 cm
Raked Wall On Center	16"	60 cm
Regular Jack On Center	16"	60 cm
Weight per Volume	1.5 Tons/Yd3	1775 kg/m3

To check setting press **[RCL]** then desired setting.

NOTE: The Restore Defaults key [2ND] [%] restores ALL changed values to their default values.

CONVERSIONS

Linear Conversions

	Key Sequence	Result Displayed
To Convert 1 Yard	**1 [Yard]**	**1. Yd**
To Feet	**[Feet]**	**3. Ft**
To Inches	**[Inch]**	**36. INCH**
To Centimeters	**[2ND] [Feet]**	**91.44 CM**

GETTING STARTED

To convert between decimal feet and feet, inch, fractions press the **[Feet]** key to cycle through them.

	Key Sequence	Result Displayed
Convert 1.6 feet	**1.6 [Feet]**	**1.6 Ft**
To feet, inch, fraction	**[Feet]**	**1 Ft- 7 13/64 INCH**

To convert a displayed fraction to another, only the desired fraction key need to be pressed

	Key Sequence	Result Displayed
Convert 7/32"	**7 [/32]**	**0 7/32 INCH**
To /16th	**[2ND] [/16]**	**0 4/16 INCH**

Area Conversions

	Key Sequence	Result Displayed
Convert 10.5625 Sq Ft	**10.5625 [Sq] [Feet]**	**10.5625 SQ Ft**
To Square Meters	**[2ND] [Yard]**	**0.981288 SQ M**
To Square Centimeters	**[2ND] [Feet]**	**9812.884 SQ CM**

GETTING STARTED

Volume Conversions

	Key Sequence	Result Displayed
Convert 9 Cubic Meters	**9 [2ND] [Sq] [2ND] [Yard]**	**9. CU M**
To Cubic Feet	**[Feet]**	**317.832 CU Ft**
To Cubic Inches	**[Inch]**	**549213.7 CU INCH**

Weight Conversions

	Key Sequence	Result Displayed
Convert 10 pounds To kgs	**10 [lbs] [2ND] [kg]**	**10. LB 4.535924 KG**

Liquid Conversions

	Key Sequence	Result Displayed
Convert 10 Gallons To Liters	**10 [Gal] [2ND] [Gal]**	**10. GL 37.85412 L**

Temperature Conversion

	Key Sequence	Result Displayed
Convert 104°F To Celsius	**104 [F°] [2ND] [F°]**	**104. °F 40. °C**

Paperless Tape Review

The Paperless Tape Review feature allows you to review up to 20 entry steps and calculation results. The display will show the entered or calculated value, along with the entry step number.

Clear Calculator and enter a string of numbers
(i.e. 2 + 3 + 4 - 6 + 7 = 10)

Enter Tape Review [2ND] [=] **Tape** icon is activated
Display will read **Tape 06 = 10.**

The **[+]** and **[-]** keys allow you to step forward and backward through the last 20 steps entered into the calculator. After the initial display of the result, the **[+]** key starts sequencing through the series of entries and calculations starting with the first step of the sequence. The **[-]** starts sequencing through the series in the reverse order starting with the next to last entry.

To review 2 + 3 + 4 - 6 + 7 = 10 in the forward direction

Key Sequence	Result Displayed	
[2ND] [=]	**Tape** 06=	**10.**
[+]	**Tape** 01	**2.**
[+]	**Tape** 02+	**3.**
[+]	**Tape** 03+	**4.**
[+]	**Tape** 04-	**6.**
[+]	**Tape** 05+	**7.**
[+]	**Tape** 06=	**10.**

To review in the reverse direction

Key Sequence	Result Displayed	
[-]	**Tape** 05+	**7.**
[-]	**Tape** 04-	**6.**
Etc.		

Note: If more than one series of calculations have been performed, the Paperless Tape will only review the last series of calculations. Previous series of calculations will be deleted.

Example:

Enter Calculation Series #1:
[1] [+] [2] [+] [3] [+] [4] [=]
10.

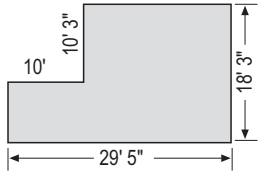
Then Enter Calculation Series #2:
[2] [Feet] [×] [3] [Feet] [×] [4] [Feet] [=]
24 CU Ft

Your paperless tape will only review the Calculation Series #2

To exit Paperless Tape Review press [2ND] [·] .

Complex Area

Determining the square feet of an "L" shaped room when depth is unknown.



Enter: [2ND] [RCL] to clear Memory.

Enter: [1] [8] [Feet] [3] [Inch] [×]
[2] [9] [Feet] [5] [Inch] [=]
Answer: **536.8542 SQ Ft**

Press: [M+] to store in memory.

Enter: [1] [0] [Feet] [×]
[1] [0] [Feet] [3] [Inch] [=]
Answer: **102.5 SQ Ft**

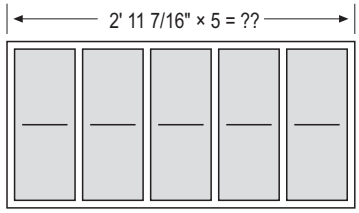
Press: [2ND] [M+] (to subtract from memory) then
Press: [RCL] [RCL] to recall total **434.3542 SQ Ft**.

NOTE: **[RCL] [RCL]** should only be used when you no longer need to keep in memory otherwise use **[RCL] [M+]** to recall and keep in memory.

EXAMPLE PROBLEMS

Carpentry Rough Opening

Given 5 windows, each 2' 11 7/16" wide, find their overall width if they are placed side by side in a wall.

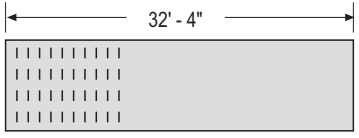


Enter: [2] [Feet] [1] [1] [Inch] [7] [/ 16] [×] [5] [=]

Answer: **14 Ft- 9 3/16 INCH**

Carpentry – Joist Numbers

Find the number of joists on 16" centers needed for a 32' 4" long room.



Enter: [3] [2] [Feet] [4] [Inch] [÷] [1] [6] [Inch] [=]

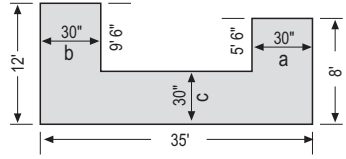
Answer: **24.25**

(Add 1 for the end = **25.25** and round up to **26**)

EXAMPLE PROBLEMS

Costing a Concrete Walkway

To find the cost of concrete for this courtyard when the concrete costs $50.00 per cubic yard:



Press [2ND] [RCL] to clear Memory.

First you must find the area of {a} – Enter:

[5] [Feet] [6] [Inch] [×] [3] [0] [Inch] [=]

Answer: **13.75 SQ Ft** Press [M+] to add to memory.

Find Area of {b} – Enter:

[9] [Feet] [6] [Inch] [×] [3] [0] [Inch] [=]

Answer: **23.75 SQ Ft** Press [M+] to add to memory.

Find Area of {c} – Enter:

[3] [5] [Feet] [×] [3] [0] [Inch] [=]

Answer: **87.5 SQFt** Press [M+] to store in memory.

Press [RCL] [RCL] to recall 125 total SQ Ft

then multiply by depth [×] [4] [Inch] [=]

Answer: **41.66667 CU Ft**

To convert to Cubic Yards press [Yard]

Answer: **1.54321 CU Yd**

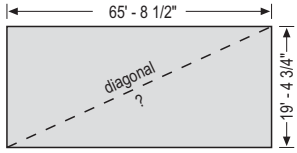
Press: [×] [5] [0] [Cost]

Answer: **$77.16**

EXAMPLE PROBLEMS

Squaring a Foundation

Calculate the DIAGONAL of this rectangle



Press: [6] [5] [Feet] [8] [Inch] [1] [/ 2] [Run]

Then [1] [9] [Feet] [4] [Inch] [3] [/ 4] [Rise] [Diag]

Answer: **68 Ft - 6 9/64 INCH**

To convert answer to /8ths press [2ND] [/ 8]

Stair – Run Known

Build a stairway where the value of the Run (22' 5 1/4") is known with a floor-floor height of 20' 6 1/2" using the default riser height of 7 1/2".

Operation: Reset

Enter: [CE/CLR] [CE/CLR]

Display: **0.**

Operation: Enter floor to floor height

Enter: [2] [0] [Feet] [6] [Inch] [1] [/ 2] [Rise]

Display: **RISE 20 Ft - 6 1/2 INCH**

Operation: Enter Run

Enter: [2] [2] [Feet] [5] [Inch] [1] [/ 4] [Run]

Display: **RUN 22 Ft - 5 1/4 INCH**

EXAMPLE PROBLEMS

Operation: Enter Nominal Riser Height
Enter: [7] [Inch] [1] [/ 2] [2ND] [Rise]
Display: **R-HT 7 1/2 INCH**

Operation: Find Number of Risers
Enter: [2ND] [Rise]
Display: **RSRS 33.**

Operation: Find Actual Riser Height
Enter: [Rise]
Display: **R-AH 7 1/2 INCH**

Operation: Find Underage/Overage of Risers
Enter: [Rise]
Display: **R+ / - 1 INCH**

Operation: Find Number of Treads
Enter: [Rise]
Display: **TRDS 32.**

Operation: Find Tread Width
Enter: [Rise]
Display: **T-WD 8 7/16 INCH**

Operation: Find Underage/Overage of Treads
Enter: [Rise]
Display: **T+ / - 0 3/4 INCH**

Operation: Find Stringer Length
Enter: [Rise]
Display: **STRG 30 Ft - 0 1/64 INCH**

Operation: Find Incline
Enter: [Rise]
Display: **INC° 41.59389°**

EXAMPLE PROBLEMS

Stairs with Unconventional Risers & Treads

Build an entryway where your rise is 3' and you require shorter risers (5") and wider treads (3') for physically challenged user.

Operation: Reset
Enter: [CE/CLR] [CE/CLR]
Display: **0.**

Operation: Enter Height
Enter: [3] [Feet] [Rise]
Display: **RISE 3 Ft - 0 INCH**

Operation: Enter Riser Height
Enter: [5] [Inch] [2ND] [Rise]
Display: **R-HT 5 INCH**

Operation: Enter Tread Width
Enter: [3] [Feet] [2ND] [Run]
Display: **T-WD 3 Ft - 0 INCH**

Operation: Find Number of Risers
Enter: [2ND] [Rise]
Display: **RSRS 7.**

Operation: Find Height of Risers
Enter: [Rise]
Display: **R-AH 5 1/8 INCH**

EXAMPLE PROBLEMS

Operation: Find Overage/Under
Enter: [Rise]
Display: **R+ / - – 0 1/8 INCH**

Operation: Find Number of Treads
Enter: [Rise]
Display: **TRDS 6.**

Operation: Find Width of Treads
Enter: [Rise]
Display: **T-WD 3 Ft - 0 INCH**

Operation: Find Overage/Underage
Enter: [Rise]
Display: **T+ / - 0 Ft - 0 INCH**

Operation: Find Run Required
Enter: [Rise]
Display: **RUN 18 Ft - 0 INCH**

Operation: Find Stringer Length
Enter: [Rise]
Display: **STRG 18 Ft - 2 13/64 INCH**

Operation: Find Inclination
Enter: [Rise]
Display: **INC° 8.134744°**

EXAMPLE PROBLEMS

Raked Wall – Stud Lengths

Find the stud lengths in the raked wall with a peak of 7'5" and length of 14' 8" (using the 16" default OC).

Operation: Reset
Enter: [CE/CLR] [CE/CLR]
Display: **0.**

Operation: Check OC Default
Enter: [RCL] [2ND] [Diag]
Display: **OCTR 16 INCH**

Operation: Enter Run
Enter: [1] [4] [Feet] [8] [Inch] [Run]
Display: **RUN 14 Ft - 8 INCH**

Operation: Enter Rise
Enter: [7] [Feet] [5] [Inch] [Rise]
Display: **RISE 7 Ft - 5 INCH**

Operation: Find Length of Longest Stud
Enter: [2ND] [Diag]
Display: **RW1 6 Ft - 8 29/32 INCH**

Operation: Find Length of Second Stud
Enter: [2ND] [Diag]
Display: **RW2 6 Ft - 13/16 INCH**

Operation: Find Length of Third Stud
Enter: [2ND] [Diag]
Display: **RW3 5 Ft - 4 47/64 INCH**

NOTE: Continue until you have last stud. To convert result to /16th press **[2ND] [/16]**

EXAMPLE PROBLEMS

Board Feet Lumber

Find the total cost for eight 2 inch x 4 inch x 12 foot piece of lumber when the unit price is $1.60/Bd Ft.

Enter: [2] [×] [4] [×] [1] [2] [2ND] [1]
Answer: **8. B Ft**

Then press: [×] [8] [=]
Answer: **64. B Ft**

Then press: [×] [1] [·] [6] [Cost]
Answer: **$102.40**

Remember: 1 board foot is 144 cubic inches or 0.08333 cubic foot of lumber, conversions can only be done to and from other cubic measurements.

Circle Solutions

After entering the diameter of a circle, the Circle function is used to find the circumference and area of a circle. After finding the circumference of a circle, the area of the circle may be found by entering **[7]** a second time. Entering **[7]** a third time displays the circle diameter.

Circumference & Area

To find the circumference and the area of a circle whose diameter is 10 inches.

EXAMPLE PROBLEMS

Enter	*Display*
[1] [0] [Inch] [2ND] [7]	**DIA 10 INCH**
[7]	**CIRC 31 27/64 INCH**
[7]	**AREA 78.53982 SQ INCH**

Arc Length

The Arc function is used to find the length of an arc. Note that the circumference will display as soon as **[2ND] [7]** is pressed, and will remain on the display until [**2ND] [4]** is pressed. To find the arc length of an 85° arc whose diameter is 5 inches.

Enter	*Display*
[5] [Inch] [2ND] [7]	**DIA 5 INCH**
[8] [5] [2ND] [4]	**ARC 3 45/64 INCH**

Simple Concrete Footings

Determine how much cement is needed to pour 5 concrete footings that have an 8 inch diameter and are 12 inches deep.

Enter Diameter by pressing [8] [Inch] [2ND] [7]

Find surface area by continuing to press the [7] key twice.
Answer: **AREA 50.26548 SQ INCH**

Then compute volume by entering: [×] [1] [2] [Inch] [=]
Answer: **603.1858 CU INCH**

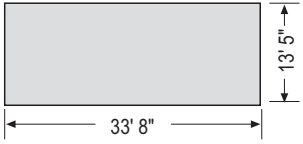
EXAMPLE PROBLEMS

Then multiply: [×] [5] [=]
Answer: **3015.929 CU INCH**

Convert to feet
by pressing: [Feet]
Answer: **1.745329 CU Ft**

Concrete Weight/Volume

Determine the weight and volume for this concrete patio.
Use default 1.5Tn/Cu Yd and depth of 6"



First check weight/volume default by pressing **[2ND] [5]**.
If not 1.5 Tn/Cu Yd see **"Default Section"**

Enter: [3] [3] [Feet] [8] [Inch] [×] [1] [3] [Feet] [5] [Inch] [×] [6] [Inch] [=]
Answer: **225.8472 CU Ft**

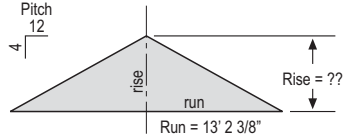
Convert to Cubic yards: Press [Yard]
Answer: **8.364712 CU Yd**

To determine weight: Press [2ND] [8]
Answer: **12.54707 Tn**

EXAMPLE PROBLEMS

Roof Rise

Given any two - pitch, rise, run or diagonal – will automatically solve for the other two. Here is a useful calculation in determining wall heights. This example will figure the RISE of a roof knowing the PITCH is 4 in 12 and the RUN is 13' - 2 3/8"

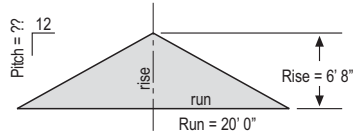


Remember: The PITCH of a roof equals its RISE in INCHES over a RUN of 12" thus a 4/12 roof has a SLOPE of 4". (when entering SLOPE always use inches) In Metric – pitch is expressed in millimeters over 1,000 millimeters of run.

Enter	*Display*
[4] [Inch] [Pitch]	**PTCH 4 INCH**
[1] [3] [Feet] [2] [Inch] [3] [/ 8] [Run]	**RUN 13 Ft - 2 3/8 INCH**
[Rise]	**RISE 4 Ft - 4 51/64 INCH**
[Diag]	**DIAG 13 Ft - 10 15/16 INCH**
[Pitch]	**PTCH 4 INCH**
[Pitch]	**PTCH 0.333333 (In Ratio)**
[Pitch]	**PTCH 18.43495°**

EXAMPLE PROBLEMS

Roof Pitch – Given Rise & Run



Enter	*Display*
[6] [Feet] [8] [Inch] [Rise]	**RISE 6 Ft- 8 INCH**
[2] [0] [Feet] [Run]	**RUN 20 Ft- 0 INCH**
[Pitch] [Pitch]	**PTCH 4 INCH**

Remember: Pitch is always rise in inches over a run of 12 inches.

Regular Hip/Valley & Jack Rafter

When two roofs are perpendicular (90°) to each other and have the same pitch, they meet at a 45° angle. This is known as a regular condition.

Given a run of 12' and a rise of 6' calculate common rafters, hip/valley rafters, hip jack/valley jack rafters. Standard on-center spacing is assumed.

Operation: Rise
Key Sequence: [6] [Feet] [Rise]
Display: **RISE 6 Ft- 0 INCH**

EXAMPLE PROBLEMS

Operation: Run
Key Sequence: [1] [2] [Feet] [Run]
Display: **RUN 12 Ft- 0 INCH**

Operation: Common Rafter
Key Sequence: [Diag]
Display: **DIAG 13 Ft- 5 INCH**

Operation: Hip Rafter Length
Key Sequence: [H/V]
Display: **H/V 18 Ft- 0 INCH**

Operation: Jack Rafter Lengths
Key Sequence: [Jack]
Display: **RJ 1 11 Ft- 11 7/64 INCH**

Key Sequence: [Jack]
Display: **RJ 2 10 Ft- 5 7/32 INCH**

Key Sequence: [Jack]
Display: **RJ 3 8 Ft- 11 21/64 INCH**

Key Sequence: [Jack]
Display: **RJ 4 7 Ft- 5 7/16 INCH**

Continuous entry of **[Jack]** will display the descending sizes of the jack rafters until "0" is displayed.

EXAMPLE PROBLEMS

Irregular Hip/Valley & Jack Rafter

When the pitch of a main roof and the pitch of the adjacent roof are not the same, this is referred to as "irregular" and we calculate the regular (main roof) and irregular (hip or gable) values.

Given a main roof with a run of 12' and a pitch of 6" and the hip roof with a pitch of 8", calculate the common rafter, hip rafter, irregular hip/common rafter, irregular and irregular hip jack rafters. (standard on-center spacing applies to main roof and 18" on-center spacing applies to hip roof) Fix Fraction to /8ths.

Operation: Change Fixed Fraction
Key Sequence: [2ND] [2] [/ 8] [2ND]
Display: [Fix] **0.**

Operation: Run
Key Sequence: [1] [2] [Feet] [Run]
Display: [Fix] **RUN 12 Ft- 0 INCH**

Operation: Regular Pitch
Key Sequence: [6] [Inch] [Pitch]
Display: [Fix] **PTCH 6 INCH**

Operation: Irregular Pitch
Key Sequence: [8] [Inch] [2ND] [H/V]
Display: [Fix] **IPCH 8 INCH**

Operation: Common Rafter
Key Sequence: [Diag]
Display: [Fix] **DIAG 13 Ft- 5 INCH**

EXAMPLE PROBLEMS

Operation: Rise
Key Sequence: [Rise]
Display: [Fix] **RISE 6 Ft- 0 INCH**

Operation: Regular Jack OC Spacing
Key Sequence: [1] [6] [Inch] [Jack]
Display: [Fix] **R-OC 16 INCH**

Operation: Irregular Jack OC Spacing
Key Sequence: [1] [8] [Inch] [2ND] [Jack]
Display: [Fix] **IROC 18 INCH**

Operation: Find Irregular Jack Rafters
Key Sequence: [2ND] [Jack]
Display: [Fix] **IJ 1 9 Ft- 5 5/8 INCH**

Key Sequence: [Jack]
Display: [Fix] **IJ 2 8 Ft- 1 3/8 INCH**

Key Sequence: [Jack]
Display: [Fix] **IJ 3 6 Ft- 9 1/8 INCH**

Continue to press **[Jack]** until 0 is displayed. Then continuing to press **[Jack]** will cause unit to cycle thru the regular jack rafters

Key Sequence: [Jack]
Display: **RJ 1 11 Ft- 5 1/8 INCH**
Key Sequence: [Jack]
Display: **RJ 2 9 Ft- 5 2/8 INCH**

Continue to press **[Jack]** until 0 is displayed.

Chaining

Your calculator utilizes chaining logic allowing you to carry out successive intermediate operations using the **[=]** key to finalize operations. Since the chaining logic works from left to right, you must use care when combining operation such as addition and multiplication by first addressing operations within brackets.

Example: 1 + 2 x 3 + 4 = 13 Enter the values and operators as they are written and press [=] to get the answer.

Example: (1 + 2) x (3 + 4) = 21
Enter… **1 [+] 2 [=] [M+]**
Then enter… **3 [+] 4 [x] [RCL] [M+] [=]**

NOTE:
To recall and remove from memory press **[RCL] [RCL]**.
To recall & keep in memory storage press **[RCL] [M+]**.

Error/Overflow

An error/overflow condition occurs when the result of a calculation has more than 7 digits to the left of the decimal point, or when you attempt to divide a value by zero or calculate mixed units that are not alike. An Error condition is indicated by the **"Error"** displayed. You must clear the calculator display by pressing **[CE/CLR]** before continuing operations. Clearing an Error condition will not clear values stored in the memory registers.

Auto-Range

If the input or calculation result with small units is out of the 7 digit range of the display, the answer will be expressed in

the next larger units instead of showing **"Error"**

Care

Don't leave calculator in direct sunlight for long periods, or store it where excessive temperatures are possible. Don't leave the calculator on when not in use (NOTE- To save the battery, calculator will turn off automatically after 10-12 minutes of inactivity, at which time the displayed value and memory contents will be cleared.

Battery

This unit requires one 3V lithium battery (CR2032 or equivalent). The average battery operating life is 2000 hours. When the display slows down and/or becomes dim, it is time for a new battery.

To change the battery

1.) Turn power off.
2.) Remove screw from battery lid & slide cover off.
3.) Before removing the battery, be sure to touch a metal object. This is to avoid any accidental discharge of static electricity, which may harm the circuit board.
4.) Install new battery with the (+) side up.

Resetting Your Calculator

To reset your calculator, turn unit over and see "RESET". Press with point of ball point pen. You calculator is now reset.

NOTE: RESETTING YOUR CALCULATOR WILL ERASE ANYTHING IN MEMORY OR PAPERLESS TAPE.

Conversion Tables

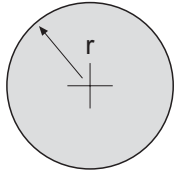
1 square inch	= 6.4515 sq centimeters
1 square foot	= 144 square inches
1 square foot	= 0.92903 sq meters
1 square yard	= 9 square feet
1 square yard	= 0.836127 sq meters
1 cubic inch	= 16.3871 cu centimeters
1 cubic foot	= 1728 cubic inches
1 cubic foot	= 0.02831 cu meters
1 cubic yard	= 27 cubic feet
1 cubic yard	= 0.76455 cu meters
1 mile	= 5,280 feet
1 mile	= 1.609344 kilometers
1 acre	= 43,560 square feet
1 ounce	= 28.349532 grams
1 pound	= 0.4535924 kilograms
1 (U.S.) gallon	= 3.7854118 liters
1 (U.K.) gallon	= 4.546090 liters
1 fluid ounce	= 29.574 milliliters
Fahrenheit	= 9/5 (C) + 32
Centigrade	= 5/9 (F - 32)
pi (π)	= 3.141593

APPENDIX

Area Formulas

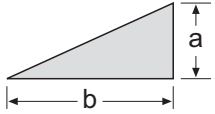
Circle

$$\pi r^2$$



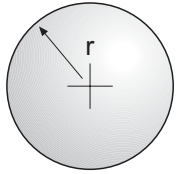
Triangle

$$\frac{ab}{2}$$



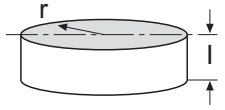
Sphere

$$4\pi r^2$$



Cylinder

$$2\pi r(r+l)$$

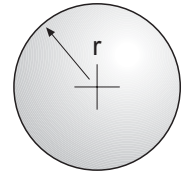


APPENDIX

Volume Formulas

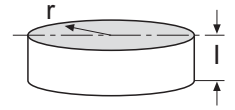
Sphere

$$\frac{4\pi r^3}{3}$$



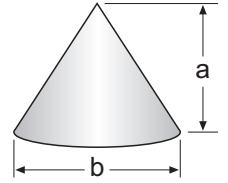
Cylinder

$$\pi r^2 l$$



Cone

$$\frac{\pi b^2 a}{12}$$



APPENDIX

Lumber Sizes

Normal Size	Actual Size (S4S)
1" x 2"	3/4" x 1 1/2"
1" x 3"	3/4" x 2 1/2"
1" x 4"	3/4" x 3 1/2"
1" x 6"	3/4" x 5 1/2"
1" x 8"	3/4" x 7 1/4"
1" x 10"	3/4" x 9 1/4"
1" x 12"	3/4" x 11 1/4"
2" x 2"	1 1/2" x 1 1/2"
2" x 3"	1 1/2" x 2 1/2"
2" x 4"	1 1/2" x 3 1/2"
2" x 6"	1 1/2" x 5 1/2"
2" x 8"	1 1/2" x 7 1/4"
2" x 10"	1 1/2" x 9 1/4"
2" x 12"	1 1/2" x 11 1/4"
4" x 4"	3 1/2" x 3 1/2"
4" x 6"	3 1/2" x 5 1/2"
4" x 8"	3 1/2" x 7 1/4"
4" x 10"	3 1/2" x 9 1/4"
4" x 12"	3 1/2" x 11 1/2"

APPENDIX

FCC Statement

This device has been tested and found to comply with the limits for a Class B device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This device generates, uses and can radiate radio frequency energy and, if not used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the device off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase separation between the device and receiver

CUSTOMER SERVICE

TECHNICAL ASSISTANCE

If you have any questions or need technical assistance, e-mail to:

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