

## HEAVYCALC™

Designed for today's excavation and heavy construction professional, the *Construction Master® HeavyCalc* adds even more power to the *Construction Master* line-up. As with earlier models, this calculator is so simple to use, even the novice will find it easy to solve hundreds of dimension-related problems in Feet, Inches, Fractions and Cubic Yards!

- *Solve Dimensional Math with Ease*
- *Instant Dimensional Conversions*
- *Imperial/Metric Conversions*
- *Weight/Volume Conversions*
- *Calculate Square and Rectangular Areas*
- *Find Cubic Volumes*
- *Determine % Grade and Slope*
- *Solve Cut and Fill*
- *Find Bank, Loose and Compact Volumes*
- *Instant Square-Up (Diagonal) Solutions*
- *Constant Add Feature*
- *Calculating Averages*
- *Material Estimations*
- *Paperless Tape*

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## GETTING STARTED

### KEY DEFINITIONS

#### Basic Function Keys



Arithmetic operation keys.



**Percent Key** — Four-function (+, -, x, ÷) percent key.



Keys used for entering numbers.



**Off Key** — Turns all power off, clearing all non-permanent registers.



**On/Clear Key** — Turns on power. Pressing once clears the display. Pressing twice clears all temporary values.



**Convert Key** — Used with the dimensional keys to convert between dimensions or with other keys to access special functions.



**Constant Key** — This key stores a value permanently. Used as a constant in repeated calculations.

**Conv** **Cnst**

**Square Root** — Used to find the Square Root of a non-dimensional or area value.

**M+**

**Memory Add Key** — Adds the displayed number to the value stored within the semi-permanent Memory.

**Conv** **M+**

**Memory Minus** — Subtracts the displayed value from Memory.

**Rcl**

**Recall Key** — Recalls values stored in any register. **Rcl** **M+** displays the value in Memory.

**Rcl** **Rcl**

**Memory Display/Clear** — Displays the value in Memory and clears the register.

**Conv** **Rcl**

**Memory Clear** — Clears the Memory without changing the current display.

#### **Dimension Keys**

**Yds**

**Yards Key** — This is an entry and conversion key. The entry can be a whole number or a decimal number. Used with the **Conv** key converts any other displayed dimensioned number to Yards.

**Feet**

**Feet Key** — Enters or converts to *Feet* as whole or Decimal numbers. Also used with the **Inch** and **/** keys for entering Feet-Inch values (e.g., **6 Feet 9 Inch 1 / 2**). Repeated presses during conversions toggle between Decimal Feet and Feet-Inch-Fractions.

**Inch**

**Inch Key** — Enters or converts to *Inches*. Entry can be whole or Decimal numbers. Also used with the **/** key for entering Fractional Inch values (e.g., **9 Inch 1 / 2**). Repeated presses during conversions toggle between Fractional and Decimal Inches.

**/**

**Fraction Bar Key** — Used to enter *Fractions*. Fractions can be entered as proper ( $1/2$ ,  $1/8$ ,  $1/16$ ) or improper ( $3/2$ ,  $9/8$ ). If the denominator (bottom) is not entered, the calculator's fractional accuracy setting is automatically used.

**Cu**

**Cubic Key** — This key is used with a dimension key (Feet, Inches, Yards, Meters, etc.) to identify a value as being a volume.  
*Example:* 5 **Cu** **Yds**

**Sq**

**Square Key** — This key is used with a dimension key (Feet, Inches, Yards, Meters, etc.) to identify a value as being an area.  
*Example:* 1 0 **Sq** **Feet**

**m**

**Meter Key** — Enters or converts to *Meters*.

**mm**

**Millimeter Key** — Enters or converts to *Millimeters*.

**Weight**

**Weight Key** — Enters or converts (a volume value) to *Tons, Pounds* or *Kilograms*. Repeated presses will cycle through these units.

**Conv %**

**Weight/Volume** — Enters or converts the *Weight per Volume* setting as *Tons/Yard<sup>3</sup>, Lbs/Yd<sup>3</sup>* or *kg/m<sup>3</sup>*. Repeated presses will cycle through these settings.

### Area/Volume Keys

**Length**

**Length Key** — Enters the value for Length in dimension problems (e.g., for calculating Area or Volume).

*Note: this key is also used to enter the length for "Square-Ups."*

**Conv Length**

**Square-Up** — Calculates the Diagonal, or "Square-Up," based on entered Length and Width.

**Width**

**Width Key** — Enters the value for Width in dimension problems (e.g., calculating Area or Volume).

*Note: this key is also used to enter the width for "Square-Ups."*

**Conv Width**

**Percent Grade** — Used to enter and/or solve Percent Grade. Calculates Percent Grade using entered values for Width and Depth or Slope.

**Depth**

**Depth Key** — Enters the value for Depth in dimension problems. Calculates Depth from entered values of Width and Percent Grade or Slope.

**Conv** **Depth**

**Slope** — Used to enter Slope as a ratio of Run per Unit Rise (e.g., 4:1), or in Decimal Degrees (e.g., 10°). Also calculates Slope using entered value for Width and Depth or Percent Grade.

**Vol**

**Volume Key** — Computes the Volume (Length x Width x Depth) in Cubic Yards based on entered Length, Width and Height values. A second press will display the area (in Square Feet) based on entered Length and Width. Successive presses will toggle the display between the calculated Area and Volume.

**Conv** **Vol**

**Area** — Computes the area in Square Feet based on entered Length and Width.

#### **Excavation/Volume Keys**

**Cut/Fill**

Used to enter or calculate the cut or fill amount. Based on entries of proposed and existing benchmarks. A fill is displayed as a positive value; a cut as a negative value.

**Exist**

**Existing Key** — Used to enter or calculate an existing benchmark, Grade or value.

**Prop**

**Proposed Key** — Used to enter or calculate a proposed benchmark, Grade or value.

**Bank**

**Bank Volume Key** — Enters or calculates the volume for bank fill material. Bank fill is material in an untouched, pristine state.

**Comp**

**Compacted Volume Key** — Enters or calculates the volume for compacted fill material. Compacted fill is material that has been compacted.

**Conv Comp**

**% Shrink** — Enters or recalls percent shrink factor for converting between bank and compacted fill volumes.

**Loose**

**Loose Volume Key** — Enters or calculates the volume for loose fill material. Loose fill is material that has been disturbed or excavated.

**Conv Loose**

**% Swell** — Enters or recalls the percent swell factor used for converting between bank and loose volumes.

**Additional Functions**

- Conv**  $\frac{1}{x}$  **Reciprocal** — 1/x function.
- Conv**  $\times$  **All Clear (AC)** — Clears all values, including Memory. Resets all permanent settings to defaults.
- Conv**  $+$  **Pi ( $\pi$ )** — Constant = 3.141593.
- Conv**  $-$  **Positive/Negative Toggle (+/-)** — Toggles the sign of the displayed value between positive and negative.
- Rcl**  $=$  **Paperless Tape** — Accesses the paperless tape mode.
- Rcl**  $\times$  **Imperial/Metric Mode** — Selects either Imperial or Metric defaults for weight.
- Conv**  $\square$  **Per** — Allows you to compute a total material cost given a unit dimension and an entered Per Unit Cost.
- Conv**  $\text{\textcircled{0}}$  **Degrees** — Used for entering Slopes that are in Decimal Degrees instead of a ratio.

## FRACTIONAL SETTINGS

### Setting Fractional Accuracy

When your calculator is in a default condition (battery change or full reset), it is set to round fractional values to the nearest 1/16th of an Inch. The fractional level can be revised by using the following key-strokes:

- Conv 1** = Accuracy set to 1/16"
- Conv 2** = Accuracy set to 1/2"
- Conv 3** = Accuracy set to 1/32"
- Conv 4** = Accuracy set to 1/4"
- Conv 6** = Accuracy set to 1/64"
- Conv 8** = Accuracy set to 1/8"

A star (★) will appear in the bottom left of the display when the calculator is turned on, if the setting is different from the default. The fractional setting can be displayed at any time by pressing **Rcl** **7**.

### Normal Fractional Mode

The default, *Normal Mode* (**Conv 7**), reduces a fraction to its lowest common denominator (for example, 8/16 rounds to 1/2). If a fraction is entered having a higher fractional accuracy than the current setting, the setting will be temporarily revised to the level of accuracy of the entered value.

### **Fixed Fractional Mode**

In the *Fixed Mode* (**Conv** **9**), fractional results are displayed in the set fractional value, not reduced. Entries of higher accuracy values will be rounded to the nearest Fraction of the accuracy setting (for example, for a Fraction level setting of 1/16, an entry of **5** **7** **3** **2** **=** will result in a display of 3/16).

### **ENTERING DIMENSIONS**

#### **Linear Dimensions**

When entering Feet-Inch values, enter dimensions from largest to smallest — Feet before Inches, Inches before Fractions. Enter Fractions by entering the numerator (top), pressing **7** (Fraction Bar key) and then the denominator (bottom).

*Note: If a denominator is not entered, the fractional setting value is used.*

*Examples of how linear dimensions are entered:*

DIMENSION	KEYSTROKES
5 Yards	<b>5</b> <b>Yds</b>
5 Feet 1-1/2 Inch	<b>5</b> <b>Feet</b> <b>1</b> <b>Inch</b> <b>1</b> <b>7</b> <b>2</b>
17.5 Meters	<b>1</b> <b>7</b> <b>.</b> <b>5</b> <b>m</b>

### Square and Cubic Dimensions

Examples of how Square and Cubic dimensions are entered:

DIMENSION	KEYSTROKES
5 Cubic Yards	<b>5</b> <b>Cu</b> <b>Yds</b>
130 Square Feet	<b>1</b> <b>3</b> <b>0</b> <b>Sq</b> <b>Feet</b>
33 Square Meters	<b>3</b> <b>3</b> <b>Sq</b> <b>m</b>

### CONVERSIONS

#### Linear Conversions

Convert 14 Feet to other dimensions:

KEYSTROKE	DISPLAY
<b>1</b> <b>4</b> <b>Feet</b> ...	
<b>Conv</b> <b>Yds</b>	4.666667 YD
<b>Feet</b> *	14 FEET 0 INCH
<b>Feet</b>	14. FEET
<b>Inch</b>	168. INCH
<b>mm</b>	4267.2 MM
<b>m</b>	4.2672 M

#### Square Conversions

Convert 14 Square Feet to other Square dimensions:

KEYSTROKE	DISPLAY
<b>1</b> <b>4</b> <b>Sq</b> <b>Feet</b> ...	
<b>Conv</b> <b>Inch</b>	2016. SQ INCH
<b>Yds</b> *	1.555556 SQ YD
<b>m</b>	1.300643 SQ M
<b>mm</b>	1300643. SQ MM

\* When performing conversions, **Conv** only has to be pressed once.

### Cubic Conversions

Convert 14 Cubic Feet to other Cubic dimensions:

KEYSTROKE	DISPLAY
1 4 Cu Feet ...	
Conv Inch	24192. CU INCH
Yds	0.518519 CU YD
m	0.396436 CU M
mm*	0.396436 CU M

\* The calculator's Auto-Range function forced the answer to be in Meters, as it is out of the calculator's normal seven-digit range (see Auto-Range on page 43).

### Weight Conversions

Convert 25 Tons to other weights:

KEYSTROKE	DISPLAY
2 5 Weight ...	
Conv Weight	50000. LB
Weight	22679.62 kg
Weight	25. Ton

### Weight per Volume Conversions

Your calculator has the capability of converting between Weight and Volume. The Weight/Volume ratio is permanently stored by entering the value and pressing **Conv** **%**. The default value is 1.5 Tons per Cubic Yard.

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Find the weight of 15 Cubic Yards at 1.75 Tons per Cubic Yard, then convert to other weights:

KEYSTROKE	DISPLAY
1 7 5 Conv %	1.75 Ton per CU YD
1 5 Cu Yds ...	
Conv Weight	26.25 Ton
Weight	52500. LB
Weight	23813.61 KG
Weight	26.25 Ton

### BASIC MATH OPERATIONS

Your calculator uses standard chaining logic, which simply means that you enter your first value, the operator (+, -, ×, ÷), the second value and then the Equal sign (=).

- A. 3 + 2 = 5
- B. 3 - 2 = 1
- C. 3 × 2 = 6
- D. 3 ÷ 2 = 1.5

This feature also makes the calculator simple to use for dimensional applications:

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**Adding Dimensions**

Add 11 Inches to 2 Feet 1 Inch:

KEYSTROKE	DISPLAY
1 1 Inch + 2 Feet 1 Inch =	*36 INCH

\* The format of the first value entered determines the answer format. Conv can be used to change to any format desired, provided convention is maintained.

**Subtracting Dimensions**

Subtract 3 Feet from 11 Feet 7-1/2 Inches:

KEYSTROKE	DISPLAY
1 1 Feet 7 Inch 1 / 2 - 3 Feet =	8 FEET 7-1/2 INCH

**Multiplying Dimensions**

Multiply 5 Feet 3 Inches by 11 Feet 6-1/2 Inches:

KEYSTROKE	DISPLAY
5 Feet 3 Inch x 1 1 Feet 6 Inch 1 / 2 =	60.59375 SQ FEET

**Dividing Dimensions**

Divide 30 Feet 4 Inches by 7 Inches:

KEYSTROKE	DISPLAY
3 0 Feet 4 Inch ÷ 7 Inch =	52.

Divide 20 Feet 3 Inches by 9:

KEYSTROKE	DISPLAY
2 0 Feet 3 Inch ÷ 9 =	2 FEET 3 INCH

### PERCENTAGE CALCULATIONS

The Percent key (%) can be used for finding a given percent of a number or for working add-on, discount or division percentage calculations. It can be used with any type of number, in any dimension (Feet, Inch, Millimeter, etc.) and any type of convention (non-dimensional, Linear, Square or Cubic).

#### Computing Percentages

*Find 18% of 500 Feet:*

KEYSTROKE	DISPLAY
5 0 0 Feet × 1 8 %	90 FEET 0 INCH

*Add 10% to 137 Square Feet:*

KEYSTROKE	DISPLAY
1 3 7 Sq Feet + 1 0 %	150.7 SQ FEET

*Take 20% from 552 Feet 6 Inches:*

KEYSTROKE	DISPLAY
5 5 2 Feet 6 Inch - 2 0 %	442 FEET 0 INCH

*Divide 350 Cubic Yards by 80%:*

KEYSTROKE	DISPLAY
3 5 0 Cu Yds ÷ 8 0 %	437.5 CU YD

### MEMORY OPERATION

Whenever the **M+** key is pressed, the displayed value will be added to the Memory. Other Memory functions:

FUNCTION	KEYSTROKES
Add to Memory	<b>M+</b>
Subtract from Memory	<b>Conv M+</b>
Recall total in Memory	<b>Rcl M+</b>
Display/Clear Memory	<b>Rcl Rcl</b>
Clear Memory	<b>Conv Rcl</b>
Replace Memory	<b>Conv Rcl M+</b>

Memory is semi-permanent, clearing only when you:

- 1) Turn off the calculator;
- 2) Press **Rcl Rcl**;
- 3) Press **Conv Rcl**;
- 4) Press **Conv X** (all clear).

Examples:

KEYSTROKE	DISPLAY
<b>3 5 5 M+</b>	355. <b>M</b>
<b>2 5 5 M+</b>	255. <b>M</b>
<b>7 4 5 Conv M+</b>	745. <b>M</b>
<b>Rcl Rcl</b>	- 135.
<b>1 0 Feet 5 Inch M+</b>	10 FEET 5 INCH <b>M</b>
<b>5 Feet 3 Inch M+</b>	5 FEET 3 INCH <b>M</b>
<b>Rcl Rcl</b>	15 FEET 8 INCH

### **Averaging**

The Memory Key (**M+**) is also capable of displaying the average and totals as well as the number (count) of values entered. This is achieved by repeated presses of **M+** after recalling the stored total value in Memory.

*Example:*

KEYSTROKE	DISPLAY
1 <b>M+</b>	1. <b>M</b>
2 <b>M+</b>	2. <b>M</b>
3 <b>M+</b>	3. <b>M</b>
4 <b>M+</b>	4. <b>M</b>
5 <b>M+</b>	5. <b>M</b>
<b>Rcl</b> <b>M+</b>	15. <b>M</b>
<b>M+</b>	AVG 3. <b>M</b>
<b>M+</b>	CNT 5. <b>M</b>
<b>Rcl</b> <b>Rcl</b>	15.

### **PAPERLESS TAPE**

The Paperless Tape allows the user to display and review the last 20 entries of a calculation. **Rec** accesses the Tape function and **+** or **-** scrolls forward or backward through the entries.

While working with the Paperless Tape function, the display will show the entered or calculated value, along with the sequence number of entry (e.g., **01**, **02**, **03**, etc.) and the math operator (**+**, **-**, **x**, **÷**, **%**) in the upper left corner of the display. If **=** has been used in the middle of a string, **SUB** (for Subtotal) will display in the upper left. If **=** was the last operation performed, the display will show **TTL** (Total) as the last entry.

Pressing any key other than **Off**, **+** or **-** exits the Paperless Tape function. The last entry made (or **TTL**) will be displayed, allowing you to either exit completely, or to continue using the last tape value for another operation.

*Note: The Paperless Tape is cleared each time **On/Off** is pressed twice, the unit is shut off, or an All Clear is performed.*

### Previewing Paperless Tape

KEYSTROKE	DISPLAY
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1. Enter a string of numbers:

<b>4</b> Feet <b>+</b>	4 FEET 0 INCH
<b>5</b> Feet <b>+</b>	9 FEET 0 INCH
<b>6</b> Feet <b>+</b>	15 FEET 0 INCH
<b>7</b> Feet <b>=</b>	22 FEET 0 INCH

2. Access the Tape function:

<b>Rcl</b> <b>=</b>	TTL= 22 FEET 0 INCH
---------------------	---------------------

3. Scroll from first value to total:

<b>+</b>	01 4 FEET 0 INCH
<b>+</b>	02+ 5 FEET 0 INCH
<b>+</b>	03+ 6 FEET 0 INCH
<b>+</b>	04+ 7 FEET 0 INCH
<b>+</b>	TTL= 22 FEET 0 INCH

4. Scroll to last two values:

<b>-</b>	04+ 7 FEET 0 INCH
<b>-</b>	03+ 6 FEET 0 INCH

5. Exit Tape function and continue:

<b>=</b> *	TTL= 22 FEET 0 INCH
<b>+</b>	22 FEET 0 INCH
<b>2</b> Feet <b>=</b>	24 FEET 0 INCH

\* Can press any key besides **Off**, **+** or **-**.

## USING THE HEAVYCALC

### LINEAR DIVISION

#### Spacing Calculation

You have a 78 Feet 6 Inch length of wall which you want to divide into five equal spaces for office partitioning. What is the Length of each section?

KEYSTROKE	DISPLAY
1. Clear calculator: <b>On/C On/C</b>	0.
2. Enter overall Length: <b>7 8 Feet 6 Inch</b>	78 FEET 6 INCH
3. Divide by number of equal spaces: <b>÷ 5 =</b>	15 FEET 8-3/8 INCH
4. Convert to Decimal Feet then Decimal Inches: <b>Conv Feet</b> <b>Conv Inch</b>	15.7 FEET 188.4 INCH

### LINEAR ADDITION

#### Building Perimeter

You are measuring a building perimeter with the following measurements: 32 Feet, 25 Feet 5-1/2 Inches, 19 Feet, 5 Feet 6-1/2 Inches, 13 Feet, and 31 Feet. What is the total Perimeter?

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KEYSTROKE	DISPLAY
1. Clear calculator: On/C On/C	0.
2. Add sides to find Perimeter:	
3 2 Feet +	32 FEET 0 INCH
2 5 Feet 5 Inch 1 7 2 +	57 FEET 5-1/2 INCH
1 9 Feet +	76 FEET 5-1/2 INCH
5 Feet 6 Inch 1 7 2 +	82 FEET 0 INCH
1 3 Feet +	95 FEET 0 INCH
3 1 Feet =	126 FEET 0 INCH

### AREA CALCULATIONS

#### Area of a Rectangle

What is the area of a room measuring 12 Feet 6 Inches by 15 Feet 8 Inches?

KEYSTROKE	DISPLAY
1. Clear calculator: On/C On/C	0.
2. Enter Length and Width:	
1 2 Feet 6 Inch Length	LNTH 12 FEET 6 INCH
1 5 Feet 8 Inch Width	WDTH 15 FEET 8 INCH
3. Find Area: Conv Vol	AREA 195.8333 SQ FEET

**VOLUME CALCULATIONS**

**Simple Concrete Volume**

*You need to calculate the Cubic Yards of concrete required for pouring a driveway. The measurements are as follows: 36 Feet 3 Inches by 11 Feet 6 Inches by 4 Inches deep. What's the Volume of the driveway? If concrete costs \$47 per Cubic Yard, how much will the concrete cost?*

**KEYSTROKE** **DISPLAY**

1. Clear calculator:  
**On/C On/C** **0.**

2. Enter Length, Width and Depth, then find Volume in Cubic Yards:

**3 6 Feet 3 Inch Length**  
**1 1 Feet 6 Inch Width**  
**4 Inch Depth**  
**Vol** **VOL 5.146605 cu yd**

3. Multiply by price per Cubic Yard to find total cost:  
**x 4 7 Conv** **\$ 241.89 Per**

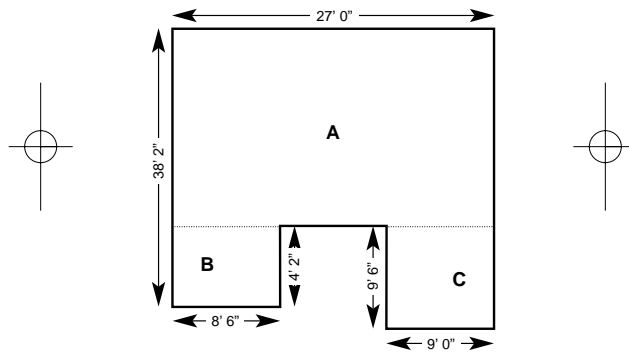
**Topsoil Volume**

*You are measuring a building perimeter for calculating topsoil excavation. If the building measurements are 45 Feet by 23 Feet, and the depth of topsoil to be removed is 8 Inches, what is the building area and volume of topsoil to be removed?*

KEYSTROKE	DISPLAY
1. Clear calculator: On/C On/C	0.
2. Enter Length and Width of building: 4 5 Feet Length 2 3 Feet Width	LNTH 45 FEET 0 INCH WDTH 23 FEET 0 INCH
3. Find building Area: Conv Vol	AREA 1035 SQ FEET
4. Enter Depth to be removed: 8 Inch Depth	DPTH 8 INCH
5. Find Volume of topsoil: Vol	VOL 25.55556 CU YD

### Complex Concrete Volume

*You're going to pour an odd-shaped patio 4-1/2 Inches deep with the dimensions as shown. First, calculate the total area (by dividing the drawing into three individual rectangles) and then determine the total Cubic Yards of concrete required for this job. What is the total cost of the concrete if it is selling for \$55 per Cubic Yard?*



Dgm-CCV-105

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**KEYSTROKE** **DISPLAY**

1. Clear calculator:  
**On/C On/C** **0.**
2. Find area "A" and add to Memory:  
**3 8 Feet 2 Inch** **38 FEET 2 INCH**  
**- 4 Feet 2 Inch = Length**  
**LNTH 34 FEET 0 INCH**  
**2 7 Feet Width** **WDTH 27 FEET 0 INCH**  
**Conv Vol** **AREA 918. SQ FEET**  
**M+** **918. SQ FEET M**
3. Find area "B" and add to Memory:  
**4 Feet 2 Inch Length** **LNTH 4 FEET 2 INCH M**  
**8 Feet 6 Inch Width** **WDTH 8 FEET 6 INCH M**  
**Conv Vol** **AREA 35.41667 SQ FEET M**  
**M+** **35.41667 SQ FEET M**
4. Find area "C" and add to Memory:  
**9 Feet Length** **LNTH 9 FEET 0 INCH M**  
**9 Feet 6 Inch Width** **WDTH 9 FEET 6 INCH M**  
**Conv Vol** **AREA 85.5 SQ FEET M**  
**M+** **85.5 SQ FEET M**
5. Find Total Area/Volume and cost:  
**Rcl Rcl** **1038.917 SQ FEET**  
**X 4 Inch 1 / 2 =** **389.5938 CU FEET**  
**Conv Yds** **14.4294 CU YD**  
**X 5 5 Conv** **\$793.62 Per**

### Trench Volume

*You're digging a trench that is 345 Feet long, 24 Inches wide and 6 Feet deep. Find the Volume of soil removed.*

KEYSTROKE	DISPLAY
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1. Clear calculator:  
**On/C On/C** **0.**

2. Enter Length, Width and Depth of trench:

<b>3</b>	<b>4</b>	<b>5</b>	<b>Feet</b>	<b>Length</b>	<b>LNTH 345 FEET 0 INCH</b>
<b>2</b>	<b>4</b>	<b>Inch</b>	<b>Width</b>		<b>WDTH 24 INCH</b>
<b>6</b>	<b>Feet</b>	<b>Depth</b>			<b>DPTH 6 FEET 0 INCH</b>

3. Find removed dirt Volume:  
**Vol** **VOL 153.3333 CU YD**

### **RIGHT TRIANGLE PROBLEMS**

The calculator's top row of keys provides built-in solutions to Square-Up, Drop, Percent Grade and Slope problems.

*Square-up* is calculated from the values entered as length and width and is the diagonal length in a Right Triangle.

*Slope and Percent Grade* are calculated using the values for width and depth, or drop. Slope can be entered as either a ratio of Run per Unit Rise, or as a Decimal Degree. Percent Grade is entered as a percentage value. The following diagram shows the relationship of these features.

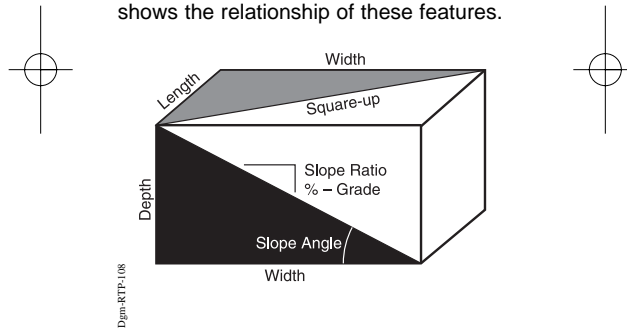


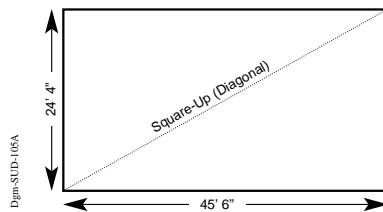
Diagram-KTP-108

Slope Ratio = Width:Unit Depth

$$\text{Percent Grade} = \frac{\text{Depth}}{\text{Width}} \times 100\%$$

### Squaring a Concrete Slab

Assume you want to "Square-Up" the forms for a concrete foundation measuring 45 Feet 6 Inches by 24 Feet 4 Inches. To square the forms, find the Square-Up (Diagonal) length. If the slab is 4 Inches thick, find the Area and Volume.



<b>KEYSTROKE</b>	<b>DISPLAY</b>
------------------	----------------

1. Clear calculator:  

<b>On/C On/C</b>	<b>0.</b>
------------------	-----------
  
2. Enter Length, Width and Depth:  

<b>4 5 Feet 6 Inch Length</b>	<b>LNTH 45 FEET 6 INCH</b>
<b>2 4 Feet 4 Inch Width</b>	<b>WDTH 24 FEET 4 INCH</b>
<b>4 Inch Depth</b>	<b>DPTH 4 INCH</b>
  
3. Solve for Square-up:  

<b>ConV Length SQUP</b>	<b>51 FEET 7-3/16 INCH</b>
-------------------------	----------------------------
  
4. Solve for Area and Volume:  

<b>ConV Vol AREA</b>	<b>1107.167 SQ FEET</b>
<b>Vol</b>	<b>VOL 13.66872 CU YD</b>

### Finding Lot Width

*What is the width of a lot that has a 5 Degree Slope and a total Drop of 2 Feet?*

KEYSTROKE	DISPLAY
1. Clear calculator: <b>On/C On/C</b>	<b>0.</b>
2. Enter Slope and Drop: <b>5 Conv 0 Conv Depth</b>	<b>SLP 5°</b>
<b>2 Feet Depth</b>	<b>DPTH 2 FEET 0 INCH</b>
3. Solve for Width: <b>Width</b>	<b>WDTH 22 FEET 10-5/16 INCH</b>

*Note: Slope and % Grade work with Width and Depth, not Length.*

### Finding Drop or Fall

*What is the total Drop over 25 Feet for a 4:1 Slope? For a 5 Degree Slope? For a 5% Grade?*

KEYSTROKE	DISPLAY
-----------	---------

1. Clear calculator: <b>On/C On/C</b>	<b>0.</b>
--	-----------

#### Solve Drop Using Slope ratio

2. Enter 4:1 Slope and Width: <b>4 Conv Depth</b>	<b>SLP 4.</b>
<b>2 5 Feet Width</b>	<b>WDTH 25 FEET 0 INCH</b>

3. Solve for Drop: <b>Depth</b>	<b>DPTH 6 FEET 3 INCH</b>
------------------------------------	---------------------------

#### Solve Drop Using Slope degree

4. Enter 5° Slope: <b>5 Conv 0 Conv Depth</b>	<b>SLP 5°</b>
--	---------------

5. Solve for Drop: <b>On/C Depth</b>	<b>DPTH 2 FEET 2-1/4 INCH</b>
---	-------------------------------

#### Solve Drop Using Percent Grade

6. Enter 5% Grade: <b>5 Conv Width</b>	<b>%GRD 5.</b>
---	----------------

7. Solve for Drop: <b>On/C Depth</b>	<b>DPTH 1 FEET 3 INCH</b>
---	---------------------------

**Finding Slope Ratio/Percent Grade**

*What is the Slope Ratio and Percent Grade of a lot that drops 3 Feet 6 Inches over 20 Feet?*

KEYSTROKE	DISPLAY
1. Clear calculator: <b>On/C On/C</b>	<b>0.</b>

**Solve for degree of Slope**

2. Enter Drop (as Depth): <b>3 Feet 6 Inch Depth</b>	<b>DPTH 3 FEET 6 INCH</b>
---	---------------------------

3. Enter Distance (Width): <b>20 Feet Width</b>	<b>WDTH 20 FEET 0 INCH</b>
--	----------------------------

4. Find Degree of Slope: <b>Conv Depth</b>	<b>SLP 9.926246°</b>
---	----------------------

**Solve for Slope ratio**

5. Find Slope Ratio: <b>Depth</b>	<b>SLP 5.714286</b>
--------------------------------------	---------------------

**Solve for Percent Grade**

6. Find Percent Grade: <b>Conv Width</b>	<b>%GRD 17.5</b>
---	------------------

**BASIC CUT / FILL SOLUTIONS**

**Finding Cut or Fill — Exercise 1**

*Find the cut/fill marks or changes of elevations for a lot with a proposed elevation of 4.0 Feet and existing elevations of 3.0 Feet, 4.5 Feet and 6.0 Feet.*

KEYSTROKE	DISPLAY
1. Clear calculator: <b>On/C On/C</b>	<b>0.</b>

**Solve for First Cut/Fill mark**

2. Enter proposed elevation: <b>4 Feet Prop</b>	<b>PROP 4 FEET 0 INCH</b>
3. Enter first existing elevation: <b>3 Feet Exist</b>	<b>EXST 3 FEET 0 INCH</b>
4. Find first Cut/Fill: <b>Cut/Fill</b>	<b>FILL 1 FEET 0 INCH</b>

**Solve for Second Cut/Fill mark**

5. Enter second existing elevation: <b>4 5 Feet Exist</b>	<b>EXST 4.5 FEET</b>
6. Find second Cut/Fill: <b>Cut/Fill</b>	<b>CUT - 0.5 FEET</b>

**Solve for Third Cut/Fill mark**

7. Enter third existing elevation: <b>6 Feet Exist</b>	<b>EXST 6 FEET 0 INCH</b>
8. Find third Cut/Fill: <b>Cut/Fill</b>	<b>CUT - 2 FEET 0 INCH</b>

**Finding Cut or Fill — Exercise 2**

Find the cut/fill marks for a lot that has a proposed elevation of 15.5 Feet, and the following existing elevations: 17.3 Feet, 20.7 Feet, 25.5 Feet and 11.8 Feet.

KEYSTROKE	DISPLAY
1. Clear calculator: On/C On/C	0.
<b>Solve for First Cut/Fill mark</b>	
2. Enter proposed elevation: 1 5 . 5 Feet Prop	PROP 15.5 FEET
3. Enter first existing elevation: 1 7 . 3 Feet Exst	EXST 17.3 FEET
4. Find First Cut/Fill: Cut/Fill	CUT - 1.8 FEET
<b>Solve for Second Cut/Fill mark</b>	
5. Enter second existing elevation: 2 0 . 7 Feet Exst	EXST 20.7 FEET
6. Find second Cut/Fill: Cut/Fill	CUT - 5.2 FEET
<b>Solve for Third Cut/Fill mark</b>	
7. Enter third existing elevation: 2 5 . 5 Feet Exst	EXST 25.5 FEET
8. Find third Cut/Fill: Cut/Fill	CUT - 10. FEET
<b>Solve for Fourth Cut/Fill mark</b>	
9. Enter fourth existing elevation: 1 1 . 8 Feet Exst	EXST 11.8 FEET
10. Find fourth Cut/Fill: Cut/Fill	FILL 3.7 FEET

**Cubic Yards of Cut/Fill**  
**— Grid Cell Method**

*The four corner elevations of a Grid cell are 75.4 Feet, 77.5 Feet, 74.6 Feet, and 80.5 Feet. If the proposed elevation is 83 Feet, and the Area of the Grid is 2,000 Square Feet, what is the Volume (in Cubic Yards) of cut or fill required for this Grid cell?*

**KEYSTROKE** **DISPLAY**

1. Clear calculator:  
**On/C On/C** **0.**

**Find average Existing Grid Elevation**

2. Enter first through fourth elevation (in Memory):

<b>7</b>	<b>5</b>	<b>.</b>	<b>4</b>	<b>Feet</b>	<b>M+</b>	<b>75.4 FEET</b>	<b>M</b>
<b>7</b>	<b>7</b>	<b>.</b>	<b>5</b>	<b>Feet</b>	<b>M+</b>	<b>77.5 FEET</b>	<b>M</b>
<b>7</b>	<b>4</b>	<b>.</b>	<b>6</b>	<b>Feet</b>	<b>M+</b>	<b>74.6 FEET</b>	<b>M</b>
<b>8</b>	<b>0</b>	<b>.</b>	<b>5</b>	<b>Feet</b>	<b>M+</b>	<b>80.5 FEET</b>	<b>M</b>

3. Find total:  
**Rcl M+** **308. FEET M**

4. Find average:  
**M+** **AVG 77. FEET M**

**Solve for Cut or Fill**

5. Enter average as existing elevation:  
**= Exst** **EXST 77. FEET M**

(Cont'd)

(Cont'd)

**KEYSTROKE** **DISPLAY**

6. Enter proposed elevation:

**8 3 Feet Prop**  
**PROP 83 FEET 0 INCH M**

7. Find Cut or Fill:

**Cut/Fill** **FILL 6 FEET 0 INCH M**

**Solve for Grid Volume**

8. Enter Grid Area and find Volume:

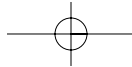
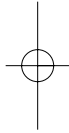
**X 2 0 0 0 Sq Feet =**  
**12000 CU FEET M**

9. Convert to Cubic Yards:

**ConV Yds** **444.4444 CU YD M**

**SHRINK and SWELL SOLUTIONS**  
**— MATERIAL VOLUME**

The *HeavyCalc* is able to convert among Bank Fill, Compacted Fill and Loose (or trucked) Fill soil Cubic Yard Volumes. Once values for %-Shrink and %-Swell are entered, converting among these volumes is done with the press of a single key. Entered values for Percent Shrink and Percent Swell will remain in Memory until they are revised or reset by using **Conv X**.



**Finding Loose Volume**

*How much dry gravel will be trucked out of a hole to be dug that measures 10 Feet long by 35 Feet wide by 15 Feet deep? Assume dry gravel has a swell factor of 15%.*

KEYSTROKE	DISPLAY
1. Clear calculator: <b>On/C On/C</b>	0.

**Solve Bank Fill Volume**

2. Enter Length, Width and Depth:	
<b>1 0 Feet Length</b>	<b>LNTH 10 FEET 0 INCH</b>
<b>3 5 Feet Width</b>	<b>WDTH 35 FEET 0 INCH</b>
<b>1 5 Feet Depth</b>	<b>DPTH 15 FEET 0 INCH</b>

3. Solve for Volume:	
<b>Vol</b>	<b>VOL 194.4444 CU YD</b>
4. Enter as Bank Volume:	
<b>= Bank</b>	<b>BANK 194.4444 CU YD</b>

**Solve Loose Fill Volume**

5. Enter 15% swell factor:	
<b>1 5 Conv Loose</b>	<b>% SWL 15.</b>
6. Find Loose Volume:	
<b>Loose</b>	<b>LOOS 223.6111 CU YD</b>

**Finding Trucked Volume/Weight  
— Both Swell and Shrink Factors**

*You need to move wet sand from one location to another that requires a 4-Inch fully compacted fill under a 125 Feet long by 75 Feet wide slab. What is the trucked (loose fill) Volume? Assume a Swell Factor of 5% and a Shrink Factor of 10%. What is the total weight of the sand if it weighs 1.55 Tons per Cubic Yard?*

- | KEYSTROKE  | DISPLAY  |
|--|--|
| 1. Clear calculator:<br>On/C On/C  | 0.   |
| 2. Enter Shrink/Swell Factors:<br>5 Conv Loose<br>1 0 Conv Comp                          | %SWL 5.<br>%SHR 10.  |
| 3. Enter Length, Width and Depth:<br>1 2 5 Feet Length<br>7 5 Feet Width<br>4 Inch Depth | LNTH 125 FEET 0 INCH<br>WDTH 75 FEET 0 INCH<br>DPTH 4 INCH |
| 4. Find Compacted Fill Volume and enter into Compacted Volume:<br>Vol = Comp             | COMP 115.7407 CU YD  |
| 5. Find Loose Volume:<br>Loose   | LOOS 135.0309 CU YD  |
| 6. Enter Unit Weight:<br>1 5 5 Conv %  | 1.55 Ton Per CU YD   |

(Cont'd)

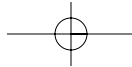
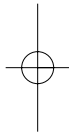
(Cont'd)

**KEYSTROKE** **DISPLAY**

7. Recall Bank Volume:  
**Bank** **BANK 128.6008** CU YD

8. Find Weight:  
**Weight** **199.3313** Ton

9. Reset calculator:  
**Conv** **X** **0.**



## APPENDIX

### ACCURACY / ERRORS

#### Accuracy/Display Capacity

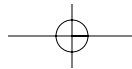
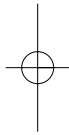
Your calculator has an eleven digit display. This is made up of seven digits (normal display) and four digits for the fraction. In a standard calculation, each calculation is carried out internally to ten digits and rounded to a seven-digit standard display. If the next undisplayed digit is five or more, the 5/4 rounding technique adds one to the least significant digit in the display. If the digit is less than five, no rounding occurs.

#### Errors

When an incorrect entry is made, or an answer is beyond the calculator's range, the word "Error" displays. To clear an error you must hit the **On/C** key twice. When you have determined what caused the error, re-key the problem. An "Error" will also occur if you enter a mathematical impossibility such as division by zero.

### **Auto-Range**

If an "overflow" occurs due to an input or calculation that use more digits than the display's standard seven-digit range, the answer automatically displays in the next larger unit (instead of showing "Error"). i.e., *10,000,000 mm* is greater than the seven-digit range; therefore, *10,000 m* is displayed instead. This auto-ranging also applies to other dimensional units such as Inches to Feet, Feet to Yards, etc.



### **BATTERY and AUTO SHUT-OFF**

Your calculator is powered by a single three-Volt Lithium CR-2016 battery. This should last approximately 800 hours of actual use (one year plus for most people). Should the display become very dim or erratic, replace the battery.

**WARNING:** Please use caution when disposing of your old batteries as they contain hazardous chemicals.

Your calculator is designed to shut itself off after about 8-12 minutes of non-use.

*Note:* Values in Memory or shown on the display will be cleared.

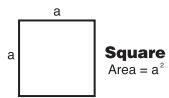
### **FULL RESET / ALL CLEAR**

Press **Conv** **X** to clear all Memory registers. After a Full Reset/All-Clear, the following settings return to their default state:

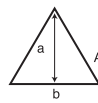
### **DEFAULT SETTINGS**

SETTING	DEFAULT
Weight per Volume	1.5 Tons/Cu. Yd.
Fractional Setting	1/16"
Fractional Mode	Normal

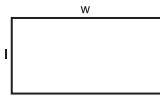
### AREA FORMULAS



**Square**  
Area =  $a^2$



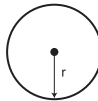
**Triangle**  
Area =  $1/2 ab$



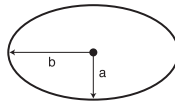
**Rectangle**  
Area =  $lw$



**Octagon**  
Area =  $(d/2)^2 \times 2.828$



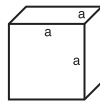
**Circle**  
Circumference =  $2\pi r$   
Area =  $\pi r^2$



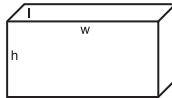
**Ellipse**  
Area =  $\pi ab$

Dgn-A1-100

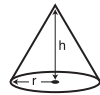
**SURFACE AREA and VOLUME  
FORMULAS**



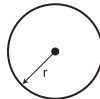
**Cube**  
Surface Area =  $6a^2$   
Volume =  $a^3$



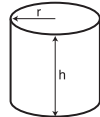
**Rectangle**  
Surface Area =  $2hw + 2hl + 2lw$   
Volume =  $l \times w \times h$



**Cone**  
Surface Area =  $\pi r \sqrt{r^2 + h^2}$   
(+  $\pi r^2$  if you add the base)  
Volume =  $\frac{\pi r^2 h}{3}$



**Sphere**  
Surface Area =  $4\pi r^2$   
Volume =  $\frac{4}{3}\pi r^3$



**Cylinder**  
Surface Area =  $2\pi rh + 2\pi r^2$   
Volume =  $\pi r^2 h$

Dgn-VF-101

## REPAIR AND RETURN

### WARRANTY, REPAIR and RETURN INFORMATION

#### Return Guidelines

1. Please read the **Warranty** in this User's Guide to determine if your Calculated Industries calculator, measuring device or electronic tool remains under warranty **before** calling or returning any device for evaluation or repairs.
2. If your calculator won't turn on, try pressing the "Reset Button" first. If it still won't turn on, check the batteries as outlined in the User's Guide.
3. **If there is a black spot on the LCD screen, THIS IS NOT A WARRANTY DEFECT. The unit can be repaired. Call for a repair quote before returning your unit.**
4. If you need more assistance, please go to our website at [www.calculated.com](http://www.calculated.com) and click on Support, then Repair Services FAQs.
5. If you believe you need to return your calculator, please speak to a Calculated Industries representative for additional information!

**Call Toll Free: 1-800-854-8075**

## **WARRANTY**

### **Warranty Repair Service – U.S.A.**

Calculated Industries ("CI") warrants this product against defects in materials and workmanship for a period of one (1) year from the date of original consumer purchase in the U.S. If a defect exists during the warranty period, CI at its option will either repair (using new or remanufactured parts) or replace (with a new or remanufactured calculator) the product at no charge.

THE WARRANTY WILL NOT APPLY TO THE PRODUCT IF IT HAS BEEN DAMAGED BY MISUSE, ALTERATION, ACCIDENT, IMPROPER HANDLING OR OPERATION, OR IF UNAUTHORIZED REPAIRS ARE ATTEMPTED OR MADE. SOME EXAMPLES OF DAMAGES NOT COVERED BY WARRANTY INCLUDE, BUT ARE NOT LIMITED TO, BATTERY LEAKAGE, BENDING, OR VISIBLE CRACKING OF THE LCD, WHICH ARE PRESUMED TO BE DAMAGES RESULTING FROM MISUSE OR ABUSE.

To obtain warranty service in the U.S., ship the product postage paid to Calculated Industries (address listed on the last page). Please provide an explanation of the service requirement, your name, address, day phone number and dated proof of purchase (typically a sales receipt). If the product is over 90 days old, include payment of \$6.95 for return shipping and handling within the contiguous 48 states. (Outside the contiguous 48 states, please call CI for return shipping costs.)

A repaired or replacement product assumes the remaining warranty of the original product or 90 days, whichever is longer.

### **Non-Warranty Repair Service – U.S.A.**

Non-warranty repair covers service beyond the warranty period, or service requested due to damage resulting from misuse or abuse.

Contact Calculated Industries at the number listed on the last page of this guide to obtain current product repair information and charges. Repairs are guaranteed for 90 days.

**Repair Service – Outside the U.S.A.**

To obtain warranty or non-warranty repair service for goods purchased outside the U.S., contact the dealer through which you initially purchased the product. If you cannot reasonably have the product repaired in your area, you may contact CI to obtain current product repair information and charges, including freight and duties.

**Disclaimer**

CI MAKES NO WARRANTY OR REPRESENTATION, EITHER EXPRESS OR IMPLIED, WITH RESPECT TO THE PRODUCT'S QUALITY, PERFORMANCE, MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE. AS A RESULT, THIS PRODUCT, INCLUDING BUT NOT LIMITED TO, KEYSTROKE PROCEDURES, MATHEMATICAL ACCURACY AND PREPROGRAMMED MATERIAL, IS SOLD "AS IS," AND YOU THE PURCHASER ASSUME THE ENTIRE RISK AS TO ITS QUALITY AND PERFORMANCE.

IN NO EVENT WILL CI BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY DEFECT IN THE PRODUCT OR ITS DOCUMENTATION.

The warranty, disclaimer, and remedies set forth above are exclusive and replace all others, oral or written, expressed or implied. No CI dealer, agent, or employee is authorized to make any modification, extension, or addition to this warranty.

Some states do not allow the exclusion or limitation of implied warranties or liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific rights, and you may also have other rights, which vary from state to state.

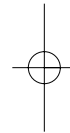
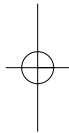
### **FCC Class B**

This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC rules.

### **Looking For New Ideas**

Calculated Industries, a leading manufacturer of special-function calculators and digital measuring instruments, is always looking for new product ideas in these areas.

If you have an idea, or a suggestion for improving this product or User's Guide, please submit your comments online at [www.calculated.com](http://www.calculated.com) under "Contact Us," "Product Idea." Thank you.



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