POCKET REFERENCE GUIDE

PIPE TRADES PRO™

Advanced Pipe Trades Math Calculator

Model 4095

CALCULATED INDUSTRIES®

FAST. ACCURATE. RELIABLE.

Designing and building new calculators like the *Pipe Trades Pro*™ Advanced Pipe Trades Math Calculator and the *PlumbingCalc Pro*™ Flow & Dimensional Math Calculator could not have been done without the support of pipefitting and plumbing professionals. Calculated Industries gratefully acknowledges the many individuals and organizations who were so generous with their time and expertise.

- United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada
    - David Kendrick, Secretary-Business Manager, Greater Kansas City Building and Construction Trades Council, AFL-CIO
    - Sprinkler Fitters Local 314
    - Plumber & Gas Fitters Local 8
    - Pipe Fitters Local 533
- Neil M. McCain, McCain Institutes
- Pete Nicacio, Training Coordinator, Plumbers & Steamfitters 598
- John Williams, Plumbing Technology Instructor, Kirkwood Community College
- Pipe Fitters Local 350
- James Witt, Instructor, Plumbers and Pipefitters Local 469

PIPE TRADES PRO™

The *Pipe Trades Pro*™ Advanced Pipe Trades Math Calculator has been specifically designed for today's pipe trade professionals. No matter what Pipe Trade you work in, you'll find it easy to use, fast, accurate, and reliable. Quickly calculate Offsets, Rolling Offsets, and Cutbacks. Immediately access Pipe Material and Type data, and Pipe Size dimensions. The *Pipe Trades Pro* will help you on the jobsite or in the office.

- *Built-in data and Pipe Sizing for 7 different Piping Materials*
- *Linear and Rolling Offset Solutions for Known and Unknown Fitting Angles*
- *Fitting Take-out and Cut Mark Solutions*
- *Cutback Solutions*
- *Trigonometric Solutions*
- *Circle, Circumference and Area Solutions*
- *Fractional Feet-Inch Input/Output*
- *Simple US/Metric and Flow Conversions and Solutions*
- *Problems Involving All Architectural Fractions — 1/2-1/64ths*
- *And more*

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GETTING STARTED

You may want to practice getting a feel for your calculator keys by reading through the key definitions and learning how to enter basic feet-inch-fractions and metric, how to store values in Memory, etc., before proceeding to the examples.

KEY DEFINITIONS

Basic Function Keys

On/C ***On/Clear Key –*** Turns on power. Pressing once clears the last entry and the display. Pressing twice clears all non-permanent values.

Off ***Off –*** Turns all power off. Clears all non-permanent memory.

+ − × ÷ = ***Arithmetic operation keys.***

0 – **9** and **•** ***Keys used for entering numbers.***

Conv ***Convert –*** Used with the dimensional keys to convert between units or with other keys to access special functions.

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Stor ***Store –*** Used for storing values.

Rcl ***Recall –*** Used with other keys to recall stored values and settings.

Conv **Rcl** ***Memory Clear (M-R/C) –*** Clears Memory without changing current display.

M+ ***Accumulative Memory –*** Adds value to Accumulative Memory.

Conv **M+** ***M- –*** Subtracts value from Accumulative Memory.

Dimensional Function Keys

Feet ***Feet –*** Enters or converts to feet as whole or decimal numbers. Also used with **Inch** and **/** keys for entering feet-inch values (e.g., 6 **Feet** 9 **Inch** 1 **/** 2). *Repeated presses during conversions toggle between fractional feet-inch and decimal feet.*

Inch ***Inch –*** Enters or converts to inches. Entry can be whole or decimal numbers. Also used with **/** for entering fractional inch values (e.g., 9 **Inch** 1 **/** 2). *Repeated presses during conversions toggle between fractional and decimal inches.*

/ ***Fraction Bar –*** 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. Results are always shown in typical building fractional format.

Conv 1 ***Gallons per Minute (gpm) –*** Enters or converts to gallons per minute.

Conv 2 ***Liters per Second (l/s) –*** Enters or converts to liters per second.

Conv 4 ***Cubic Feet per Minute (cfm) –*** Enters or converts to cubic feet per minute.

Conv 5 ***Cubic Feet per Second (cfs) –*** Enters or converts to cubic feet per second.

Conv 3 ***Degrees Celsius (°C) –*** Enters or converts to degrees Celsius.

Conv 6 ***Degrees Fahrenheit (°F) –*** Enters or Converts to degrees Fahrenheit.

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mm ***Millimeters –*** Enters or converts to millimeters.

Conv **mm** ***Meters (m) –*** Enters or converts to meters.

Conv **8** ***Gallons –*** Enters or converts to gallons.

Conv **9** ***Liters –*** Enters or converts to liters.

Weight/Volume Functions

Stor **+** ***Weight/Volume (wt/vol) –*** Stores a new weight volume as pounds per cubic feet or other format as shown below. Default value is 62.42796 pounds per cubic foot of water (1000 kg/m^3).

- Pounds per cubic foot
- Pounds per cubic inch
- Pounds per gallon
- Kilograms per cubic meter
- Kilograms per liter

Conv **7** ***Pounds (lbs) –*** Enters or converts a weight or volume value to pounds.

Conv **/** ***Kilograms (kg) –*** Enters or converts a weight or volume value to kilograms.

Circle Key

Circle ***Circle –*** Enters diameter and calculates circle area and circumference.

Trigonometric Keys

Sine ***Sine –*** Finds the sine of a degree or undimensioned value.

Conv **Sine** ***Arcsine (sin^{-1}) –*** Gives the angle in degrees for the Sine value.

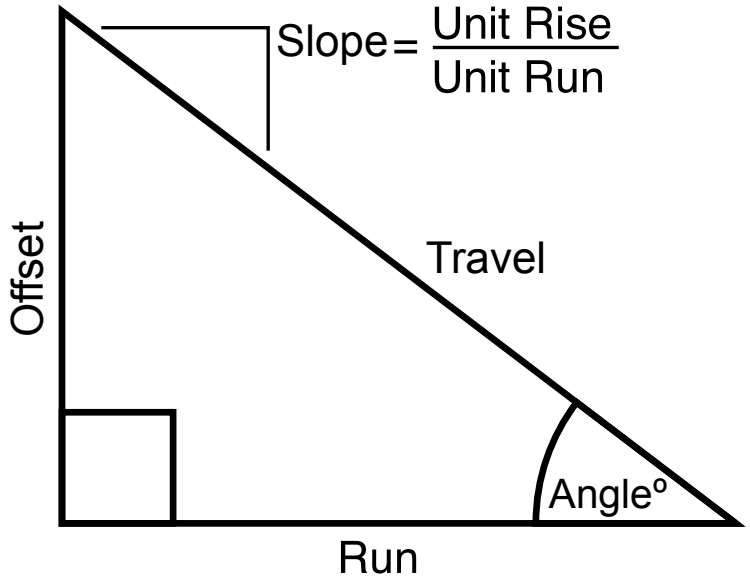
Cos ***Cosine –*** Finds the Cosine of a degree or undimensioned value.

Conv **Cos** ***Arccosine (cos^{-1}) –*** Gives the angle in degrees for the Cosine value.

Tan ***Tangent –*** Finds the Tangent of a degree or undimensioned value.

Conv **Tan** ***Arctangent (tan^{-1}) –*** Gives the angle in degrees for the Tangent value.

Pipefitting Project Keys



Angle/ Slope — ***Angle/Slope –*** Enters or calculates a linear Slope, Slope Angle, or Percent Grade. The linear slope is the amount of "Offset" over 12 inches of "Run." Values may be entered as:

- a Dimension: 9 Inch Angle/ Slope
- an Angle or Degrees: 4 5 Angle/ Slope
- a Percentage (percent grade): 7 5 Conv ← Angle/ Slope

Once an angle or slope has been entered, consecutive presses of Angle/ Slope will convert to the remaining formats listed above.

Conv Angle/ Slope — ***Take-Out (T.O./Arc) –*** Used to enter or solve fitting Take-Outs when calculating pipe cut lengths. Calculates inner, center, and outer arc lengths for marking field cut fittings.

Offset — ***Offset –*** Calculates or enters the Offset (Rise).

Conv Offset — ***Welder's Gap –*** Defines the Welder's Gap subtracted from the end-to-end pipe length calculation. Default value is 1/8", 0 is a valid value.

Run — ***Run –*** Enters or calculates the Run.

Travel — ***Travel –*** Enters or calculates the Travel (Diagonal).

Pipe Mat'l — ***Pipe Material –*** Defines the Pipe Material. (Steel, Stainless Steel, Brass, Aluminum, Cast Iron, PVC or Copper).

Conv Pipe Mat'l — ***Elbow Type –*** Defines the type of radius (long or short) and whether a factory or field cut 45˚ Butt Weld elbow is being used. Default value is Butt Weld – Long.

Pipe Size — ***Pipe Size –*** Enters the nominal Pipe Size and provides data pertaining to the entered size. *(cont'd)*

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Conv **Pipe Size** ***Pipe Type* –** Defines the Pipe Type based on Pipe Material.

Conv **Run** ***Cutback* –** Calculates pipe Cutback after Bend Angle and Offset are entered.

Conv **Travel** ***Rolling Offset (Roll)* –** Calculates Rolling Offset pipe length.

Conv **(** ***Flow* –** Enter or calculate volumetric Flow Rate through a pipe.

Conv **)** ***Velocity* –** Enter or calculate Velocity and convert between feet per second, feet per minute, and meters per second.

Conv **Circle** ***Pressure* –** Enter Pressure value. Calculate Pressure loss. Convert between units of pressure.

Conv **x^2** ***Force* –** Enter or calculate Force and convert between lbf, newton.

Conv **$\sqrt{x}$** ***Area* –** Enter pipe area for use in Flow, Velocity, Pressure, and Force calculations. Calculate Area given values for Flow/Velocity or Force/ Pressure.

Miscellaneous Functions

(Open parenthesis key.

) Close parenthesis key.

x^y ***X^y* –** Enters an exponential value other than x^2 or Square Root.

Conv **x^y** ***Exponential Root Value ($X^{1/y}$)* –** Enters an exponential root value.

Conv **+** ***Pi* –** Displays value of π (3.141593).

Conv **÷** ***Reciprocal (1/x)* –** Finds the reciprocal of a number (e.g., **8** **Conv** **÷** 0.125).

Conv **–** ***Change Sign (+/–)* –** Toggle displayed value between minus and plus value.

Conv **×** ***Clear All* –** Returns all stored values to the default settings. Does not affect Preference settings.

x^2 ***X^2* –** Squares the value in the display.

$\sqrt{x}$ ***$\sqrt{x}$* –** Square root function.

Conv **0** ***Cost* -** Cost function.

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Stor 0 Store unit cost.

Conv • ***Degrees:Minutes:Seconds (dms◄►deg) –*** Converts between D:M:S and decimal degree formats; repeated presses will toggle between the two formats.

Conv − ***Paperless tape (Tape) –*** Accesses the Paperless Tape mode.

Conv Stor ***Preference settings (Prefs) –*** Used to access various customizable settings.

← ***Backspace Function –*** Used to delete entries one keystroke at a time (unlike the On/C function, which deletes the entire entry).

Conv ← ***% –*** Percent function.

Stor 1-9 Used to store values in Memory registers 1 through 9.

PREFERENCE SETTINGS

HOW TO SET PREFERENCES

The following sections detail Preference Setting options for the *PipeTrades Pro* calculator.

Enter the Preference Mode by pressing Conv Stor (Prefs). Access each category by pressing the Stor key until you reach the desired setting. Within each category, press the + or − keys to toggle between individual selections. Press On/C to exit and set your Preference.

Note: *Press + to advance and press − to back up. Pressing the Stor key continuously in this mode will cycle through all of the Preference Settings.*

You may change these settings at any time by repeating the above, and setting in a new preference.

To reset preferences back to factory default settings, turn your calculator off, hold down the × key and turn the calculator back on.

For example, if you wish to display all your dimensional area answers in square meters, press Conv Stor Stor (Area Std), then the + key until **"AREA 0. SQ M"** is displayed. Simply exit this mode by pressing On/C and all your future area answers will be displayed in square meters.

KEYSTROKE	DISPLAY
Conv Stor *(Prefs)*	
(Fractional Resolution)	**FRAC 0-1/16 INCH**

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KEYSTROKE	DISPLAY
➕	**FRAC 0-1/32 INCH**
➕	**FRAC 0-1/64 INCH**
➕	**FRAC 0-1/2 INCH**
➕	**FRAC 0-1/4 INCH**
➕	**FRAC 0-1/8 INCH**
➕ *(repeats options)*	**FRAC 0-1/16 INCH**

Second press of **Stor**:

(Area displays)	**AREA Std.**
➕	**AREA 0. SQ FEET**
➕	**AREA 0. SQ INCH**
➕	**AREA 0. SQ M**
➕ *(repeats options)*	**AREA Std.**

Third press of **Stor**:

(Volume displays)	**VOL Std.**
➕	**VOL 0. CU FEET**
➕	**VOL 0. CU M**
➕ (repeats options)	**VOL Std.**

Fourth press of **Stor**:

(Meter Linear displays)	**METR 0.000 M**
➕ *(floating point)*	**METR FLOAt M**
➕ *(repeats options)*	**METR 0.000 M**

Fifth press of **Stor**:

(Decimal Degree displays)	**DEG 0.00º**
➕ *(floating point)*	**DEG FLOAt**
➕ *(repeats options)*	**DEG 0.00º**

Sixth press of **Stor**:

(Fractional mode)	**FRAC Std.**
➕	**FRAC COnSt.**
➕ (repeats options)	**FRAC Std.**

Seventh press of **Stor**:

(Mathematical Operation)	**MATH OrdEr**
➕	**MATH CHAIn**
➕ *(repeats options)*	**MATH OrdEr**

PERCENTAGE CALCULATIONS

The **Conv** ⬅ keys 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-dimensioned, linear, square or cubic).

Calculating Percentages

Find 18% of 500 feet:

KEYSTROKE	DISPLAY
On/C **On/C**	**0.**
5 0 0 **Feet** ✖ 1 8	
Conv ⬅ *(%)*	**90 FEET 0 INCH**

Take 20% from 286 Feet 6 inches:

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KEYSTROKE	DISPLAY
On/C On/C	0.
2 8 6 Feet 6 Inch − 2 0	
Conv ← *(%)*	229 FEET 2-3/8 INCH

Add a 10% waste allowance to 275 feet of pipe:

KEYSTROKE	DISPLAY
On/C On/C	0.
2 7 5 Feet + 1 0 Conv ←	302 FEET 6 INCH

MEMORY OPERATION

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

FUNCTION	KEYSTROKE
Add to Memory	M+
Subtract from Memory	Conv M+
Recall total in Memory	Rcl M+
Display/Clear Memory	Rcl Rcl
Clear Memory	Conv Rcl

Memory is semi-permanent, clearing only when you:

1) turn off the calculator
2) press Rcl Rcl
3) press Conv Rcl
4) press Conv × *(Clear All)*

When Memory is recalled (Rcl M+), consecutive presses of M+ will display the calculated average and total count of the accumulated values.

Using M+

KEYSTROKE	DISPLAY
3 5 5 M+	M+ 355. M
2 5 5 M+	M+ 255. M
7 4 5 Conv M+ *(M-)*	M- 745. M
Rcl M+	TTL – 135. M
M+	AVG – 45. M
M+	CNT 3. M
Rcl Rcl	M+ – 135.

USING THE PIPE TRADES PRO

Pipe Material Key

The Pipe Material key lets you choose a pipe material, which defines the available sizes and surface roughness used by the calculator. The default material for the *Pipe Trades Pro* is Steel, but you can choose from material types as shown.

KEYSTROKE	DISPLAY
On/C On/C	0.
Pipe Mat'l *(Steel)*	MATL StEEL
Pipe Mat'l *(Stainless Steel)*	MATL S.StEEL
Pipe Mat'l *(Brass)*	MATL brASS
Pipe Mat'l *(Aluminum)*	MATL AL.
Pipe Mat'l *(Cast Iron)*	MATL CASt
Pipe Mat'l *(Plastic)*	MATL PLAStIC

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KEYSTROKE	DISPLAY
Pipe Mat'l *(Copper)*	**MATL COPPEr**

The last material setting displayed is selected, and the calculator will retain your setting even after the power has been turned off. Once a material is selected, you can easily toggle through the available types (Schedules, etc.) using the Pipe Type function (Conv Pipe Size). Available types of pipe are dependent upon the material setting.

Keystrokes below show the pipe types available for Plastic (press Pipe Mat'l until **PLAStIC** is shown in the display).

KEYSTROKE	DISPLAY
On/C On/C	**0.**
Rcl Pipe Mat'l	**MATL PLAStIC**
Conv Pipe Size *(Schedule 40)*	**TYPE 40 PLAStIC**
Pipe Size *(Schedule 80)*	**TYPE 80 PLAStIC**
Pipe Size *(Schedule 120)*	**TYPE 120 PLAStIC**
Pipe Size *(SDR 21)*	**TYPE SD21 PLAStIC**
Pipe Size *(SDR 26)*	**TYPE SD26 PLAStIC**
Pipe Size *(SDR 32.5)*	**TYPE SD32 PLAStIC**
Pipe Size *(SDR 41)*	**TYPE SD41 PLAStIC**

You can also directly enter a Pipe Type, e.g., Schedule 80, by entering a number corresponding to the pipe type.

KEYSTROKE	DISPLAY
On/C On/C	**0.**
Pipe Mat'l	**MATL PLAStIC**
8 0 Conv Pipe Size *(Pipe Type)*	**TYPE 80 PLAStIC**

Pipe Size Key

When you have chosen a Pipe Material and Type and then enter Pipe Size, the pipe data will be displayed.

For this example we are using 3" Steel, Schedule 80 pipe.

KEYSTROKE	DISPLAY
Conv ⌧	**ALL CLEArEd**
1. Choose the Pipe Material:	
Pipe Mat'l	**MATL StEEL**
2. Enter the Pipe Type:	
8 0 Conv Pipe Size *(Pipe Type)*	**TYPE 80 StEEL**
3. Enter the Pipe Size:	
3 Inch	**3 INCH**
4. Toggle through the Pipe data:	
Pipe Size	**80 SIZE 3 INCH**
Pipe Size *(Outside Diameter)*	**OD SIZE 3.5 INCH**
Pipe Size *(Internal Diameter)*	**ID SIZE 2.9 INCH**
Pipe Size *(Wall Thickness)*	**THK SIZE 0.3 INCH**
Pipe Size *(Material)*	**MATL SIZE StEEL**
Pipe Size *(Weight per Foot)*	**PIPE SIZE 10.2528 LB PER FEET**

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KEYSTROKE	DISPLAY
Pipe Size *(Filled Weight/Foot)*	**FILL SIZE 13.11634 LB PER FEET**
Pipe Size *(Internal Area)*	**AREA SIZE 6.605199 SQ INCH**

WARNING: If you are using 12" Schedule 40 pipe, the Wall Thickness and Weight outputs of the Pipe Size function are incorrect for the materials below. The error understates the LB/FEET Pipe Size outputs. This table has the corrected 12" Schedule 40 pipe data.

Material (12" SCHED 40)	Wall Thickness	LB/FEET	Filled LB/FEET
Steel	.406 INCH	53.5246	150.5755
Brass	.406 INCH	59.9475	156.9985
Aluminum	.406 INCH	18.7336	115.7845
Cast Iron	.406 INCH	48.7074	145.7583

Elbow Type

The Elbow Type function lets you chose between long or short radius, and between factory and field cut 45º Butt Weld (B.W.) elbow types. The default value is for long radius, factory cut 45º B.W. elbow type.

The Elbow option setting has an impact on the Take-Out calculations as the radii vary between long and short Butt Weld fittings. Additionally, factory made 45º B.W. elbow fittings can have a different Take-Out calculation from the field cut variants.

This function toggles the Elbow types between the following options:

Butt Weld – Long

Default. Use this option when utilizing 90° long radius or factory 45° long radius B.W. elbow fittings, or any odd-angle long radius fitting cut from a 90° B.W. elbow.

Butt Weld – Short

Use this option when utilizing 90° short radius or factory 45° short radius fittings, or any odd-angle short radius fitting cut in the field from a 90° B.W. elbow.

Field Cut – Long

Use this option when utilizing long radius B.W. elbows, or any odd-angle long radius fitting cut from a 90° B.W. elbow, including a 45° B.W.

Field Cut – Short

Use this option when utilizing short radius B.W. elbows, or any odd-angle short radius fitting cut from a 90° B.W. elbow, including a 45° B.W.

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KEYSTROKE	DISPLAY
Conv Pipe Mat'l *(Default)*	BW-L EL. tYPE
Pipe Mat'l	BW-S EL. tYPE
Pipe Mat'l	FC-L EL. tYPE
Pipe Mat'l	FC-S EL. tYPE
Pipe Mat'l *(Default)*	BW-L EL. tYPE

Simple Offset – Known Bend Angle

Find the center-to-center travel for a pipe offset with a 24” Offset.

KEYSTROKE	DISPLAY
On/C On/C	0.
1. Enter Offset:	
2 4 Inch Offset	OFST 24 INCH
2. Enter bend angle:	
4 5 Angle/ Slope	∠Ø 45.00°
3. Find the pipe length:	
Travel	TRAV 33-15/16 INCH

Simple Offset – Unknown Bend Angle

Find the center-to-center travel and unknown bend angle for a pipe offset with a 16” Offset and 27” Run.

KEYSTROKE	DISPLAY
On/C On/C	0.
1. Enter Offset:	
1 6 Inch Offset	OFST 16 INCH
2. Enter Run:	
2 7 Inch Run	RUN 27 INCH
3. Find the pipe length:	
Travel	TRAV 31-3/8 INCH
4. Find the bend angle:	
Angle/ Slope	∠Ø 30.65°

Simple Offset – Cut Length

Find the cut length (end-to-end) for a pipe offset with a 10” Offset and a 12” Run. The bend angle is unknown. This example assumes 6” Steel, factory made long radius butt weld elbows are used. The following example shows an optional override of the Welder’s Gap when working with Stainless Steel.

Note: *All Take-Out calculations are based on Carbon Steel O.D. See the* ***Cut Length – Known Take-Out Value*** *example to solve Cut Lengths for known Take-Out values.*

KEYSTROKE	DISPLAY
Conv ⊠	ALL CLEArEd

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KEYSTROKE	DISPLAY
1. Select Stainless Steel:	
Pipe Mat'l Pipe Mat'l	**MATL S.StEEL**
2. Enter Pipe Size:	
6 Inch Pipe Size	**40 SIZE 6 INCH**
3. Enter 0 for Welder's Gap:	
0 Conv Offset *(Welder's Gap)*	**GAP 0 INCH**
4. Enter Offset:	
1 0 Inch Offset	**OFST 10 INCH**
5. Enter Run:	
1 2 Inch Run	**RUN 12 INCH**
6. Find the pipe length:	
Travel	**TRAV 15-5/8 INCH**
Travel	**CUT 9-1/8 INCH**
Travel	**TO 3-1/4 INCH**
Travel	**GAP 0 INCH**
Travel	**FIT° 39.81°**
Travel	**IARC 3-15/16 INCH**
Travel	**CARC 6-1/4 INCH**
Travel	**OARC 8-9/16 INCH**

The cut length for the pipe is 9 and 1/8 inches and bend angle is 39.81°. Included in the outputs are the arc lengths to be used to cut your butt weld elbow to the calculated bend angle. These are inner arc length of 3 and 15/16 inches, center arc length of 6 and 1/4 inches, and outer arc length of 8 and 9/16 inches.

Note: *To return the Welder's Gap to the default 1/8", press* Conv ✕ *to reset your calculator back to default values.*

Rolling Offset – Known Bend Angle

Find the center-to-center travel for a rolling pipe offset with a 4" Roll and a 24" Offset.

KEYSTROKE	DISPLAY
Conv ✕	**ALL CLEArEd**
1. Enter Offset:	
2 4 Inch Offset	**OFST 24 INCH**
2. Enter bend angle:	
4 5 Angle/ Slope	**∠Ø 45.00º**
3. Enter the Roll and calculate the pipe length:	
4 Inch Conv Travel *(Roll)*	**LNTH 34-7/16 INCH**

Continue pressing the Travel *key to view all related values.*

Rolling Offset – Unknown Bend Angle

Find the center-to-center travel for a rolling pipe offset with a 6-1/2" Roll, a 17" Offset, and an advance of 28". The bend angle is unknown.

KEYSTROKE	DISPLAY
Conv ✕	**ALL CLEArEd**

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KEYSTROKE	DISPLAY
1. Enter Offset:	
1 7 Inch Offset	OFST 17 INCH
2. Enter the advance:	
2 8 Inch Run *(Advance)*	RUN 28 INCH
3. Enter the Roll and calculate the pipe length and unknown bend angle:	
6 Inch 1 / 2	
Conv Travel *(Roll)*	LNTH 33-3/8 INCH
Travel	FIT° 33.02°

Continue pressing the Travel *key to view all related values.*

Rolling Offset – Cut Length

Find the end-to-end pipe length for a rolling pipe offset with a 13” Roll, a 24” Offset, and an advance of 32”. The bend angle is unknown. This example assumes 6” Steel, factory made long radius butt weld elbows are used with a Welder’s Gap of 3/32” (the default is 1/8”).

Note: *All Take-Out calculations are based on Carbon Steel O.D. See the* ***Cut Length – Known Take-Out Value*** *example to solve Cut Lengths for known Take-Out values.*

KEYSTROKE	DISPLAY
Conv ✕	ALL CLEArEd

KEYSTROKE	DISPLAY
1. Enter Pipe Size:	
6 Inch Pipe Size	STD SIZE 6 INCH
2. Change the default Welder’s Gap from 1/8” to 3/32”:	
3 / 3 2 Conv Offset*	GAP 0-3/32 INCH
3. Enter Offset:	
2 4 Inch Offset	OFST 24 INCH
4. Enter the advance:	
3 2 Inch Run *(Advance)*	RUN 32 INCH
5. Enter the Roll and calculate the pipe length and unknown bend angle:	
1 3 Inch	
Conv Travel *(Roll)*	LNTH 42-1/16 INCH
Travel	CUT 35-1/4 INCH
Travel	TO 3-5/16 INCH
Travel	GAP 0-3/32 INCH
Travel	FIT° 40.46°
Travel	IARC 4-1/32 INCH
Travel	CARC 6-11/32 INCH
Travel	OARC 8-11/16 INCH

**Setting welder's gap to 3/32 inch will temporarily set the outputs to 1/32 fractional resolution. To keep outputs in their current*

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fractional resolution (default is 1/16) press **On/C** *once after entering the welder's gap. For example, if you keep the fractional resolution at 1/16, the outputs above for IARC would be 4 inches, and CARC would be 6-3/8 inches.*

The cut length for the pipe is 35 and 1/4 inches and bend angle is 40.46°. Included in the outputs are the arc lengths to be used to cut your butt weld elbow to the calculated bend angle. These are inner arc length of 4 and 1/32 inches, center arc length of 6 and 11/32 inches, and outer arc length of 8 and 11/16 inches.

Concentric Pipe Bend Cutback

Find the pipe Cutback when you are running pipes through a 45º bend with a 10" offset.

KEYSTROKE	DISPLAY
On/C **On/C**	**0.**
1. Enter the bend angle:	
4 5 **Angle/ Slope**	**∠Ø 45.00 º**
2. Enter the Offset:	
1 0 **Inch** **Offset**	**OFST 10 INCH**
3. Calculate the Cutback:	
Conv **Run** *(Cutback)*	**CUT 4-1/8 INCH**

Calculate Take-Out and Butt Weld Elbow Cut Marks

The Take-Out function can be used to quickly solve a Take-Out and butt weld elbow cut marks for a known bend angle and Pipe Size.

Find the arc lengths for an odd bend angle of 37° for 12” pipe.

Note: *All Take-Out calculations are based on Standard type steel pipes. O.D. See the* ***Cut Length – Known Take-Out Value*** *example to solve Cut Lengths for known Take-Out values.*

KEYSTROKE	DISPLAY
Conv **X**	**ALL CLEArEd**
1. Enter the Pipe Size:	
1 2 **Inch** **Pipe Size**	**STD SIZE 12 INCH**
2. Enter the known bend angle:	
3 7 **Angle/ Slope**	**∠Ø 37.00°**
3. Calculate the Take-Out and Arc Lengths:	
Conv **Angle/ Slope** *(T.O./Arc)*	**TO 6 INCH**
Angle/ Slope	**IARC 7-1/2 INCH**
Angle/ Slope	**CARC 11-5/8 INCH**
Angle/ Slope	**OARC 15-3/4 INCH**

Continue pressing the **Angle/ Slope** *key to view all related values.*

Cut Length – Known Take-Out Value

The *Pipe Trades Pro* can solve cut lengths for materials and fittings not currently built into the calculator by entering a known Take-Out value.

Find the cut length (end-to-end) for a pipe offset with a 10” Offset and bend angle of 45°. This example assumes 4” Type 40 PVC, with a known Take-Out value of 2 and 3/16 inches.

Note: *Override the Welder’s Gap for this example.*

KEYSTROKE	DISPLAY
On/C On/C	**0.**
1. Select PVC:	
Pipe Mat'l *(press until **PLAStIC** is displayed)*	**PLAStIC**
2. Enter Pipe Size:	
4 Inch Pipe Size	**40 SIZE 4 INCH**
3. Enter Offset:	
1 0 Inch Offset	**OFST 10 INCH**
4. Enter bend angle:	
4 5 Angle/ Slope	**∠Ø 45.00°**
5. Enter known Take-Out:	
2 Inch 3 / 1 6	
Conv Angle/ Slope *(T.O./Arc)*	**TO 2-3/16 INCH**
6. Enter 0 for Welder’s Gap:	
0 Conv Offset *(Welder's Gap)*	**GAP 0 INCH**
7. Find the pipe cut length:	
Travel	**TRAV 14-1/8 INCH**
Travel	**CUT 9-3/4 INCH**
Travel	**TO 2-3/16 INCH**

Continue pressing the Travel key to view all related values.

The cut length for the Type 40 PVC pipe is 9 and 3/4 inches when using 4”, 45° fittings with a user-defined Take-Out value of 2 and 3/16 inches.

Note: *To return the Welder’s Gap to the default 1/8”, press Conv ⊠ to reset your calculator back to default values.*

Calculating Drop

If a pipe Run requires 1/8" drop per foot for drainage, how much total drop is required for a 25' Run?

KEYSTROKE	DISPLAY
On/C On/C	**0.**
1. Enter the Slope (Drop):	
1 / 8 Angle/ Slope	**SLP 0-1/8 INCH**

(cont'd)

(cont'd)

KEYSTROKE	DISPLAY

2. Calculate the total drop (Offset):

2 5 Feet
Run Offset — **OFST 0 FEET 3-1/8 INCH**

Find the slope of a pipe Run if it drops 6 inches over 50 feet. What is its Angle and Percent Grade?

KEYSTROKE	DISPLAY
On/C On/C	**0.**
1. Enter the Run:	
5 0 Feet Run	**RUN 50 FEET 0 INCH**
2. Enter the Offset:	
6 Inch Offset	**OFST 6 INCH**
3. Calculate the Slope, Angle and Percent Grade:	
Angle/ Slope	**SLP 0-1/8 INCH**
Angle/ Slope	**∠Ø 0.57º**
Angle/ Slope	**% GRD 1.**
Angle/ Slope	**GRD 0.01**

Weight of Filled Pipe

Find the weight of a 10 foot length of 6 inch Type 5 stainless steel pipe filled with water:

KEYSTROKE	DISPLAY
On/C On/C	**0.**
1. Choose Stainless Steel:	
Pipe Mat'l *(Press until S.StEEL is displayed)*	**MATL S.StEEL**
2. Choose the Pipe Type:	
5 Conv Pipe Size *(Pipe Type)*	**TYPE 5 S.StEEL**
3. Enter the Pipe Size:	
6 Inch Pipe Size	**5 SIZE 6 INCH**
4. Find the weight of one foot of water-filled pipe:	
Pipe Size (6 times)	**FILL SIZE 21.71418 LB PER FEET**
5. Find the weight of the filled 10' length of pipe:	
× 1 0 =	**217.1418 LB**

Find the weight of the same length of pipe filled, with ethanol (one gallon of ethanol weighs 6.59 lbs.) Do not clear previous keystrokes.

KEYSTROKE	DISPLAY
1. Enter the weight of one gallon of ethanol:	
6 • 5 9 Stor + + +	**LB/G 6.59**
2. Find weight of one foot of ethanol-filled pipe:	
Pipe Size (7 times)	**FILL SIZE 18.77419 LB PER FEET**
3. Find the weight of the filled 10' length of pipe:	
× 1 0 =	**187.7419 LB**
Conv ×*	**ALL CLEArEd**

**Restores default weight conversion to the weight of water—62.42796 lbs per cubic foot.*

Circle Area and Circumference

Find the area and circumference of a circle with a diameter of 25 Inches:

KEYSTROKE	DISPLAY
On/C On/C	0.
2 5 Inch Circle	DIA 25 INCH
Circle	AREA 490.8739 SQ INCH
Circle	CIRC 78-9/16 INCH

Basic D:M:S and Trigonometry Examples

Converting Degrees:Minutes:Seconds

Convert 23° 42’ 39” to decimal degrees:

KEYSTROKE	DISPLAY
On/C On/C	0.
2 3 • 4 2 • 3 9	DMS 23.42.39
Conv • *(dms◄►deg)*	23.71°

Convert 44.29° to degrees:minutes:seconds format:

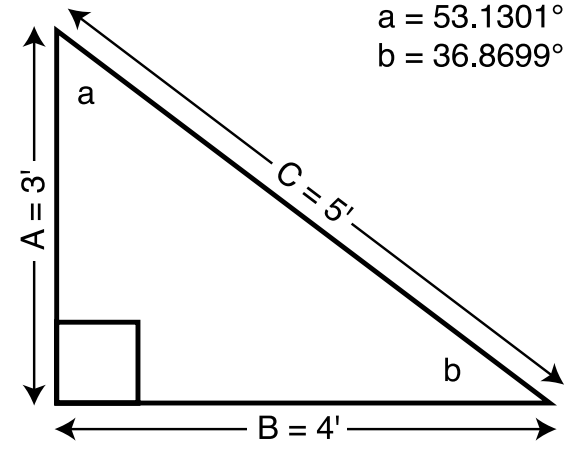
KEYSTROKE	DISPLAY
On/C On/C	0.
4 4 • 2 9	44.29
Conv • *(dms◄►deg)*	DMS 44.17.24

Note: *Improperly formatted entries will be redisplayed in the correct convention after any operator key is pressed. For example, 30° 89’ entered will be corrected and displayed at 31° 29’ 0” or 31.48°.*

Trigonometric Functions

Trigonometric functions are available on the *Pipe Trades Pro* calculator.

The drawing and formulas below list basic trigonometric formulas, for your reference:



Given side A and angle a, find:

Side C	A ÷ a Cos =
(e.g., 3 Feet ÷ 5 3 • 1 3 Cos =)	
Side B	A × a Tan =
Angle b	90° − a =

Given side A and angle b, find:

Side B	A ÷ b Tan =
Side C	A ÷ b Sine =
Angle a	90° − b =

(cont'd)

(cont'd)

Given side B and angle a, find:

Side A	B ÷ a Tan =
Side C	B ÷ a Sine =

Given side C and angle a, find:

Side A	C × a Cos =
Side B	C × a Sine =

Given side A and side C, find:

Angle a	A ÷ C = Conv Cos
Angle b	A ÷ C = Conv Sine

Given side B and angle b, find:

Side C	B ÷ b Cos =
Side A	B × b Tan =

APPENDIX

Auto Shut-Off

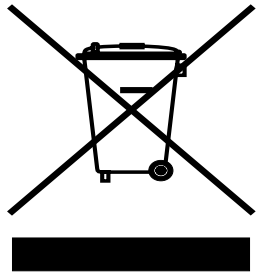
Your calculator is designed to shut itself off after about 8-12 minutes of non-use.

Batteries

The *Pipe Trades Pro* uses two LR-44 batteries.

Replacing Batteries

Should your calculator display become very dim or erratic, replace the batteries.



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

Replacement batteries are available at most discount or electronics stores. You may also call Calculated Industries at **1-775-885-4900**.

Battery Replacement Instructions

To replace the batteries, slide open the battery door (at top backside of unit) and replace with new batteries. Make sure the batteries are facing positive side up.

Reset

If your calculator should ever “lock up”, insert the tip of a paperclip into the small Reset hole located above the Angle/ Slope key – to perform a total reset.

CALCULATED INDUSTRIES®

Putting answers at your fingertips since 1978

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.

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4840 Hytech Drive
Carson City, NV 89706 U.S.A.
1-800-854-8075 or 1-775-885-4900
Fax: 1-775-885-4949
E-mail: info@calculated.com
www.calculated.com

Designed in the USA
Printed in China
04/12

PRG4095E-C

For more information regarding Warranty, Repair and Return, see the full User's Guide.