CALC-1500
Building Calculator

Instruction Manual

JOHNSON®

Building Calculator

Product Features

- Pre-programmed right angle and stair calculations including pitch, rise and run
- Accurate stair, rafter, roof and framing calculations
- Easily calculate linear, area and volume
- Complete rafter, circular, rake wall and board feet calculations

Table of Contents

Building Calculator 2

Key Descriptions 4

Calculator Function Keys 4
Length Keys 4
Arc/Circle Keys 5
Right Triangle/Roof Framing Keys 5
Stair Layout Keys 6
Stair Settings 6
Additional Functions 6
User Settings 7
Using the Memory 8

Basic Functions 9

Entering Dimensions 9
Basic Math Operations 9
Adding and Subtracting Dimensions 9
Multiplying Dimensions 9
Dividing Dimensions 10
Calculating Percentages 10
Calculating Square Area 10
Calculating Rectangular Area and Volume 10
Adding a Waste Allowance to Squared and Cubic Units 11
Converting Weight 11
Converting Length Measurements 11
Converting Area Measurement 12

Sample Project Calculations 13

Board Feet and Cost 13
Carpentry: Calculating Number of Studs 13
Baluster Spacing 13
Circle Area and Circumference 13
Arc Angle or Degree 14
Concrete Volume for Driveway 14
Concrete Columns 14
Complex Concrete Volume 15
Right Angle/Framing 15
Squaring-Up a Foundation 15
Pitch — Converting Roof Angle 16
Converting Slope 16
Common Rafter Length 16
Regular Hip/Valley and Jack Rafters 17
Irregular Hip/Valley 17
Rake-Wall — With Base 18
Stairs 19
Stairs — Given Rise and Run 19
Stairs — Given Only the Floor-to-Floor Rise; Entering Other Than 7-1/2 Inch 19

Appendix 20

Default Settings 20
Setting Custom Fractional Resolution 20
Display Capacity and Errors 21
Auto-Shut off 21
Battery 21
Replacing the Battery 21
Reset 21

Area and Volume 22

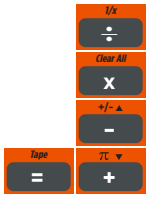
Area 22
Surface Area and Volume 23
Product Warranty 24
Product Registration 24

Key Descriptions

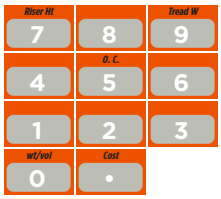
CALCULATOR FUNCTION KEYS

- **Off Key:** Turns off the calculator. All temporary registers are cleared.

- **On/Clear Key:** Turns on the calculator. Press once to clear the display. Press twice to clear all temporary values.



- Mathematical operation keys.



- Keys for entering numbers.

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

- **Square Root Key:** Use to find the Square Root of a non-dimensional or area value.

- **Fraction Key:** Use to enter fractions. Fractions can be entered as proper (1/8, 1/5, 3/16) or improper (5/2, 17/16). If the denominator (bottom value) is not entered, the calculator will default to a 16th of an inch setting.

- **Convert Key**: Use with number keys to convert between dimensions, or to access special functions with other keys.

- **Memory Key:** Add the displayed value to the temporary Memory. The temporary Memory will clear when the calculator is shut off.

- **Recall Key:** Use with other keys to recall stored settings and calculations.

LENGTH KEYS

- **Yards Key:** Enter or convert units to yards. When entering values, press the ***Yds*** key once for yards, twice for square yards, and three times for cubic yards.

- **Feet Key:** Enter or convert units to feet as a whole or a decimal. When entering values, press the ***Feet*** key once for feet, twice for square feet, and three times for cubic feet. Use with the ***Inch*** and / keys to enter feet-inch values. Press the ***Feet*** key to toggle between fraction and decimal feet.

- **Inch Key:** Enter or convert to inches as a whole or a decimal. When entering values, press the ***Inch*** key once for inches, twice for square inches, and three times for cubic inches. Use with the / key to enter fractions of an inch values. Press the ***Inch*** key to toggle between fraction and decimal inches.

- **Meters Key:** Enter or convert units to meters. When entering values, press the ***m*** key once for meters, twice for square meters, and three times for cubic meters.

- **Centimeters Key:** Enter or convert units to centimeters. When entering values, press the ***cm*** key once for centimeters, twice for square centimeters, and three times for cubic centimeters.

Length Keys (continued)

mm

- **Millimeters Key:** Enter or convert units to millimeters. When entering values, press the ***mm*** key once for millimeters, twice for square millimeters, and three times for cubic millimeters.

Bd Ft

- **Board Feet (Bd Ft):** Enter or convert cubic values to board feet (e.g. 1 Bd Ft = 144 cubic inches).

Weight

- **Weight Key:** Enter or calculate a volume to tons, pounds, metric tons or kilograms. Press the ***Weight*** key to scroll through these units. The default setting is 1.5 tons per cubic yard.

ARC/CIRCLE KEYS

Arc Circ

- **Circle Key:** Calculate the area and circumference of a circle based on the entered diameter. Press the ***Circ*** key to scroll through the area and circumference calculations.

Conv Arc Circ

- **Arc:** Calculate arc length or degree based on the entered diameter and arc degree or length (e.g., if arc degree is entered, it will calculate arc length, and vice versa). Press the ***Circ*** key to scroll through the diameter, area, and circumference calculations.

RIGHT TRIANGLE/ROOF FRAMING KEYS

Pitch

- **Pitch Key:** Use to enter or calculate the pitch (angle) of a roof or other right angle. Pitch is the steepness of a slope over a length such as the amount of "rise" over 12 inches of "run". Press the ***Pitch*** key to scroll through pitch, degree of pitch, % grade, and slope. Pitch may be entered as:

a dimension	Tread W 9	Inch	Pitch			
an angle	2	O. C. 5	Pitch			
a ratio	wt/vol 0	Cost •	6	O. C. 5	Conv	Pitch
a percentage	6	O. C. 5	Prefs %	Pitch		

A pitch entry will remain in permanent storage until revised or the calculator is reset. A solution will be replaced by its entered value once the calculator is cleared.

Conv Pitch

- Enter a pitch ratio (e.g., ***• 653 Conv Pitch***).

Rise

- **Rise Key:** Enter or calculate the rise or vertical leg (height) of a right triangle.

Run

- **Run Key:** Enter or calculate the run or horizontal leg (base) of a right triangle.

Diag

- **Diagonal Key:** Enter or calculate the common or diagonal leg (hypotenuse) of a right triangle. Typical applications are "squaring" slabs or finding common rafter lengths.

Ir/Pitch Hip/V

- **Hip/Valley Key:** Calculate length of the regular or irregular hip/valley rafter.

Conv Ir/Pitch Hip/V

- **Irregular Pitch:** Enter the irregular pitch used to calculate lengths of the irregular hip/valley and jack rafters.

Right Triangle/Roof Framing Keys (continued)

- **Jack Key:** Calculate jack rafter lengths on the regular-pitched roof side.

- **Irregular Jack:** Calculate the jack rafter lengths on the irregular-pitched roof side.

- **Rake-Wall Key:** Find the stud sizes based on entered right triangle values and the stored on-center spacing. If a dimensional value is entered before pressing ***R/Wall***, that value is considered the base and will be added to the stud lengths.

STAIR LAYOUT KEYS

- **Stair Key:** Calculate or display various calculations for stair construction. Enter a rise and/or run with an entered or stored variable to display the following:

PRESS	RESULT
1	Riser height
2	Number of risers
3	Riser overage/underage
4	Tread width
5	Number of treads
6	Tread overage/underage
7	Stringer length
8	Angle of incline
9	Stored run
10	Stored rise
11	Stored desired riser height
12	Stored desired tread width

Stair Default Values

- 7-1/2" Riser height
- 10" Tread width

STAIR SETTINGS

Set "riser height" and "tread width" to any value by using the following keys:

- **Riser Height:** Store a custom riser height other than 7-1/2" (default). For example, enter 4-1/2 inches: ***4 Inch 1/2 Conv 7***.

- **Tread Width:** Store a custom tread width other than 10" (default). For example, enter 22 inches: ***22 Inch Conv 9***.

ADDITIONAL FUNCTIONS

- **Backspace Key:** Use to delete entries one character at a time (unlike the ***On/C*** function, which deletes the entire entry).

- **(1/x) Reciprocal:** Find the reciprocal of a number, calculated as 1 divided by that number. (e.g., ***5 Conv ÷*** = 0.2).

- **Clear All:** Clear all values, including ***M+***, and return all stored values to the default settings. This does not affect Preference Settings.

- **(+/-) Toggle:** Convert a positive value to a negative one, or a negative value to a positive one.

- **Pi (π):** Use to calculate various curves using Pi (3.141593).

- **x2:** Square a linear or non-dimensional value.

- **Preference Settings:** Use to permanently store custom preferences. See the Appendix for a list of preferences available.

- **Memory Minus (M-):** Subtract the displayed value from Memory.

Conv M-R/C Rcl

- **Memory Clear:** Clear the temporary calculator Memory without changing the current display.

M-R/C Rcl M-R/C Rcl

- **Memory Clear:** Total all values stored in the temporary calculator Memory.

  NOTE: This will also clear all values in the temporary Memory.

M-R/C Rcl Tape =

- **Paperless Tape:** Scroll through the past 20 entries or calculations to review figures. Press ***Rcl*** = to access Paperless Tape mode. Press **+** or **–** to scroll forward or backward. Press = to exit mode and continue with a new entry or calculation.

Paperless Tape Example

Add 8 feet, 6 feet and 2 feet, then access the paperless tape mode and scroll back through your entries. Then, back up one entry, exit the tape mode and add 8 feet to the total.

KEYSTROKE	DISPLAY
On/C On/C	0
8 Feet π +	8 FEET 0 INCH
6 Feet π +	14 FEET 0 INCH
2 Feet Tape =	16 FEET 0 INCH
M-R/C Rcl Tape =	TTL = 16 FEET 0 INCH
π +	01 8 FEET 0 INCH
π +	02 + 6 FEET 0 INCH
π +	03 + 2 FEET 0 INCH
+/- –	02 + 6 FEET 0 INCH
Tape =	TTL = 16 FEET 0 INCH
π + 8 Feet Tape =	24 FEET 0 INCH

USER SETTINGS

Press ***Conv***, then *%* to enter User Settings. Press *%* to scroll through the main settings. Press the **+** key to enter and advance through sub-settings of each main user setting. Use the **–** key to reverse through the sub-settings. Press the ***On/C*** key to exit Preferences. See the chart below for a listing of User Settings available.

PRESS Conv AND Prefs % : SETTING — FUNCTION	
First press of Prefs %:	Fractional Resolution: 1/16
π +	1/32
π +	1/64
π +	1/2
π +	1/4
π +	1/8
π +	1/16 *(repeats options)*
Second press of Prefs %:	Area Displays: Std.
π +	0. SQ FEET
π +	0. SQ YD
π +	0. SQ M
π +	Std. *(repeats options)*
Third press of Prefs %:	Volume Displays: Std.
π +	0. CU FEET
π +	0. CU YD
π +	0. CU M
π +	Std. *(repeats options)*
Fourth press of Prefs %:	Meter Linear Displays: 0.000 M
π +	FLOAt M *(floating point)*
π +	0.000 M *(repeats options)*
Fifth press of Prefs %:	Decimal Degree Displays: 0.00º
π +	FLOAt DEG *(floating point)*
π +	Std. *(repeats options)*
Sixth press of Prefs %:	Fractional Mode: Std.
π +	COnSt
π +	Std. *(repeats options)*

USING THE MEMORY

Store values in a temporary Memory by pressing ***M+***. Other Memory functions include:

FUNCTION	KEYSTROKES
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:

- Turn off the calculator
- Press Rcl, Rcl
- Press Conv, Rcl
- Press Conv, x *(Clear All)*

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

Example:

KEYSTROKE	DISPLAY
4, 4, 5, M+	M+ 445 M
1, 6, 5, M+	M+ 165 M
7, 7, 5, Conv, M+	M- 775 M
Rcl, M+	TTL STORED - 165 M
M+	AVG – 55 M
M+	CNT 3 M
Rcl, Rcl	M+ – 165

Basic Functions

ENTERING DIMENSIONS

Linear Dimensions

When entering feet-inch values, enter dimensions from largest to smallest, feet, then inches, then fractions. Enter fractions by entering the numerator (top number), pressing **/** (Fraction key) and then the denominator (bottom number).

Note: If the denominator (bottom value) is not entered, the calculator will default to a 16th of an inch setting.

When entering metric values, enter as a decimal value. For example, 58 meters and 50 cm would be entered as 58.5 m.

Examples of how linear dimensions are entered (press ***On/C*** after each entry):

DIMENSIONS	KEYSTROKE
9 yards	9 Yds
8 feet 4-1/4 inch	8 Feet 4 Inch 1 / 4
72.6 meters	7 2 • 6 m

BASIC MATH OPERATIONS

This calculator uses standard chaining logic, which means that you enter the first value, the operator (**+, –, x, ÷**) the second value and then the Equals key (**=**).

A. 4 + 2 = 6

B. 4 – 2 = 2

C. 4 x 2 = 8

D. 4 ÷ 2 = 2

ADDING AND SUBTRACTING DIMENSIONS

Add the following measurements:

- 6 feet 1-1/4 inches
- 14 feet 7-1/4 inches
- 16.75 inches

Then subtract 5-3/8 inches.

KEYSTROKE	DISPLAY
On/C On/C	0
6 Feet 1 Inch 1 / 4 +	6 FEET 1-1/4 INCH
1 4 Feet 7 Inch 1 / 4 +	20 FEET 8-1/2 INCH
1 6 • 7 5 Inch =	22 FEET 1-1/4 INCH
– 5 Inch 3 / 8 =	21 FEET 7-7/8 INCH

MULTIPLYING DIMENSIONS

Calculate the perimeter of a room with three walls that each measure 15 feet 3-3/4 inches:

KEYSTROKE	DISPLAY
3 x 1 5 Feet 3 Inch 3 / 4 =	45 FEET 11-1/4 INCH

Multiply 4 feet 8 inches by 10 feet 3-3/4 inches:

KEYSTROKE	DISPLAY
4 Feet 8 Inch x 1 0 Feet 3 Inch 3 / 4 =	48.125 SQ FEET

DIVIDING DIMENSIONS

Divide 17 Feet 7-3/4 inches into thirds (divide by 3):

KEYSTROKE	DISPLAY
On/C On/C	0
1 7 Feet 7 Inch 3 / 4 ÷ 3 =	5 FEET 10-9/16 INCH

Calculate the number of 4 feet 2-1/2 inch pieces that can be cut from a 25 foot board:

KEYSTROKE	DISPLAY
On/C On/C	0
2 5 Feet ÷ 2 Inch 1 / 2 =	5.940594 *(or 5 whole pieces)*

CALCULATING PERCENTAGES

Add a 15% waste allowance to 3.45 cubic yards:

KEYSTROKE	DISPLAY
On/C On/C	0
3 • 4 5 Yds Yds Yds + 1 5 %	3.9675 CU YD

Calculate 22% of $2,150:

KEYSTROKE	DISPLAY
On/C On/C	0
2 1 5 0 x 2 2 %	473

CALCULATING SQUARE AREA

Calculate the area of a square room with sides measuring 17 feet 5-1/2 inches:

KEYSTROKE	DISPLAY
On/C On/C	0
1 7 Feet 5 Inch 1 / 2	17 FEET 5-1/2 INCH
Conv √x	304.7934 SQ FEET

CALCULATING RECTANGULAR AREA AND VOLUME

Calculate the area and volume:

- Length: 18 feet 9-3/4 inches
- Width: 16 feet 4-1/4 inches
- Height: 10 inches

First, multiply the length times the width to find the area. Then, multiply the area times the height to find the volume:

KEYSTROKE	DISPLAY
On/C On/C	0
1 8 Feet 9 Inch 3 / 4 x	18 FEET 9-3/4 INCH
1 6 Feet 4 Inch 1 / 4 x	307.6628 SQ FEET
1 0 Inch =	256.3856 CU FEET

Convert to YD:

Conv Yds	9.495764 CU YD

ADDING A WASTE ALLOWANCE TO SQUARED AND CUBIC UNITS

Add a 12% waste allowance to 20 square feet:

KEYSTROKE	DISPLAY
On/C On/C	0
2 0 (wt/vol) Feet Feet π + 1 2 % (Prefs)	22.4 SQ FEET

Add a 18% waste allowance to 145 cubic feet: :

KEYSTROKE	DISPLAY
On/C On/C	0
1 4 5 (O. C.) Feet Feet Feet π + 1 8 % (Prefs)	171.1 CU FEET

CONVERTING WEIGHT

Convert 35 pounds to other weights (tons, metric tons, kilograms):

KEYSTROKE	DISPLAY
On/C On/C	0
3 5 (O. C.) Weight Weight *	35 LB
Weight	0.015876 MET Ton
Weight	15.87573 kG
Weight	0.0175 Ton

* Calculator may not display pounds upon first press of ***Weight***; it depends on which unit was accessed last. Press ***Weight*** until LB (or desired unit) is displayed, then convert to one of the other units of measure.

CONVERTING LENGTH MEASUREMENTS

Convert 12 feet 7 inches to other dimensions, including metric:

KEYSTROKE	DISPLAY
On/C On/C	0
1 2 Feet 7 (Riser Ht) Inch	12 FEET 7 INCH
Yds	4.194444 YD
Inch	151 INCH
m	3.835 M
cm	383.54 CM
mm	3835.4 MM

Convert 22 feet 4-1/4 inches to decimal feet:

KEYSTROKE	DISPLAY
On/C On/C	0
2 2 Feet 4 Inch 1 / 4	22 FEET 4-1/4
Feet	22.35417 FEET

Convert 20.75 feet to feet-inches:

KEYSTROKE	DISPLAY
On/C On/C	0
2 0 (wt/vol) (Cost) • 7 (Riser Ht) 5 (O. C.) Feet	20.75 FEET
Feet	20 FEET 9 INCH

CONVERTING AREA MEASUREMENT

Convert 72 square feet to square yards:

KEYSTROKE	DISPLAY
On/C On/C	0
Riser Ht 7 2 Feet Feet	72 SQ FEET
Yds	8 SQ YD

Convert 35 square yards to square feet:

KEYSTROKE	DISPLAY
On/C On/C	0
3 a.c. 5 Yds Yds	35 SQ YD
Feet	315 SQ FEET

Convert 246 cubic feet to cubic yards:

KEYSTROKE	DISPLAY
On/C On/C	0
2 4 6 Feet Feet Feet	246 CU FEET
Yds	9.111111 CU YD

Sample Project Calculations

BOARD FEET AND COST

Find the total board feet for the following boards: 2x4x16, 2x10x18 and 2x12x20. What is the total cost at $572.50 per MBM*?

*Per thousand board foot measure

KEYSTROKE	DISPLAY
On/C On/C	0
2 Clear All x 4 Clear All x 1 6 Bd Ft M- M+	BDFT 10.66667 M
2 Clear All x 1 wt/vol 0 Clear All x 1 8 Bd Ft M- M+	BDFT 30 M
2 Clear All x 1 2 Clear All x 2 wt/vol 0 Bd Ft M- M+	BDFT 40 M
M-R/C Rcl M-R/C Rcl	BDFT 80.66667
Clear All x O. C. 5 Riser Ht 7 2 Cost • O. C. 5 Conv Cost •	TTL$ 46.18

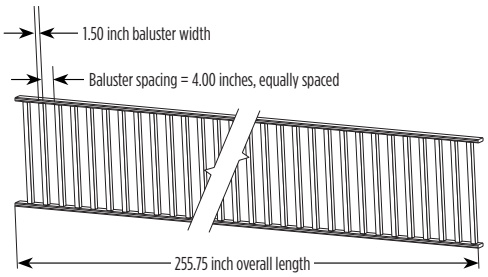
CARPENTRY: CALCULATING NUMBER OF STUDS

Calculate the number of 16-inch on-center studs needed for a 18 feet 7-1/4 inch wall.

KEYSTROKE	DISPLAY
1. Divide length by spacing:	
On/C On/C	0
1 8 Feet Riser Ht 7 Inch 1 / 4	18 FEET 7-1/4 INCH
1/x ÷ 1 6 Inch Tape =	13.95313 *(13 studs)*
2. Add one for the end:	
TC + 1 Tape =	14.95313 *(14 studs)*

Note: Also applies to trusses and joists.

BALUSTER SPACING



Calculate the number of balusters needed for a handrail measuring 255.75 inches long. The space between balusters is to be about 4 inches. Each baluster is 1-1/2 inches wide.

KEYSTROKE	DISPLAY
On/C On/C	0
2 O. C. 5 O. C. 5 Cost • Riser Ht 7 O. C. 5 Inch 1/x ÷	255.75 INCH
O. C. 5 Inch 1 / 2 Tape = *	46.5

(Round to nearest whole number, i.e. 47)

*47-1=48** (48 balusters)*

** Desired spacing plus baluster width (4 inches plus 1-1/2 inch)*

*** 1 baluster is subtracted since we don't want one on the very end of the handrail.*

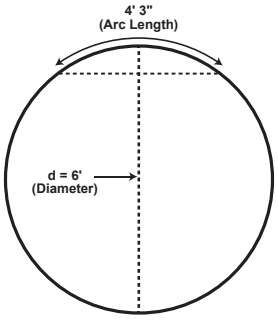
CIRCLE AREA AND CIRCUMFERENCE

Calculate the area and circumference of a circle with a diameter of 33 inches:

KEYSTROKE	DISPLAY
On/C On/C	0
3 3 Inch Arc Circ	DIA 33 INCH
Arc Circ	AREA 855.2986 SQ INCH
Arc Circ	CIRC 103-11/16 INCH

ARC ANGLE OR DEGREE

Calculate the arc angle (or degree of arc), given a 6-foot diameter and an arc length of 4 feet 3 inches:



KEYSTROKE	DISPLAY
1. Enter circle diameter and arc length:	
On/C On/C	0
6 Feet Arc Circ	DIA 6 FEET 0 INCH
4 Feet 3 Inch	4 FEET 3 INCH
2. Find degree of arc:	
Conv Arc Circ	ARC 81.17°

CONCRETE VOLUME FOR DRIVEWAY

Calculate the cubic yards of concrete required to pour a driveway that measures: 12 feet 3 inches long x 8 feet 4 inches wide x 3 inches deep. If concrete is $135 per cubic yard, what will it cost?

KEYSTROKE	DISPLAY
On/C On/C	0
1 2 Feet 3 Inch	12 FEET 3 INCH
Clear All x 8 Feet 4 Inch	8 FEET 4 INCH
Clear All x 3 Inch Tape =	0.945216 CU YD
Clear All x 1 3 0. C. 5 Conv Cost •	TTL$ 127.60 *(total cost)*

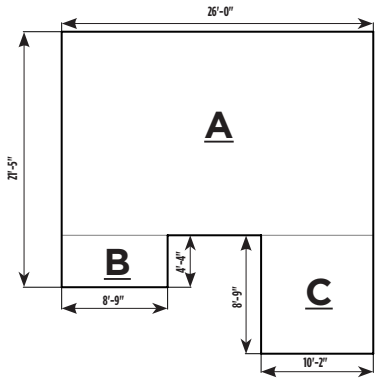
CONCRETE COLUMNS

Calculate the cubic yards of concrete needed for four columns, each with a diameter of 5 feet 3-1/4 inches and a height of 10 feet 4 inches:

KEYSTROKE	DISPLAY
On/C On/C	0
1. Enter the diameter of a circle:	
0. C. 5 Feet 3 Inch 1 / 4 Arc Circ	DIA 5 FEET 3-1/4 INCH
2. Find the surface area of a circle:	
Arc Circ	AREA 21.81968 SQ FEET
3. Find total volume:	
Clear All x 1 wt/vol 0 Feet 4 Inch Tape =	225.4701 CU FEET
Yds	8.350743 CU YD
Clear All x 4 Tape =	33.40297 CU YD

COMPLEX CONCRETE VOLUME

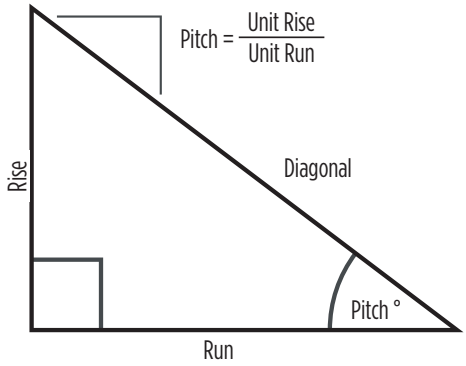
You're going to pour an odd-shaped patio 3-1/2 inches deep with the dimensions shown below. First, calculate the total area (by dividing the drawing into three individual rectangles) and then determine the total yards of concrete required for this job.



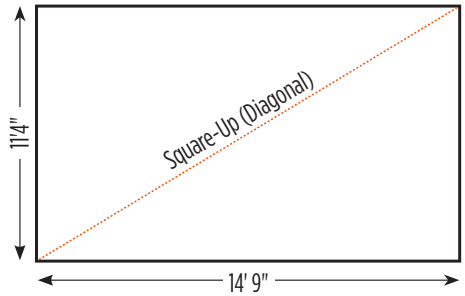
KEYSTROKE	DISPLAY
On/C On/C	0
1. Find area of part "A" and add to memory:	
2 1 Feet 5 Inch +/- – 4 Feet 4 Inch Tape =	17 FEET 1 INCH
Clear All x 2 6 Feet Tape =	444.1667 SQ FEET
M- M+	M+ 444.1667 SQ FEET M
2. Find area of part "B" and add to memory:	
4 Feet 4 Inch	4 FEET 4 INCH M
Clear All x 8 Feet Tread W 9 Inch Tape =	37.91667 SQ FEET M
M- M+	M+ 37.91667 SQ FEET M
3. Find area of part "C" and add to memory:	
1 wt/vol 0 Feet 2 Inch	10 FEET 2 INCH M
Clear All x 8 Feet Tread W 9 Inch Tape =	88.95833 SQ FEET M
M- M+	M+ 88.95833 SQ FEET M
4. Recall and clear total area stored in memory:	
M-R/C Rcl M-R/C Rcl	M+ 571.0417 SQ FEET
5. Find total cubic yards:	
Clear All x 3 Inch 1 / 2 Tape =	6.168394 CU YD

RIGHT ANGLE/FRAMING

The Pitch, Rise, Run, and Diag keys provide built-in solutions to right triangles. The solutions are available in any of the linear dimensions offered on the calculator including feet and inches, decimal feet, meters, etc. Any value of a right triangle can be found given two of the four variables: 1) Rise, 2) Run, 3) Diagonal or 4) Pitch.



SQUARING-UP A FOUNDATION



Square-up 14 feet 9 inch (run) x 11 feet 4 inch (rise):

KEYSTROKE	DISPLAY
On/C On/C	0
1 4 Feet Tread W 9 Inch Run	RUN 14 FEET 9 INCH
1 1 Feet 4 Inch Rise	RISE 11 FEET 4 INCH
Diag	DIAG 18 FEET 7-3/16 INCH

PITCH — CONVERTING ROOF ANGLE

Calculate the % grade, pitch ratio/slope and pitch in inches if the roof angle is 18.4°:

KEYSTROKE	DISPLAY
On/C On/C	0
1 8 Cost • 4 Pitch	PTCH 18.40°
Pitch	GRD 33.26557
Pitch	SLP 0.332656
Pitch	PTCH 4 INCH

CONVERTING SLOPE

Calculate the pitch in inches, pitch degrees, and percent grade if the pitch ratio/slope is 0.249:

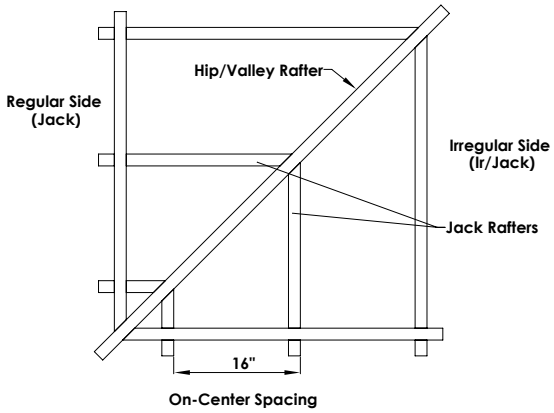
KEYSTROKE	DISPLAY
On/C On/C	0
Cost • 2 4 Tread W 9 Conv Pitch	SLP 0.249
Pitch	PTCH 3 INCH
Pitch	PTCH 13.98°
Pitch	%GRD 24.9

COMMON RAFTER LENGTH

Calculate the point-to-point length of the common rafter on a 7/12-pitched roof with a span of 27 feet:

KEYSTROKE	DISPLAY
On/C On/C	0
1. Enter pitch	
Riser Ht 7 Inch Pitch	PTCH 7 INCH
2. Enter half the span as the run:	
2 Riser Ht 7 Feet 1/x ÷ 2 Tape =	13 FEET 6 INCH
Run	RUN 13 FEET 6 INCH
3. Find the rise:	
Rise	RISE 7 FEET 10-1/2 INCH
4. Find the length of the common rafter:	
Diag	DIAG 15 FEET 7-9/16 INCH

REGULAR HIP/VALLEY AND JACK RAFTERS



Calculate the lengths of the common, hip/valley and jack rafters (jack rafters at 16 inch on-center). The roof's pitch is 11/12 and half the total span is 7 feet.

KEYSTROKE	DISPLAY
1. Find the common rafter length:	
On/C On/C	0
Riser Ht 7 Feet Run	RUN 7 FEET 0 INCH
1 1 Inch Pitch	PTCH 11 INCH
Diag (common)	DIAG 9 FEET 5-15/16 INCH
2. Find the hip/valley rafter and jack rafter lengths:	
Ir/Pitch Hip/V	H/V 11 FEET 9-9/16 INCH
Ir/Jack Jack *	JKOC STORED 16 INCH
Ir/Jack Jack	JK 1 7 FEET 8-1/4 INCH
Ir/Jack Jack	JK 2 5 FEET 10-9/16 INCH
Ir/Jack Jack	JK 3 4 FEET 0-13/16 INCH
Ir/Jack Jack	JK 4 2 FEET 3-1/8 INCH
Ir/Jack Jack	JK 5 0 FEET 5-7/16 INCH
Ir/Jack Jack	JK 6 0 FEET 0 INCH

*Uses standard (default) 16-inch on-center. To enter a custom on-center (e.g., 17 inches) press ***17 Inch Conv 5***. Press ***Rcl 5*** to review stored value. This value will remain stored until you re-enter a new value or perform a Clear All (***Conv x***).

IRREGULAR HIP/VALLEY

Calculate the common rafter length, irregular hip/valley and jack rafter lengths. The rafter has a 8/12 pitch and half of your overall span is 12 feet 9 inches. The irregular pitch is 6/8.

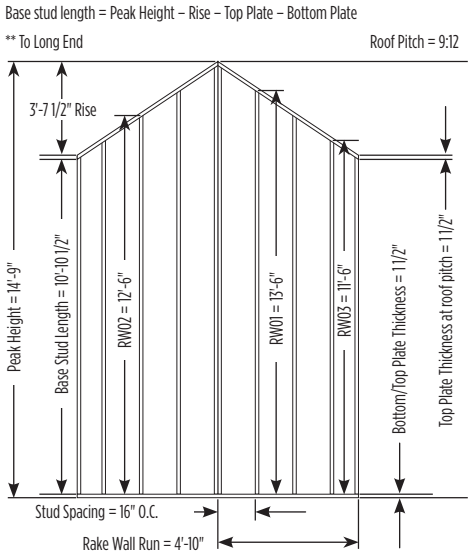
KEYSTROKE	DISPLAY
On/C On/C	0
1. Find the common rafter length:	
8 Inch Pitch	PTCH 8 INCH
1 2 Feet Tread W 9 Inch Run	RUN 12 FEET 9 INCH
Diag	DIAG 15 FEET 3-7/8 INCH
2. Find irregular hip rafter length:	
6 Inch Conv Ir/Pitch Hip/V	IPCH 6 INCH
Ir/Pitch Hip/V	IH/V 22 FEET 10-5/8 INCH
3. Find irregular jack lengths:	
Conv Ir/Jack Jack	IJOC STORED 16 INCH
Ir/Jack Jack *	IJ 1 17 FEET 0-1/4 INCH
Ir/Jack Jack	IJ 2 15 FEET 0-3/8 INCH
Ir/Jack Jack	IJ 3 13 FEET 0-1/2 INCH
Ir/Jack Jack	IJ 4 11 FEET 0-11/16 INCH
Ir/Jack Jack	IJ 5 9 FEET 0-13/16 INCH

Continue to press ***Jack*** until the last regular jack or "0." is reached.

* It is not necessary to keep pressing ***Conv*** when displaying the irregular jack sizes.

RAKE-WALL — WITH BASE

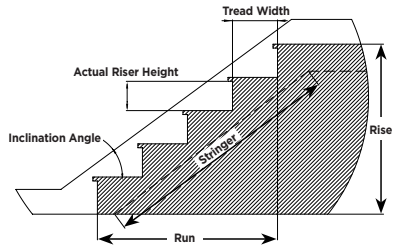
Calculate each stud length in a rake-wall with a peak of 14 feet 9 inches at an 9/12 roof pitch, and a run length of 4 feet 10 inches. Use 16 inches as your spacing (default):

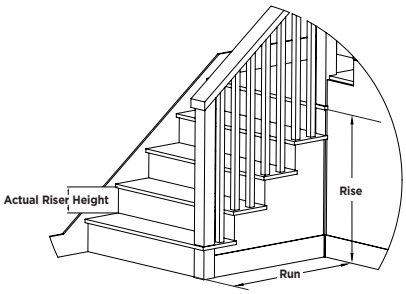


KEYSTROKE	DISPLAY
1. Enter roof pitch and run to find rise:	
On/C On/C	0
Tread W 9 Inch Pitch	PTCH 9 INCH
4 Feet 1 wt/vol 0 Inch Run	RUN 4 FEET 10 INCH
Rise	3 FEET 7-1/2 INCH
2. Find base stud length:	
On/C	0
1 4 Feet Tread W 9 Inch +/- ▲ -	14 FEET 9 INCH
3 Feet Riser Ht 7 Inch 1 / 2 +/- ▲ -	11 FEET 1-1/2 INCH
1 Inch 1 / 2 +/- ▲ -	11 FEET 0 INCH
1 Inch 1 / 2 Tape =	10 FEET 10-1/2 INCH
3. Enter base stud length:	
R/Wall	BASE 10 FEET 10-1/2 INCH

KEYSTROKE	DISPLAY
4. Find interior stud lengths:	
R/Wall	RW0C STORED 16 INCH
R/Wall	RW01 13 FEET 6 INCH
R/Wall	RW02 12 FEET 6 INCH
R/Wall	RW03 11 FEET 6 INCH
R/Wall	BASE 10 FEET 10-1/2 INCH
R/Wall	RW 36.87°

STAIRS





STAIRS — GIVEN RISE AND RUN

Calculate the stair dimensions for a stairway that has a floor-to-floor height of 11 feet 4 inch, a run of 13 feet 6 inches, and a desired riser height of 7-1/2 inches (default):

KEYSTROKE	DISPLAY
1. Enter rise and run:	
On/C On/C	0
1 1 Feet 4 Inch Rise	RISE 11 FEET 4 INCH
1 3 Feet 6 Inch Run	RUN 13 FEET 6 INCH
2. Recall stored 7-1/2 inch desired riser height and find stair values:	
Stair	R-HT ⚠ 7-9/16 INCH*
Stair	RSRS 18
Stair	R+/– 0-1/8 INCH
Stair	T-WD ⚠ 9-1/2 INCH*
Stair	TRDS 17
Stair	T+/– 0-1/2 INCH
Stair	STRG 17 FEET 2-7/16 INCH
Stair	INCL 38.52°

*A ⚠ in the display means the calculated riser height or tread width is greater than the stored desired riser height or tread width.

STAIRS — GIVEN ONLY THE FLOOR-TO-FLOOR RISE; ENTERING OTHER THAN 7-1/2 INCH

Desired Riser Height

Calculate the stair dimensions if the floor-to-floor rise is 9 feet 11 inches, and the desired riser height is 7 inches:

KEYSTROKE	DISPLAY
1. Enter desired riser height and floor-to-floor rise:	
On/C On/C	0
Riser Ht 7 Inch Conv Riser Ht 7	R-HT STORED 7 INCH
Tread W 9 Feet 1 1 Inch Rise	RISE 9 FEET 11 INCH
2. Calculate stair values:	
Stair	R-HT ⚠ 7 INCH
Stair	RSRS 17
Stair	R+/– 0 INCH
Stair	T-WD STORED 10 INCH
Stair	TRDS 16
Stair	T+/– 0 INCH
Stair	STRG 16 FEET 3-5/16 INCH
Stair	INCL 34.99°
Stair	RUN 13 FEET 4 INCH*
Stair	RISE STORED 9 FEET 11 INCH
Stair	R-HT STORED 7 INCH
Stair	T-WD STORED 10 INCH

**Note: run is calculated based on tread values, as it was not entered. The total run of a stairway is equal to the width of each tread multiplied by the number of treads.*

Appendix

DEFAULT SETTINGS

Perform a Clear All (***Conv x***), to return the calculator to the following default settings:

STORED VALUE	DEFAULT VALUE
Stair Riser Height	7-1/2 Inch
Stair Tread Width	10 Inch
On-Center Spacing	16 Inch
Weight per Volume	1.5 Tons/Cu Yd

If you replace the calculator's batteries or perform a Full Reset* (press ***Off***, hold down ***x***, and Press ***On/C***), the calculator will return to the following settings (in addition to those listed above):

PREFERENCE SETTINGS	DEFAULT VALUE
Fractional Resolution	1/16
Area Display	Standard
Volume Display	Standard
Meter Linear Display	0.000
Decimal Degree Display	0.00°
Fractional Mode	Standard

* Pressing a small device (such as the end of a paperclip) into the Reset hole located above the ***Pitch*** key will also perform a Full Reset.

SETTING CUSTOM FRACTIONAL RESOLUTION

Convert entered or calculated fractions to units other than the calculator default of 1/16th. Fractional resolution of 1/16th is permanently set in the default settings. See Default Settings for more information.

Add 36/64th to 1/64th and then convert the answer to other fractional resolutions:

KEYSTROKE	DISPLAY
On/C On/C	0
3 6 / 6 4	0-36/64 INCH
π + 1 / 6 4 Tape =	0-37/64 INCH
Conv 1 (1/16)	0-9/16 INCH
Conv 2 (1/2)	0-1/2 INCH
Conv 3 (1/32)	0-19/32 INCH
Conv 4 (1/4)	0-1/2 INCH
Conv 6 (1/64)	0-37/64 INCH
Conv 8 (1/8)	0-5/8 INCH
On/C On/C	0

*Note: This is a temporary setting that does not affect the Permanent Fractional Resolution Setting. Press **On/C** to return the calculator to the permanently set fractional resolution.*

DISPLAY CAPACITY AND ERRORS

Accuracy/Display Capacity — The calculator has a twelve-digit display made up of eight digits (normal display) and four fractional digits. You may enter or calculate values up to 19,999,999.99. Each calculation is carried out internally to twelve digits. Most material calculations will result in an answer rounded up two places. Press the **=** key to see the non-rounded value.

Errors — When an incorrect entry is made, or the answer is beyond the range of the calculator, it will display an error. To clear an error condition, press the ***On/C*** button once. At this point, you must determine what caused the error and re-key the problem.

Error Codes:

DISPLAY	ERROR TYPE
OFLO	Overflow (too large)
MATH Error	Divide by 0
DIM Error	Dimension error
ENT Error	Entry error
None	Attempt to calculate stairs without entering Rise and Run

Auto-Range — If an "overflow" is created because of an input and calculation with small units that are out of the standard seven-digit range of the display, the answer will be automatically expressed in the next larger units (instead of showing "OFLO") — e.g., 20,000,000 mm is shown as 20,000 m. Also applies to inches, feet and yards.

AUTO-SHUT OFF

Your calculator will shut itself off after about 8 to 12 minutes of inactivity.

BATTERY

This model uses one CR2032 battery (included). Should the calculator display become very dim, does not power on or remain on, replace the battery.

Note: Please use caution when disposing of old batteries, as it contains hazardous chemicals.

REPLACING THE BATTERY

While the calculator is off, turn the calculator over to remove the battery holder near the top center of the unit. Remove the old battery and slide a new battery into the holder. The positive side of the battery should be facing you as you insert the battery into the calculator. Replace the battery holder and power on the calculator.

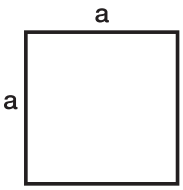
RESET

If the calculator should ever "lock up," perform a Reset by pressing a small device (such as the end of a paper clip) into the small hole located above the ***Pitch*** key. This will perform a total reset of the calculator.

Area and Volume

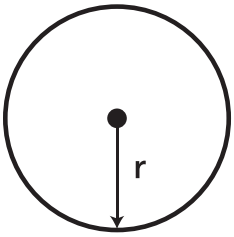
AREA

Square



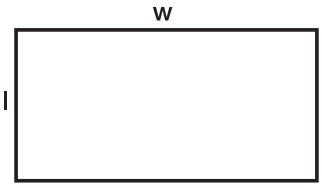
Area = a x a
or
a^2

Circle



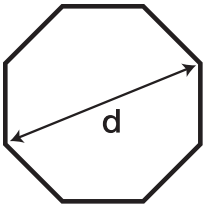
Circumference = $2\pi r$
Area = πr^2

Rectangle



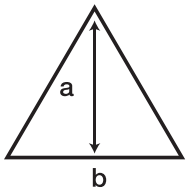
Area = l x w

Octagon



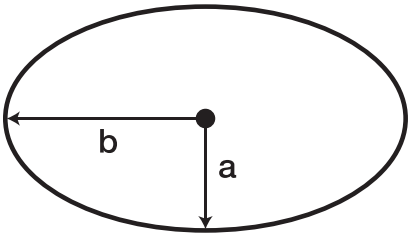
Area = $(d/2)^2$ x 2.828

Triangle



Area = 1/2 x a x b

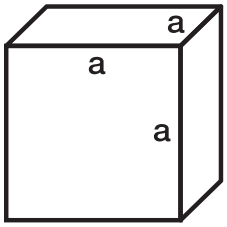
Ellipse



Area = πab

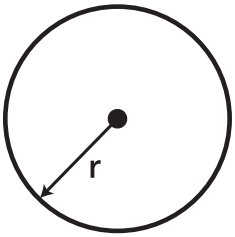
SURFACE AREA AND VOLUME

Cube



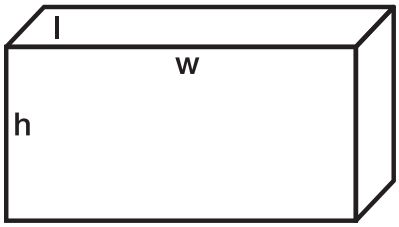
Surface Area = $6a^2$
Volume = a^3

Sphere



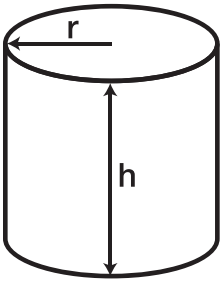
Surface Area = $4\pi r^2$
Volume = $4/3\pi r^3$

Rectangle



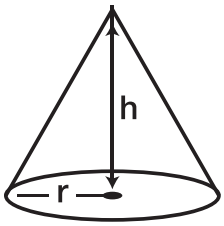
Surface Area = 2hw + 2hl + 2lw
Volume = l x w x h

Cylinder



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

Cone



Surface Area = $\pi r \sqrt{r^2 + h^2}$
(+ πr^2 if you add the base)

Volume = $\frac{\pi r^2 h}{3}$

PRODUCT WARRANTY

Johnson Level & Tool offers a one-year limited warranty on this product. You can obtain a copy of this warranty on our website or by contacting our customer service department. The limited warranty contains various limitations and exclusions.

Email: service@johnsonlevel.com
Tel: 888-953-8357
Online: www.johnsonlevel.com

PRODUCT REGISTRATION

Please register your product within 30 days of purchase. Registering ensures we have your information on file for warranty service even if you lose your receipt, and lets us contact you if there is ever a product recall. We will never sell your information and will only send you marketing information if you opt-in.

To register, scan or click:
www.johnsonlevel.com/register