

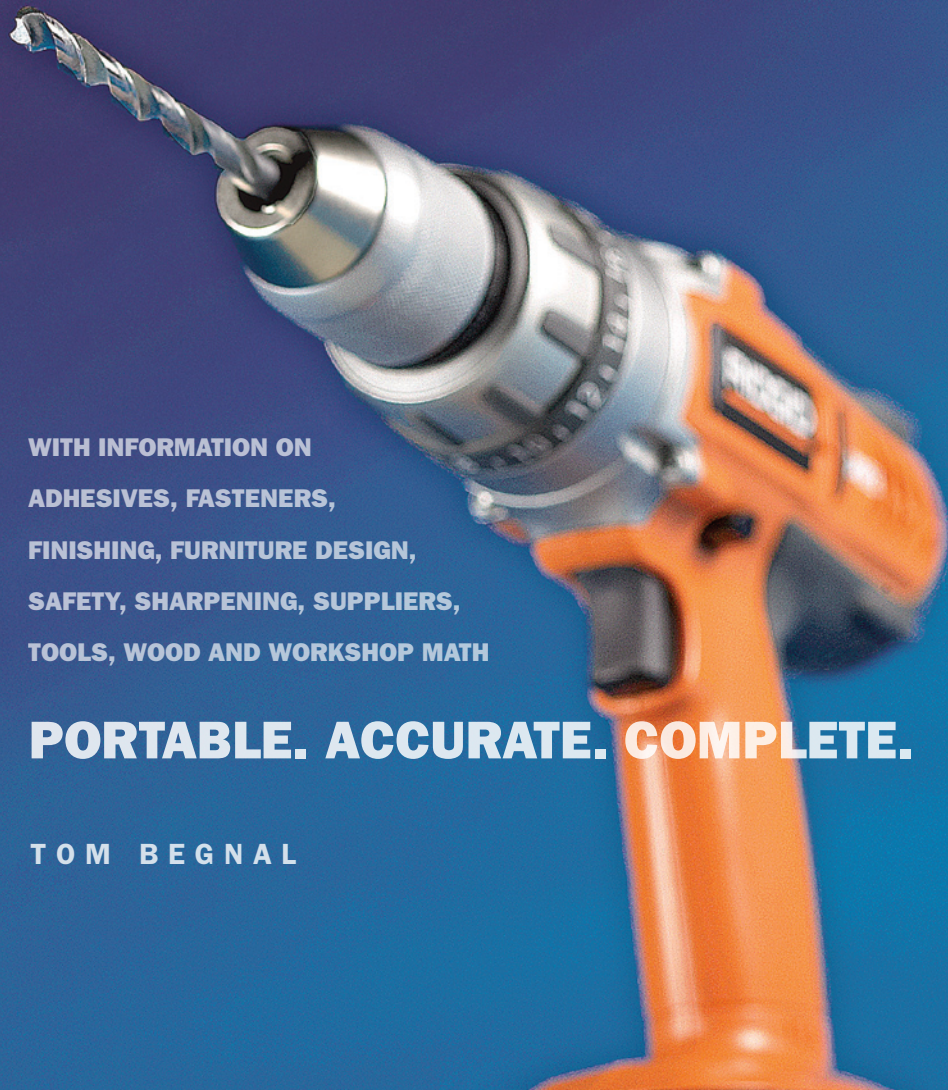
 **POPULAR WOODWORKING**

# pocket shop reference

WITH INFORMATION ON  
ADHESIVES, FASTENERS,  
FINISHING, FURNITURE DESIGN,  
SAFETY, SHARPENING, SUPPLIERS,  
TOOLS, WOOD AND WORKSHOP MATH

**PORTABLE. ACCURATE. COMPLETE.**

T O M B E G N A L



**POPULAR WOODWORKING**  
**pocket shop**  
**reference**

**PORTABLE. ACCURATE. COMPLETE.**

**TOM BEGNAL**



**POPULAR WOODWORKING BOOKS**

CINCINNATI, OHIO

[www.popularwoodworking.com](http://www.popularwoodworking.com)

# read this important safety notice

To prevent accidents, keep safety in mind while you work. Use the safety guards installed on power equipment; they are for your protection. When working on power equipment, keep fingers away from saw blades, wear safety goggles to prevent injuries from flying wood chips and sawdust, wear ear protectors, and consider installing a dust vacuum to reduce the amount of airborne sawdust in your woodshop. Don't wear loose clothing, such as neckties or shirts with loose sleeves, or jewelry, such as rings, necklaces or bracelets, when working on power equipment. Tie back long hair to prevent it from getting caught in your equipment. People who are sensitive to certain chemicals should check the chemical content of any product before using it. The authors and editors who compiled this book have tried to make the contents as accurate and correct as possible. Plans, illustrations, photographs and text have been carefully checked. All instructions, plans and projects should be carefully read, studied and understood before beginning construction. Due to the variability of local conditions, construction materials, skill levels, etc., neither the author nor Popular Woodworking Books assumes any responsibility for any accidents, injuries, damages or other losses incurred resulting from the material presented in this book. Prices listed for supplies and equipment were current at the time of publication and are subject to change. Glass shelving should have all edges polished and must be tempered. Untempered glass shelves may shatter and can cause serious bodily injury. Tempered shelves are very strong and if they break will just crumble, minimizing personal injury.

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<i>to convert</i>	<i>to</i>	<i>multiply by</i>
Inches . . . . .	Centimeters . . . . .	2.54
Centimeters . . . . .	Inches . . . . .	0.4
Feet . . . . .	Centimeters . . . . .	30.5
Centimeters . . . . .	Feet . . . . .	0.03
Yards . . . . .	Meters . . . . .	0.9
Meters . . . . .	Yards . . . . .	1.1

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#### DEDICATION

*To my wife Susan, for all her love and kindness*

## about the author



Tom Begnal was managing editor of *The Woodworker's Journal* magazine for more than fifteen years. He has written or edited woodworking and how-to books for several publishers including F+W Publications (Popular Woodworking Books), McGraw-Hill, Rodale Press and Sterling Publishing. Currently an associate editor at *Fine Woodworking* magazine, he lives in Kent, Connecticut.

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*As we enjoy an evening in the workshop*, it is easy to forget that the craft of woodworking encompasses a surprisingly large body of information. Much of that information is learned only through considerable practice and experience. And, once learned, it is usually applied to the task at hand with little thought or effort. An experienced woodworker knows, almost intuitively, what to do and how to do it.

But even veteran woodworkers understand that practice, experience and intuition are not always enough. Despite what seems to be second nature, it's often necessary to find an important bit of information in order to move a project forward. Usually, however, that bit of information is found only after a lengthy search through a pile of woodworking books, magazines, owner's manuals and shop-worn notes. And, of course, the search too often comes up empty.

This book is an effort to make that search considerably easier. Here, in a single volume, is an easy-to-understand compilation of the many facts, figures and formulas that are important to every woodworker. From shop geometry to lumber grades to drill press speeds, *Popular Woodworking Pocket Shop Reference* provides an extensive storehouse of valuable woodworking data.

This is a book to be used, not admired. Keep it near your workbench. My sincere hope is that you often find yourself reaching for it, and that it quickly provides you with all the information you need.

*Have fun and work safely.*



# introduction



CHAPTER ONE

# woodworking math



## Basic Geometry for Woodworkers

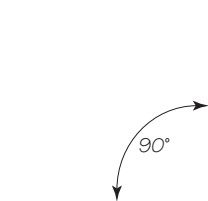
An understanding of basic geometry is very useful to woodworkers. Indeed, when you consider that every woodworking project is made from parts that form straight lines, curved lines or a combination of the two, it is clear that geometry is very much a part of the workshop.

### ANGLES

The space between two lines that meet is called an angle. An angle is usually measured in degrees.

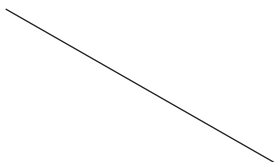
#### Right Angle

The angle formed by a line perpendicular to another line. A right angle measures  $90^\circ$ .



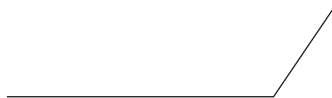
#### Acute Angle

An angle measuring less than a right angle.



#### Obtuse Angle

An angle larger than a right angle, but less than  $180^\circ$ .





**POLYGONS**

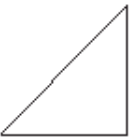
A polygon is a closed plane figure that has three or more sides and angles. A polygon with all angles equal and all equal-length sides is called a regular polygon. Some of the common polygons are:

POLYGON	NUMBER OF SIDES
Triangle	3
Quadrilateral	4
Pentagon	5
Hexagon	6

POLYGON	NUMBER OF SIDES
Octagon	8
Decagon	10
Dodecagon	12

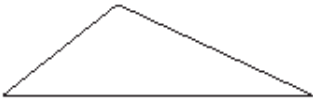
**TRIANGLES**

A triangle is a polygon with three sides and three angles. The sum of the three angles is always 180°.



**Right Triangle**

A triangle with one angle at 90°



**Scalene Triangle**

A triangle with all sides unequal



**Equilateral Triangle**

A triangle with all sides of equal length.



**Obtuse Triangle**

A triangle with one angle obtuse (greater than 90°)



**Isosceles Triangle**

A triangle with two sides of equal length

## QUADRILATERALS

A quadrilateral is a polygon that has four sides and four angles. The sum of the four angles is always  $360^\circ$ .

### Rectangle

A four-sided plane figure with four right angles



### Square

A four-sided plane figure with four right angles and four equal-length sides



### Rhomboid

A four-sided plane figure with all sides parallel, adjacent sides unequal, and usually having two acute angles and two obtuse angles



### Rhombus

A four-sided plane figure with all sides equal-length and parallel, usually having two acute angles and two obtuse angles



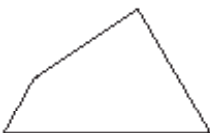
### Trapezoid

A four-sided plane figure with two sides parallel and two sides not parallel



### Trapezium

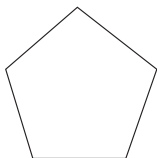
A four-sided plane figure having no sides parallel



## OTHER POLYGONS

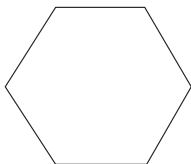
### Regular Pentagon

A plane figure having five equal-length sides and five equal angles



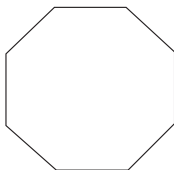
### Regular Hexagon

A plane figure having six equal-length sides and six equal angles



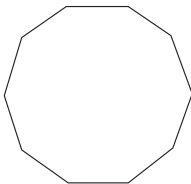
### Regular Octagon

A plane figure having eight equal-length sides and eight equal angles



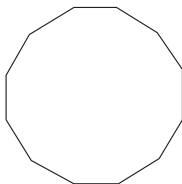
### Regular Decagon

A plane figure having ten equal-length sides and ten equal angles



### Regular Dodecagon

A plane figure having twelve equal-length sides and twelve equal angles

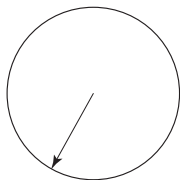


## **CIRCLES**

A circle is a closed curve, with all points on the curve equally distant from the center.

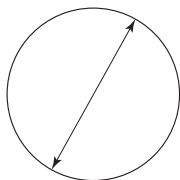
### **Radius**

A straight line extending from the center of the circle to any point on the circle



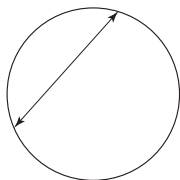
### **Diameter**

A straight line that passes through the center of a circle and extends from one side of the circle to the other



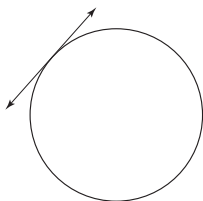
### **Chord**

A straight line connecting two points on a circle



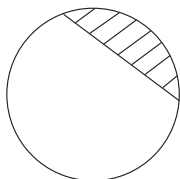
### **Tangent**

A straight line that touches a circle at only one point



### **Segment**

That part of a circle cut off by a straight line



## AREA FORMULAS

Area is a measure of the amount of surface of an object. Square units of measurement (square inches, square feet, square millimeters, square meters, etc.) are used to describe area.

### Triangle

$$\text{Area} = \frac{1}{2}B \times H$$

where:

B = length of the triangle base

H = height of the triangle

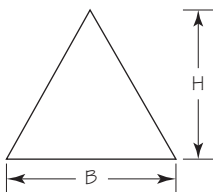
#### Example

$$B = 12" \quad H = 8"$$

$$\text{Area} = \frac{1}{2}(12) \times 8$$

$$= 6 \times 8$$

$$= 48 \text{ square inches}$$



### Square

$$\text{Area} = S \times S$$

where:

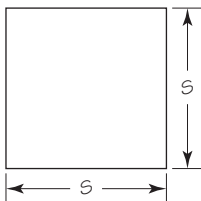
S = length of the sides

#### Example

$$S = 6"$$

$$\text{Area} = 6 \times 6$$

$$= 36 \text{ square inches}$$



### Rectangle

$$\text{Area} = L \times W$$

where:

L = length of the rectangle

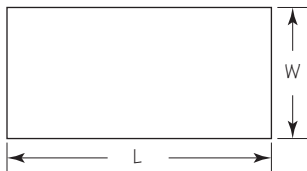
W = width of the rectangle

#### Example

$$L = 4" \quad W = 2"$$

$$\text{Area} = 4 \times 2$$

$$= 8 \text{ square inches}$$



### Trapezoid

$$\text{Area} = \frac{1}{2}(L1 + L2) \times W$$

where:

L1 = long parallel side

L2 = short parallel side

W = width of trapezoid

#### Example

$$L1 = 12" \quad L2 = 8"$$

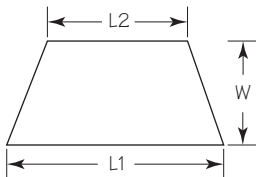
$$W = 5"$$

$$\text{Area} = \frac{1}{2}(12 + 8) \times 5$$

$$= \frac{1}{2}(20) \times 5$$

$$= 10 \times 5$$

$$= 50 \text{ square inches}$$



### Trapezium

$$\text{Area} = (G + H)E + (F \times G) + (D \times H)/2$$

#### Example

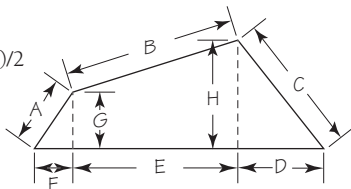
$$A = 5'' \quad B = 11.75''$$

$$C = 10'' \quad D = 6''$$

$$E = 11'' \quad F = 3''$$

$$G = 4'' \quad H = 8''$$

$$\begin{aligned}\text{Area} &= [(4 + 8)11 + (3 \times 4) + (6 \times 8)]/2 \\ &= [(12)11 + 12 + 48]/2 \\ &= [132 + 12 + 48]/2 \\ &= 192/2 \\ &= 96 \text{ square inches}\end{aligned}$$



### Regular Pentagon

(all sides equal)

$$\text{Area} = 1.7205 \times (A \times A)$$

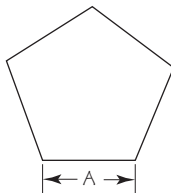
where:

A = length of sides

#### Example

$$A = 6''$$

$$\begin{aligned}\text{Area} &= 1.7205 \times (6 \times 6) \\ &= 1.7205 \times 36 \\ &= 61.938 \text{ square inches}\end{aligned}$$



### Regular Hexagon

(all sides equal)

$$\text{Area} = 2.5981 \times (A \times A)$$

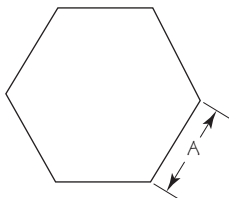
where:

A = length of sides

#### Example

$$A = 2''$$

$$\begin{aligned}\text{Area} &= 2.5981 \times (2 \times 2) \\ &= 2.5981 \times 4 \\ &= 10.3924 \text{ square inches}\end{aligned}$$



### Regular Octagon

(all sides equal)

$$\text{Area} = 4.8284 \times (A \times A)$$

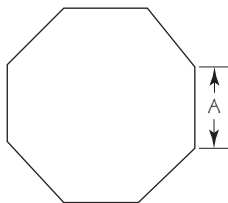
where:

A = length of sides

#### Example

$$A = 3''$$

$$\begin{aligned}\text{Area} &= 4.8284 \times (3 \times 3) \\ &= 4.8284 \times 9 \\ &= 43.456 \text{ square inches}\end{aligned}$$



## Circle

$$\text{Area} = 3.14159 \times (R \times R)$$

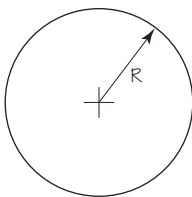
where:

R = radius of circle

### Example

$$R = 15''$$

$$\begin{aligned}\text{Area} &= 3.14159 \times (15 \times 15) \\ &= 3.14159 \times 225 \\ &= 706.86 \text{ square inches}\end{aligned}$$



## woodshop application

### Using the Area Formula

Two coats of polyurethane varnish must be applied to the top and bottom surfaces of a round tabletop that has a 48" diameter. Is a pint of polyurethane enough to do the job?

1. Determine the area of the tabletop surface in square inches. 48" diameter means 24" radius.

$$\begin{aligned}\text{Area} &= 3.14159 \times (R \times R) \\ &= 3.14159 \times (24 \times 24) \\ &= 3.14159 \times 576 \\ &= 1810 \text{ square inches}\end{aligned}$$

Multiply by 2 to get area for the top and bottom surfaces.

$$1810 \times 2 = 3620 \text{ square inches.}$$

2. Convert square inches to square feet (see conversion table, page 35).

$3620 \text{ square inches} \times .00694 = 25.12 \text{ square feet.}$  Multiply by 2 to get amount needed for two coats.

$$25.12 \times 2 = 50.24 \text{ square feet.}$$

3. Check label on can for coverage of product.

A pint of polyurethane that can cover at least 60 square feet will be able to do the job.