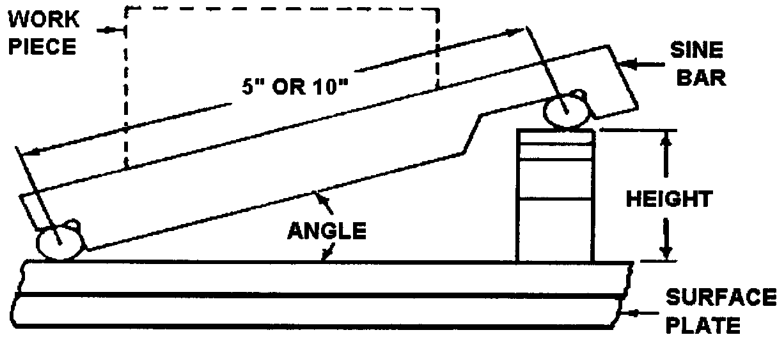
APPENDIX C

FORMULAS

SINE BAR OR SINE PLATE SETTING



Sine bars or sine plates usually have a length of 5 inches or 10 inches. These standard lengths are commonly used by the tool maker or inspector. The sine bar or sine plate is used for accurately setting up work for machining or for inspection. Gage blocks are usually used for establishing the height.

Rule for determining the height of the sine bar setting for a given angle: multiply the sine of the angle by the length of the sine bar. The sine of the angle is taken from the tables of trigonometric functions.

Problem: What would be the height to set a sine bar for establishing an angle of 230 41‘? **Solution:** The sine of 23’41‘ is 0.40168. Multiply this by 5 because a 5-inch sine bar is used; 5 x 0.40168 = 2.0084, which is the height to set the sine bar.

RULES FOR FIGURING TAPERS

TO FIND	GIVEN	RULE
Taper per inch	Taper per foot	Divide the taper per foot by 12.
Taper per foot	Taper per inch	Multiply the taper per inch by 12.
Taper per foot	End diameters and length of taper in inches	Subtract small diameter from large, divided by length of taper, and multiply quotient by 12.
Diameter at small end in inches	Large diametre, length of taper in inches, and taper foot	Divide taper per foot by 12, multiply by length of taper, and subtract from large diameter.
Diameter at large end in inches	Small diameter, length of taper in inches, and taper per foot	Divide taper per foot by 12, multiply by length of taper, and add results to small diameter.
Distance between two given diameters in inches	Taper per foot and two diameters in inches	Subtract small diameter from large, divide remainder by taper per foot and multiply quotient by 12.
Amount of taper in a certain length given in inches	Taper per foot	Divide taper per foot by 12 and multiply by given length of tappered part

To find the circumference of a circle Ξ xD or D / 0.3183.

To find the diameter of a circle 0.31831 x C or C / Ξ.

To find the area of a circle Ξ r^2.

To find size of round stock needed to machine a hexagon, D = 1.1547 x distance across the flats

To find size of round stock needed to machine a square, D = 1.4142 x distance across the flats

To find the area of a square, square one side

To find the area of a rectangle, multiply length times width

To find the volume of a cube, multiply length times width times depth

To find the volume of a square prism, multiply length times width times depth

To find the volume of a cylinder, multiply Ξ times radius squared times height

To find the area of a triangle, multiply base times height divided by 2

To find the area of a ring, subtract the area of inside diameter from the area of the outside diameter.

TRIGONOMETRY FORMULAS

Formulas for Finding Functions of Angles

$$\frac{\text{Side opposite}}{\text{Hypotenuse}} = \text{sine}$$

$$\frac{\text{Side adjacent}}{\text{Hypotenuse}} = \text{cosine}$$

$$\frac{\text{Side opposite}}{\text{Side adjacent}} = \text{tangent}$$

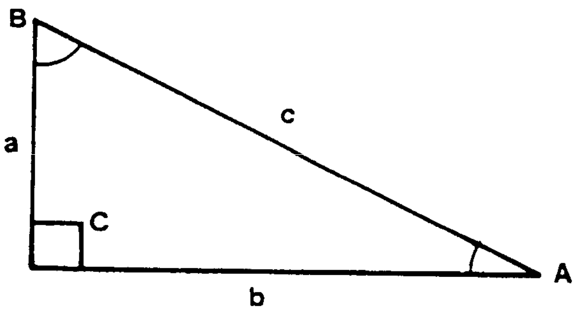
$$\frac{\text{Side adjacent}}{\text{Side opposite}} = \text{cotangent}$$

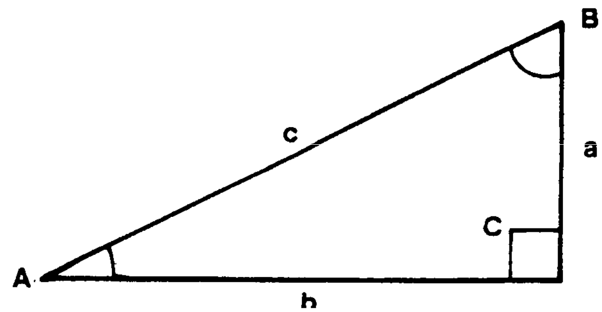
$$\frac{\text{Hypotenuse}}{\text{Side adjacent}} = \text{secant}$$

$$\frac{\text{Hypotenuse}}{\text{Side opposite}} = \text{cosecant}$$

Formulas for Finding the Length of Slides for Right-Angle Triangle When an Angle and Side are Known

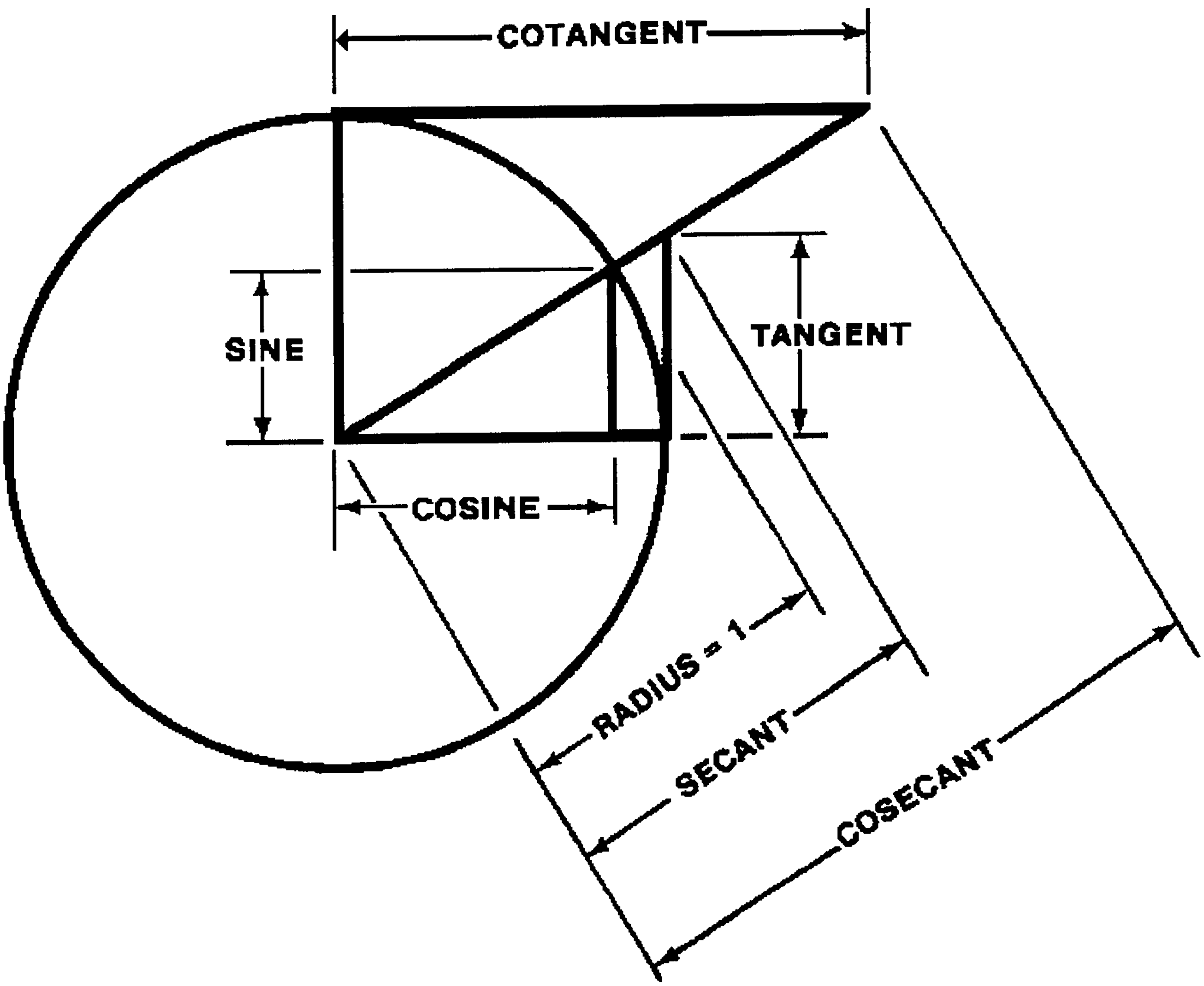
Length of side adjacent	Hypotenuse * sine Hypotenuse/cosecant Side adjacent * tangent Side adjacent/cotangent
Length of side adjacent	Hypotenuse * sine Hypotenuse/secant Side opposite * cotangent Side opposite/tangent
Length of hypotenuse	Side opposite * cosecant Side opposite/sine Side adjacent * secant Side adjacent/cosine





RIGHT TRIANGLES

KNOWN	SIDE a	TO FIND SIDE b	SIDE c
Side c, Angle B	Cosine B x c or $\frac{c}{\text{Secant B}}$	Sine B x c or $\frac{c}{\text{Cosecant B}}$	Angle A = 90° - B
Side c, Angle A	Sine A x c or $\frac{c}{\text{Cosecant A}}$	Cosine A x c or $\frac{c}{\text{Secant A}}$	Angle B = 90° - A
Side b, Angle B	Cotangent B x b or $\frac{b}{\text{Tangent B}}$	Angle A = 90° - B	Cosecant B x b or $\frac{b}{\text{Sine B}}$
Side b, Angle A	Tangent A x b or $\frac{b}{\text{Cotangent A}}$	Angle B = 90° - A	Secant A x b or $\frac{b}{\text{Cosine A}}$
Side a, Angle B	Angle A = 90° - B	Tangent B x b or $\frac{a}{\text{Cotangent B}}$	Secant B x b or $\frac{a}{\text{Cosine B}}$
Side a, Angle A	Angle B = 90° - A	Cotangent A x a or $\frac{a}{\text{Tangent A}}$	Cosecant A x a or $\frac{a}{\text{Sine A}}$
	ANGLE A	**ANGLE B**	**SIDE x**
Side c and b	Cosine A = b+c or Secant A = c+b	Sine B = b+c or Cosecant B = c+b	Side A = $\overline{c^2 - b^2}$
Side c and a	Sine A = a+c or Cosecant A = c+a	Cosine B = a+c or Secant B = c+a	Side b = $\overline{c^2 - a^2}$
Side c and a	Tangent A = a+b or Cotangent A = b+a	Cotangent B = a+b or Tangent B = b+a	Side c = $\overline{a^2 - b^2}$


COTANGENT
SINE
TANGENT
COSINE
RADIUS = 1
SECANT
COSECANT