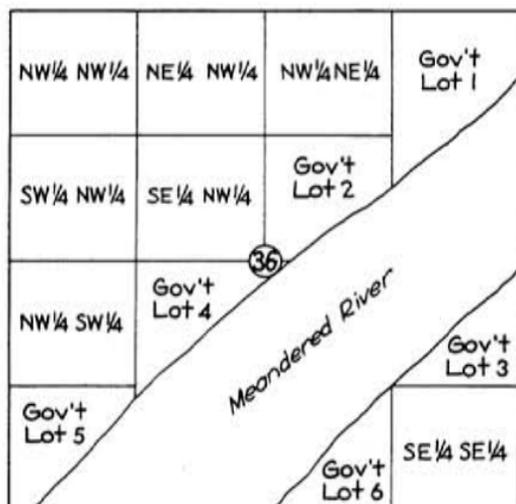


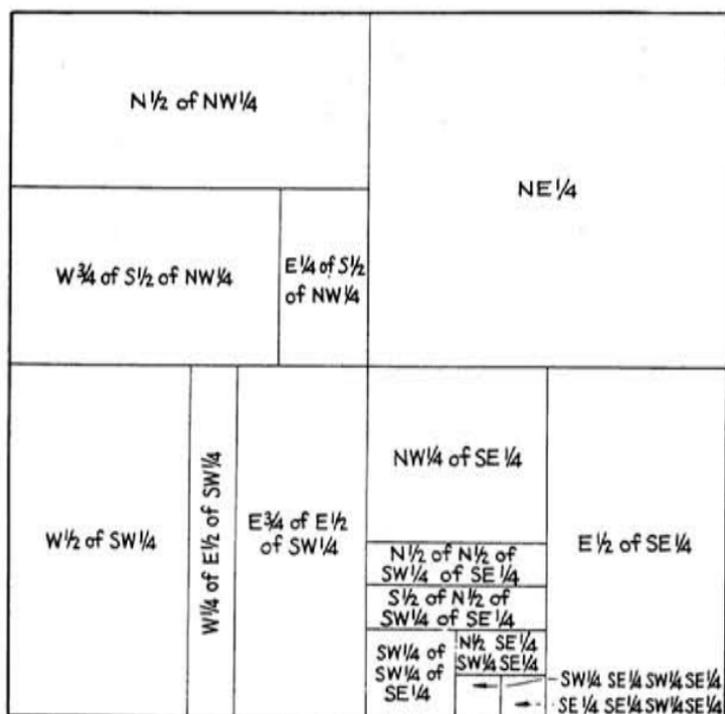


# TOWNSHIPS & SECTION SUBDIVISIONS

**FIGURE III**  
TYPICAL SECTION

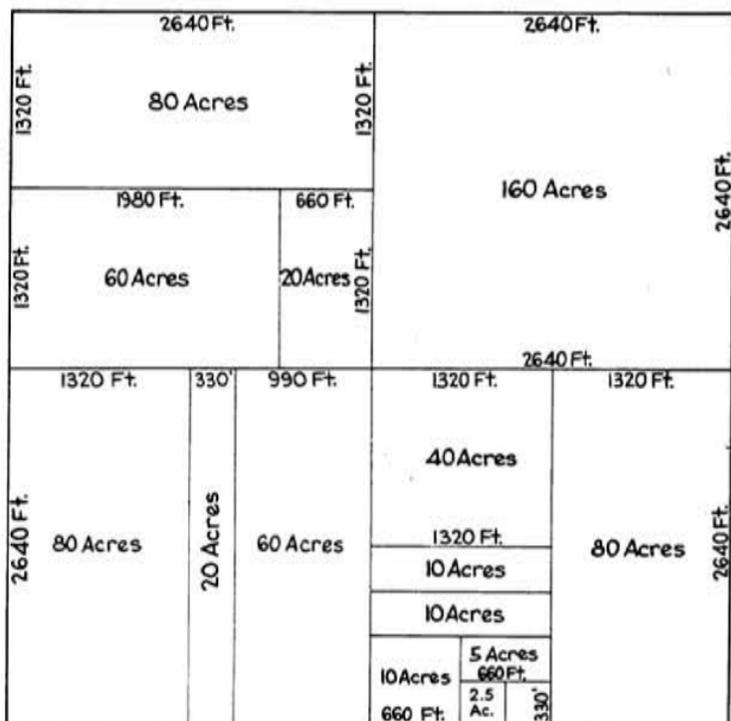


**FIGURE IV**  
LEGAL DESCRIPTION OF A SECTION



# TOWNSHIPS & SECTION SUBDIVISIONS

**FIGURE V**  
ACREAGE AND STANDARD DIMENSIONS



A rod is  $16\frac{1}{2}$  feet.

A chain is 66 feet or 4 rods.

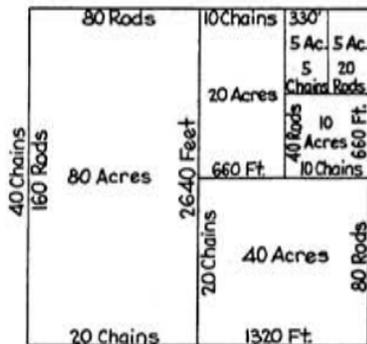
A mile is 320 rods, 80 chains or 5,280 feet.

A square rod is  $272\frac{1}{4}$  square feet.

An acre contains 43,560 square feet.

An acre contains 160 square rods.

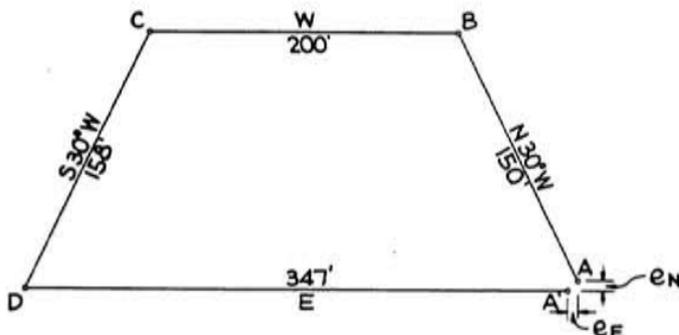
An acre is about  $208\frac{3}{4}$  feet square.



## BALANCING AND ADJUSTING A TRAVERSE BY THE COMPASS RULE

THE COMPASS RULE STATES: The correction to be applied to the latitude and departure of any course is to the total correction in latitude and departure as the length of the course is to the length of the traverse.

EXAMPLE:



COURSE	BEARING	DISTANCE	LAT.	DEP.	N. COORDS	E. COORDS
A					10,000.00	10,000.00
AB	N30°W	150.0'	+129.90'	- 75.00'	10,129.90	9,925.00
BC	W	200.0'	0.00	-200.00'	10,129.90	9,725.00
CD	S30°W	158.0'	-136.83'	- 79.00'	9,993.07	9,646.00
DA <sup>1</sup>	E	347.0'	0.00	+347.00'	9,993.07	9,993.00

Latitude Correction =  $e_n = 10,000.00 - 9,993.07' = +6.93'$

Departure Correction =  $e_e = 10,000.00 - 9,993.00 = +7.00'$

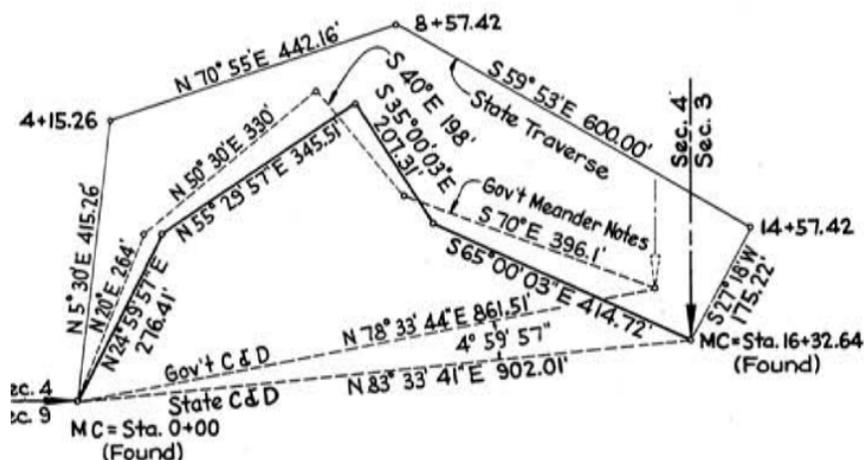
$\Sigma d$  = Total Distance of all Courses in the traverse = 855.0'

COURSE		COURSE	
LATITUDE CORRECTIONS		DEPARTURE CORRECTIONS	
Distance		Distance	
$\Sigma d$	( $e_n$ )	$\Sigma d$	( $e_e$ )
AB	$(150.0/855.0)(6.93)=1.22$	AB	$(150.0/855.0)(7.00)=1.23$
BC	$(200.0/855.0)(6.93)=1.62$	BC	$(200.0/855.0)(7.00)=1.64$
CD	$(158.0/855.0)(6.93)=1.28$	CD	$(158.0/855.0)(7.00)=1.29$
DA <sup>1</sup>	$(347.0/855.0)(6.93)=2.81$	DA <sup>1</sup>	$(347.0/855.0)(7.00)=2.84$

**BALANCING AND ADJUSTING A TRAVERSE BY THE  
COMPASS RULE (Cont.)**

COORDINATE CORRECTIONS		BEARING AND DISTANCE CORRECTION EQUATIONS	
	N. E.		
COURSE	COORDS	COORDS	
A	10,000.00	10,000.00	Coord. Departure of Course
	+129.90	- 75.00	$\tan \text{ Bearing} = \frac{\text{Coord. Departure of Course}}{\text{Coord. Latitude of Course}}$
	+ 1.22	+ 1.23	
AB	10,131.12	9,926.23	EXAMPLE:
	0.00	-200.00	
	+ 1.62	+ 1.64	$\tan \text{ Bearing Course AB} = \frac{73.77}{131.12} = .56261$
BC	10,132.74	9,727.87	Bearing = N 29°21'45" W
	-136.83	- 79.00	
	+ 1.28	+ 1.29	
CD	9,997.19	9,650.16	Distance = $\frac{\text{Coord. Latitude of Course}}{\text{Cosine of Corr. Bearing}}$
	0.00	+347.00	
	+ 2.81	+ 2.84	
DA'	10,000.00	10,000.00	EXAMPLE:
			$\text{Distance Course AB} = \frac{131.12}{.87153} = 150.45 \text{ Ft.}$

## BALANCING A GOVERNMENT MEANDER LINE SWING METHOD



It is desired to correct a government meander line between two known meander corners, having established positions by balancing the line to the correct co-ordinates of the corners as determined by the new survey.

In this method it is assumed that the angles of the government line are rigid and that any correction is made to the chained distances only, either lengthening or shortening them; so that when the entire survey, hinged at one M.C., is swung, the final course will pass through the other M.C. and also that the final distance coincides with the M.C.

In detail the method is as follows:

1. Compute the closing course and distance for the government meander notes.
2. Compute the closing course and distance between the meander corners from the State's traverse or from their established co-ordinates.
3. Take the angular difference between the closing course as obtained from the known co-ordinates of the meander corners and of the closing course as obtained from the government notes and correct all courses by this amount.
4. Take the ratio of the closing distance for the State's traverse between meander corners to the closing distance as derived from the government meander notes, and adjust all meander distances by this ratio.

An example can also be found in the *Computer Manual*.

## STATE TRAVERSE BETWEEN MEANDER CORNERS

Station	Course	Dist.	Cos	Sin	Lats. and Deps.	Co-ords.	
						N	E
M.C. 4/9 0+00						0.00	0.00
	N 5°30'E	415.26	.99540	.09585	+413.35 + 39.80		
4+15.26						+413.35	+ 39.80
	N 70°55'E	442.16	.32694	.94504	+144.56 +417.86		
8+57.42						+557.91	+457.66
	S 59°53'E	600.00	.50176	.86501	-301.06 +519.01		
14+57.42						+256.85	+976.67
	S 27°18'W	175.22	.88862	.45865	-155.70 - 80.36		
M.C. ¾ 16+32.64						+101.15	+896.31
					+557.91	+976.67	
					-456.76	- 80.36	
					N 101.15	E 896.31	

Closing Course:  $896.31 \div 101.15 = 8.861196 = \tan 83^\circ 33' 41''$ , N & E

Closing Distance:  $896.31 \div \sin 83^\circ 33' 41'' = 902.00$

Use Cos Distance

$101.15 \div \cos 83^\circ 33' 41'' = 902.01$

## GOVERNMENT MEANDER NOTES

Station	Course	Dist.	Cos	Sin	Lats. and Deps.	Co-ords.	
						N	E
M.C. 4/9						0.00	0.00
	N 20° E	264	.93969	.34202	+248.08 + 90.29		
1						+248.08	+ 90.29
	N 50°30'E	330	.63608	.77162	+209.91 +254.63		
2						+457.99	+344.92
	S 40° E	198	.76604	.64279	-151.68 +127.27		
3						+306.31	+472.19
	S 70° E	396.1	.34202	.93969	-135.47 +372.21		
M.C. ¾						+170.84	+844.40
					+457.99	+844.40	
					-287.15	- 0.00	
					N 170.84	E 844.40	

Closing Course:  $844.40 \div 170.84 = 4.94264 = \tan 78^\circ 33' 44''$ , N & E

Closing Distance:  $844.40 \div \sin 78^\circ 33' 44'' = 861.51$

Check

$170.84 \div \cos 78^\circ 33' 44'' = 861.51$

Correction to Courses of Gov't. Meander =  $(83^\circ 33' 41'') - (78^\circ 33' 44'') = 4^\circ 59' 57''$

N 20°00'00" E	N 50°30'00" E	S 40°00'00" E	S 70°00'00" E
+ 4°59'57"	+ 4°59'57"	- 4°59'57"	- 4°59'57"

N 24°59'57" E	N 55°29'57" E	S 35°00'03" E	S 65°00'03" E
---------------	---------------	---------------	---------------

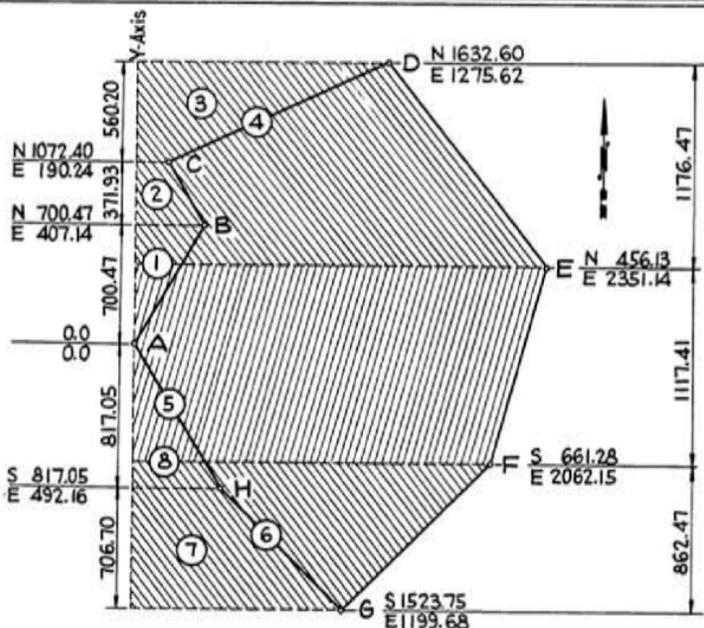
Correction to Distances of Gov't. Meander (Factor) =  $902.01 \div 861.51 = 1.04701$

264	×	1.04701	=	276.41
330	×	1.04701	=	345.51
198	×	1.04701	=	207.31
396.1	×	1.04701	=	414.72

## BALANCED GOVERNMENT MEANDER LINE (And Check on Work)

Station	Course	Dist.	Cos	Sin	Lats. and Deps.		Co-ords.	
							N	E
M.C. 4/9							0.00	0.00
1	N 24°59'57" E	276.41	.90631	.42261	+250.51	+116.81	+250.51	+116.81
2	N 55°29'57" E	345.51	.56642	.82412	+195.70	+284.74	+446.21	+401.55
3	S 35°00'03" E	207.31	.81914	.57359	-169.82	+118.91	+276.39	+520.46
M.C. 3/4	S 65°00'03" E	414.72	.42261	.90631	-175.26	+375.86	+101.13	+896.32
							=101.15	=896.31

## COMPUTATION OF AREAS BY DOUBLE MERIDIAN DISTANCES (DMD's)



For this particular figure the Y-Axis which passes through the most westerly point A. The computation by double meridian distances gives double areas for the trapezoids numbers 4, 5 and 6, from which are subtracted the trapezoids 3, 2, 1, 8 and 7; 1 and 8 being trapezoids with one parallel side equal to zero.

Areas may be very conveniently and rapidly computed by the method known as "Double Meridian Distances."

In the figure, which shows the geometry of this method, there are eight angle points assigned: A, B, C, D, etc. It is assumed that the co-ordinates shown represent a balanced survey and thus show a perfect closure.

From the co-ordinates shown the corresponding latitudes and departures have been computed.

## COMPUTATION OF AREAS BY DOUBLE MERIDIAN DISTANCES (DMD's)—Continued

From the departures (meridian distances) the double meridian distances are computed as follows:

The DMD at B is the algebraic sum of the departure at A and the departure to B.

The DMD at C is the algebraic sum of the DMD at B and the departures on either side of B.

The DMD at D is the algebraic sum of the DMD at C and the departures on either side of C, etc.

Thus, in the accompanying example:

$$\text{the DMD at B} = 0 + (+407.14) = +407.14$$

$$\text{the DMD at C} = +407.14 + (+407.14) + (-216.90) = +597.38$$

$$\text{the DMD at D} = +597.38 + (-216.90) + (+1085.38) = 1465.86$$

The check on this series of calculations is that the final DMD is equal to the last departure but of opposite sign.

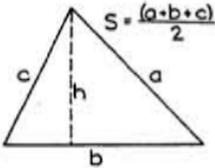
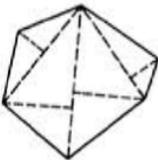
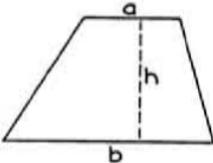
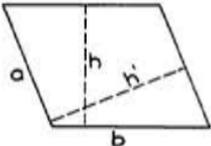
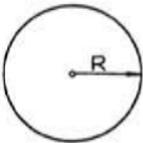
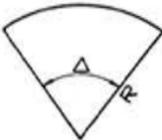
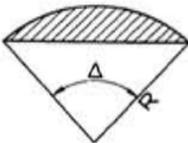
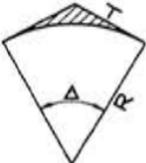
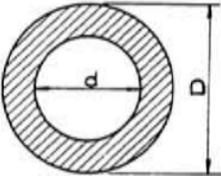
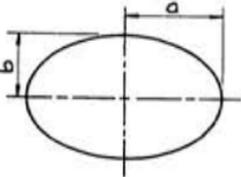
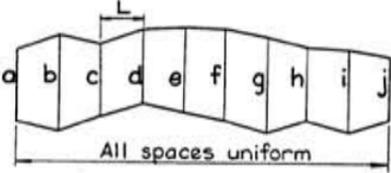
To obtain the double areas each DMD is multiplied by its corresponding latitude distance. The result is a plus or minus double area, depending on the sign of the DMD and the sign of the latitude distance.

The algebraic summation of the double areas gives a final double area of either a + or - sign. At this stage of the computation the algebraic sign is discarded. The algebraic result of the summation whether + or - is the numerical value of the double area.

### DMD AREA—BASE MERIDIAN (Y-Axis)

Station	Co-ordinates		Lats. (+or-)	Deps. (+or-)	DMD	Double Area
	N & S (+or-)	E & W (+or-)				
A ....	0.00	0.00				
B ....	+ 700.47	+ 407.14	+ 700.47	+ 407.14	+ 407.14	+ 285,189.36
C ....	+1,072.40	+ 190.24	+ 371.93	- 216.90	+ 597.38	+ 222,183.54
D ....	+1,632.60	+1,275.62	+ 560.20	+1,085.38	+1,465.86	+ 821,174.77
E ....	+ 456.13	+2,351.14	-1,176.47	+1,075.52	+3,626.76	-4,266,774.34
F ....	- 661.28	+2,062.15	-1,117.41	- 288.99	+4,413.29	-4,931,454.38
G ....	-1,523.75	+1,199.68	- 862.47	- 862.47	+3,261.83	-2,813,230.52
H ....	- 817.05	+ 492.16	+ 706.70	- 707.52	+1,691.84	+1,195,623.33
A ....	0.00	0.00	+ 817.05	- 492.16	+ 492.16	+ 402,119.33
	+3,156.35	+2,568.04				+ 2,926,290.33
	-3,156.35	-2,568.04				-12,011,459.24
					Double Area Area	9,085,168.91 4,542,584.45

**FIGURE VI**  
AREAS OF PLANE FIGURES

<p align="center"><b>TRIANGLE</b></p>  <p align="center"><math>S = \frac{(a+b+c)}{2}</math></p> <p align="center"><math>A = \frac{bh}{2}</math></p> <p align="center"><math>A = \sqrt{s(s-a)(s-b)(s-c)}</math></p>	<p align="center"><b>POLYGON</b></p>  <p align="center">Divide into triangles</p> <p align="center"><math>A = \text{Sum of all triangles}</math></p>	<p align="center"><b>TRAPEZOID</b></p>  <p align="center"><math>A = \frac{(a+b)h}{2}</math></p>
<p align="center"><b>PARALLELOGRAM</b></p>  <p align="center"><math>A = bh</math></p> <p align="center"><math>A = ah'</math></p>	<p align="center"><b>CIRCLE</b></p>  <p align="center"><math>A = \pi R^2</math></p>	<p align="center"><b>SECTOR</b></p>  <p align="center"><math>A = \pi R^2 \left( \frac{\Delta}{360} \right)</math></p>
<p align="center"><b>SEGMENT</b></p>  <p align="center"><math>A = \pi R^2 \left( \frac{\Delta}{360} \right) - \frac{R^2 \sin \Delta}{2}</math></p>	<p align="center"><b>FILLET</b></p>  <p align="center"><math>A = RT - \left( \frac{\Delta}{360} \right) \pi R^2</math></p> <p align="center">When <math>\Delta = 90^\circ</math>, <math>A = 0.2146R^2</math></p>	<p align="center"><b>CIRCULAR RING</b></p>  <p align="center"><math>A = \frac{\pi}{4} (D^2 - d^2)</math></p> <p align="center"><math>A = \frac{\pi}{4} (D+d)(D-d)</math></p>
<p align="center"><b>ELLIPSE</b></p>  <p align="center"><math>A = \pi ab</math></p>	<p align="center"><b>IRREGULAR FIGURE</b></p>  <p align="center">All spaces uniform</p> <p align="center"><math>A = \left( \frac{a+j}{2} + b+c+d+e+f+g+h+i \right) L</math></p>	

**FIGURE VIIa**  
SURFACES AND VOLUMES OF SOLIDS

**SYMBOLS**

S = Lateral Surface Area

V = Volume

A = Area of Section Perpendicular to Sides

B = Area of Base

P = Perimeter of Base

$P_A$  = Perimeter of Section Perpendicular to Sides

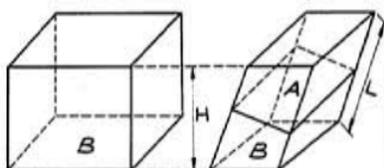
R = Radius of Sphere or Circle

L = Slant Height or Lateral Length

H = Perpendicular Height

C = Circumference of Circle of Sphere

**PARALLELEPIPED**

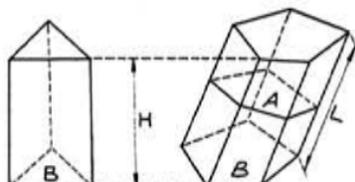


$$S = PH$$

$$S = P_A L$$

$$V = BH = AL$$

**PRISM, RIGHT OR OBLIQUE, REGULAR OR IRREGULAR**

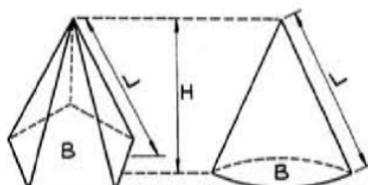


$$S = PH$$

$$S = P_A L$$

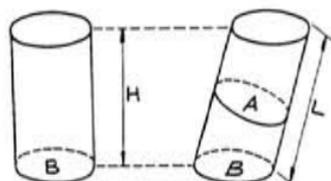
$$V = BH = AL$$

**PYRAMID OR CONE, RIGHT AND REGULAR**



$$S = \frac{1}{2} PL \quad V = \frac{1}{3} BH$$

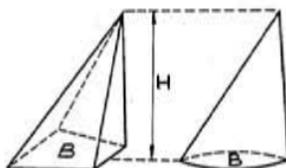
**CYLINDER, RIGHT OR OBLIQUE, CIRCULAR OR ELLIPTIC**



$$S = PH = P_A L$$

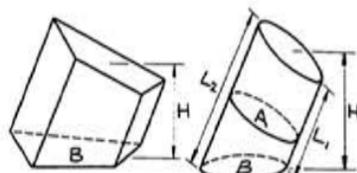
$$V = BH = AL$$

**PYRAMID OR CONE, RIGHT OR OBLIQUE, REGULAR OR IRREGULAR**



$$V = \frac{1}{3} BH$$

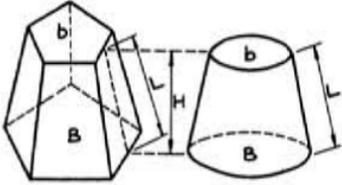
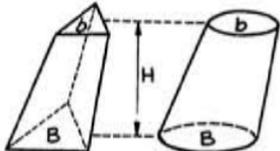
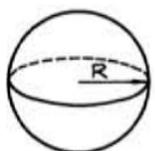
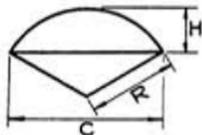
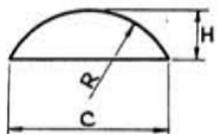
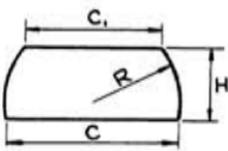
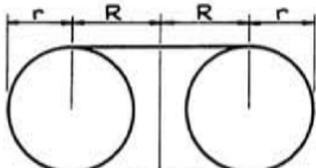
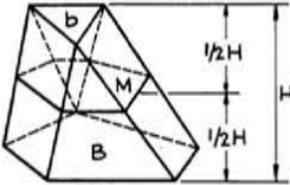
**FRUSTUM OF ANY PRISM OR CYLINDER**



$$V = BH$$

$$V = \frac{1}{2} A(L_1 + L_2) \text{ for cylinder}$$

**FIGURE VIIb**  
SURFACES AND VOLUMES OF SOLIDS

<p align="center">FRUSTUM OF PYRAMID OR CONE RIGHT AND REGULAR, PARALLEL ENDS</p>  <p> <math>S = \frac{1}{2} L (P+p)</math>    <math>V = \frac{1}{3} H (B+b + \sqrt{Bb})</math>            (p=perimeter of top base)            (b=area of top base)         </p>	<p align="center">FRUSTUM OF ANY PYRAMID OR CONE, PARALLEL ENDS</p>  <p> <math>V = \frac{1}{3} H (B+b + \sqrt{Bb})</math>            b= Area of top base         </p>
<p align="center">SPHERE</p>  <p> <math>S = 4 \pi R^2</math>    <math>V = \frac{4}{3} \pi R^3</math> </p>	<p align="center">SPHERICAL SECTOR</p>  <p> <math>S = \frac{1}{2} \pi R (4H+C)</math>    <math>V = \frac{2}{3} \pi R^2 H</math> </p>
<p align="center">SPHERICAL SEGMENT</p>  <p> <math>S = 2 \pi R H = \frac{1}{4} \pi (4H^2 + C^2)</math>    <math>V = \frac{1}{3} \pi H^2 (3R-H)</math> </p>	<p align="center">SPHERICAL ZONE</p>  <p> <math>S = 2 \pi R H</math>    <math>V = \frac{1}{24} \pi H (3C^2 + 3C_1^2 + 4H^2)</math> </p>
<p align="center">CIRCULAR RING</p>  <p> <math>S = 4 \pi^2 R r</math>    <math>V = 2 \pi^2 R r^2</math> </p>	<p align="center">PRISMOIDAL FORMULA</p>  <p> <math>V = \frac{H}{6} (B+b+4M)</math>            M= Area of Section Parallel to Bases, Midway between them.         </p>

**FIGURE VIIIa**

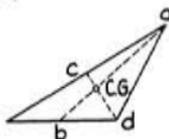
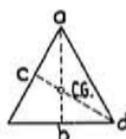
**CENTERS OF GRAVITY OF ORDINARY PLANE FIGURES**

**Squares, Rectangles & Parallelograms**



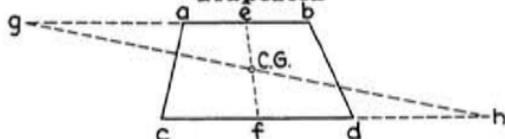
Center of gravity is at the intersection of the diagonals or midway between the bases on a line drawn between the centers of those bases.

**Triangles**



Center of gravity is at the intersection of the medial lines  $a b$  and  $c d$ ; a medial line is a line drawn from any apex to the middle of the opposite side. The distance  $b$  (C.G.) =  $\frac{1}{3} a b$ ; that is, the center of gravity is on the medial line  $\frac{1}{3}$  of the distance from the base to the apex.

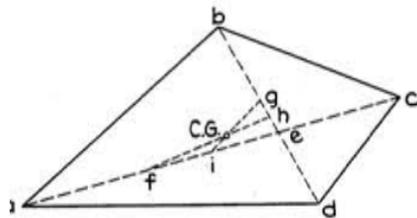
**Trapezoid**



*Graphic Method.* Prolong  $b a$  to  $g$ , making  $a g = c d$ . Prolong  $c d$  to  $h$ , making  $d h = a b$ . Connect  $g h$ . Bisect  $a b$  at  $e$ . Bisect  $c d$  at  $f$ . Connect  $e f$ : the intersection of  $g h$  and  $e f$  is the center of gravity.

$$\text{The distance } f \text{ (C.G.)} = \frac{ef}{3} \times \frac{2ab + cd}{ab + cd}$$

**Any Quadrilateral**



*Graphic Method.* Draw the diagonals  $ac$  and  $bd$  intersecting at  $e$ .

Lay off  $af = ec$

Lay off  $bg = ed$

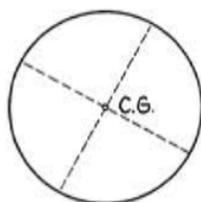
Bisect  $eg$  at  $h$ ; bisect  $ef$  at  $i$ .

The intersection of  $fh$  and  $gi$  is the center of gravity of the figure.

### FIGURE VIIIb

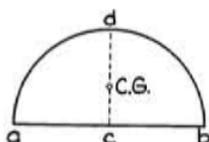
#### CENTERS OF GRAVITY OF ORDINARY PLANE FIGURES— (Continued)

##### Circles



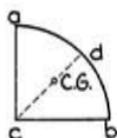
Center of gravity at the center

##### Semicircle



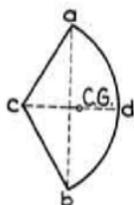
The center of gravity lies on the radius perpendicular to the diameter. The distance  $c$  (C.G.) = radius  $\times$  0.4244

##### Quadrant



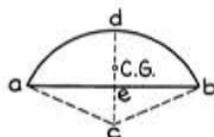
The center of gravity lies on the radius which bisects the  $\angle acb$ . The distance  $c$  (C.G.) = radius  $\times$  0.6002

##### Sector



The center of gravity lies on the radius bisecting the  $\angle acb$ . The distance  $c$  (C.G.) =  $\frac{2}{3}$  radius  $\times$  chord  $ab$  /  $\frac{\text{radius}^2 \times \text{chord}}{3 \times \text{area}}$

##### Segment



The center of gravity lies on the perpendicular erected at the center of the chord  $ab$ .  
The distance  $c$  (C.G.) =  $\frac{\text{chord } ab^3}{12 \times \text{area of segment}}$



## TRIGONOMETRIC LAWS

LAW OF SINES:

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

LAW OF COSINES:

$$a^2 = b^2 + c^2 - 2bc \cos A$$

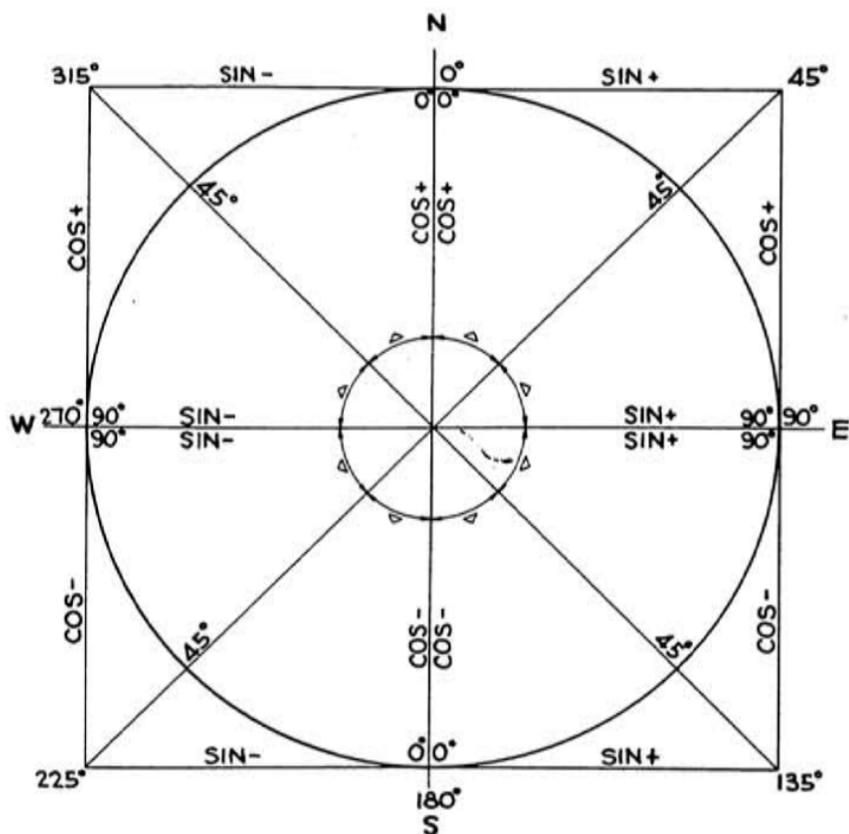
LAW OF TANGENTS:

$$\tan \frac{1}{2} A = \sqrt{\frac{(s-b)(s-c)}{s(s-a)}}$$

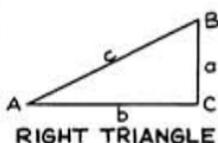
$$\text{where } s = \frac{1}{2} (a + b + c)$$

# SIGNS OF TRIGONOMETRIC FUNCTIONS FOR ALL QUADRANTS

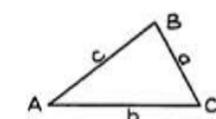
(CARTESIAN COORDINATE SYSTEM)



# TRIGONOMETRIC SOLUTIONS OF TRIANGLES



RIGHT TRIANGLE



OBLIQUE TRIANGLE

$$A + B + C = 180^\circ$$

$$K = \text{Area}$$

$$s = \frac{a + b + c}{2}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$b^2 = a^2 + c^2 - 2ac \cos B$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$

## RIGHT TRIANGLES

GIVEN	TO FIND	EQUATION		
a, c	A, B, b K	$\sin A = \frac{a}{c}$	$\cos B = \frac{a}{c}$ $K = \frac{a}{2} \sqrt{c^2 - a^2}$	$b = \sqrt{c^2 - a^2}$
a, b	A, B, c K	$\tan A = \frac{a}{b}$	$\tan B = \frac{b}{a}$ $K = \frac{ab}{2}$	$c = \sqrt{a^2 + b^2}$
A, a	B, b, c K	$B = 90^\circ - A$	$b = a \cdot \cot A$ $K = \frac{a^2 \cdot \cot A}{2}$	$c = \frac{a}{\sin A}$
A, b	B, a, c K	$B = 90^\circ - A$	$a = b \cdot \tan A$ $K = \frac{b^2 \cdot \tan A}{2}$	$c = \frac{b}{\cos A}$
A, c	B, a, b K	$B = 90^\circ - A$	$a = c \cdot \sin A$ $K = \frac{c^2 \cdot \sin A \cdot \cos A}{2} = \frac{c^2 \cdot \sin 2A}{4}$	$b = c \cdot \cos A$

## OBLIQUE TRIANGLES

GIVEN	TO FIND	EQUATION		
a, b, c	A	$\sin \frac{A}{2} = \sqrt{\frac{(s-b)(s-c)}{bc}}$	$\cos \frac{A}{2} = \sqrt{\frac{s(s-a)}{bc}}$	$\tan \frac{A}{2} = \sqrt{\frac{(s-b)(s-c)}{s(s-a)}}$
	B	$\sin \frac{B}{2} = \sqrt{\frac{(s-a)(s-c)}{ac}}$	$\cos \frac{B}{2} = \sqrt{\frac{s(s-b)}{ac}}$	$\tan \frac{B}{2} = \sqrt{\frac{(s-a)(s-c)}{s(s-b)}}$
	C	$\sin \frac{C}{2} = \sqrt{\frac{(s-a)(s-b)}{ab}}$	$\cos \frac{C}{2} = \sqrt{\frac{s(s-c)}{ab}}$	$\tan \frac{C}{2} = \sqrt{\frac{(s-a)(s-b)}{s(s-c)}}$
	K	$K = \sqrt{s(s-a)(s-b)(s-c)}$		
a, A, B	b, c	$b = \frac{a \cdot \sin B}{\sin A}, \quad c = \frac{a \cdot \sin(A+B)}{\sin A}$		
	K	$K = \frac{ab \cdot \sin C}{2} = \frac{a^2 \cdot \sin B \cdot \sin C}{2 \cdot \sin A}$		
a, b, A	B	$\sin B = \frac{b \cdot \sin A}{a}$		
	c	$c = \frac{a \cdot \sin C}{\sin A} = \frac{b \cdot \sin C}{\sin B} = \sqrt{a^2 + b^2 - 2ab \cdot \cos C}$		
	K	$K = \frac{ab \cdot \sin C}{2}$		
a, b, C	A	$\tan A = \frac{a \cdot \sin C}{b - a \cdot \cos C}$		
	c	$c = \frac{a \cdot \sin(A+B)}{\sin A} = \sqrt{a^2 + b^2 - 2ab \cdot \cos C}$		
	K	$K = \frac{ab \cdot \sin C}{2}$		

# NATURAL TANGENTS, CO-TANGENTS, SINES AND CO-SINES

0°					1°						
/	Sin	Tan	Cot	Cos	/	/	Sin	Tan	Cot	Cos	/
0	.00000	.00000	.....	1.0000	60	0	.01745	.01746	57.290	.99985	60
1	.00029	.00029	3437.7	1.0000	59	1	.01774	.01775	56.351	.99984	59
2	.00058	.00058	1718.9	1.0000	58	2	.01803	.01804	55.442	.99984	58
3	.00087	.00087	1145.9	1.0000	57	3	.01832	.01833	54.561	.99983	57
4	.00116	.00116	859.44	1.0000	56	4	.01862	.01862	53.709	.99983	56
5	.00145	.00145	687.55	1.0000	55	5	.01891	.01891	52.882	.99982	55
6	.00175	.00175	572.96	1.0000	54	6	.01920	.01920	52.081	.99982	54
7	.00204	.00204	491.11	1.0000	53	7	.01949	.01949	51.303	.99981	53
8	.00233	.00233	429.72	1.0000	52	8	.01978	.01978	50.549	.99980	52
9	.00262	.00262	381.97	1.0000	51	9	.02007	.02007	49.816	.99980	51
10	.00291	.00291	343.77	1.0000	50	10	.02036	.02036	49.104	.99979	50
11	.00320	.00320	312.52	.99999	49	11	.02065	.02066	48.412	.99979	49
12	.00349	.00349	286.48	.99999	48	12	.02094	.02095	47.740	.99978	48
13	.00378	.00378	264.44	.99999	47	13	.02123	.02124	47.085	.99977	47
14	.00407	.00407	245.55	.99999	46	14	.02152	.02153	46.449	.99977	46
15	.00436	.00436	229.18	.99999	45	15	.02181	.02182	45.829	.99976	45
16	.00465	.00465	214.86	.99999	44	16	.02211	.02211	45.226	.99976	44
17	.00495	.00495	202.22	.99999	43	17	.02240	.02240	44.639	.99975	43
18	.00524	.00524	190.98	.99999	42	18	.02269	.02269	44.066	.99974	42
19	.00553	.00553	180.93	.99998	41	19	.02298	.02298	43.508	.99974	41
20	.00582	.00582	171.89	.99998	40	20	.02327	.02328	42.964	.99973	40
21	.00611	.00611	163.70	.99998	39	21	.02356	.02357	42.433	.99972	39
22	.00640	.00640	156.26	.99998	38	22	.02385	.02386	41.916	.99972	38
23	.00669	.00669	149.47	.99998	37	23	.02414	.02415	41.411	.99971	37
24	.00698	.00698	143.24	.99998	36	24	.02443	.02444	40.917	.99970	36
25	.00727	.00727	137.51	.99997	35	25	.02472	.02473	40.436	.99969	35
26	.00756	.00756	132.22	.99997	34	26	.02501	.02502	39.965	.99969	34
27	.00785	.00785	127.32	.99997	33	27	.02530	.02531	39.506	.99968	33
28	.00814	.00815	122.77	.99997	32	28	.02560	.02560	39.057	.99967	32
29	.00844	.00844	118.54	.99996	31	29	.02589	.02589	38.618	.99966	31
30	.00873	.00873	114.59	.99996	30	30	.02618	.02619	38.188	.99966	30
31	.00902	.00902	110.89	.99996	29	31	.02647	.02648	37.769	.99965	29
32	.00931	.00931	107.43	.99996	28	32	.02676	.02677	37.358	.99964	28
33	.00960	.00960	104.17	.99995	27	33	.02705	.02706	36.956	.99963	27
34	.00989	.00989	101.11	.99995	26	34	.02734	.02735	36.563	.99963	26
35	.01018	.01018	98.218	.99995	25	35	.02763	.02764	36.178	.99962	25
36	.01047	.01047	95.489	.99995	24	36	.02792	.02793	35.801	.99961	24
37	.01076	.01076	92.908	.99994	23	37	.02821	.02822	35.431	.99960	23
38	.01105	.01105	90.463	.99994	22	38	.02850	.02851	35.070	.99959	22
39	.01134	.01135	88.144	.99994	21	39	.02879	.02881	34.715	.99959	21
40	.01164	.01164	85.940	.99993	20	40	.02908	.02910	34.368	.99958	20
41	.01193	.01193	83.844	.99993	19	41	.02938	.02939	34.027	.99957	19
42	.01222	.01222	81.847	.99993	18	42	.02967	.02968	33.694	.99956	18
43	.01251	.01251	79.943	.99992	17	43	.02996	.02997	33.366	.99955	17
44	.01280	.01280	78.125	.99992	16	44	.03025	.03026	33.045	.99954	16
45	.01309	.01309	76.390	.99991	15	45	.03054	.03055	32.730	.99953	15
46	.01338	.01338	74.729	.99991	14	46	.03083	.03084	32.421	.99952	14
47	.01367	.01367	73.139	.99991	13	47	.03112	.03114	32.118	.99951	13
48	.01396	.01396	71.615	.99990	12	48	.03141	.03143	31.821	.99951	12
49	.01425	.01425	70.153	.99990	11	49	.03170	.03172	31.528	.99950	11
50	.01454	.01455	68.750	.99989	10	50	.03199	.03201	31.242	.99949	10
51	.01483	.01484	67.402	.99989	9	51	.03228	.03230	30.960	.99948	9
52	.01513	.01513	66.105	.99989	8	52	.03257	.03259	30.683	.99947	8
53	.01542	.01542	64.858	.99988	7	53	.03286	.03288	30.412	.99946	7
54	.01571	.01571	63.657	.99988	6	54	.03316	.03317	30.145	.99945	6
55	.01600	.01600	62.499	.99987	5	55	.03345	.03346	29.882	.99944	5
56	.01629	.01629	61.383	.99987	4	56	.03374	.03376	29.624	.99943	4
57	.01658	.01658	60.306	.99986	3	57	.03403	.03405	29.371	.99942	3
58	.01687	.01687	59.266	.99986	2	58	.03432	.03434	29.122	.99941	2
59	.01716	.01716	58.261	.99985	1	59	.03461	.03463	28.877	.99940	1
60	.01745	.01746	57.290	.99985	0	60	.03490	.03492	28.636	.99939	0
/	Cos	Cot	Tan	Sin	/	/	Cos	Cot	Tan	Sin	/
			89°						88°		

# NATURAL TANGENTS, CO-TANGENTS, SINES AND CO-SINES

2°					3°						
°	Sin	Tan	Cot	Cos	°	Sin	Tan	Cot	Cos	°	
0	.03490	.03492	28.636	.99939	60	0	.05234	.05241	19.081	.99863	60
1	.03519	.03521	28.399	.99938	59	1	.05263	.05270	18.976	.99861	59
2	.03548	.03550	28.166	.99937	58	2	.05292	.05299	18.871	.99860	58
3	.03577	.03579	27.937	.99936	57	3	.05321	.05328	18.768	.99858	57
4	.03606	.03609	27.712	.99935	56	4	.05350	.05357	18.666	.99857	56
5	.03635	.03638	27.490	.99934	55	5	.05379	.05387	18.564	.99855	55
6	.03664	.03667	27.271	.99933	54	6	.05408	.05416	18.464	.99854	54
7	.03693	.03696	27.057	.99932	53	7	.05437	.05445	18.366	.99852	53
8	.03723	.03725	26.845	.99931	52	8	.05466	.05474	18.268	.99851	52
9	.03752	.03754	26.637	.99930	51	9	.05495	.05503	18.171	.99849	51
10	.03781	.03783	26.432	.99929	50	10	.05524	.05533	18.075	.99847	50
11	.03810	.03812	26.230	.99927	49	11	.05553	.05562	17.980	.99846	49
12	.03839	.03842	26.031	.99926	48	12	.05582	.05591	17.886	.99844	48
13	.03868	.03871	25.835	.99925	47	13	.05611	.05620	17.793	.99842	47
14	.03897	.03900	25.642	.99924	46	14	.05640	.05649	17.702	.99841	46
15	.03926	.03929	25.452	.99923	45	15	.05669	.05678	17.611	.99839	45
16	.03955	.03958	25.264	.99922	44	16	.05698	.05708	17.521	.99838	44
17	.03984	.03987	25.080	.99921	43	17	.05727	.05737	17.431	.99836	43
18	.04013	.04016	24.898	.99919	42	18	.05756	.05766	17.343	.99834	42
19	.04042	.04046	24.719	.99918	41	19	.05785	.05795	17.256	.99833	41
20	.04071	.04075	24.542	.99917	40	20	.05814	.05824	17.169	.99831	40
21	.04100	.04104	24.368	.99916	39	21	.05843	.05854	17.084	.99829	39
22	.04129	.04133	24.196	.99915	38	22	.05873	.05883	16.999	.99827	38
23	.04159	.04162	24.026	.99913	37	23	.05902	.05912	16.915	.99826	37
24	.04188	.04191	23.859	.99912	36	24	.05931	.05941	16.832	.99824	36
25	.04217	.04220	23.695	.99911	35	25	.05960	.05970	16.750	.99822	35
26	.04246	.04250	23.532	.99910	34	26	.05989	.05999	16.668	.99821	34
27	.04275	.04279	23.372	.99909	33	27	.06018	.06029	16.587	.99819	33
28	.04304	.04308	23.214	.99907	32	28	.06047	.06058	16.507	.99817	32
29	.04333	.04337	23.058	.99906	31	29	.06076	.06087	16.428	.99815	31
30	.04362	.04366	22.904	.99905	30	30	.06105	.06116	16.350	.99813	30
31	.04391	.04395	22.752	.99904	29	31	.06134	.06145	16.272	.99812	29
32	.04420	.04424	22.602	.99902	28	32	.06163	.06175	16.195	.99810	28
33	.04449	.04453	22.454	.99901	27	33	.06192	.06204	16.119	.99808	27
34	.04478	.04483	22.308	.99900	26	34	.06221	.06233	16.043	.99806	26
35	.04507	.04512	22.164	.99898	25	35	.06250	.06262	15.969	.99804	25
36	.04536	.04541	22.022	.99897	24	36	.06279	.06291	15.895	.99803	24
37	.04565	.04570	21.881	.99896	23	37	.06308	.06321	15.821	.99801	23
38	.04594	.04599	21.743	.99894	22	38	.06337	.06350	15.748	.99799	22
39	.04623	.04628	21.606	.99893	21	39	.06366	.06379	15.676	.99797	21
40	.04653	.04658	21.470	.99892	20	40	.06395	.06408	15.605	.99795	20
41	.04682	.04687	21.337	.99890	19	41	.06424	.06438	15.534	.99793	19
42	.04711	.04716	21.205	.99889	18	42	.06453	.06467	15.464	.99792	18
43	.04740	.04745	21.075	.99888	17	43	.06482	.06496	15.394	.99790	17
44	.04769	.04774	20.946	.99886	16	44	.06511	.06525	15.325	.99788	16
45	.04798	.04803	20.819	.99885	15	45	.06540	.06554	15.257	.99786	15
46	.04827	.04833	20.693	.99883	14	46	.06569	.06584	15.189	.99784	14
47	.04856	.04862	20.569	.99882	13	47	.06598	.06613	15.122	.99782	13
48	.04885	.04891	20.446	.99881	12	48	.06627	.06642	15.056	.99780	12
49	.04914	.04920	20.325	.99879	11	49	.06656	.06671	14.990	.99778	11
50	.04943	.04949	20.206	.99878	10	50	.06685	.06700	14.924	.99776	10
51	.04972	.04978	20.087	.99876	9	51	.06714	.06730	14.860	.99774	9
52	.05001	.05007	19.970	.99875	8	52	.06743	.06759	14.795	.99772	8
53	.05030	.05037	19.855	.99873	7	53	.06773	.06788	14.732	.99770	7
54	.05059	.05066	19.740	.99872	6	54	.06802	.06817	14.669	.99768	6
55	.05088	.05095	19.627	.99870	5	55	.06831	.06847	14.606	.99766	5
56	.05117	.05124	19.516	.99869	4	56	.06860	.06876	14.544	.99764	4
57	.05146	.05153	19.405	.99867	3	57	.06889	.06905	14.482	.99762	3
58	.05175	.05182	19.296	.99866	2	58	.06918	.06934	14.421	.99760	2
59	.05205	.05212	19.188	.99864	1	59	.06947	.06963	14.361	.99758	1
60	.05234	.05241	19.081	.99863	0	60	.06976	.06993	14.301	.99756	0
	Cos	Cot	Tan	Sin			Cos	Cot	Tan	Sin	

87°

86°



# NATURAL TANGENTS, CO-TANGENTS, SINES AND CO-SINES

<b>6°</b>					<b>7°</b>					
°	Sin	Tan	Cot	Cos	°	Sin	Tan	Cot	Cos	°
0	.10453	.10510	9.5144	.99452	60	.12187	.12278	8.1443	.99255	60
1	.10482	.10540	9.4878	.99449	59	.12216	.12308	8.1248	.99251	59
2	.10511	.10569	9.4614	.99446	58	.12245	.12338	8.1054	.99248	58
3	.10540	.10599	9.4352	.99443	57	.12274	.12367	8.0860	.99244	57
4	.10569	.10628	9.4090	.99440	56	.12302	.12397	8.0667	.99240	56
5	.10597	.10657	9.3831	.99437	55	.12331	.12426	8.0476	.99237	55
6	.10626	.10687	9.3572	.99434	54	.12360	.12456	8.0285	.99233	54
7	.10655	.10716	9.3315	.99431	53	.12389	.12485	8.0095	.99230	53
8	.10684	.10746	9.3060	.99428	52	.12418	.12515	7.9906	.99226	52
9	.10713	.10775	9.2806	.99424	51	.12447	.12544	7.9718	.99222	51
10	.10742	.10805	9.2553	.99421	50	.12476	.12574	7.9530	.99219	50
11	.10771	.10834	9.2302	.99418	49	.12504	.12603	7.9344	.99215	49
12	.10800	.10863	9.2052	.99415	48	.12533	.12633	7.9158	.99211	48
13	.10829	.10893	9.1803	.99412	47	.12562	.12662	7.8973	.99208	47
14	.10858	.10922	9.1555	.99409	46	.12591	.12692	7.8789	.99204	46
15	.10887	.10952	9.1309	.99406	45	.12620	.12722	7.8606	.99200	45
16	.10916	.10981	9.1065	.99402	44	.12649	.12751	7.8424	.99197	44
17	.10945	.11011	9.0821	.99399	43	.12678	.12781	7.8243	.99193	43
18	.10973	.11040	9.0579	.99396	42	.12706	.12810	7.8062	.99189	42
19	.11002	.11070	9.0338	.99393	41	.12735	.12840	7.7882	.99186	41
20	.11031	.11099	9.0098	.99390	40	.12764	.12869	7.7704	.99182	40
21	.11060	.11128	8.9860	.99386	39	.12793	.12899	7.7525	.99178	39
22	.11089	.11158	8.9623	.99383	38	.12822	.12929	7.7348	.99175	38
23	.11118	.11187	8.9387	.99380	37	.12851	.12958	7.7171	.99171	37
24	.11147	.11217	8.9152	.99377	36	.12880	.12988	7.6996	.99167	36
25	.11176	.11246	8.8919	.99374	35	.12908	.13017	7.6821	.99163	35
26	.11205	.11276	8.8686	.99370	34	.12937	.13047	7.6647	.99160	34
27	.11234	.11305	8.8455	.99367	33	.12966	.13076	7.6473	.99156	33
28	.11263	.11335	8.8225	.99364	32	.12995	.13106	7.6301	.99152	32
29	.11292	.11364	8.7996	.99361	31	.13024	.13136	7.6129	.99148	31
30	.11320	.11394	8.7769	.99357	30	.13053	.13165	7.5958	.99144	30
31	.11349	.11423	8.7542	.99354	29	.13081	.13195	7.5787	.99141	29
32	.11378	.11452	8.7317	.99351	28	.13110	.13224	7.5618	.99137	28
33	.11407	.11482	8.7093	.99347	27	.13139	.13254	7.5449	.99133	27
34	.11436	.11511	8.6870	.99344	26	.13168	.13284	7.5281	.99129	26
35	.11465	.11541	8.6648	.99341	25	.13197	.13313	7.5113	.99125	25
36	.11494	.11570	8.6427	.99337	24	.13226	.13343	7.4947	.99122	24
37	.11523	.11600	8.6208	.99334	23	.13254	.13372	7.4781	.99118	23
38	.11552	.11629	8.5989	.99331	22	.13283	.13402	7.4615	.99114	22
39	.11580	.11659	8.5772	.99327	21	.13312	.13432	7.4451	.99110	21
40	.11609	.11688	8.5555	.99324	20	.13341	.13461	7.4287	.99106	20
41	.11638	.11718	8.5340	.99320	19	.13370	.13491	7.4124	.99102	19
42	.11667	.11747	8.5126	.99317	18	.13399	.13521	7.3962	.99098	18
43	.11696	.11777	8.4913	.99314	17	.13427	.13550	7.3800	.99094	17
44	.11725	.11806	8.4701	.99310	16	.13456	.13580	7.3639	.99091	16
45	.11754	.11836	8.4490	.99307	15	.13485	.13609	7.3479	.99087	15
46	.11783	.11865	8.4280	.99303	14	.13514	.13639	7.3319	.99083	14
47	.11812	.11895	8.4071	.99300	13	.13543	.13669	7.3160	.99079	13
48	.11840	.11924	8.3863	.99297	12	.13572	.13698	7.3002	.99075	12
49	.11869	.11954	8.3656	.99293	11	.13600	.13728	7.2844	.99071	11
50	.11898	.11983	8.3450	.99290	10	.13629	.13758	7.2687	.99067	10
51	.11927	.12013	8.3245	.99286	9	.13658	.13787	7.2531	.99063	9
52	.11956	.12042	8.3041	.99283	8	.13687	.13817	7.2375	.99059	8
53	.11985	.12072	8.2838	.99279	7	.13716	.13846	7.2220	.99055	7
54	.12014	.12101	8.2636	.99276	6	.13744	.13876	7.2066	.99051	6
55	.12043	.12131	8.2434	.99272	5	.13773	.13906	7.1912	.99047	5
56	.12071	.12160	8.2234	.99269	4	.13802	.13935	7.1759	.99043	4
57	.12100	.12190	8.2035	.99265	3	.13831	.13965	7.1607	.99039	3
58	.12129	.12219	8.1837	.99262	2	.13860	.13995	7.1455	.99035	2
59	.12158	.12249	8.1640	.99258	1	.13889	.14024	7.1304	.99031	1
60	.12187	.12278	8.1443	.99255	0	.13917	.14054	7.1154	.99027	0
°	Cos	Cot	Tan	Sin	°	Cos	Cot	Tan	Sin	°

83°

82°

# NATURAL TANGENTS, CO-TANGENTS, SINES AND CO-SINES

8°					9°						
'	Sin	Tan	Cot	Cos	'	Sin	Tan	Cot	Cos	'	
0	.13917	.14054	7.1154	.99027	60	0	.15643	.15838	6.3138	.98769	60
1	.13946	.14084	7.1004	.99023	59	1	.15672	.15868	6.3019	.98764	59
2	.13975	.14113	7.0855	.99019	58	2	.15701	.15898	6.2901	.98760	58
3	.14004	.14143	7.0706	.99015	57	3	.15730	.15928	6.2783	.98755	57
4	.14033	.14173	7.0558	.99011	56	4	.15758	.15958	6.2666	.98751	56
5	.14061	.14202	7.0410	.99006	55	5	.15787	.15988	6.2549	.98746	55
6	.14090	.14232	7.0264	.99002	54	6	.15816	.16017	6.2432	.98741	54
7	.14119	.14262	7.0117	.98998	53	7	.15845	.16047	6.2316	.98737	53
8	.14148	.14291	6.9972	.98994	52	8	.15873	.16077	6.2200	.98732	52
9	.14177	.14321	6.9827	.98990	51	9	.15902	.16107	6.2085	.98728	51
10	.14205	.14351	6.9682	.98986	50	10	.15931	.16137	6.1970	.98723	50
11	.14234	.14381	6.9538	.98982	49	11	.15959	.16167	6.1856	.98718	49
12	.14263	.14410	6.9395	.98978	48	12	.15988	.16196	6.1742	.98714	48
13	.14292	.14440	6.9252	.98973	47	13	.16017	.16226	6.1628	.98709	47
14	.14320	.14470	6.9110	.98969	46	14	.16046	.16256	6.1515	.98704	46
15	.14349	.14499	6.8969	.98965	45	15	.16074	.16286	6.1402	.98700	45
16	.14378	.14529	6.8828	.98961	44	16	.16103	.16316	6.1290	.98695	44
17	.14407	.14559	6.8687	.98957	43	17	.16132	.16346	6.1178	.98690	43
18	.14436	.14588	6.8548	.98953	42	18	.16160	.16376	6.1066	.98686	42
19	.14464	.14618	6.8408	.98948	41	19	.16189	.16405	6.0955	.98681	41
20	.14493	.14648	6.8269	.98944	40	20	.16218	.16435	6.0844	.98676	40
21	.14522	.14678	6.8131	.98940	39	21	.16246	.16465	6.0734	.98671	39
22	.14551	.14707	6.7994	.98936	38	22	.16275	.16495	6.0624	.98667	38
23	.14580	.14737	6.7856	.98931	37	23	.16304	.16525	6.0514	.98662	37
24	.14608	.14767	6.7720	.98927	36	24	.16333	.16555	6.0405	.98657	36
25	.14637	.14796	6.7584	.98923	35	25	.16361	.16585	6.0296	.98652	35
26	.14666	.14826	6.7448	.98919	34	26	.16390	.16615	6.0188	.98648	34
27	.14695	.14856	6.7313	.98914	33	27	.16419	.16645	6.0080	.98643	33
28	.14723	.14886	6.7179	.98910	32	28	.16447	.16674	5.9972	.98638	32
29	.14752	.14915	6.7045	.98906	31	29	.16476	.16704	5.9865	.98633	31
30	.14781	.14945	6.6912	.98902	30	30	.16505	.16734	5.9758	.98629	30
31	.14810	.14975	6.6779	.98897	29	31	.16533	.16764	5.9651	.98624	29
32	.14838	.15005	6.6646	.98893	28	32	.16562	.16794	5.9545	.98619	28
33	.14867	.15034	6.6514	.98889	27	33	.16591	.16824	5.9439	.98614	27
34	.14896	.15064	6.6383	.98884	26	34	.16620	.16854	5.9333	.98609	26
35	.14925	.15094	6.6252	.98880	25	35	.16648	.16884	5.9228	.98604	25
36	.14954	.15124	6.6122	.98876	24	36	.16677	.16914	5.9124	.98600	24
37	.14982	.15153	6.5992	.98871	23	37	.16706	.16944	5.9019	.98595	23
38	.15011	.15183	6.5863	.98867	22	38	.16734	.16974	5.8915	.98590	22
39	.15040	.15213	6.5734	.98863	21	39	.16763	.17004	5.8811	.98585	21
40	.15069	.15243	6.5606	.98858	20	40	.16792	.17033	5.8708	.98580	20
41	.15097	.15272	6.5478	.98854	19	41	.16820	.17063	5.8605	.98575	19
42	.15126	.15302	6.5350	.98849	18	42	.16849	.17093	5.8502	.98570	18
43	.15155	.15332	6.5223	.98845	17	43	.16878	.17123	5.8400	.98565	17
44	.15184	.15362	6.5097	.98841	16	44	.16906	.17153	5.8298	.98561	16
45	.15212	.15391	6.4971	.98836	15	45	.16935	.17183	5.8197	.98556	15
46	.15241	.15421	6.4846	.98832	14	46	.16964	.17213	5.8095	.98551	14
47	.15270	.15451	6.4721	.98827	13	47	.16992	.17243	5.7994	.98546	13
48	.15299	.15481	6.4596	.98823	12	48	.17021	.17273	5.7894	.98541	12
49	.15327	.15511	6.4472	.98818	11	49	.17050	.17303	5.7794	.98536	11
50	.15356	.15540	6.4348	.98814	10	50	.17078	.17333	5.7694	.98531	10
51	.15385	.15570	6.4225	.98809	9	51	.17107	.17363	5.7594	.98526	9
52	.15414	.15600	6.4103	.98805	8	52	.17136	.17393	5.7495	.98521	8
53	.15442	.15630	6.3980	.98800	7	53	.17164	.17423	5.7396	.98516	7
54	.15471	.15660	6.3859	.98796	6	54	.17193	.17453	5.7297	.98511	6
55	.15500	.15689	6.3737	.98791	5	55	.17222	.17483	5.7199	.98506	5
56	.15529	.15719	6.3617	.98787	4	56	.17250	.17513	5.7101	.98501	4
57	.15557	.15749	6.3496	.98782	3	57	.17279	.17543	5.7004	.98496	3
58	.15586	.15779	6.3376	.98778	2	58	.17308	.17573	5.6906	.98491	2
59	.15615	.15809	6.3257	.98773	1	59	.17336	.17603	5.6809	.98486	1
60	.15643	.15838	6.3138	.98769	0	60	.17365	.17633	5.6713	.98481	0
'	Cos	Cot	Tan	Sin	'	'	Cos	Cot	Tan	Sin	'

81°

80°

# NATURAL TANGENTS, CO-TANGENTS, SINES AND CO-SINES

10°					11°					
'	Sin	Tan	Cot	Cos	'	Sin	Tan	Cot	Cos	'
0	.17365	.17633	5.6713	.98481	60	.19081	.19438	5.1446	.98163	60
1	.17393	.17663	5.6617	.98476	59	.19109	.19468	5.1366	.98157	59
2	.17422	.17693	5.6521	.98471	58	.19138	.19498	5.1286	.98152	58
3	.17451	.17723	5.6425	.98466	57	.19167	.19529	5.1207	.98146	57
4	.17479	.17753	5.6329	.98461	56	.19195	.19559	5.1128	.98140	56
5	.17508	.17783	5.6234	.98455	55	.19224	.19589	5.1049	.98135	55
6	.17537	.17813	5.6140	.98450	54	.19252	.19619	5.0970	.98129	54
7	.17565	.17843	5.6045	.98445	53	.19281	.19649	5.0892	.98124	53
8	.17594	.17873	5.5951	.98440	52	.19309	.19680	5.0814	.98118	52
9	.17623	.17903	5.5857	.98435	51	.19338	.19710	5.0736	.98112	51
10	.17651	.17933	5.5764	.98430	50	.19366	.19740	5.0658	.98107	50
11	.17680	.17963	5.5671	.98425	49	.19395	.19770	5.0581	.98101	49
12	.17708	.17993	5.5578	.98420	48	.19423	.19801	5.0504	.98096	48
13	.17737	.18023	5.5485	.98414	47	.19452	.19831	5.0427	.98090	47
14	.17766	.18053	5.5393	.98409	46	.19481	.19861	5.0350	.98084	46
15	.17794	.18083	5.5301	.98404	45	.19509	.19891	5.0273	.98079	45
16	.17823	.18113	5.5209	.98399	44	.19538	.19921	5.0197	.98073	44
17	.17852	.18143	5.5118	.98394	43	.19566	.19952	5.0121	.98067	43
18	.17880	.18173	5.5026	.98389	42	.19595	.19982	5.0045	.98061	42
19	.17909	.18203	5.4936	.98383	41	.19623	.20012	4.9969	.98056	41
20	.17937	.18233	5.4845	.98378	40	.19652	.20042	4.9894	.98050	40
21	.17966	.18263	5.4755	.98373	39	.19680	.20073	4.9819	.98044	39
22	.17995	.18293	5.4665	.98368	38	.19709	.20103	4.9744	.98039	38
23	.18023	.18323	5.4575	.98362	37	.19737	.20133	4.9669	.98033	37
24	.18052	.18353	5.4486	.98357	36	.19766	.20164	4.9594	.98027	36
25	.18081	.18384	5.4397	.98352	35	.19794	.20194	4.9520	.98021	35
26	.18109	.18414	5.4308	.98347	34	.19823	.20224	4.9446	.98016	34
27	.18138	.18444	5.4219	.98341	33	.19851	.20254	4.9372	.98010	33
28	.18166	.18474	5.4131	.98336	32	.19880	.20285	4.9298	.98004	32
29	.18195	.18504	5.4043	.98331	31	.19908	.20315	4.9225	.97998	31
30	.18224	.18534	5.3955	.98325	30	.19937	.20345	4.9152	.97992	30
31	.18252	.18564	5.3868	.98320	29	.19965	.20376	4.9078	.97987	29
32	.18281	.18594	5.3781	.98315	28	.19994	.20406	4.9006	.97981	28
33	.18309	.18624	5.3694	.98310	27	.20022	.20436	4.8933	.97975	27
34	.18338	.18654	5.3607	.98304	26	.20051	.20466	4.8860	.97969	26
35	.18367	.18684	5.3521	.98299	25	.20079	.20497	4.8788	.97963	25
36	.18395	.18714	5.3435	.98294	24	.20108	.20527	4.8716	.97958	24
37	.18424	.18745	5.3349	.98288	23	.20136	.20557	4.8644	.97952	23
38	.18452	.18775	5.3263	.98283	22	.20165	.20588	4.8573	.97946	22
39	.18481	.18805	5.3178	.98277	21	.20193	.20618	4.8501	.97940	21
40	.18509	.18835	5.3093	.98272	20	.20222	.20648	4.8430	.97934	20
41	.18538	.18865	5.3008	.98267	19	.20250	.20679	4.8359	.97928	19
42	.18567	.18895	5.2924	.98261	18	.20279	.20709	4.8288	.97922	18
43	.18595	.18925	5.2839	.98256	17	.20307	.20739	4.8218	.97916	17
44	.18624	.18955	5.2755	.98250	16	.20336	.20770	4.8147	.97910	16
45	.18652	.18986	5.2672	.98245	15	.20364	.20800	4.8077	.97905	15
46	.18681	.19016	5.2588	.98240	14	.20393	.20830	4.8007	.97899	14
47	.18710	.19046	5.2505	.98234	13	.20421	.20861	4.7937	.97893	13
48	.18738	.19076	5.2422	.98229	12	.20450	.20891	4.7867	.97887	12
49	.18767	.19106	5.2339	.98223	11	.20478	.20921	4.7798	.97881	11
50	.18795	.19136	5.2257	.98218	10	.20507	.20952	4.7729	.97875	10
51	.18824	.19166	5.2174	.98212	9	.20535	.20982	4.7659	.97869	9
52	.18852	.19197	5.2092	.98207	8	.20563	.21013	4.7591	.97863	8
53	.18881	.19227	5.2011	.98201	7	.20592	.21043	4.7522	.97857	7
54	.18910	.19257	5.1929	.98196	6	.20620	.21073	4.7453	.97851	6
55	.18938	.19287	5.1848	.98190	5	.20649	.21104	4.7385	.97845	5
56	.18967	.19317	5.1767	.98185	4	.20677	.21134	4.7317	.97839	4
57	.18995	.19347	5.1686	.98179	3	.20706	.21164	4.7249	.97833	3
58	.19024	.19378	5.1606	.98174	2	.20734	.21195	4.7181	.97827	2
59	.19052	.19408	5.1526	.98168	1	.20763	.21225	4.7114	.97821	1
60	.19081	.19438	5.1446	.98163	0	.20791	.21256	4.7046	.97815	0
'	Cos	Cot	Tan	Sin	'	Cos	Cot	Tan	Sin	'

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# NATURAL TANGENTS, CO-TANGENTS, SINES AND CO-SINES

12°				13°							
'	Sin	Tan	Cot	Cos	'	Sin	Tan	Cot	Cos	'	
0	.20791	.21256	4.7046	.97815	60	0	.22495	.23087	4.3315	.97437	60
1	.20820	.21286	4.6979	.97809	59	1	.22523	.23117	4.3257	.97430	59
2	.20848	.21316	4.6912	.97803	58	2	.22552	.23148	4.3200	.97424	58
3	.20877	.21347	4.6845	.97797	57	3	.22580	.23179	4.3143	.97417	57
4	.20905	.21377	4.6779	.97791	56	4	.22608	.23209	4.3086	.97411	56
5	.20933	.21408	4.6712	.97784	55	5	.22637	.23240	4.3029	.97404	55
6	.20962	.21438	4.6646	.97778	54	6	.22665	.23271	4.2972	.97398	54
7	.20990	.21469	4.6580	.97772	53	7	.22693	.23301	4.2916	.97391	53
8	.21019	.21499	4.6514	.97766	52	8	.22722	.23332	4.2859	.97384	52
9	.21047	.21529	4.6448	.97760	51	9	.22750	.23363	4.2803	.97378	51
10	.21076	.21560	4.6382	.97754	50	10	.22778	.23393	4.2747	.97371	50
11	.21104	.21590	4.6317	.97748	49	11	.22807	.23424	4.2691	.97365	49
12	.21132	.21621	4.6252	.97742	48	12	.22835	.23455	4.2635	.97358	48
13	.21161	.21651	4.6187	.97735	47	13	.22863	.23485	4.2580	.97351	47
14	.21189	.21682	4.6122	.97729	46	14	.22892	.23516	4.2524	.97345	46
15	.21218	.21712	4.6057	.97723	45	15	.22920	.23547	4.2468	.97338	45
16	.21246	.21743	4.5993	.97717	44	16	.22948	.23578	4.2413	.97331	44
17	.21275	.21773	4.5929	.97711	43	17	.22977	.23608	4.2358	.97325	43
18	.21303	.21804	4.5864	.97705	42	18	.23005	.23639	4.2303	.97318	42
19	.21331	.21834	4.5800	.97698	41	19	.23033	.23670	4.2248	.97311	41
20	.21360	.21864	4.5736	.97692	40	20	.23062	.23700	4.2193	.97304	40
21	.21388	.21895	4.5673	.97686	39	21	.23090	.23731	4.2139	.97298	39
22	.21417	.21925	4.5609	.97680	38	22	.23118	.23762	4.2084	.97291	38
23	.21445	.21956	4.5546	.97673	37	23	.23146	.23793	4.2030	.97284	37
24	.21474	.21986	4.5483	.97667	36	24	.23175	.23823	4.1976	.97278	36
25	.21502	.22017	4.5420	.97661	35	25	.23203	.23854	4.1922	.97271	35
26	.21530	.22047	4.5357	.97655	34	26	.23231	.23885	4.1868	.97264	34
27	.21559	.22078	4.5294	.97648	33	27	.23259	.23916	4.1814	.97257	33
28	.21587	.22108	4.5232	.97642	32	28	.23288	.23946	4.1760	.97251	32
29	.21616	.22139	4.5169	.97636	31	29	.23316	.23977	4.1706	.97244	31
30	.21644	.22169	4.5107	.97630	30	30	.23345	.24008	4.1653	.97237	30
31	.21672	.22200	4.5045	.97623	29	31	.23373	.24039	4.1600	.97230	29
32	.21701	.22231	4.4983	.97617	28	32	.23401	.24069	4.1547	.97223	28
33	.21729	.22261	4.4922	.97611	27	33	.23429	.24100	4.1493	.97217	27
34	.21758	.22292	4.4860	.97604	26	34	.23458	.24131	4.1441	.97210	26
35	.21786	.22322	4.4799	.97598	25	35	.23486	.24162	4.1388	.97203	25
36	.21814	.22353	4.4737	.97592	24	36	.23514	.24193	4.1335	.97196	24
37	.21843	.22383	4.4676	.97585	23	37	.23542	.24223	4.1282	.97189	23
38	.21871	.22414	4.4615	.97579	22	38	.23571	.24254	4.1230	.97182	22
39	.21899	.22444	4.4555	.97573	21	39	.23599	.24285	4.1178	.97176	21
40	.21928	.22475	4.4494	.97566	20	40	.23627	.24316	4.1126	.97169	20
41	.21956	.22505	4.4434	.97560	19	41	.23656	.24347	4.1074	.97162	19
42	.21985	.22536	4.4373	.97553	18	42	.23684	.24377	4.1022	.97155	18
43	.22013	.22567	4.4313	.97547	17	43	.23712	.24408	4.0970	.97148	17
44	.22041	.22597	4.4253	.97541	16	44	.23740	.24439	4.0918	.97141	16
45	.22070	.22628	4.4191	.97534	15	45	.23769	.24470	4.0867	.97134	15
46	.22098	.22658	4.4131	.97528	14	46	.23797	.24501	4.0815	.97127	14
47	.22126	.22689	4.4075	.97521	13	47	.23825	.24532	4.0764	.97120	13
48	.22155	.22719	4.4015	.97515	12	48	.23853	.24562	4.0713	.97113	12
49	.22183	.22750	4.3956	.97508	11	49	.23882	.24593	4.0662	.97106	11
50	.22212	.22781	4.3897	.97502	10	50	.23910	.24624	4.0611	.97100	10
51	.22240	.22811	4.3838	.97496	9	51	.23938	.24655	4.0560	.97093	9
52	.22268	.22842	4.3779	.97489	8	52	.23966	.24686	4.0509	.97086	8
53	.22297	.22872	4.3721	.97483	7	53	.23995	.24717	4.0459	.97079	7
54	.22325	.22903	4.3662	.97476	6	54	.24023	.24747	4.0408	.97072	6
55	.22353	.22934	4.3604	.97470	5	55	.24051	.24778	4.0358	.97065	5
56	.22382	.22964	4.3546	.97463	4	56	.24079	.24809	4.0308	.97058	4
57	.22410	.22995	4.3488	.97457	3	57	.24108	.24840	4.0257	.97051	3
58	.22438	.23026	4.3430	.97450	2	58	.24136	.24871	4.0207	.97044	2
59	.22467	.23056	4.3372	.97444	1	59	.24164	.24902	4.0156	.97037	1
60	.22495	.23087	4.3315	.97437	0	60	.24192	.24933	4.0106	.97030	0
	Cos	Cot	Tan	Sin			Cos	Cot	Tan	Sin	

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# NATURAL TANGENTS, CO-TANGENTS, SINES AND CO-SINES

14°					15°					
/	Sin	Tan	Cot	Cos	/	Sin	Tan	Cot	Cos	/
0	.24192	.24933	4.0108	.97030	0	.25882	.26795	3.7321	.96593	60
1	.24220	.24964	4.0058	.97023	59	.25910	.26826	3.7277	.96585	59
2	.24249	.24995	4.0009	.97015	58	.25938	.26857	3.7234	.96578	58
3	.24277	.25026	3.9959	.97008	57	.25966	.26888	3.7191	.96570	57
4	.24305	.25056	3.9910	.97001	56	.25994	.26920	3.7148	.96562	56
5	.24333	.25087	3.9861	.96994	55	.26022	.26951	3.7105	.96555	55
6	.24362	.25118	3.9812	.96987	54	.26050	.26982	3.7062	.96547	54
7	.24390	.25149	3.9763	.96980	53	.26079	.27013	3.7019	.96540	53
8	.24418	.25180	3.9714	.96973	52	.26107	.27044	3.6976	.96532	52
9	.24446	.25211	3.9665	.96966	51	.26135	.27075	3.6933	.96524	51
10	.24474	.25242	3.9617	.96959	50	.26163	.27107	3.6891	.96517	50
11	.24503	.25273	3.9568	.96952	49	.26191	.27138	3.6848	.96509	49
12	.24531	.25304	3.9520	.96945	48	.26219	.27169	3.6806	.96502	48
13	.24559	.25335	3.9471	.96937	47	.26247	.27201	3.6764	.96494	47
14	.24587	.25366	3.9423	.96930	46	.26275	.27232	3.6722	.96486	46
15	.24615	.25397	3.9375	.96923	45	.26303	.27263	3.6680	.96479	45
16	.24644	.25428	3.9327	.96916	44	.26331	.27294	3.6638	.96471	44
17	.24672	.25459	3.9279	.96909	43	.26359	.27326	3.6596	.96463	43
18	.24700	.25490	3.9232	.96902	42	.26387	.27357	3.6554	.96456	42
19	.24728	.25521	3.9184	.96894	41	.26415	.27388	3.6512	.96448	41
20	.24756	.25552	3.9136	.96887	40	.26443	.27419	3.6470	.96440	40
21	.24784	.25583	3.9089	.96880	39	.26471	.27451	3.6428	.96433	39
22	.24813	.25614	3.9042	.96873	38	.26500	.27482	3.6387	.96425	38
23	.24841	.25645	3.8995	.96866	37	.26528	.27513	3.6346	.96417	37
24	.24869	.25676	3.8947	.96858	36	.26556	.27545	3.6305	.96410	36
25	.24897	.25707	3.8900	.96851	35	.26584	.27576	3.6264	.96402	35
26	.24925	.25738	3.8854	.96844	34	.26612	.27607	3.6222	.96394	34
27	.24954	.25769	3.8807	.96837	33	.26640	.27638	3.6181	.96386	33
28	.24982	.25800	3.8760	.96829	32	.26668	.27670	3.6140	.96379	32
29	.25010	.25831	3.8714	.96822	31	.26696	.27701	3.6100	.96371	31
30	.25038	.25862	3.8667	.96815	30	.26724	.27732	3.6059	.96363	30
31	.25066	.25893	3.8621	.96807	29	.26752	.27764	3.6018	.96355	29
32	.25094	.25924	3.8575	.96800	28	.26780	.27795	3.5978	.96347	28
33	.25122	.25955	3.8528	.96793	27	.26808	.27826	3.5937	.96340	27
34	.25151	.25986	3.8482	.96786	26	.26836	.27858	3.5897	.96332	26
35	.25179	.26017	3.8436	.96778	25	.26864	.27889	3.5856	.96324	25
36	.25207	.26048	3.8391	.96771	24	.26892	.27921	3.5816	.96316	24
37	.25235	.26079	3.8345	.96764	23	.26920	.27952	3.5776	.96308	23
38	.25263	.26110	3.8299	.96756	22	.26948	.27983	3.5736	.96301	22
39	.25291	.26141	3.8254	.96749	21	.26976	.28015	3.5696	.96293	21
40	.25320	.26172	3.8208	.96742	20	.27004	.28046	3.5656	.96285	20
41	.25348	.26203	3.8163	.96734	19	.27032	.28077	3.5616	.96277	19
42	.25376	.26235	3.8118	.96727	18	.27060	.28109	3.5576	.96269	18
43	.25404	.26266	3.8073	.96719	17	.27088	.28140	3.5536	.96261	17
44	.25432	.26297	3.8028	.96712	16	.27116	.28172	3.5497	.96253	16
45	.25460	.26328	3.7983	.96705	15	.27144	.28203	3.5457	.96246	15
46	.25488	.26359	3.7938	.96697	14	.27172	.28234	3.5418	.96238	14
47	.25516	.26390	3.7893	.96690	13	.27200	.28266	3.5379	.96230	13
48	.25545	.26421	3.7848	.96682	12	.27228	.28297	3.5339	.96222	12
49	.25573	.26452	3.7804	.96675	11	.27256	.28329	3.5300	.96214	11
50	.25601	.26483	3.7760	.96667	10	.27284	.28360	3.5261	.96206	10
51	.25629	.26515	3.7715	.96660	9	.27312	.28391	3.5222	.96198	9
52	.25657	.26546	3.7671	.96653	8	.27340	.28423	3.5183	.96190	8
53	.25685	.26577	3.7627	.96645	7	.27368	.28454	3.5144	.96182	7
54	.25713	.26608	3.7583	.96638	6	.27396	.28486	3.5105	.96174	6
55	.25741	.26639	3.7539	.96630	5	.27424	.28517	3.5067	.96166	5
56	.25769	.26670	3.7495	.96623	4	.27452	.28549	3.5028	.96158	4
57	.25797	.26701	3.7451	.96615	3	.27480	.28580	3.4989	.96150	3
58	.25826	.26733	3.7408	.96608	2	.27508	.28612	3.4951	.96142	2
59	.25854	.26764	3.7364	.96600	1	.27536	.28643	3.4912	.96134	1
60	.25882	.26795	3.7321	.96593	0	.27564	.28675	3.4874	.96126	0
/	Cos	Cot	Tan	Sin	/	Cos	Cot	Tan	Sin	/

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# NATURAL TANGENTS, CO-TANGENTS, SINES AND CO-SINES

16°					17°					
'	Sin	Tan	Cot	Cos	'	Sin	Tan	Cot	Cos	'
0	.27564	.28675	3.4874	.96126	60	.29237	.30573	3.2709	.95630	60
1	.27592	.28706	3.4836	.96118	59	.29265	.30605	3.2675	.95622	59
2	.27620	.28738	3.4798	.96110	58	.29293	.30637	3.2641	.95613	58
3	.27648	.28769	3.4760	.96102	57	.29321	.30669	3.2607	.95605	57
4	.27676	.28801	3.4722	.96094	56	.29348	.30700	3.2573	.95596	56
5	.27704	.28832	3.4684	.96086	55	.29376	.30732	3.2539	.95588	55
6	.27731	.28864	3.4646	.96078	54	.29404	.30764	3.2506	.95579	54
7	.27759	.28895	3.4608	.96070	53	.29432	.30796	3.2472	.95571	53
8	.27787	.28927	3.4570	.96062	52	.29460	.30828	3.2438	.95562	52
9	.27815	.28958	3.4533	.96054	51	.29487	.30860	3.2405	.95554	51
10	.27843	.28990	3.4495	.96046	50	.29515	.30891	3.2371	.95545	50
11	.27871	.29021	3.4458	.96037	49	.29543	.30923	3.2338	.95536	49
12	.27899	.29053	3.4420	.96029	48	.29571	.30955	3.2305	.95528	48
13	.27927	.29084	3.4383	.96021	47	.29599	.30987	3.2272	.95519	47
14	.27955	.29116	3.4346	.96013	46	.29626	.31019	3.2238	.95511	46
15	.27983	.29147	3.4308	.96005	45	.29654	.31051	3.2205	.95502	45
16	.28011	.29179	3.4271	.95997	44	.29682	.31083	3.2172	.95493	44
17	.28039	.29210	3.4234	.95989	43	.29710	.31115	3.2139	.95485	43
18	.28067	.29242	3.4197	.95981	42	.29737	.31147	3.2106	.95476	42
19	.28095	.29274	3.4160	.95972	41	.29765	.31178	3.2073	.95467	41
20	.28123	.29305	3.4124	.95964	40	.29793	.31210	3.2041	.95459	40
21	.28150	.29337	3.4087	.95956	39	.29821	.31242	3.2008	.95450	39
22	.28178	.29368	3.4050	.95948	38	.29849	.31274	3.1975	.95441	38
23	.28206	.29400	3.4014	.95940	37	.29876	.31306	3.1943	.95433	37
24	.28234	.29432	3.3977	.95931	36	.29904	.31338	3.1910	.95424	36
25	.28262	.29463	3.3941	.95923	35	.29932	.31370	3.1878	.95415	35
26	.28290	.29495	3.3904	.95915	34	.29960	.31402	3.1845	.95407	34
27	.28318	.29526	3.3868	.95907	33	.29987	.31434	3.1813	.95398	33
28	.28346	.29558	3.3832	.95898	32	.30015	.31466	3.1780	.95389	32
29	.28374	.29590	3.3796	.95890	31	.30043	.31498	3.1748	.95380	31
30	.28402	.29621	3.3759	.95882	30	.30071	.31530	3.1716	.95372	30
31	.28429	.29653	3.3723	.95874	29	.30098	.31562	3.1684	.95363	29
32	.28457	.29685	3.3687	.95865	28	.30126	.31594	3.1652	.95354	28
33	.28485	.29716	3.3652	.95857	27	.30154	.31626	3.1620	.95345	27
34	.28513	.29748	3.3616	.95849	26	.30182	.31658	3.1588	.95337	26
35	.28541	.29780	3.3580	.95841	25	.30209	.31690	3.1556	.95328	25
36	.28569	.29811	3.3544	.95832	24	.30237	.31722	3.1524	.95319	24
37	.28597	.29843	3.3509	.95824	23	.30265	.31754	3.1492	.95310	23
38	.28625	.29875	3.3473	.95816	22	.30292	.31786	3.1460	.95301	22
39	.28652	.29906	3.3438	.95807	21	.30320	.31818	3.1429	.95292	21
40	.28680	.29938	3.3402	.95799	20	.30348	.31850	3.1397	.95284	20
41	.28708	.29970	3.3367	.95791	19	.30376	.31882	3.1366	.95275	19
42	.28736	.30001	3.3332	.95782	18	.30403	.31914	3.1334	.95266	18
43	.28764	.30033	3.3297	.95774	17	.30431	.31946	3.1303	.95257	17
44	.28792	.30065	3.3261	.95766	16	.30459	.31978	3.1271	.95248	16
45	.28820	.30097	3.3226	.95757	15	.30486	.32010	3.1240	.95240	15
46	.28847	.30128	3.3191	.95749	14	.30514	.32042	3.1209	.95231	14
47	.28875	.30160	3.3156	.95740	13	.30542	.32074	3.1178	.95222	13
48	.28903	.30192	3.3122	.95732	12	.30570	.32106	3.1146	.95213	12
49	.28930	.30224	3.3087	.95724	11	.30597	.32139	3.1115	.95204	11
50	.28959	.30255	3.3052	.95715	10	.30625	.32171	3.1084	.95195	10
51	.28987	.30287	3.3017	.95707	9	.30653	.32203	3.1053	.95186	9
52	.29015	.30319	3.2983	.95698	8	.30680	.32235	3.1022	.95177	8
53	.29042	.30351	3.2948	.95690	7	.30708	.32267	3.0991	.95168	7
54	.29070	.30382	3.2914	.95681	6	.30736	.32299	3.0961	.95159	6
55	.29098	.30414	3.2879	.95673	5	.30763	.32331	3.0930	.95150	5
56	.29126	.30446	3.2845	.95664	4	.30791	.32363	3.0899	.95142	4
57	.29154	.30478	3.2811	.95655	3	.30819	.32396	3.0868	.95133	3
58	.29182	.30509	3.2777	.95647	2	.30846	.32428	3.0838	.95124	2
59	.29209	.30541	3.2743	.95639	1	.30874	.32460	3.0807	.95115	1
60	.29237	.30573	3.2709	.95630	0	.30902	.32492	3.0777	.95106	0
'	Cos	Cot	Tan	Sin	'	Cos	Cot	Tan	Sin	'

73°

72°

# NATURAL TANGENTS, CO-TANGENTS, SINES AND CO-SINES

18°				19°							
°	Sin	Tan	Cot	Cos	°	Sin	Tan	Cot	Cos	°	
0	.30902	.32492	3.0777	.95106	60	0	.32557	.34433	2.9042	.94552	60
1	.30929	.32524	3.0746	.95097	59	1	.32584	.34465	2.9015	.94542	59
2	.30957	.32556	3.0716	.95088	58	2	.32612	.34498	2.8987	.94533	58
3	.30985	.32588	3.0686	.95079	57	3	.32639	.34530	2.8960	.94523	57
4	.31012	.32621	3.0655	.95070	56	4	.32667	.34563	2.8933	.94514	56
5	.31040	.32653	3.0625	.95061	55	5	.32694	.34596	2.8905	.94504	55
6	.31068	.32685	3.0595	.95052	54	6	.32722	.34628	2.8878	.94495	54
7	.31095	.32717	3.0565	.95043	53	7	.32749	.34661	2.8851	.94485	53
8	.31123	.32749	3.0535	.95033	52	8	.32777	.34693	2.8824	.94476	52
9	.31151	.32782	3.0505	.95024	51	9	.32804	.34726	2.8797	.94466	51
10	.31178	.32814	3.0475	.95015	50	10	.32832	.34758	2.8770	.94457	50
11	.31206	.32846	3.0445	.95006	49	11	.32859	.34791	2.8743	.94447	49
12	.31233	.32878	3.0415	.94997	48	12	.32887	.34824	2.8716	.94438	48
13	.31261	.32911	3.0385	.94988	47	13	.32914	.34856	2.8689	.94428	47
14	.31289	.32943	3.0356	.94979	46	14	.32942	.34889	2.8662	.94418	46
15	.31316	.32975	3.0326	.94970	45	15	.32969	.34922	2.8636	.94409	45
16	.31344	.33007	3.0296	.94961	44	16	.32997	.34954	2.8609	.94399	44
17	.31372	.33040	3.0267	.94952	43	17	.33024	.34987	2.8582	.94390	43
18	.31399	.33072	3.0237	.94943	42	18	.33051	.35020	2.8556	.94380	42
19	.31427	.33104	3.0208	.94933	41	19	.33079	.35052	2.8529	.94370	41
20	.31454	.33136	3.0178	.94924	40	20	.33106	.35085	2.8502	.94361	40
21	.31482	.33169	3.0149	.94915	39	21	.33134	.35118	2.8476	.94351	39
22	.31510	.33201	3.0120	.94906	38	22	.33161	.35150	2.8449	.94342	38
23	.31537	.33233	3.0090	.94897	37	23	.33189	.35183	2.8423	.94332	37
24	.31565	.33266	3.0061	.94888	36	24	.33216	.35216	2.8397	.94322	36
25	.31593	.33298	3.0032	.94878	35	25	.33244	.35248	2.8370	.94313	35
26	.31620	.33330	3.0003	.94869	34	26	.33271	.35281	2.8344	.94303	34
27	.31648	.33363	2.9974	.94860	33	27	.33298	.35314	2.8318	.94293	33
28	.31675	.33395	2.9945	.94851	32	28	.33326	.35346	2.8291	.94284	32
29	.31703	.33427	2.9916	.94842	31	29	.33353	.35379	2.8265	.94274	31
30	.31730	.33460	2.9887	.94833	30	30	.33381	.35412	2.8239	.94264	30
31	.31758	.33492	2.9858	.94823	29	31	.33408	.35445	2.8213	.94254	29
32	.31786	.33524	2.9829	.94814	28	32	.33436	.35477	2.8187	.94245	28
33	.31813	.33557	2.9800	.94805	27	33	.33463	.35510	2.8161	.94235	27
34	.31841	.33589	2.9772	.94795	26	34	.33490	.35543	2.8135	.94226	26
35	.31868	.33621	2.9743	.94786	25	35	.33518	.35576	2.8109	.94215	25
36	.31896	.33654	2.9714	.94777	24	36	.33545	.35608	2.8083	.94206	24
37	.31923	.33686	2.9686	.94768	23	37	.33573	.35641	2.8057	.94196	23
38	.31951	.33718	2.9657	.94758	22	38	.33600	.35674	2.8032	.94186	22
39	.31979	.33751	2.9629	.94749	21	39	.33627	.35707	2.8006	.94176	21
40	.32006	.33783	2.9600	.94740	20	40	.33655	.35740	2.7980	.94167	20
41	.32034	.33816	2.9572	.94730	19	41	.33682	.35772	2.7955	.94157	19
42	.32061	.33848	2.9544	.94721	18	42	.33710	.35805	2.7929	.94147	18
43	.32089	.33881	2.9515	.94712	17	43	.33737	.35838	2.7903	.94137	17
44	.32116	.33913	2.9487	.94702	16	44	.33764	.35871	2.7878	.94127	16
45	.32144	.33945	2.9459	.94693	15	45	.33792	.35904	2.7852	.94118	15
46	.32171	.33978	2.9431	.94684	14	46	.33819	.35937	2.7827	.94108	14
47	.32199	.34010	2.9403	.94674	13	47	.33846	.35969	2.7801	.94098	13
48	.32227	.34043	2.9375	.94665	12	48	.33874	.36002	2.7776	.94088	12
49	.32254	.34075	2.9347	.94656	11	49	.33901	.36035	2.7751	.94078	11
50	.32282	.34108	2.9319	.94646	10	50	.33929	.36068	2.7725	.94068	10
51	.32309	.34140	2.9291	.94637	9	51	.33956	.36101	2.7700	.94058	9
52	.32337	.34173	2.9263	.94627	8	52	.33983	.36134	2.7675	.94049	8
53	.32364	.34205	2.9235	.94618	7	53	.34011	.36167	2.7650	.94039	7
54	.32392	.34238	2.9208	.94609	6	54	.34038	.36199	2.7625	.94029	6
55	.32419	.34270	2.9180	.94599	5	55	.34065	.36232	2.7600	.94019	5
56	.32447	.34303	2.9152	.94590	4	56	.34093	.36265	2.7575	.94009	4
57	.32474	.34335	2.9125	.94580	3	57	.34120	.36298	2.7550	.93999	3
58	.32502	.34368	2.9097	.94571	2	58	.34147	.36331	2.7525	.93989	2
59	.32529	.34400	2.9070	.94561	1	59	.34175	.36364	2.7500	.93979	1
60	.32557	.34433	2.9042	.94552	0	60	.34202	.36397	2.7475	.93969	0
°	Cos	Cot	Tan	Sin	°	Cos	Cot	Tan	Sin	°	

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70°

# NATURAL TANGENTS, CO-TANGENTS, SINES AND CO-SINES

20°					21°						
'	Sin	Tan	Cot	Cos	'	Sin	Tan	Cot	Cos	'	
0	.34202	.36397	2.7475	.93969	60	0	.35837	.38386	2.6051	.93358	60
1	.34229	.36430	2.7450	.93959	59	1	.35864	.38420	2.6028	.93348	59
2	.34257	.36463	2.7425	.93949	58	2	.35891	.38453	2.6006	.93337	58
3	.34284	.36496	2.7400	.93939	57	3	.35918	.38487	2.5983	.93327	57
4	.34311	.36529	2.7376	.93929	56	4	.35945	.38520	2.5961	.93316	56
5	.34339	.36562	2.7351	.93919	55	5	.35973	.38553	2.5938	.93306	55
6	.34366	.36595	2.7326	.93909	54	6	.36000	.38587	2.5916	.93295	54
7	.34393	.36628	2.7302	.93899	53	7	.36027	.38620	2.5893	.93285	53
8	.34421	.36661	2.7277	.93889	52	8	.36054	.38654	2.5871	.93274	52
9	.34448	.36694	2.7253	.93879	51	9	.36081	.38687	2.5848	.93264	51
10	.34475	.36727	2.7228	.93869	50	10	.36108	.38721	2.5826	.93253	50
11	.34503	.36760	2.7204	.93859	49	11	.36135	.38754	2.5804	.93243	49
12	.34530	.36793	2.7179	.93849	48	12	.36162	.38787	2.5782	.93232	48
13	.34557	.36826	2.7155	.93839	47	13	.36190	.38821	2.5760	.93222	47
14	.34584	.36859	2.7130	.93829	46	14	.36217	.38854	2.5737	.93211	46
15	.34612	.36892	2.7106	.93819	45	15	.36244	.38888	2.5715	.93201	45
16	.34639	.36925	2.7082	.93809	44	16	.36271	.38921	2.5693	.93190	44
17	.34666	.36958	2.7058	.93799	43	17	.36298	.38955	2.5671	.93180	43
18	.34694	.36991	2.7034	.93789	42	18	.36325	.38988	2.5649	.93169	42
19	.34721	.37024	2.7009	.93779	41	19	.36352	.39022	2.5627	.93159	41
20	.34748	.37057	2.6985	.93769	40	20	.36379	.39055	2.5605	.93148	40
21	.34775	.37090	2.6961	.93759	39	21	.36406	.39089	2.5583	.93137	39
22	.34803	.37123	2.6937	.93748	38	22	.36434	.39122	2.5561	.93127	38
23	.34830	.37157	2.6913	.93738	37	23	.36461	.39156	2.5539	.93116	37
24	.34857	.37190	2.6889	.93728	36	24	.36488	.39190	2.5517	.93106	36
25	.34884	.37223	2.6865	.93718	35	25	.36515	.39223	2.5495	.93095	35
26	.34912	.37256	2.6841	.93708	34	26	.36542	.39257	2.5473	.93084	34
27	.34939	.37289	2.6818	.93698	33	27	.36569	.39290	2.5452	.93074	33
28	.34966	.37322	2.6794	.93688	32	28	.36596	.39324	2.5430	.93063	32
29	.34993	.37355	2.6770	.93677	31	29	.36623	.39357	2.5408	.93053	31
30	.35021	.37388	2.6746	.93667	30	30	.36650	.39391	2.5386	.93042	30
31	.35048	.37422	2.6723	.93657	29	31	.36677	.39425	2.5365	.93031	29
32	.35075	.37455	2.6699	.93647	28	32	.36704	.39458	2.5343	.93020	28
33	.35102	.37488	2.6675	.93637	27	33	.36731	.39492	2.5322	.93010	27
34	.35130	.37521	2.6652	.93626	26	34	.36758	.39526	2.5300	.92999	26
35	.35157	.37554	2.6628	.93616	25	35	.36785	.39559	2.5279	.92988	25
36	.35184	.37588	2.6605	.93606	24	36	.36812	.39593	2.5257	.92978	24
37	.35211	.37621	2.6581	.93596	23	37	.36839	.39626	2.5236	.92967	23
38	.35239	.37654	2.6558	.93586	22	38	.36867	.39660	2.5214	.92956	22
39	.35266	.37687	2.6534	.93575	21	39	.36894	.39694	2.5193	.92945	21
40	.35293	.37720	2.6511	.93565	20	40	.36921	.39727	2.5172	.92935	20
41	.35320	.37754	2.6488	.93555	19	41	.36948	.39761	2.5150	.92924	19
42	.35347	.37787	2.6464	.93544	18	42	.36975	.39795	2.5129	.92913	18
43	.35375	.37820	2.6441	.93534	17	43	.37002	.39829	2.5108	.92902	17
44	.35402	.37853	2.6418	.93524	16	44	.37029	.39862	2.5086	.92892	16
45	.35429	.37887	2.6395	.93514	15	45	.37056	.39896	2.5065	.92881	15
46	.35456	.37920	2.6371	.93503	14	46	.37083	.39930	2.5044	.92870	14
47	.35484	.37953	2.6348	.93493	13	47	.37110	.39963	2.5023	.92859	13
48	.35511	.37986	2.6325	.93483	12	48	.37137	.39997	2.5002	.92849	12
49	.35538	.38020	2.6302	.93472	11	49	.37164	.40031	2.4981	.92838	11
50	.35565	.38053	2.6279	.93462	10	50	.37191	.40065	2.4960	.92827	10
51	.35592	.38086	2.6256	.93452	9	51	.37218	.40098	2.4939	.92816	9
52	.35619	.38120	2.6233	.93441	8	52	.37245	.40132	2.4918	.92805	8
53	.35647	.38153	2.6210	.93431	7	53	.37272	.40166	2.4897	.92794	7
54	.35674	.38186	2.6187	.93420	6	54	.37299	.40200	2.4876	.92784	6
55	.35701	.38220	2.6165	.93410	5	55	.37326	.40234	2.4855	.92773	5
56	.35728	.38253	2.6142	.93400	4	56	.37353	.40267	2.4834	.92762	4
57	.35755	.38286	2.6119	.93389	3	57	.37380	.40301	2.4813	.92751	3
58	.35782	.38320	2.6096	.93379	2	58	.37407	.40335	2.4792	.92740	2
59	.35810	.38353	2.6074	.93368	1	59	.37434	.40369	2.4772	.92729	1
60	.35837	.38386	2.6051	.93358	0	60	.37461	.40403	2.4751	.92718	0
'	Cos	Cot	Tan	Sin	'	'	Cos	Cot	Tan	Sin	'
69°					68°						

# NATURAL TANGENTS, CO-TANGENTS, SINES AND CO-SINES

22°					23°						
'	Sin	Tan	Cot	Cos	'	Sin	Tan	Cot	Cos	'	
0	.37451	.40403	2.4751	.92718	60	0	.39073	.42447	2.3559	.92050	60
1	.37488	.40436	2.4730	.92707	59	1	.39100	.42482	2.3539	.92039	59
2	.37515	.40470	2.4709	.92697	58	2	.39127	.42516	2.3520	.92028	58
3	.37542	.40504	2.4689	.92686	57	3	.39153	.42551	2.3501	.92016	57
4	.37569	.40538	2.4668	.92675	56	4	.39180	.42585	2.3483	.92005	56
5	.37595	.40572	2.4648	.92664	55	5	.39207	.42619	2.3464	.91994	55
6	.37622	.40606	2.4627	.92653	54	6	.39234	.42654	2.3445	.91982	54
7	.37649	.40640	2.4606	.92642	53	7	.39260	.42688	2.3426	.91971	53
8	.37676	.40674	2.4586	.92631	52	8	.39287	.42722	2.3407	.91959	52
9	.37703	.40707	2.4566	.92620	51	9	.39314	.42757	2.3388	.91948	51
10	.37730	.40741	2.4545	.92609	50	10	.39341	.42791	2.3369	.91936	50
11	.37757	.40775	2.4525	.92598	49	11	.39367	.42826	2.3351	.91925	49
12	.37784	.40809	2.4504	.92587	48	12	.39394	.42860	2.3332	.91914	48
13	.37811	.40843	2.4484	.92576	47	13	.39421	.42894	2.3313	.91902	47
14	.37838	.40877	2.4464	.92565	46	14	.39448	.42929	2.3294	.91891	46
15	.37865	.40911	2.4443	.92554	45	15	.39474	.42963	2.3276	.91879	45
16	.37892	.40945	2.4423	.92543	44	16	.39501	.42998	2.3257	.91868	44
17	.37919	.40979	2.4403	.92532	43	17	.39528	.43032	2.3238	.91856	43
18	.37946	.41013	2.4383	.92521	42	18	.39555	.43067	2.3220	.91845	42
19	.37973	.41047	2.4362	.92510	41	19	.39581	.43101	2.3201	.91833	41
20	.37999	.41081	2.4342	.92499	40	20	.39608	.43136	2.3183	.91822	40
21	.38026	.41115	2.4322	.92488	39	21	.39635	.43170	2.3164	.91810	39
22	.38053	.41149	2.4302	.92477	38	22	.39661	.43205	2.3146	.91799	38
23	.38080	.41183	2.4282	.92466	37	23	.39688	.43239	2.3127	.91787	37
24	.38107	.41217	2.4262	.92455	36	24	.39715	.43274	2.3109	.91775	36
25	.38134	.41251	2.4242	.92444	35	25	.39741	.43308	2.3090	.91764	35
26	.38161	.41285	2.4222	.92432	34	26	.39768	.43343	2.3072	.91752	34
27	.38188	.41319	2.4202	.92421	33	27	.39795	.43378	2.3053	.91741	33
28	.38215	.41353	2.4182	.92410	32	28	.39822	.43412	2.3035	.91729	32
29	.38241	.41387	2.4162	.92399	31	29	.39848	.43447	2.3017	.91718	31
30	.38268	.41421	2.4142	.92388	30	30	.39875	.43481	2.2998	.91706	30
31	.38295	.41455	2.4122	.92377	29	31	.39902	.43516	2.2980	.91694	29
32	.38322	.41490	2.4102	.92366	28	32	.39928	.43550	2.2962	.91683	28
33	.38349	.41524	2.4083	.92355	27	33	.39955	.43585	2.2944	.91671	27
34	.38376	.41558	2.4063	.92343	26	34	.39982	.43620	2.2925	.91660	26
35	.38403	.41592	2.4043	.92332	25	35	.40008	.43654	2.2907	.91648	25
36	.38430	.41626	2.4023	.92321	24	36	.40035	.43689	2.2889	.91636	24
37	.38456	.41660	2.4004	.92310	23	37	.40062	.43724	2.2871	.91625	23
38	.38483	.41694	2.3984	.92299	22	38	.40088	.43758	2.2853	.91613	22
39	.38510	.41728	2.3964	.92287	21	39	.40115	.43793	2.2835	.91601	21
40	.38537	.41763	2.3945	.92276	20	40	.40141	.43828	2.2817	.91590	20
41	.38564	.41797	2.3925	.92265	19	41	.40168	.43862	2.2799	.91578	19
42	.38591	.41831	2.3906	.92254	18	42	.40195	.43897	2.2781	.91566	18
43	.38617	.41865	2.3886	.92243	17	43	.40221	.43932	2.2763	.91555	17
44	.38644	.41899	2.3867	.92231	16	44	.40248	.43966	2.2745	.91543	16
45	.38671	.41933	2.3847	.92220	15	45	.40275	.44001	2.2727	.91531	15
46	.38698	.41968	2.3828	.92209	14	46	.40301	.44036	2.2709	.91519	14
47	.38725	.42002	2.3808	.92198	13	47	.40328	.44071	2.2691	.91508	13
48	.38752	.42036	2.3789	.92186	12	48	.40355	.44105	2.2673	.91496	12
49	.38778	.42070	2.3770	.92175	11	49	.40381	.44140	2.2655	.91484	11
50	.38805	.42105	2.3750	.92164	10	50	.40408	.44175	2.2637	.91472	10
51	.38832	.42139	2.3731	.92152	9	51	.40434	.44210	2.2620	.91461	9
52	.38859	.42173	2.3712	.92141	8	52	.40461	.44244	2.2602	.91449	8
53	.38886	.42207	2.3693	.92130	7	53	.40488	.44279	2.2584	.91437	7
54	.38912	.42242	2.3673	.92119	6	54	.40514	.44314	2.2566	.91425	6
55	.38939	.42276	2.3654	.92107	5	55	.40541	.44349	2.2549	.91414	5
56	.38966	.42310	2.3635	.92096	4	56	.40567	.44384	2.2531	.91402	4
57	.38993	.42345	2.3616	.92085	3	57	.40594	.44418	2.2513	.91390	3
58	.39020	.42379	2.3597	.92073	2	58	.40621	.44453	2.2496	.91378	2
59	.39046	.42413	2.3578	.92062	1	59	.40647	.44488	2.2478	.91366	1
60	.39073	.42447	2.3559	.92050	0	60	.40674	.44523	2.2460	.91355	0
'	Cos	Cot	Tan	Sin	'	'	Cos	Cot	Tan	Sin	'

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66°

# NATURAL TANGENTS, CO-TANGENTS, SINES AND CO-SINES

24°					25°						
'	Sin	Tan	Cot	Cos	'	Sin	Tan	Cot	Cos	'	
0	.40674	.44523	2.2460	.91355	60	0	.42262	.46631	2.1445	.90631	60
1	.40700	.44558	2.2443	.91343	59	1	.42288	.46666	2.1429	.90618	59
2	.40727	.44593	2.2425	.91331	58	2	.42315	.46702	2.1413	.90606	58
3	.40753	.44627	2.2408	.91319	57	3	.42341	.46737	2.1396	.90594	57
4	.40780	.44662	2.2390	.91307	56	4	.42367	.46772	2.1380	.90582	56
5	.40806	.44697	2.2373	.91295	55	5	.42394	.46808	2.1364	.90569	55
6	.40833	.44732	2.2355	.91283	54	6	.42420	.46843	2.1348	.90557	54
7	.40860	.44767	2.2338	.91272	53	7	.42446	.46879	2.1332	.90545	53
8	.40886	.44802	2.2320	.91260	52	8	.42473	.46914	2.1315	.90532	52
9	.40913	.44837	2.2303	.91248	51	9	.42499	.46950	2.1299	.90520	51
10	.40939	.44872	2.2286	.91236	50	10	.42525	.46985	2.1283	.90507	50
11	.40966	.44907	2.2268	.91224	49	11	.42552	.47021	2.1267	.90495	49
12	.40992	.44942	2.2251	.91212	48	12	.42578	.47056	2.1251	.90483	48
13	.41019	.44977	2.2234	.91200	47	13	.42604	.47092	2.1235	.90470	47
14	.41045	.45012	2.2216	.91188	46	14	.42631	.47128	2.1219	.90458	46
15	.41072	.45047	2.2199	.91176	45	15	.42657	.47163	2.1203	.90446	45
16	.41098	.45082	2.2182	.91164	44	16	.42683	.47199	2.1187	.90433	44
17	.41125	.45117	2.2165	.91152	43	17	.42709	.47234	2.1171	.90421	43
18	.41151	.45152	2.2148	.91140	42	18	.42736	.47270	2.1155	.90408	42
19	.41178	.45187	2.2130	.91128	41	19	.42762	.47305	2.1139	.90396	41
20	.41204	.45222	2.2113	.91116	40	20	.42788	.47341	2.1123	.90383	40
21	.41231	.45257	2.2096	.91104	39	21	.42815	.47377	2.1107	.90371	39
22	.41257	.45292	2.2079	.91092	38	22	.42841	.47412	2.1092	.90358	38
23	.41284	.45327	2.2062	.91080	37	23	.42867	.47448	2.1076	.90346	37
24	.41310	.45362	2.2045	.91068	36	24	.42894	.47483	2.1060	.90334	36
25	.41337	.45397	2.2028	.91056	35	25	.42920	.47519	2.1044	.90321	35
26	.41363	.45432	2.2011	.91044	34	26	.42946	.47555	2.1028	.90309	34
27	.41390	.45467	2.1994	.91032	33	27	.42972	.47590	2.1013	.90296	33
28	.41416	.45502	2.1977	.91020	32	28	.42999	.47626	2.0997	.90284	32
29	.41443	.45537	2.1960	.91008	31	29	.43025	.47662	2.0981	.90271	31
30	.41469	.45573	2.1943	.90996	30	30	.43051	.47698	2.0965	.90259	30
31	.41496	.45608	2.1926	.90984	29	31	.43077	.47733	2.0950	.90246	29
32	.41522	.45643	2.1909	.90972	28	32	.43104	.47769	2.0934	.90233	28
33	.41549	.45678	2.1892	.90960	27	33	.43130	.47805	2.0918	.90221	27
34	.41575	.45713	2.1876	.90948	26	34	.43156	.47840	2.0903	.90208	26
35	.41602	.45748	2.1859	.90936	25	35	.43182	.47876	2.0887	.90196	25
36	.41628	.45784	2.1842	.90924	24	36	.43209	.47912	2.0872	.90183	24
37	.41655	.45819	2.1825	.90911	23	37	.43235	.47948	2.0856	.90171	23
38	.41681	.45854	2.1808	.90899	22	38	.43261	.47984	2.0840	.90158	22
39	.41707	.45889	2.1792	.90887	21	39	.43287	.48019	2.0825	.90146	21
40	.41734	.45924	2.1775	.90875	20	40	.43313	.48055	2.0809	.90133	20
41	.41760	.45960	2.1758	.90863	19	41	.43340	.48091	2.0794	.90120	19
42	.41787	.45995	2.1742	.90851	18	42	.43366	.48127	2.0778	.90108	18
43	.41813	.46030	2.1725	.90839	17	43	.43392	.48163	2.0763	.90095	17
44	.41840	.46065	2.1708	.90826	16	44	.43418	.48198	2.0748	.90082	16
45	.41866	.46101	2.1692	.90814	15	45	.43445	.48234	2.0732	.90070	15
46	.41892	.46136	2.1675	.90802	14	46	.43471	.48270	2.0717	.90057	14
47	.41919	.46171	2.1659	.90790	13	47	.43497	.48306	2.0701	.90045	13
48	.41945	.46206	2.1642	.90778	12	48	.43523	.48342	2.0686	.90032	12
49	.41972	.46242	2.1625	.90766	11	49	.43549	.48378	2.0671	.90019	11
50	.41998	.46277	2.1609	.90753	10	50	.43575	.48414	2.0655	.90007	10
51	.42024	.46312	2.1592	.90741	9	51	.43602	.48450	2.0640	.89994	9
52	.42051	.46348	2.1576	.90729	8	52	.43628	.48486	2.0625	.89981	8
53	.42077	.46383	2.1560	.90717	7	53	.43654	.48521	2.0609	.89968	7
54	.42104	.46418	2.1543	.90704	6	54	.43680	.48557	2.0594	.89956	6
55	.42130	.46454	2.1527	.90692	5	55	.43706	.48593	2.0579	.89943	5
56	.42156	.46489	2.1510	.90680	4	56	.43733	.48629	2.0564	.89930	4
57	.42183	.46525	2.1494	.90668	3	57	.43759	.48665	2.0549	.89918	3
58	.42209	.46560	2.1478	.90655	2	58	.43785	.48701	2.0533	.89905	2
59	.42235	.46595	2.1461	.90643	1	59	.43811	.48737	2.0518	.89892	1
60	.42262	.46631	2.1445	.90631	0	60	.43837	.48773	2.0503	.89879	0
'	Cos	Cot	Tan	Sin	'	'	Cos	Cot	Tan	Sin	'

65°

64°

# NATURAL TANGENTS, CO-TANGENTS, SINES AND CO-SINES

26°					27°						
'	Sin	Tan	Cot	Cos	'	Sin	Tan	Cot	Cos	'	
0	.43837	.48773	2.0503	.89879	60	0	.45399	.50953	1.9626	.89101	60
1	.43863	.48809	2.0488	.89867	59	1	.45425	.50989	1.9612	.89087	59
2	.43889	.48845	2.0473	.89854	58	2	.45451	.51026	1.9598	.89074	58
3	.43916	.48881	2.0458	.89841	57	3	.45477	.51063	1.9584	.89061	57
4	.43942	.48917	2.0443	.89828	56	4	.45503	.51099	1.9570	.89048	56
5	.43968	.48953	2.0428	.89816	55	5	.45529	.51136	1.9556	.89035	55
6	.43994	.48989	2.0413	.89803	54	6	.45554	.51173	1.9542	.89021	54
7	.44020	.49026	2.0398	.89790	53	7	.45580	.51209	1.9528	.89008	53
8	.44046	.49062	2.0383	.89777	52	8	.45606	.51246	1.9514	.88995	52
9	.44072	.49098	2.0368	.89764	51	9	.45632	.51283	1.9500	.88981	51
10	.44098	.49134	2.0353	.89752	50	10	.45658	.51319	1.9486	.88968	50
11	.44124	.49170	2.0338	.89739	49	11	.45684	.51356	1.9472	.88955	49
12	.44151	.49206	2.0323	.89726	48	12	.45710	.51393	1.9458	.88942	48
13	.44177	.49242	2.0308	.89713	47	13	.45736	.51430	1.9444	.88929	47
14	.44203	.49278	2.0293	.89700	46	14	.45762	.51467	1.9430	.88915	46
15	.44229	.49315	2.0278	.89687	45	15	.45787	.51503	1.9416	.88902	45
16	.44255	.49351	2.0263	.89674	44	16	.45813	.51540	1.9402	.88888	44
17	.44281	.49387	2.0248	.89662	43	17	.45839	.51577	1.9388	.88875	43
18	.44307	.49423	2.0233	.89649	42	18	.45865	.51614	1.9375	.88862	42
19	.44333	.49459	2.0219	.89636	41	19	.45891	.51651	1.9361	.88848	41
20	.44359	.49495	2.0204	.89623	40	20	.45917	.51688	1.9347	.88835	40
21	.44385	.49532	2.0189	.89610	39	21	.45942	.51724	1.9333	.88822	39
22	.44411	.49568	2.0174	.89597	38	22	.45968	.51761	1.9319	.88808	38
23	.44437	.49604	2.0160	.89584	37	23	.45994	.51798	1.9306	.88795	37
24	.44463	.49640	2.0145	.89571	36	24	.46020	.51835	1.9292	.88782	36
25	.44489	.49677	2.0130	.89558	35	25	.46046	.51872	1.9278	.88768	35
26	.44515	.49713	2.0115	.89545	34	26	.46072	.51909	1.9265	.88755	34
27	.44541	.49749	2.0101	.89532	33	27	.46097	.51946	1.9251	.88741	33
28	.44567	.49786	2.0086	.89519	32	28	.46123	.51983	1.9237	.88728	32
29	.44593	.49822	2.0072	.89506	31	29	.46149	.52020	1.9223	.88715	31
30	.44620	.49858	2.0057	.89493	30	30	.46175	.52057	1.9210	.88701	30
31	.44646	.49894	2.0042	.89480	29	31	.46201	.52094	1.9196	.88688	29
32	.44672	.49931	2.0028	.89467	28	32	.46226	.52131	1.9183	.88674	28
33	.44698	.49967	2.0013	.89454	27	33	.46252	.52168	1.9169	.88661	27
34	.44724	.50004	1.9999	.89441	26	34	.46278	.52205	1.9155	.88647	26
35	.44750	.50040	1.9984	.89428	25	35	.46304	.52242	1.9142	.88634	25
36	.44776	.50076	1.9970	.89415	24	36	.46330	.52279	1.9128	.88620	24
37	.44802	.50113	1.9955	.89402	23	37	.46355	.52316	1.9115	.88607	23
38	.44828	.50149	1.9941	.89389	22	38	.46381	.52353	1.9101	.88593	22
39	.44854	.50185	1.9926	.89376	21	39	.46407	.52390	1.9088	.88580	21
40	.44880	.50222	1.9912	.89363	20	40	.46433	.52427	1.9074	.88566	20
41	.44906	.50258	1.9897	.89350	19	41	.46458	.52464	1.9061	.88553	19
42	.44932	.50295	1.9883	.89337	18	42	.46484	.52501	1.9047	.88539	18
43	.44958	.50331	1.9868	.89324	17	43	.46510	.52538	1.9034	.88526	17
44	.44984	.50368	1.9854	.89311	16	44	.46536	.52575	1.9020	.88512	16
45	.45010	.50404	1.9840	.89298	15	45	.46561	.52613	1.9007	.88499	15
46	.45036	.50441	1.9825	.89285	14	46	.46587	.52650	1.8993	.88485	14
47	.45062	.50477	1.9811	.89272	13	47	.46613	.52687	1.8980	.88472	13
48	.45088	.50514	1.9797	.89259	12	48	.46639	.52724	1.8967	.88458	12
49	.45114	.50550	1.9782	.89245	11	49	.46664	.52761	1.8953	.88445	11
50	.45140	.50587	1.9768	.89232	10	50	.46690	.52798	1.8940	.88431	10
51	.45166	.50623	1.9754	.89219	9	51	.46716	.52836	1.8927	.88417	9
52	.45192	.50660	1.9740	.89206	8	52	.46742	.52873	1.8913	.88404	8
53	.45218	.50696	1.9725	.89193	7	53	.46767	.52910	1.8900	.88390	7
54	.45243	.50733	1.9711	.89180	6	54	.46793	.52947	1.8887	.88377	6
55	.45269	.50769	1.9697	.89167	5	55	.46819	.52985	1.8873	.88363	5
56	.45295	.50806	1.9683	.89153	4	56	.46844	.53022	1.8860	.88349	4
57	.45321	.50843	1.9669	.89140	3	57	.46870	.53059	1.8847	.88336	3
58	.45347	.50879	1.9654	.89127	2	58	.46896	.53096	1.8834	.88322	2
59	.45373	.50916	1.9640	.89114	1	59	.46921	.53133	1.8820	.88308	1
60	.45399	.50953	1.9626	.89101	0	60	.46947	.53171	1.8807	.88295	0
'	Cos	Cot	Tan	Sin	'	Cos	Cot	Tan	Sin	'	
63°					62°						

# NATURAL TANGENTS, CO-TANGENTS, SINES AND CO-SINES

28°					29°						
'	Sin	Tan	Cot	Cos	'	Sin	Tan	Cot	Cos	'	
0	.46947	.53171	1.8807	.88295	60	0	.48481	.55431	1.8040	.87462	60
1	.46973	.53208	1.8794	.88281	59	1	.48506	.55469	1.8028	.87448	59
2	.46999	.53246	1.8781	.88267	58	2	.48532	.55507	1.8016	.87434	58
3	.47024	.53283	1.8768	.88254	57	3	.48557	.55545	1.8003	.87420	57
4	.47050	.53320	1.8755	.88240	56	4	.48583	.55583	1.7991	.87406	56
5	.47076	.53358	1.8741	.88226	55	5	.48608	.55621	1.7979	.87391	55
6	.47101	.53395	1.8728	.88213	54	6	.48634	.55659	1.7966	.87377	54
7	.47127	.53432	1.8715	.88199	53	7	.48659	.55697	1.7954	.87363	53
8	.47153	.53470	1.8702	.88185	52	8	.48684	.55736	1.7942	.87349	52
9	.47178	.53507	1.8689	.88172	51	9	.48710	.55774	1.7930	.87335	51
10	.47204	.53545	1.8676	.88158	50	10	.48735	.55812	1.7917	.87321	50
11	.47229	.53582	1.8663	.88144	49	11	.48761	.55850	1.7905	.87306	49
12	.47255	.53620	1.8650	.88130	48	12	.48786	.55888	1.7893	.87292	48
13	.47281	.53657	1.8637	.88117	47	13	.48811	.55926	1.7881	.87278	47
14	.47306	.53694	1.8624	.88103	46	14	.48837	.55964	1.7868	.87264	46
15	.47332	.53732	1.8611	.88089	45	15	.48862	.56003	1.7856	.87250	45
16	.47358	.53769	1.8598	.88075	44	16	.48888	.56041	1.7844	.87235	44
17	.47383	.53807	1.8585	.88062	43	17	.48913	.56079	1.7832	.87221	43
18	.47409	.53844	1.8572	.88048	42	18	.48938	.56117	1.7820	.87207	42
19	.47434	.53882	1.8559	.88034	41	19	.48964	.56156	1.7808	.87193	41
20	.47460	.53920	1.8546	.88020	40	20	.48989	.56194	1.7796	.87178	40
21	.47486	.53957	1.8533	.88006	39	21	.49014	.56232	1.7783	.87164	39
22	.47511	.53995	1.8520	.87993	38	22	.49040	.56270	1.7771	.87150	38
23	.47537	.54032	1.8507	.87979	37	23	.49065	.56309	1.7759	.87136	37
24	.47562	.54070	1.8495	.87965	36	24	.49090	.56347	1.7747	.87121	36
25	.47588	.54107	1.8482	.87951	35	25	.49116	.56385	1.7735	.87107	35
26	.47614	.54145	1.8469	.87937	34	26	.49141	.56424	1.7723	.87093	34
27	.47639	.54183	1.8456	.87923	33	27	.49166	.56462	1.7711	.87079	33
28	.47665	.54220	1.8443	.87909	32	28	.49192	.56501	1.7699	.87064	32
29	.47690	.54258	1.8430	.87896	31	29	.49217	.56539	1.7687	.87050	31
30	.47716	.54296	1.8418	.87882	30	30	.49242	.56577	1.7675	.87036	30
31	.47741	.54333	1.8405	.87868	29	31	.49268	.56616	1.7663	.87021	29
32	.47767	.54371	1.8392	.87854	28	32	.49293	.56654	1.7651	.87007	28
33	.47793	.54409	1.8379	.87840	27	33	.49318	.56693	1.7639	.86993	27
34	.47818	.54446	1.8367	.87826	26	34	.49344	.56731	1.7627	.86978	26
35	.47844	.54484	1.8354	.87812	25	35	.49369	.56769	1.7615	.86964	25
36	.47869	.54522	1.8341	.87798	24	36	.49394	.56808	1.7603	.86949	24
37	.47895	.54560	1.8329	.87784	23	37	.49419	.56846	1.7591	.86935	23
38	.47920	.54597	1.8316	.87770	22	38	.49444	.56885	1.7579	.86921	22
39	.47946	.54635	1.8303	.87756	21	39	.49470	.56923	1.7567	.86906	21
40	.47971	.54673	1.8291	.87743	20	40	.49495	.56962	1.7555	.86892	20
41	.47997	.54711	1.8278	.87729	19	41	.49521	.57000	1.7544	.86878	19
42	.48022	.54748	1.8265	.87715	18	42	.49546	.57039	1.7532	.86863	18
43	.48048	.54786	1.8253	.87701	17	43	.49571	.57078	1.7520	.86849	17
44	.48073	.54824	1.8240	.87687	16	44	.49596	.57116	1.7508	.86834	16
45	.48099	.54862	1.8228	.87673	15	45	.49622	.57155	1.7496	.86820	15
46	.48124	.54900	1.8215	.87659	14	46	.49647	.57193	1.7485	.86805	14
47	.48150	.54938	1.8202	.87645	13	47	.49672	.57232	1.7473	.86791	13
48	.48175	.54975	1.8190	.87631	12	48	.49697	.57271	1.7461	.86777	12
49	.48201	.55013	1.8177	.87617	11	49	.49723	.57309	1.7449	.86762	11
50	.48226	.55051	1.8165	.87603	10	50	.49748	.57348	1.7437	.86748	10
51	.48252	.55089	1.8152	.87589	9	51	.49773	.57386	1.7426	.86733	9
52	.48277	.55127	1.8140	.87575	8	52	.49798	.57425	1.7414	.86719	8
53	.48303	.55165	1.8127	.87561	7	53	.49824	.57464	1.7402	.86704	7
54	.48328	.55203	1.8115	.87546	6	54	.49849	.57503	1.7391	.86690	6
55	.48354	.55241	1.8103	.87532	5	55	.49874	.57541	1.7379	.86675	5
56	.48379	.55279	1.8090	.87518	4	56	.49899	.57580	1.7367	.86661	4
57	.48405	.55317	1.8078	.87504	3	57	.49924	.57619	1.7355	.86646	3
58	.48430	.55355	1.8065	.87490	2	58	.49950	.57657	1.7344	.86632	2
59	.48456	.55393	1.8053	.87476	1	59	.49975	.57696	1.7332	.86617	1
60	.48481	.55431	1.8043	.87462	0	60	.50000	.57735	1.7321	.86603	0
'	Cos	Cot	Tan	Sin	'	'	Cos	Cot	Tan	Sin	'

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60°

# NATURAL TANGENTS, CO-TANGENTS, SINES AND CO-SINES

30°					31°					
/	Sin	Tan	Cot	Cos	/	Sin	Tan	Cot	Cos	/
0	.50000	.57735	1.7321	.86603	60	.51504	.60086	1.6643	.85717	60
1	.50025	.57774	1.7309	.86588	59	.51529	.60126	1.6632	.85702	59
2	.50050	.57813	1.7297	.86573	58	.51554	.60165	1.6621	.85687	58
3	.50076	.57851	1.7286	.86559	57	.51579	.60205	1.6610	.85672	57
4	.50101	.57890	1.7274	.86544	56	.51604	.60245	1.6599	.85657	56
5	.50126	.57929	1.7262	.86530	55	.51628	.60284	1.6588	.85642	55
6	.50151	.57968	1.7251	.86515	54	.51653	.60324	1.6577	.85627	54
7	.50176	.58007	1.7239	.86501	53	.51678	.60364	1.6566	.85612	53
8	.50201	.58046	1.7228	.86486	52	.51703	.60403	1.6555	.85597	52
9	.50227	.58085	1.7216	.86471	51	.51728	.60443	1.6545	.85582	51
10	.50252	.58124	1.7205	.86457	50	.51753	.60483	1.6534	.85567	50
11	.50277	.58162	1.7193	.86442	49	.51778	.60522	1.6523	.85551	49
12	.50302	.58201	1.7182	.86427	48	.51803	.60562	1.6512	.85536	48
13	.50327	.58240	1.7170	.86413	47	.51828	.60602	1.6501	.85521	47
14	.50352	.58279	1.7159	.86398	46	.51852	.60642	1.6490	.85506	46
15	.50377	.58318	1.7147	.86384	45	.51877	.60681	1.6479	.85491	45
16	.50403	.58357	1.7136	.86369	44	.51902	.60721	1.6469	.85476	44
17	.50428	.58396	1.7124	.86354	43	.51927	.60761	1.6458	.85461	43
18	.50453	.58435	1.7113	.86340	42	.51952	.60801	1.6447	.85446	42
19	.50478	.58474	1.7102	.86325	41	.51977	.60841	1.6436	.85431	41
20	.50503	.58513	1.7090	.86310	40	.52002	.60881	1.6426	.85416	40
21	.50528	.58552	1.7079	.86295	39	.52026	.60921	1.6415	.85401	39
22	.50553	.58591	1.7067	.86281	38	.52051	.60960	1.6404	.85385	38
23	.50578	.58631	1.7056	.86266	37	.52076	.61000	1.6393	.85370	37
24	.50603	.58670	1.7045	.86251	36	.52101	.61040	1.6383	.85355	36
25	.50628	.58709	1.7033	.86237	35	.52126	.61080	1.6372	.85340	35
26	.50654	.58748	1.7022	.86222	34	.52151	.61120	1.6361	.85325	34
27	.50679	.58787	1.7011	.86207	33	.52175	.61160	1.6351	.85310	33
28	.50704	.58826	1.6999	.86192	32	.52200	.61200	1.6340	.85294	32
29	.50729	.58865	1.6988	.86178	31	.52225	.61240	1.6329	.85279	31
30	.50754	.58905	1.6977	.86163	30	.52250	.61280	1.6319	.85264	30
31	.50779	.58944	1.6965	.86148	29	.52275	.61320	1.6308	.85249	29
32	.50804	.58983	1.6954	.86133	28	.52300	.61360	1.6297	.85234	28
33	.50829	.59022	1.6943	.86119	27	.52324	.61400	1.6287	.85218	27
34	.50854	.59061	1.6932	.86104	26	.52349	.61440	1.6276	.85203	26
35	.50879	.59101	1.6920	.86089	25	.52374	.61480	1.6265	.85188	25
36	.50904	.59140	1.6909	.86074	24	.52399	.61520	1.6255	.85173	24
37	.50929	.59179	1.6898	.86059	23	.52423	.61561	1.6244	.85157	23
38	.50954	.59218	1.6887	.86045	22	.52448	.61601	1.6234	.85142	22
39	.50979	.59258	1.6875	.86030	21	.52473	.61641	1.6223	.85127	21
40	.51004	.59297	1.6864	.86015	20	.52498	.61681	1.6212	.85112	20
41	.51029	.59336	1.6853	.86000	19	.52522	.61721	1.6202	.85096	19
42	.51054	.59376	1.6842	.85985	18	.52547	.61761	1.6191	.85081	18
43	.51079	.59415	1.6831	.85970	17	.52572	.61801	1.6181	.85066	17
44	.51104	.59454	1.6820	.85956	16	.52597	.61842	1.6170	.85051	16
45	.51129	.59494	1.6808	.85941	15	.52621	.61882	1.6160	.85035	15
46	.51154	.59533	1.6797	.85926	14	.52646	.61922	1.6149	.85020	14
47	.51179	.59573	1.6786	.85911	13	.52671	.61962	1.6139	.85005	13
48	.51204	.59612	1.6775	.85896	12	.52696	.62003	1.6128	.84989	12
49	.51229	.59651	1.6764	.85881	11	.52720	.62043	1.6118	.84974	11
50	.51254	.59691	1.6753	.85866	10	.52745	.62083	1.6107	.84959	10
51	.51279	.59730	1.6742	.85851	9	.52770	.62124	1.6097	.84943	9
52	.51304	.59770	1.6731	.85836	8	.52794	.62164	1.6087	.84928	8
53	.51329	.59809	1.6720	.85821	7	.52819	.62204	1.6076	.84913	7
54	.51354	.59849	1.6709	.85806	6	.52844	.62245	1.6066	.84897	6
55	.51379	.59888	1.6698	.85792	5	.52869	.62285	1.6055	.84882	5
56	.51404	.59928	1.6687	.85777	4	.52893	.62325	1.6045	.84866	4
57	.51429	.59967	1.6676	.85762	3	.52918	.62366	1.6034	.84851	3
58	.51454	.60007	1.6665	.85747	2	.52943	.62406	1.6024	.84836	2
59	.51479	.60046	1.6654	.85732	1	.52967	.62446	1.6014	.84820	1
60	.51504	.60086	1.6643	.85717	0	.52992	.62487	1.6003	.84805	0
/	Cos	Cot	Tan	Sin	/	Cos	Cot	Tan	Sin	/

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# NATURAL TANGENTS, CO-TANGENTS, SINES AND CO-SINES

32°					33°						
°	Sin	Tan	Cot	Cos	°	Sin	Tan	Cot	Cos		
0	.52992	.62487	1.6003	.84805	60	0	.54464	.64941	1.5399	.83867	60
1	.53017	.62527	1.5993	.84789	59	1	.54488	.64982	1.5389	.83851	59
2	.53041	.62568	1.5983	.84774	58	2	.54513	.65024	1.5379	.83835	58
3	.53066	.62608	1.5972	.84759	57	3	.54537	.65065	1.5369	.83819	57
4	.53091	.62649	1.5962	.84743	56	4	.54561	.65106	1.5359	.83804	56
5	.53115	.62689	1.5952	.84728	55	5	.54586	.65148	1.5350	.83788	55
6	.53140	.62730	1.5941	.84712	54	6	.54610	.65189	1.5340	.83772	54
7	.53164	.62770	1.5931	.84697	53	7	.54635	.65231	1.5330	.83756	53
8	.53189	.62811	1.5921	.84681	52	8	.54659	.65272	1.5320	.83740	52
9	.53214	.62852	1.5911	.84666	51	9	.54683	.65314	1.5311	.83724	51
10	.53238	.62892	1.5900	.84650	50	10	.54708	.65355	1.5301	.83708	50
11	.53263	.62933	1.5890	.84635	49	11	.54732	.65397	1.5291	.83692	49
12	.53288	.62973	1.5880	.84619	48	12	.54756	.65438	1.5282	.83676	48
13	.53312	.63014	1.5869	.84604	47	13	.54781	.65480	1.5272	.83660	47
14	.53337	.63055	1.5859	.84588	46	14	.54805	.65521	1.5262	.83644	46
15	.53361	.63095	1.5849	.84573	45	15	.54829	.65563	1.5253	.83629	45
16	.53386	.63136	1.5839	.84557	44	16	.54854	.65604	1.5243	.83613	44
17	.53411	.63177	1.5829	.84542	43	17	.54878	.65646	1.5233	.83597	43
18	.53435	.63217	1.5818	.84526	42	18	.54902	.65688	1.5224	.83581	42
19	.53460	.63258	1.5808	.84511	41	19	.54927	.65729	1.5214	.83565	41
20	.53484	.63299	1.5798	.84495	40	20	.54951	.65771	1.5204	.83549	40
21	.53509	.63340	1.5788	.84480	39	21	.54975	.65813	1.5195	.83533	39
22	.53534	.63380	1.5778	.84464	38	22	.54999	.65854	1.5185	.83517	38
23	.53558	.63421	1.5768	.84448	37	23	.55024	.65896	1.5175	.83501	37
24	.53583	.63462	1.5757	.84433	36	24	.55048	.65938	1.5166	.83485	36
25	.53607	.63503	1.5747	.84417	35	25	.55072	.65980	1.5156	.83469	35
26	.53632	.63544	1.5737	.84402	34	26	.55097	.66021	1.5147	.83453	34
27	.53656	.63584	1.5727	.84386	33	27	.55121	.66063	1.5137	.83437	33
28	.53681	.63625	1.5717	.84370	32	28	.55145	.66105	1.5127	.83421	32
29	.53705	.63666	1.5707	.84355	31	29	.55169	.66147	1.5118	.83405	31
30	.53730	.63707	1.5697	.84339	30	30	.55194	.66189	1.5108	.83389	30
31	.53754	.63748	1.5687	.84324	29	31	.55218	.66230	1.5099	.83373	29
32	.53779	.63789	1.5677	.84308	28	32	.55242	.66272	1.5089	.83356	28
33	.53804	.63830	1.5667	.84292	27	33	.55266	.66314	1.5080	.83340	27
34	.53828	.63871	1.5657	.84277	26	34	.55291	.66356	1.5070	.83324	26
35	.53853	.63912	1.5647	.84261	25	35	.55315	.66398	1.5061	.83308	25
36	.53877	.63953	1.5637	.84245	24	36	.55339	.66440	1.5051	.83292	24
37	.53902	.63994	1.5627	.84230	23	37	.55363	.66482	1.5042	.83276	23
38	.53926	.64035	1.5617	.84214	22	38	.55388	.66524	1.5032	.83260	22
39	.53951	.64076	1.5607	.84198	21	39	.55412	.66566	1.5023	.83244	21
40	.53975	.64117	1.5597	.84182	20	40	.55436	.66608	1.5013	.83228	20
41	.54000	.64158	1.5587	.84167	19	41	.55460	.66650	1.5004	.83212	19
42	.54024	.64199	1.5577	.84151	18	42	.55484	.66692	1.4994	.83196	18
43	.54049	.64240	1.5567	.84135	17	43	.55509	.66734	1.4985	.83179	17
44	.54073	.64281	1.5557	.84120	16	44	.55533	.66776	1.4975	.83163	16
45	.54097	.64322	1.5547	.84104	15	45	.55557	.66818	1.4966	.83147	15
46	.54122	.64363	1.5537	.84088	14	46	.55581	.66860	1.4957	.83131	14
47	.54146	.64404	1.5527	.84072	13	47	.55605	.66902	1.4947	.83115	13
48	.54171	.64446	1.5517	.84057	12	48	.55630	.66944	1.4938	.83098	12
49	.54195	.64487	1.5507	.84041	11	49	.55654	.66986	1.4928	.83082	11
50	.54220	.64528	1.5497	.84025	10	50	.55678	.67028	1.4919	.83066	10
51	.54244	.64569	1.5487	.84009	9	51	.55702	.67071	1.4910	.83050	9
52	.54269	.64610	1.5477	.83994	8	52	.55726	.67113	1.4900	.83034	8
53	.54293	.64652	1.5468	.83978	7	53	.55750	.67155	1.4891	.83017	7
54	.54317	.64693	1.5458	.83962	6	54	.55775	.67197	1.4882	.83001	6
55	.54342	.64734	1.5448	.83946	5	55	.55799	.67239	1.4872	.82985	5
56	.54366	.64775	1.5438	.83930	4	56	.55823	.67282	1.4863	.82969	4
57	.54391	.64817	1.5428	.83915	3	57	.55847	.67324	1.4854	.82953	3
58	.54415	.64858	1.5418	.83899	2	58	.55871	.67366	1.4844	.82936	2
59	.54440	.64899	1.5408	.83883	1	59	.55895	.67409	1.4835	.82920	1
60	.54464	.64941	1.5399	.83867	0	60	.55919	.67451	1.4826	.82904	0
°	Cos	Cot	Tan	Sin	°	Cos	Cot	Tan	Sin		

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56°

# NATURAL TANGENTS, CO-TANGENTS, SINES AND CO-SINES

34°					35°					
'	Sin	Tan	Cot	Cos	'	Sin	Tan	Cot	Cos	'
0	.55919	.67451	1.4826	.82904	60	.57358	.70021	1.4281	.81915	60
1	.55943	.67493	1.4816	.82887	59	.57381	.70064	1.4273	.81899	59
2	.55968	.67536	1.4807	.82871	58	.57405	.70107	1.4264	.81882	58
3	.55992	.67578	1.4798	.82855	57	.57429	.70151	1.4255	.81865	57
4	.56016	.67620	1.4788	.82839	56	.57453	.70194	1.4246	.81848	56
5	.56040	.67663	1.4779	.82822	55	.57477	.70238	1.4237	.81832	55
6	.56064	.67705	1.4770	.82806	54	.57501	.70281	1.4229	.81815	54
7	.56088	.67748	1.4761	.82790	53	.57524	.70325	1.4220	.81798	53
8	.56112	.67790	1.4751	.82773	52	.57548	.70368	1.4211	.81782	52
9	.56136	.67832	1.4742	.82757	51	.57572	.70412	1.4202	.81765	51
10	.56160	.67875	1.4733	.82741	50	.57596	.70455	1.4193	.81748	50
11	.56184	.67917	1.4724	.82724	49	.57619	.70499	1.4185	.81731	49
12	.56208	.67960	1.4715	.82708	48	.57643	.70542	1.4176	.81714	48
13	.56232	.68002	1.4705	.82692	47	.57667	.70586	1.4167	.81698	47
14	.56256	.68045	1.4696	.82675	46	.57691	.70629	1.4158	.81681	46
15	.56280	.68088	1.4687	.82659	45	.57715	.70673	1.4150	.81664	45
16	.56305	.68130	1.4678	.82643	44	.57738	.70717	1.4141	.81647	44
17	.56329	.68173	1.4669	.82626	43	.57762	.70760	1.4132	.81631	43
18	.56353	.68215	1.4659	.82610	42	.57786	.70804	1.4124	.81614	42
19	.56377	.68258	1.4650	.82593	41	.57810	.70848	1.4115	.81597	41
20	.56401	.68301	1.4641	.82577	40	.57833	.70891	1.4106	.81580	40
21	.56425	.68343	1.4632	.82561	39	.57857	.70935	1.4097	.81563	39
22	.56449	.68386	1.4623	.82544	38	.57881	.70979	1.4089	.81546	38
23	.56473	.68429	1.4614	.82528	37	.57904	.71023	1.4080	.81530	37
24	.56497	.68471	1.4605	.82511	36	.57928	.71066	1.4071	.81513	36
25	.56521	.68514	1.4596	.82495	35	.57952	.71110	1.4063	.81496	35
26	.56545	.68557	1.4586	.82478	34	.57976	.71154	1.4054	.81479	34
27	.56569	.68600	1.4577	.82462	33	.57999	.71198	1.4045	.81462	33
28	.56593	.68642	1.4568	.82446	32	.58023	.71242	1.4037	.81445	32
29	.56617	.68685	1.4559	.82429	31	.58047	.71285	1.4028	.81428	31
30	.56641	.68728	1.4550	.82413	30	.58070	.71329	1.4019	.81412	30
31	.56665	.68771	1.4541	.82396	29	.58094	.71373	1.4011	.81395	29
32	.56689	.68814	1.4532	.82380	28	.58118	.71417	1.4002	.81378	28
33	.56713	.68857	1.4523	.82363	27	.58141	.71461	1.3994	.81361	27
34	.56736	.68900	1.4514	.82347	26	.58165	.71505	1.3985	.81344	26
35	.56760	.68942	1.4505	.82330	25	.58189	.71549	1.3976	.81327	25
36	.56784	.68985	1.4496	.82314	24	.58212	.71593	1.3968	.81310	24
37	.56808	.69028	1.4487	.82297	23	.58236	.71637	1.3959	.81293	23
38	.56832	.69071	1.4478	.82281	22	.58260	.71681	1.3951	.81276	22
39	.56856	.69114	1.4469	.82264	21	.58283	.71725	1.3942	.81259	21
40	.56880	.69157	1.4460	.82248	20	.58307	.71769	1.3934	.81242	20
41	.56904	.69200	1.4451	.82231	19	.58330	.71813	1.3925	.81225	19
42	.56928	.69243	1.4442	.82214	18	.58354	.71857	1.3916	.81208	18
43	.56952	.69286	1.4433	.82198	17	.58378	.71901	1.3908	.81191	17
44	.56976	.69329	1.4424	.82181	16	.58401	.71946	1.3899	.81174	16
45	.57000	.69372	1.4415	.82165	15	.58425	.71990	1.3891	.81157	15
46	.57024	.69416	1.4406	.82148	14	.58449	.72034	1.3882	.81140	14
47	.57047	.69459	1.4397	.82132	13	.58472	.72078	1.3874	.81123	13
48	.57071	.69502	1.4388	.82115	12	.58496	.72122	1.3865	.81106	12
49	.57095	.69545	1.4379	.82098	11	.58519	.72167	1.3857	.81089	11
50	.57119	.69588	1.4370	.82082	10	.58543	.72211	1.3848	.81072	10
51	.57143	.69631	1.4361	.82065	9	.58567	.72255	1.3840	.81055	9
52	.57167	.69675	1.4352	.82048	8	.58590	.72299	1.3831	.81038	8
53	.57191	.69718	1.4344	.82032	7	.58614	.72344	1.3823	.81021	7
54	.57215	.69761	1.4335	.82015	6	.58637	.72388	1.3814	.81004	6
55	.57238	.69804	1.4326	.81999	5	.58661	.72432	1.3806	.80987	5
56	.57262	.69847	1.4317	.81982	4	.58684	.72477	1.3798	.80970	4
57	.57286	.69891	1.4308	.81965	3	.58708	.72521	1.3789	.80953	3
58	.57310	.69934	1.4299	.81949	2	.58731	.72565	1.3781	.80936	2
59	.57334	.69977	1.4290	.81932	1	.58755	.72610	1.3772	.80919	1
60	.57358	.70021	1.4281	.81915	0	.58779	.72654	1.3764	.80902	0
'	Cos	Cot	Tan	Sin	'	Cos	Cot	Tan	Sin	'

55°

54°

# NATURAL TANGENTS, CO-TANGENTS, SINES AND CO-SINES

36°					37°						
'	Sin	Tan	Cot	Cos	'	Sin	Tan	Cot	Cos	'	
0	.58779	.72654	1.3764	.80902	60	0	.60182	.75355	1.3270	.79864	60
1	.58802	.72699	1.3755	.80885	59	1	.60205	.75401	1.3262	.79846	59
2	.58826	.72743	1.3747	.80867	58	2	.60228	.75447	1.3254	.79829	58
3	.58849	.72788	1.3739	.80850	57	3	.60251	.75492	1.3246	.79811	57
4	.58873	.72832	1.3730	.80833	56	4	.60274	.75538	1.3238	.79793	56
5	.58896	.72877	1.3722	.80816	55	5	.60298	.75584	1.3230	.79776	55
6	.58920	.72921	1.3713	.80799	54	6	.60321	.75629	1.3222	.79758	54
7	.58943	.72966	1.3705	.80782	53	7	.60344	.75675	1.3214	.79741	53
8	.58967	.73010	1.3697	.80765	52	8	.60367	.75721	1.3206	.79723	52
9	.58990	.73055	1.3688	.80748	51	9	.60390	.75767	1.3198	.79706	51
10	.59014	.73100	1.3680	.80730	50	10	.60414	.75812	1.3190	.79688	50
11	.59037	.73144	1.3672	.80713	49	11	.60437	.75858	1.3182	.79671	49
12	.59061	.73189	1.3663	.80696	48	12	.60460	.75904	1.3175	.79653	48
13	.59084	.73234	1.3655	.80679	47	13	.60483	.75950	1.3167	.79635	47
14	.59108	.73278	1.3647	.80662	46	14	.60506	.75996	1.3159	.79618	46
15	.59131	.73323	1.3638	.80644	45	15	.60529	.76042	1.3151	.79600	45
16	.59154	.73368	1.3630	.80627	44	16	.60553	.76088	1.3143	.79583	44
17	.59178	.73413	1.3622	.80610	43	17	.60576	.76134	1.3135	.79565	43
18	.59201	.73457	1.3613	.80593	42	18	.60599	.76180	1.3127	.79547	42
19	.59225	.73502	1.3605	.80576	41	19	.60622	.76226	1.3119	.79530	41
20	.59248	.73547	1.3597	.80558	40	20	.60645	.76272	1.3111	.79512	40
21	.59272	.73592	1.3588	.80541	39	21	.60668	.76318	1.3103	.79494	39
22	.59295	.73637	1.3580	.80524	38	22	.60691	.76364	1.3095	.79477	38
23	.59318	.73681	1.3572	.80507	37	23	.60714	.76410	1.3087	.79459	37
24	.59342	.73726	1.3564	.80489	36	24	.60738	.76456	1.3079	.79441	36
25	.59365	.73771	1.3555	.80472	35	25	.60761	.76502	1.3072	.79424	35
26	.59389	.73816	1.3547	.80455	34	26	.60784	.76548	1.3064	.79406	34
27	.59412	.73861	1.3539	.80438	33	27	.60807	.76594	1.3056	.79388	33
28	.59436	.73906	1.3531	.80420	32	28	.60830	.76640	1.3048	.79371	32
29	.59459	.73951	1.3522	.80403	31	29	.60853	.76686	1.3040	.79353	31
30	.59482	.73996	1.3514	.80386	30	30	.60876	.76733	1.3032	.79335	30
31	.59506	.74041	1.3506	.80368	29	31	.60899	.76779	1.3024	.79318	29
32	.59529	.74086	1.3498	.80351	28	32	.60922	.76825	1.3017	.79300	28
33	.59552	.74131	1.3490	.80334	27	33	.60945	.76871	1.3009	.79282	27
34	.59576	.74176	1.3481	.80316	26	34	.60968	.76918	1.3001	.79264	26
35	.59599	.74221	1.3473	.80299	25	35	.60991	.76964	1.2993	.79247	25
36	.59622	.74267	1.3465	.80282	24	36	.61015	.77010	1.2985	.79229	24
37	.59646	.74312	1.3457	.80264	23	37	.61038	.77057	1.2977	.79211	23
38	.59669	.74357	1.3449	.80247	22	38	.61061	.77103	1.2970	.79193	22
39	.59693	.74402	1.3440	.80230	21	39	.61084	.77149	1.2962	.79176	21
40	.59716	.74447	1.3432	.80212	20	40	.61107	.77196	1.2954	.79158	20
41	.59739	.74492	1.3424	.80195	19	41	.61130	.77242	1.2946	.79140	19
42	.59763	.74538	1.3416	.80178	18	42	.61153	.77289	1.2938	.79122	18
43	.59786	.74583	1.3408	.80160	17	43	.61176	.77335	1.2931	.79105	17
44	.59809	.74628	1.3400	.80143	16	44	.61199	.77382	1.2923	.79087	16
45	.59832	.74674	1.3392	.80125	15	45	.61222	.77428	1.2915	.79069	15
46	.59856	.74719	1.3384	.80108	14	46	.61245	.77475	1.2907	.79051	14
47	.59879	.74764	1.3375	.80091	13	47	.61268	.77521	1.2900	.79033	13
48	.59902	.74810	1.3367	.80073	12	48	.61291	.77568	1.2892	.79016	12
49	.59926	.74855	1.3359	.80056	11	49	.61314	.77615	1.2884	.78998	11
50	.59949	.74900	1.3351	.80038	10	50	.61337	.77661	1.2876	.78980	10
51	.59972	.74946	1.3343	.80021	9	51	.61360	.77708	1.2869	.78962	9
52	.59995	.74991	1.3335	.80003	8	52	.61383	.77754	1.2861	.78944	8
53	.60019	.75037	1.3327	.79986	7	53	.61406	.77801	1.2853	.78926	7
54	.60042	.75082	1.3319	.79968	6	54	.61429	.77848	1.2846	.78908	6
55	.60065	.75128	1.3311	.79951	5	55	.61451	.77895	1.2838	.78891	5
56	.60089	.75173	1.3303	.79934	4	56	.61474	.77941	1.2830	.78873	4
57	.60112	.75219	1.3295	.79916	3	57	.61497	.77988	1.2822	.78855	3
58	.60135	.75264	1.3287	.79899	2	58	.61520	.78035	1.2815	.78837	2
59	.60158	.75310	1.3278	.79881	1	59	.61543	.78082	1.2807	.78819	1
60	.60182	.75355	1.3270	.79864	0	60	.61566	.78129	1.2799	.78801	0
'	Cos	Cot	Tan	Sin	'	Cos	Cot	Tan	Sin	'	

53°

52°

# NATURAL TANGENTS, CO-TANGENTS, SINES AND CO-SINES

38°					39°					
'	Sin	Tan	Cot	Cos	'	Sin	Tan	Cot	Cos	'
0	.61566	.78129	1.2799	.78801	60	.62932	.80978	1.2349	.77715	60
1	.61589	.78175	1.2792	.78783	59	.62955	.81027	1.2342	.77696	59
2	.61612	.78222	1.2784	.78765	58	.62977	.81075	1.2334	.77678	58
3	.61635	.78269	1.2776	.78747	57	.63000	.81123	1.2327	.77660	57
4	.61658	.78316	1.2769	.78729	56	.63022	.81171	1.2320	.77641	56
5	.61681	.78363	1.2761	.78711	55	.63045	.81220	1.2312	.77623	55
6	.61704	.78410	1.2753	.78694	54	.63068	.81268	1.2305	.77605	54
7	.61726	.78457	1.2746	.78676	53	.63090	.81316	1.2298	.77586	53
8	.61749	.78504	1.2738	.78658	52	.63113	.81364	1.2290	.77568	52
9	.61772	.78551	1.2731	.78640	51	.63135	.81413	1.2283	.77550	51
10	.61795	.78598	1.2723	.78622	50	.63158	.81461	1.2276	.77531	50
11	.61818	.78645	1.2715	.78604	49	.63180	.81510	1.2268	.77513	49
12	.61841	.78692	1.2708	.78586	48	.63203	.81558	1.2261	.77494	48
13	.61864	.78739	1.2700	.78568	47	.63225	.81606	1.2254	.77476	47
14	.61887	.78786	1.2693	.78550	46	.63248	.81655	1.2247	.77458	46
15	.61909	.78834	1.2685	.78532	45	.63271	.81703	1.2239	.77439	45
16	.61932	.78881	1.2677	.78514	44	.63293	.81752	1.2232	.77421	44
17	.61955	.78928	1.2670	.78496	43	.63316	.81800	1.2225	.77402	43
18	.61978	.78975	1.2662	.78478	42	.63338	.81849	1.2218	.77384	42
19	.62001	.79022	1.2655	.78460	41	.63361	.81898	1.2210	.77366	41
20	.62024	.79070	1.2647	.78442	40	.63383	.81946	1.2203	.77347	40
21	.62046	.79117	1.2640	.78424	39	.63406	.81995	1.2196	.77329	39
22	.62069	.79164	1.2632	.78405	38	.63428	.82044	1.2189	.77310	38
23	.62092	.79212	1.2624	.78387	37	.63451	.82092	1.2181	.77292	37
24	.62115	.79259	1.2617	.78369	36	.63473	.82141	1.2174	.77273	36
25	.62138	.79306	1.2609	.78351	35	.63496	.82190	1.2167	.77255	35
26	.62160	.79354	1.2602	.78333	34	.63518	.82238	1.2160	.77236	34
27	.62183	.79401	1.2594	.78315	33	.63540	.82287	1.2153	.77218	33
28	.62206	.79449	1.2587	.78297	32	.63563	.82336	1.2145	.77199	32
29	.62229	.79496	1.2579	.78279	31	.63585	.82385	1.2138	.77181	31
30	.62251	.79544	1.2572	.78261	30	.63608	.82434	1.2131	.77162	30
31	.62274	.79591	1.2564	.78243	29	.63630	.82483	1.2124	.77144	29
32	.62297	.79639	1.2557	.78225	28	.63653	.82531	1.2117	.77125	28
33	.62320	.79686	1.2549	.78206	27	.63675	.82580	1.2110	.77107	27
34	.62342	.79734	1.2542	.78188	26	.63698	.82629	1.2102	.77088	26
35	.62365	.79781	1.2534	.78170	25	.63720	.82678	1.2095	.77070	25
36	.62388	.79829	1.2527	.78152	24	.63742	.82727	1.2088	.77051	24
37	.62411	.79877	1.2519	.78134	23	.63765	.82776	1.2081	.77033	23
38	.62433	.79924	1.2512	.78116	22	.63787	.82825	1.2074	.77014	22
39	.62456	.79972	1.2504	.78098	21	.63810	.82874	1.2066	.76996	21
40	.62479	.80020	1.2497	.78079	20	.63832	.82923	1.2059	.76977	20
41	.62502	.80067	1.2489	.78061	19	.63854	.82972	1.2052	.76959	19
42	.62524	.80115	1.2482	.78043	18	.63877	.83022	1.2045	.76940	18
43	.62547	.80163	1.2475	.78025	17	.63899	.83071	1.2038	.76921	17
44	.62570	.80211	1.2467	.78007	16	.63922	.83120	1.2031	.76903	16
45	.62592	.80258	1.2460	.77988	15	.63944	.83169	1.2024	.76884	15
46	.62615	.80306	1.2452	.77970	14	.63966	.83218	1.2017	.76866	14
47	.62638	.80354	1.2445	.77952	13	.63989	.83268	1.2010	.76847	13
48	.62660	.80402	1.2437	.77934	12	.64011	.83317	1.2002	.76828	12
49	.62683	.80450	1.2430	.77916	11	.64033	.83366	1.1995	.76810	11
50	.62706	.80498	1.2423	.77897	10	.64056	.83415	1.1988	.76791	10
51	.62728	.80546	1.2415	.77879	9	.64078	.83465	1.1981	.76772	9
52	.62751	.80594	1.2408	.77861	8	.64100	.83514	1.1974	.76754	8
53	.62774	.80642	1.2401	.77843	7	.64123	.83564	1.1967	.76735	7
54	.62796	.80690	1.2393	.77824	6	.64145	.83613	1.1960	.76717	6
55	.62819	.80738	1.2386	.77806	5	.64167	.83662	1.1953	.76698	5
56	.62842	.80786	1.2378	.77788	4	.64190	.83712	1.1946	.76679	4
57	.62864	.80834	1.2371	.77769	3	.64212	.83761	1.1939	.76661	3
58	.61887	.80882	1.2364	.77751	2	.64234	.83811	1.1932	.76642	2
59	.62909	.80930	1.2356	.77733	1	.64256	.83860	1.1925	.76623	1
60	.62932	.80978	1.2349	.77715	0	.64279	.83910	1.1918	.76604	0
'	Cos	Cot	Tan	Sin	'	Cos	Cot	Tan	Sin	'

51°

50°

# NATURAL TANGENTS, CO-TANGENTS, SINES AND CO-SINES

40°					41°						
'	Sin	Tan	Cot	Cos	'	Sin	Tan	Cot	Cos	'	
0	.64279	.83910	1.1918	.76604	60	0	.65606	.86929	1.1504	.75471	60
1	.64301	.83960	1.1910	.76586	59	1	.65628	.86980	1.1497	.75452	59
2	.64323	.84009	1.1903	.76567	58	2	.65650	.87031	1.1490	.75433	58
3	.64346	.84059	1.1896	.76548	57	3	.65672	.87082	1.1483	.75414	57
4	.64368	.84108	1.1889	.76530	56	4	.65694	.87133	1.1477	.75395	56
5	.64390	.84158	1.1882	.76511	55	5	.65716	.87184	1.1470	.75375	55
6	.64412	.84208	1.1875	.76492	54	6	.65738	.87236	1.1463	.75356	54
7	.64435	.84258	1.1868	.76473	53	7	.65759	.87287	1.1456	.75337	53
8	.64457	.84307	1.1861	.76455	52	8	.65781	.87338	1.1450	.75318	52
9	.64479	.84357	1.1854	.76436	51	9	.65803	.87389	1.1443	.75299	51
10	.64501	.84407	1.1847	.76417	50	10	.65825	.87441	1.1436	.75280	50
11	.64524	.84457	1.1840	.76398	49	11	.65847	.87492	1.1430	.75261	49
12	.64546	.84507	1.1833	.76380	48	12	.65869	.87543	1.1423	.75241	48
13	.64568	.84556	1.1826	.76361	47	13	.65891	.87595	1.1416	.75222	47
14	.64590	.84606	1.1819	.76342	46	14	.65913	.87646	1.1410	.75203	46
15	.64612	.84656	1.1812	.76323	45	15	.65935	.87698	1.1403	.75184	45
16	.64635	.84706	1.1806	.76304	44	16	.65956	.87749	1.1396	.75165	44
17	.64657	.84756	1.1799	.76286	43	17	.65978	.87801	1.1389	.75146	43
18	.64679	.84806	1.1792	.76267	42	18	.66000	.87852	1.1383	.75126	42
19	.64701	.84856	1.1785	.76248	41	19	.66022	.87904	1.1376	.75107	41
20	.64723	.84906	1.1778	.76229	40	20	.66044	.87955	1.1369	.75088	40
21	.64746	.84956	1.1771	.76210	39	21	.66066	.88007	1.1363	.75069	39
22	.64768	.85006	1.1764	.76192	38	22	.66088	.88059	1.1356	.75050	38
23	.64790	.85057	1.1757	.76173	37	23	.66110	.88110	1.1349	.75030	37
24	.64812	.85107	1.1750	.76154	36	24	.66131	.88162	1.1343	.75011	36
25	.64834	.85157	1.1743	.76135	35	25	.66153	.88214	1.1336	.74992	35
26	.64856	.85207	1.1736	.76116	34	26	.66175	.88265	1.1329	.74973	34
27	.64878	.85257	1.1729	.76097	33	27	.66197	.88317	1.1323	.74953	33
28	.64901	.85308	1.1722	.76078	32	28	.66218	.88369	1.1316	.74934	32
29	.64923	.85358	1.1715	.76059	31	29	.66240	.88421	1.1310	.74915	31
30	.64945	.85408	1.1708	.76041	30	30	.66262	.88473	1.1303	.74896	30
31	.64967	.85458	1.1702	.76022	29	31	.66284	.88524	1.1296	.74876	29
32	.64989	.85509	1.1695	.76003	28	32	.66306	.88576	1.1290	.74857	28
33	.65011	.85559	1.1688	.75984	27	33	.66327	.88628	1.1283	.74838	27
34	.65033	.85609	1.1681	.75965	26	34	.66349	.88680	1.1276	.74818	26
35	.65055	.85660	1.1674	.75946	25	35	.66371	.88732	1.1270	.74799	25
36	.65077	.85710	1.1667	.75927	24	36	.66393	.88784	1.1263	.74780	24
37	.65100	.85761	1.1660	.75908	23	37	.66414	.88836	1.1257	.74760	23
38	.65122	.85811	1.1653	.75889	22	38	.66436	.88888	1.1250	.74741	22
39	.65144	.85862	1.1647	.75870	21	39	.66458	.88940	1.1243	.74722	21
40	.65166	.85912	1.1640	.75851	20	40	.66480	.88992	1.1237	.74703	20
41	.65188	.85963	1.1633	.75832	19	41	.66501	.89045	1.1230	.74683	19
42	.65210	.86014	1.1626	.75813	18	42	.66523	.89097	1.1224	.74664	18
43	.65232	.86064	1.1619	.75794	17	43	.66545	.89149	1.1217	.74644	17
44	.65254	.86115	1.1612	.75775	16	44	.66566	.89201	1.1211	.74625	16
45	.65276	.86166	1.1606	.75756	15	45	.66588	.89253	1.1204	.74606	15
46	.65298	.86216	1.1599	.75738	14	46	.66610	.89306	1.1197	.74586	14
47	.65320	.86267	1.1592	.75719	13	47	.66632	.89358	1.1191	.74567	13
48	.65342	.86318	1.1585	.75700	12	48	.66653	.89410	1.1184	.74548	12
49	.65364	.86368	1.1578	.75680	11	49	.66675	.89463	1.1178	.74528	11
50	.65386	.86419	1.1571	.75661	10	50	.66697	.89515	1.1171	.74509	10
51	.65408	.86470	1.1565	.75642	9	51	.66718	.89567	1.1165	.74489	9
52	.65430	.86521	1.1558	.75623	8	52	.66740	.89620	1.1158	.74470	8
53	.65452	.86572	1.1551	.75604	7	53	.66762	.89672	1.1152	.74451	7
54	.65474	.86623	1.1544	.75585	6	54	.66783	.89725	1.1145	.74431	6
55	.65496	.86674	1.1538	.75566	5	55	.66805	.89777	1.1139	.74412	5
56	.65518	.86725	1.1531	.75547	4	56	.66827	.89830	1.1132	.74392	4
57	.65540	.86776	1.1524	.75528	3	57	.66848	.89883	1.1126	.74373	3
58	.65562	.86827	1.1517	.75509	2	58	.66870	.89935	1.1119	.74353	2
59	.65584	.86878	1.1510	.75490	1	59	.66891	.89988	1.1113	.74334	1
60	.65606	.86929	1.1504	.75471	0	60	.66913	.90040	1.1106	.74314	0
'	Cos	Cot	Tan	Sin	'	Cos	Cot	Tan	Sin	'	

49°

48°

# NATURAL TANGENTS, CO-TANGENTS, SINES AND CO-SINES

42°					43°						
'	Sin	Tan	Cot	Cos	'	Sin	Tan	Cot	Cos	'	
0	.66913	.90040	1.1106	.74314	60	.68200	.93252	1.0724	.73135	60	
1	.66935	.90093	1.1100	.74295	59	1	.68221	.93306	1.0717	.73116	59
2	.66956	.90146	1.1093	.74276	58	2	.68242	.93360	1.0711	.73096	58
3	.66978	.90199	1.1087	.74256	57	3	.68264	.93415	1.0705	.73076	57
4	.66999	.90251	1.1080	.74237	56	4	.68285	.93469	1.0699	.73056	56
5	.67021	.90304	1.1074	.74217	55	5	.68306	.93524	1.0692	.73036	55
6	.67043	.90357	1.1067	.74198	54	6	.68327	.93578	1.0686	.73016	54
7	.67064	.90410	1.1061	.74178	53	7	.68349	.93633	1.0680	.72996	53
8	.67086	.90463	1.1054	.74159	52	8	.68370	.93688	1.0674	.72976	52
9	.67107	.90516	1.1048	.74139	51	9	.68391	.93742	1.0668	.72957	51
10	.67129	.90569	1.1041	.74120	50	10	.68412	.93797	1.0661	.72937	50
11	.67151	.90621	1.1035	.74100	49	11	.68434	.93852	1.0655	.72917	49
12	.67172	.90674	1.1028	.74080	48	12	.68455	.93906	1.0649	.72897	48
13	.67194	.90727	1.1022	.74061	47	13	.68476	.93961	1.0643	.72877	47
14	.67215	.90781	1.1016	.74041	46	14	.68497	.94016	1.0637	.72857	46
15	.67237	.90834	1.1009	.74022	45	15	.68518	.94071	1.0630	.72837	45
16	.67258	.90887	1.1003	.74002	44	16	.68539	.94125	1.0624	.72817	44
17	.67280	.90940	1.0996	.73983	43	17	.68561	.94180	1.0618	.72797	43
18	.67301	.90993	1.0990	.73963	42	18	.68582	.94235	1.0612	.72777	42
19	.67323	.91046	1.0983	.73944	41	19	.68603	.94290	1.0606	.72757	41
20	.67344	.91099	1.0977	.73924	40	20	.68624	.94345	1.0599	.72737	40
21	.67366	.91153	1.0971	.73904	39	21	.68645	.94400	1.0593	.72717	39
22	.67387	.91206	1.0964	.73885	38	22	.68666	.94455	1.0587	.72697	38
23	.67409	.91259	1.0958	.73865	37	23	.68688	.94510	1.0581	.72677	37
24	.67430	.91313	1.0951	.73846	36	24	.68709	.94565	1.0575	.72657	36
25	.67452	.91366	1.0945	.73826	35	25	.68730	.94620	1.0569	.72637	35
26	.67473	.91419	1.0939	.73806	34	26	.68751	.94676	1.0562	.72617	34
27	.67495	.91473	1.0932	.73787	33	27	.68772	.94731	1.0556	.72597	33
28	.67516	.91526	1.0926	.73767	32	28	.68793	.94786	1.0550	.72577	32
29	.67538	.91580	1.0919	.73747	31	29	.68814	.94841	1.0544	.72557	31
30	.67559	.91633	1.0913	.73728	30	30	.68835	.94896	1.0538	.72537	30
31	.67580	.91687	1.0907	.73708	29	31	.68857	.94952	1.0532	.72517	29
32	.67602	.91740	1.0900	.73688	28	32	.68878	.95007	1.0526	.72497	28
33	.67623	.91794	1.0894	.73669	27	33	.68899	.95062	1.0519	.72477	27
34	.67645	.91847	1.0888	.73649	26	34	.68920	.95118	1.0513	.72457	26
35	.67666	.91901	1.0881	.73629	25	35	.68941	.95173	1.0507	.72437	25
36	.67688	.91955	1.0875	.73610	24	36	.68962	.95229	1.0501	.72417	24
37	.67709	.92008	1.0869	.73590	23	37	.68983	.95284	1.0495	.72397	23
38	.67730	.92062	1.0862	.73570	22	38	.69004	.95340	1.0489	.72377	22
39	.67752	.92116	1.0856	.73551	21	39	.69025	.95395	1.0483	.72357	21
40	.67773	.92170	1.0850	.73531	20	40	.69046	.95451	1.0477	.72337	20
41	.67795	.92224	1.0843	.73511	19	41	.69067	.95506	1.0470	.72317	19
42	.67816	.92277	1.0837	.73491	18	42	.69088	.95562	1.0464	.72297	18
43	.67837	.92331	1.0831	.73472	17	43	.69109	.95618	1.0458	.72277	17
44	.67859	.92385	1.0824	.73452	16	44	.69130	.95673	1.0452	.72257	16
45	.67880	.92439	1.0818	.73432	15	45	.69151	.95729	1.0446	.72236	15
46	.67901	.92493	1.0812	.73413	14	46	.69172	.95785	1.0440	.72216	14
47	.67923	.92547	1.0805	.73393	13	47	.69193	.95841	1.0434	.72196	13
48	.67944	.92601	1.0799	.73373	12	48	.69214	.95897	1.0428	.72176	12
49	.67965	.92655	1.0793	.73353	11	49	.69235	.95952	1.0422	.72156	11
50	.67987	.92709	1.0786	.73333	10	50	.69256	.96008	1.0416	.72136	10
51	.68008	.92763	1.0780	.73314	9	51	.69277	.96064	1.0410	.72116	9
52	.68029	.92817	1.0774	.73294	8	52	.69298	.96120	1.0404	.72096	8
53	.68051	.92872	1.0768	.73274	7	53	.69319	.96176	1.0398	.72076	7
54	.68072	.92926	1.0761	.73254	6	54	.69340	.96232	1.0392	.72056	6
55	.68093	.92980	1.0755	.73234	5	55	.69361	.96288	1.0385	.72036	5
56	.68115	.93034	1.0749	.73215	4	56	.69382	.96344	1.0379	.72016	4
57	.68136	.93088	1.0742	.73195	3	57	.69403	.96400	1.0373	.71996	3
58	.68157	.93143	1.0736	.73175	2	58	.69424	.96457	1.0367	.71976	2
59	.68179	.93197	1.0730	.73155	1	59	.69445	.96513	1.0361	.71956	1
60	.68200	.93252	1.0724	.73135	0	60	.69466	.96569	1.0355	.71936	0
'	Cos	Cot	Tan	Sin	'	'	Cos	Cot	Tan	Sin	'

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46°

# NATURAL TANGENTS, CO-TANGENTS, SINES AND CO-SINES

44°					
/	Sin	Tan	Cot	Cos	/
0	.69466	.96569	1.0355	.71934	60
1	.69487	.96625	1.0349	.71914	59
2	.69508	.96681	1.0343	.71894	58
3	.69529	.96738	1.0337	.71873	57
4	.69549	.96794	1.0331	.71853	56
5	.69570	.96850	1.0325	.71833	55
6	.69591	.96907	1.0319	.71813	54
7	.69612	.96963	1.0313	.71792	53
8	.69633	.97020	1.0307	.71772	52
9	.69654	.97076	1.0301	.71752	51
10	.69675	.97133	1.0295	.71732	50
11	.69696	.97189	1.0289	.71711	49
12	.69717	.97246	1.0283	.71691	48
13	.69737	.97302	1.0277	.71671	47
14	.69758	.97359	1.0271	.71650	46
15	.69779	.97416	1.0265	.71630	45
16	.69800	.97472	1.0259	.71610	44
17	.69821	.97529	1.0253	.71590	43
18	.69842	.97586	1.0247	.71569	42
19	.69862	.97643	1.0241	.71549	41
20	.69883	.97700	1.0235	.71529	40
21	.69904	.97756	1.0230	.71508	39
22	.69925	.97813	1.0224	.71488	38
23	.69946	.97870	1.0218	.71468	37
24	.69966	.97927	1.0212	.71447	36
25	.69987	.97984	1.0206	.71427	35
26	.70008	.98041	1.0200	.71407	34
27	.70029	.98098	1.0194	.71386	33
28	.70049	.98155	1.0188	.71366	32
29	.70070	.98213	1.0182	.71345	31
30	.70091	.98270	1.0176	.71325	30
31	.70112	.98327	1.0170	.71305	29
32	.70132	.98384	1.0164	.71284	28
33	.70153	.98441	1.0158	.71264	27
34	.70174	.98499	1.0152	.71243	26
35	.70195	.98556	1.0147	.71223	25
36	.70215	.98613	1.0141	.71203	24
37	.70236	.98671	1.0135	.71182	23
38	.70257	.98728	1.0129	.71162	22
39	.70277	.98786	1.0123	.71141	21
40	.70298	.98843	1.0117	.71121	20
41	.70319	.98901	1.0111	.71100	19
42	.70339	.98958	1.0105	.71080	18
43	.70360	.99016	1.0099	.71059	17
44	.70381	.99073	1.0094	.71039	16
45	.70401	.99131	1.0088	.71019	15
46	.70422	.99189	1.0082	.70998	14
47	.70443	.99247	1.0076	.70978	13
48	.70463	.99304	1.0070	.70957	12
49	.70484	.99362	1.0064	.70937	11
50	.70505	.99420	1.0058	.70916	10
51	.70525	.99478	1.0052	.70896	9
52	.70546	.99536	1.0047	.70875	8
53	.70567	.99594	1.0041	.70855	7
54	.70587	.99652	1.0035	.70834	6
55	.70608	.99710	1.0029	.70813	5
56	.70628	.99768	1.0023	.70793	4
57	.70649	.99826	1.0017	.70772	3
58	.70670	.99884	1.0012	.70752	2
59	.70690	.99942	1.0006	.70731	1
60	.70711	1.0000	1.0000	.70711	0
/	Cos	Cot	Tan	Sin	/

45°

# NATURAL SECANTS AND CO-SECANTS

'	0°		1°		2°		3°		'
	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	
0	1.0000	Infinite	1.0001	57.299	1.0006	28.654	1.0014	19.107	60
1	1.0000	3437.70	1.0001	56.359	1.0006	28.417	1.0014	19.002	59
2	1.0000	1718.90	1.0002	55.450	1.0006	28.184	1.0014	18.897	58
3	1.0000	1145.90	1.0002	54.570	1.0006	27.955	1.0014	18.794	57
4	1.0000	859.44	1.0002	53.718	1.0006	27.730	1.0014	18.692	56
5	1.0000	687.55	1.0002	52.891	1.0007	27.508	1.0014	18.591	55
6	1.0000	572.96	1.0002	52.090	1.0007	27.290	1.0015	18.491	54
7	1.0000	491.11	1.0002	51.313	1.0007	27.075	1.0015	18.393	53
8	1.0000	429.72	1.0002	50.558	1.0007	26.864	1.0015	18.295	52
9	1.0000	381.97	1.0002	49.826	1.0007	26.655	1.0015	18.198	51
10	1.0000	343.77	1.0002	49.114	1.0007	26.450	1.0015	18.103	50
11	1.0000	312.52	1.0002	48.422	1.0007	26.249	1.0015	18.008	49
12	1.0000	286.48	1.0002	47.750	1.0007	26.050	1.0016	17.914	48
13	1.0000	264.44	1.0002	47.096	1.0007	25.854	1.0016	17.821	47
14	1.0000	245.55	1.0002	46.460	1.0008	25.661	1.0016	17.730	46
15	1.0000	229.18	1.0002	45.840	1.0008	25.471	1.0016	17.639	45
16	1.0000	214.86	1.0002	45.237	1.0008	25.284	1.0016	17.549	44
17	1.0000	202.22	1.0002	44.650	1.0008	25.100	1.0016	17.460	43
18	1.0000	190.99	1.0002	44.077	1.0008	24.918	1.0017	17.372	42
19	1.0000	180.73	1.0003	43.520	1.0008	24.739	1.0017	17.285	41
20	1.0000	171.89	1.0003	42.976	1.0008	24.562	1.0017	17.198	40
21	1.0000	163.70	1.0003	42.445	1.0008	24.388	1.0017	17.113	39
22	1.0000	156.26	1.0003	41.928	1.0008	24.216	1.0017	17.028	38
23	1.0000	149.47	1.0003	41.423	1.0009	24.047	1.0017	16.944	37
24	1.0000	143.24	1.0003	40.930	1.0009	23.880	1.0018	16.861	36
25	1.0000	137.51	1.0003	40.448	1.0009	23.716	1.0018	16.779	35
26	1.0000	132.22	1.0003	39.978	1.0009	23.553	1.0018	16.698	34
27	1.0000	127.32	1.0003	39.518	1.0009	23.393	1.0018	16.617	33
28	1.0000	122.78	1.0003	39.069	1.0009	23.235	1.0018	16.538	32
29	1.0000	118.54	1.0003	38.631	1.0009	23.079	1.0018	16.459	31
30	1.0000	114.59	1.0003	38.201	1.0009	22.925	1.0019	16.380	30
31	1.0000	110.90	1.0003	37.782	1.0010	22.774	1.0019	16.303	29
32	1.0000	107.43	1.0003	37.371	1.0010	22.624	1.0019	16.226	28
33	1.0000	104.17	1.0004	36.969	1.0010	22.476	1.0019	16.150	27
34	1.0000	101.11	1.0004	36.576	1.0010	22.330	1.0019	16.075	26
35	1.0000	98.223	1.0004	36.191	1.0010	22.186	1.0019	16.000	25
36	1.0000	95.495	1.0004	35.814	1.0010	22.044	1.0020	15.926	24
37	1.0000	92.914	1.0004	35.445	1.0010	21.904	1.0020	15.853	23
38	1.0001	92.469	1.0004	35.084	1.0010	21.765	1.0020	15.780	22
39	1.0001	88.149	1.0004	34.729	1.0011	21.629	1.0020	15.708	21
40	1.0001	85.946	1.0004	34.382	1.0011	21.494	1.0020	15.637	20
41	1.0001	83.849	1.0004	34.042	1.0011	21.360	1.0021	15.566	19
42	1.0001	81.853	1.0004	33.708	1.0011	21.228	1.0021	15.496	18
43	1.0001	79.950	1.0004	33.381	1.0011	21.098	1.0021	15.427	17
44	1.0001	78.133	1.0004	33.060	1.0011	20.970	1.0021	15.358	16
45	1.0001	76.396	1.0005	32.745	1.0011	20.843	1.0021	15.290	15
46	1.0001	74.736	1.0005	32.437	1.0012	20.717	1.0022	15.222	14
47	1.0001	73.146	1.0005	32.134	1.0012	20.593	1.0022	15.155	13
48	1.0001	71.622	1.0005	31.836	1.0012	20.471	1.0022	15.089	12
49	1.0001	71.160	1.0005	31.544	1.0012	20.350	1.0022	15.023	11
50	1.0001	68.757	1.0005	31.257	1.0012	20.230	1.0022	14.958	10
51	1.0001	67.409	1.0005	30.976	1.0012	20.112	1.0023	14.893	9
52	1.0001	66.113	1.0005	30.699	1.0012	19.995	1.0023	14.829	8
53	1.0001	64.866	1.0005	30.428	1.0013	19.880	1.0023	14.765	7
54	1.0001	63.664	1.0005	30.161	1.0013	19.766	1.0023	14.702	6
55	1.0001	62.507	1.0005	29.899	1.0013	19.653	1.0023	14.640	5
56	1.0001	61.391	1.0006	29.641	1.0013	19.541	1.0024	14.578	4
57	1.0001	61.314	1.0006	29.388	1.0013	19.431	1.0024	14.517	3
58	1.0001	59.274	1.0006	29.139	1.0013	19.322	1.0024	14.456	2
59	1.0001	58.270	1.0006	28.894	1.0013	19.214	1.0024	14.395	1
60	1.0001	57.299	1.0006	28.654	1.0014	19.107	1.0024	14.335	0

Co-sec.    Sec.
Co-sec.    Sec.
Co-sec.    Sec.
Co-sec.    Sec.

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87°

86°

# NATURAL SECANTS AND CO-SECANTS

'	4°		5°		6°		7°		'
	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	
0	1.0024	14.335	1.0038	11.474	1.0055	9.5668	1.0075	8.2055	60
1	1.0025	14.276	1.0038	11.436	1.0055	9.5404	1.0075	8.1861	59
2	1.0025	14.217	1.0039	11.398	1.0056	9.5141	1.0076	8.1668	58
3	1.0025	14.159	1.0039	11.360	1.0056	9.4880	1.0076	8.1476	57
4	1.0025	14.101	1.0039	11.323	1.0056	9.4620	1.0076	8.1285	56
5	1.0025	14.043	1.0039	11.286	1.0057	9.4362	1.0077	8.1094	55
6	1.0026	13.986	1.0040	11.249	1.0057	9.4105	1.0077	8.0905	54
7	1.0026	13.930	1.0040	11.213	1.0057	9.3850	1.0078	8.0717	53
8	1.0026	13.874	1.0040	11.176	1.0057	9.3596	1.0078	8.0529	52
9	1.0026	13.818	1.0040	11.140	1.0058	9.3343	1.0078	8.0342	51
10	1.0026	13.763	1.0041	11.104	1.0058	9.3092	1.0079	8.0156	50
11	1.0027	13.708	1.0041	11.069	1.0058	9.2842	1.0079	7.9971	49
12	1.0027	13.654	1.0041	11.033	1.0059	9.2593	1.0079	7.9787	48
13	1.0027	13.600	1.0041	10.988	1.0059	9.2346	1.0080	7.9604	47
14	1.0027	13.547	1.0042	10.963	1.0059	9.2100	1.0080	7.9421	46
15	1.0027	13.494	1.0042	10.929	1.0060	9.1855	1.0080	7.9240	45
16	1.0028	13.441	1.0042	10.894	1.0060	9.1612	1.0081	7.9059	44
17	1.0028	13.389	1.0043	10.860	1.0060	9.1370	1.0081	7.8879	43
18	1.0028	13.337	1.0043	10.826	1.0061	9.1129	1.0082	7.8700	42
19	1.0028	13.286	1.0043	10.792	1.0061	9.0890	1.0082	7.8522	41
20	1.0029	13.235	1.0043	10.758	1.0061	9.0651	1.0082	7.8344	40
21	1.0029	13.184	1.0044	10.725	1.0062	9.0414	1.0083	7.8168	39
22	1.0029	13.134	1.0044	10.692	1.0062	9.0179	1.0083	7.7992	38
23	1.0029	13.084	1.0044	10.659	1.0062	8.9944	1.0084	7.7817	37
24	1.0029	13.034	1.0044	10.626	1.0063	8.9711	1.0084	7.7642	36
25	1.0030	12.985	1.0045	10.593	1.0063	8.9479	1.0084	7.7469	35
26	1.0030	12.937	1.0045	10.561	1.0063	8.9248	1.0085	7.7296	34
27	1.0030	12.888	1.0045	10.529	1.0064	8.9018	1.0085	7.7124	33
28	1.0030	12.840	1.0046	10.497	1.0064	8.8790	1.0085	7.6953	32
29	1.0031	12.793	1.0046	10.465	1.0064	8.8563	1.0086	7.6783	31
30	1.0031	12.745	1.0046	10.433	1.0065	8.8337	1.0086	7.6613	30
31	1.0031	12.698	1.0046	10.402	1.0065	8.8112	1.0087	7.6444	29
32	1.0031	12.652	1.0047	10.371	1.0065	8.7888	1.0087	7.6276	28
33	1.0032	12.606	1.0047	10.340	1.0066	8.7665	1.0087	7.6108	27
34	1.0032	12.560	1.0047	10.309	1.0066	8.7444	1.0088	7.5942	26
35	1.0032	12.514	1.0048	10.278	1.0066	8.7223	1.0088	7.5776	25
36	1.0032	12.469	1.0048	10.248	1.0067	8.7004	1.0089	7.5611	24
37	1.0032	12.424	1.0048	10.217	1.0067	8.6786	1.0089	7.5446	23
38	1.0033	12.379	1.0048	10.187	1.0067	8.6569	1.0089	7.5282	22
39	1.0033	12.335	1.0049	10.157	1.0068	8.6353	1.0090	7.5119	21
40	1.0033	12.291	1.0049	10.127	1.0068	8.6138	1.0090	7.4957	20
41	1.0033	12.248	1.0049	10.098	1.0068	8.5924	1.0090	7.4795	19
42	1.0034	12.204	1.0050	10.068	1.0069	8.5711	1.0091	7.4634	18
43	1.0034	12.161	1.0050	10.039	1.0069	8.5499	1.0091	7.4474	17
44	1.0034	12.118	1.0050	10.010	1.0069	8.5289	1.0092	7.4315	16
45	1.0034	12.076	1.0050	9.9812	1.0070	8.5079	1.0092	7.4156	15
46	1.0035	12.034	1.0051	9.9525	1.0070	8.4871	1.0092	7.3998	14
47	1.0035	11.992	1.0051	9.9239	1.0070	8.4663	1.0093	7.3840	13
48	1.0035	11.950	1.0051	9.8955	1.0071	8.4457	1.0093	7.3683	12
49	1.0035	11.909	1.0052	9.8672	1.0071	8.4251	1.0094	7.3527	11
50	1.0036	11.868	1.0052	9.8391	1.0071	8.4046	1.0094	7.3372	10
51	1.0036	11.828	1.0052	9.8112	1.0072	8.3843	1.0094	7.3217	9
52	1.0036	11.787	1.0053	9.7834	1.0072	8.3640	1.0095	7.3063	8
53	1.0036	11.747	1.0053	9.7558	1.0073	8.3439	1.0095	7.2909	7
54	1.0037	11.707	1.0053	9.7283	1.0073	8.3238	1.0096	7.2757	6
55	1.0037	11.668	1.0053	9.7010	1.0073	8.3039	1.0096	7.2604	5
56	1.0037	11.628	1.0054	9.6739	1.0074	8.2840	1.0097	7.2453	4
57	1.0037	11.589	1.0054	9.6469	1.0074	8.2642	1.0097	7.2302	3
58	1.0038	11.550	1.0054	9.6200	1.0074	8.2446	1.0097	7.2152	2
59	1.0038	11.512	1.0055	9.5933	1.0075	8.2250	1.0098	7.2002	1
60	1.0038	11.474	1.0055	9.5668	1.0075	8.2055	1.0098	7.1853	0
'	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	'
	85°		84°		83°		82°		

# NATURAL SECANTS AND CO-SECANTS

'	8°		9°		10°		11°		'
	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	
0	1.0098	7.1853	1.0125	6.3924	1.0154	5.7588	1.0178	5.2408	60
1	1.0099	7.1704	1.0125	6.3807	1.0155	5.7493	1.0188	5.2330	59
2	1.0099	7.1557	1.0125	6.3690	1.0155	5.7398	1.0188	5.2252	58
3	1.0099	7.1409	1.0126	6.3574	1.0156	5.7304	1.0189	5.2174	57
4	1.0100	7.1263	1.0126	6.3458	1.0156	5.7210	1.0189	5.2097	56
5	1.0100	7.1117	1.0127	6.3343	1.0157	5.7117	1.0190	5.2019	55
6	1.0101	7.0972	1.0127	6.3228	1.0157	5.7023	1.0191	5.1942	54
7	1.0101	7.0827	1.0128	6.3113	1.0158	5.6930	1.0191	5.1865	53
8	1.0102	7.0683	1.0128	6.2999	1.0158	5.6838	1.0192	5.1788	52
9	1.0102	7.0539	1.0129	6.2885	1.0159	5.6745	1.0192	5.1712	51
10	1.0102	7.0396	1.0129	6.2772	1.0159	5.6653	1.0193	5.1635	50
11	1.0103	7.0254	1.0130	6.2659	1.0160	5.6561	1.0193	5.1560	49
12	1.0103	7.0112	1.0130	6.2546	1.0160	5.6470	1.0194	5.1484	48
13	1.0104	6.9971	1.0131	6.2434	1.0161	5.6379	1.0195	5.1409	47
14	1.0104	6.9830	1.0131	6.2322	1.0162	5.6288	1.0195	5.1333	46
15	1.0104	6.9690	1.0132	6.2211	1.0162	5.6197	1.0196	5.1258	45
16	1.0105	6.9550	1.0132	6.2100	1.0163	5.6107	1.0196	5.1183	44
17	1.0105	6.9411	1.0133	6.1990	1.0163	5.6017	1.0197	5.1109	43
18	1.0106	6.9273	1.0133	6.1880	1.0164	5.5928	1.0198	5.1034	42
19	1.0106	6.9135	1.0134	6.1770	1.0164	5.5838	1.0198	5.0960	41
20	1.0107	6.8998	1.0134	6.1661	1.0165	5.5749	1.0199	5.0886	40
21	1.0107	6.8861	1.0135	6.1552	1.0165	5.5660	1.0199	5.0812	39
22	1.0107	6.8725	1.0135	6.1443	1.0166	5.5572	1.0200	5.0739	38
23	1.0108	6.8589	1.0136	6.1335	1.0166	5.5484	1.0201	5.0666	37
24	1.0108	6.8454	1.0136	6.1227	1.0167	5.5396	1.0201	5.0593	36
25	1.0109	6.8320	1.0136	6.1120	1.0167	5.5308	1.0202	5.0520	35
26	1.0109	6.8185	1.0137	6.1013	1.0168	5.5221	1.0202	5.0447	34
27	1.0110	6.8052	1.0137	6.0906	1.0169	5.5134	1.0203	5.0375	33
28	1.0110	6.7919	1.0138	6.0800	1.0169	5.5047	1.0204	5.0302	32
29	1.0111	6.7787	1.0138	6.0694	1.0170	5.4960	1.0204	5.0230	31
30	1.0111	6.7655	1.0139	6.0588	1.0170	5.4874	1.0205	5.0158	30
31	1.0111	6.7523	1.0139	6.0483	1.0171	5.4788	1.0205	5.0087	29
32	1.0112	6.7392	1.0140	6.0379	1.0171	5.4702	1.0206	5.0015	28
33	1.0112	6.7262	1.0140	6.0274	1.0172	5.4617	1.0207	4.9944	27
34	1.0113	6.7132	1.0141	6.0170	1.0172	5.4532	1.0207	4.9873	26
35	1.0113	6.7003	1.0141	6.0066	1.0173	5.4447	1.0208	4.9802	25
36	1.0114	6.6874	1.0142	5.9963	1.0174	5.4362	1.0208	4.9732	24
37	1.0114	6.6745	1.0142	5.9860	1.0174	5.4278	1.0209	4.9661	23
38	1.0115	6.6617	1.0143	5.9758	1.0175	5.4194	1.0210	4.9591	22
39	1.0115	6.6490	1.0143	5.9655	1.0175	5.4110	1.0210	4.9521	21
40	1.0115	6.6363	1.0144	5.9554	1.0176	5.4026	1.0211	4.9452	20
41	1.0116	6.6237	1.0144	5.9452	1.0176	5.3943	1.0211	4.9382	19
42	1.0116	6.6111	1.0145	5.9351	1.0177	5.3860	1.0212	4.9313	18
43	1.0117	6.5985	1.0145	5.9250	1.0177	5.3777	1.0213	4.9244	17
44	1.0117	6.5860	1.0146	5.9150	1.0178	5.3695	1.0213	4.9175	16
45	1.0118	6.5736	1.0146	5.9049	1.0179	5.3612	1.0214	4.9106	15
46	1.0118	6.5612	1.0147	5.8950	1.0179	5.3530	1.0215	4.9037	14
47	1.0119	6.5488	1.0147	5.8850	1.0180	5.3449	1.0215	4.8969	13
48	1.0119	6.5365	1.0148	5.8751	1.0180	5.3367	1.0216	4.8901	12
49	1.0119	6.5243	1.0148	5.8652	1.0181	5.3286	1.0216	4.8833	11
50	1.0120	6.5121	1.0149	5.8554	1.0181	5.3205	1.0217	4.8765	10
51	1.0120	6.4999	1.0150	5.8456	1.0182	5.3124	1.0218	4.8697	9
52	1.0121	6.4878	1.0150	5.8358	1.0182	5.3044	1.0218	4.8630	8
53	1.0121	6.4757	1.0151	5.8261	1.0183	5.2963	1.0219	4.8563	7
54	1.0122	6.4637	1.0151	5.8163	1.0184	5.2883	1.0220	4.8496	6
55	1.0122	6.4517	1.0152	5.8067	1.0184	5.2803	1.0220	4.8429	5
56	1.0123	6.4398	1.0152	5.7970	1.0185	5.2724	1.0221	4.8362	4
57	1.0123	6.4279	1.0153	5.7874	1.0185	5.2645	1.0221	4.8296	3
58	1.0124	6.4160	1.0153	5.7778	1.0186	5.2566	1.0222	4.8229	2
59	1.0124	6.4042	1.0154	5.7683	1.0186	5.2487	1.0223	4.8163	1
60	1.0125	6.3924	1.0154	5.7588	1.0187	5.2408	1.0223	4.8097	0
/	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	/
	81°		80°		79°		78°		

# NATURAL SECANTS AND CO-SECANTS

'	12°		13°		14°		15°		'
	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	
0	1.0223	4.8097	1.0263	4.4454	1.0306	4.1336	1.0353	3.8637	60
1	1.0224	4.8032	1.0264	4.4398	1.0307	4.1287	1.0353	3.8595	59
2	1.0225	4.7966	1.0264	4.4342	1.0308	4.1239	1.0354	3.8553	58
3	1.0225	4.7901	1.0265	4.4287	1.0308	4.1191	1.0355	3.8512	57
4	1.0226	4.7835	1.0266	4.4231	1.0309	4.1144	1.0356	3.8470	56
5	1.0226	4.7770	1.0266	4.4176	1.0310	4.1096	1.0357	3.8428	55
6	1.0227	4.7706	1.0267	4.4121	1.0311	4.1048	1.0358	3.8387	54
7	1.0228	4.7641	1.0268	4.4065	1.0311	4.1001	1.0358	3.8346	53
8	1.0228	4.7576	1.0268	4.4011	1.0312	4.0953	1.0359	3.8304	52
9	1.0229	4.7512	1.0269	4.3956	1.0313	4.0906	1.0360	3.8263	51
10	1.0230	4.7448	1.0270	4.3910	1.0314	4.0859	1.0361	3.8222	50
11	1.0230	4.7384	1.0271	4.3847	1.0314	4.0812	1.0362	3.8181	49
12	1.0231	4.7320	1.0271	4.3792	1.0315	4.0765	1.0362	3.8140	48
13	1.0232	4.7257	1.0272	4.3738	1.0316	4.0718	1.0363	3.8100	47
14	1.0232	4.7193	1.0273	4.3684	1.0317	4.0672	1.0364	3.8059	46
15	1.0233	4.7130	1.0273	4.3630	1.0317	4.0625	1.0365	3.8018	45
16	1.0234	4.7067	1.0274	4.3576	1.0318	4.0579	1.0366	3.7978	44
17	1.0234	4.7004	1.0275	4.3522	1.0319	4.0532	1.0367	3.7937	43
18	1.0235	4.6942	1.0276	4.3469	1.0320	4.0486	1.0367	3.7897	42
19	1.0235	4.6879	1.0276	4.3415	1.0320	4.0440	1.0368	3.7857	41
20	1.0236	4.6817	1.0277	4.3362	1.0321	4.0394	1.0369	3.7816	40
21	1.0237	4.6754	1.0278	4.3309	1.0322	4.0348	1.0370	3.7776	39
22	1.0237	4.6692	1.0278	4.3256	1.0323	4.0302	1.0371	3.7736	38
23	1.0238	4.6631	1.0279	4.3203	1.0323	4.0256	1.0371	3.7697	37
24	1.0239	4.6569	1.0280	4.3150	1.0324	4.0211	1.0372	3.7657	36
25	1.0239	4.6507	1.0280	4.3098	1.0325	4.0165	1.0373	3.7617	35
26	1.0240	4.6446	1.0281	4.3045	1.0326	4.0120	1.0374	3.7577	34
27	1.0241	4.6385	1.0282	4.2993	1.0327	4.0074	1.0375	3.7538	33
28	1.0241	4.6324	1.0283	4.2941	1.0327	4.0029	1.0376	3.7498	32
29	1.0242	4.6263	1.0283	4.2888	1.0328	3.9984	1.0376	3.7459	31
30	1.0243	4.6202	1.0284	4.2836	1.0329	3.9939	1.0377	3.7420	30
31	1.0243	4.6142	1.0285	4.2785	1.0330	3.9894	1.0378	3.7380	29
32	1.0244	4.6081	1.0285	4.2733	1.0330	3.9850	1.0379	3.7341	28
33	1.0245	4.6021	1.0286	4.2681	1.0331	3.9805	1.0380	3.7302	27
34	1.0245	4.5961	1.0287	4.2630	1.0332	3.9760	1.0381	3.7263	26
35	1.0246	4.5901	1.0288	4.2579	1.0333	3.9716	1.0382	3.7224	25
36	1.0247	4.5841	1.0288	4.2527	1.0334	3.9672	1.0382	3.7186	24
37	1.0247	4.5782	1.0289	4.2476	1.0334	3.9627	1.0383	3.7147	23
38	1.0248	4.5722	1.0290	4.2425	1.0335	3.9583	1.0384	3.7108	22
39	1.0249	4.5663	1.0291	4.2375	1.0336	3.9539	1.0385	3.7070	21
40	1.0249	4.5604	1.0291	4.2324	1.0337	3.9495	1.0386	3.7031	20
41	1.0250	4.5545	1.0292	4.2273	1.0338	3.9451	1.0387	3.6993	19
42	1.0251	4.5486	1.0293	4.2223	1.0338	3.9408	1.0387	3.6955	18
43	1.0251	4.5428	1.0293	4.2173	1.0339	3.9364	1.0388	3.6917	17
44	1.0252	4.5369	1.0294	4.2122	1.0340	3.9320	1.0389	3.6878	16
45	1.0253	4.5311	1.0295	4.2072	1.0341	3.9277	1.0390	3.6840	15
46	1.0253	4.5253	1.0296	4.2022	1.0341	3.9234	1.0391	3.6802	14
47	1.0254	4.5195	1.0296	4.1972	1.0342	3.9191	1.0392	3.6765	13
48	1.0255	4.5137	1.0297	4.1923	1.0343	3.9147	1.0393	3.6727	12
49	1.0255	4.5079	1.0298	4.1873	1.0344	3.9104	1.0393	3.6689	11
50	1.0256	4.5021	1.0299	4.1824	1.0345	3.9061	1.0394	3.6651	10
51	1.0257	4.4964	1.0299	4.1774	1.0345	3.9018	1.0395	3.6614	9
52	1.0257	4.4907	1.0300	4.1725	1.0346	3.8976	1.0396	3.6576	8
53	1.0258	4.4850	1.0301	4.1676	1.0347	3.8933	1.0397	3.6539	7
54	1.0259	4.4793	1.0302	4.1627	1.0348	3.8890	1.0398	3.6502	6
55	1.0260	4.4736	1.0302	4.1578	1.0349	3.8848	1.0399	3.6464	5
56	1.0260	4.4679	1.0303	4.1529	1.0349	3.8805	1.0399	3.6427	4
57	1.0261	4.4623	1.0304	4.1481	1.0350	3.8763	1.0400	3.6390	3
58	1.0262	4.4566	1.0305	4.1432	1.0351	3.8721	1.0401	3.6353	2
59	1.0262	4.4510	1.0305	4.1384	1.0352	3.8679	1.0402	3.6316	1
60	1.0263	4.4454	1.0306	4.1336	1.0353	3.8637	1.0403	3.6279	0
'	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	'
	77°		76°		75°		74°		

# NATURAL SECANTS AND CO-SECANTS

'	16°		17°		18°		19°		'
	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	
0	1.0403	3.6279	1.0457	3.4203	1.0515	3.2361	1.0576	3.0715	60
1	1.0404	3.6243	1.0458	3.4170	1.0516	3.2332	1.0577	3.0690	59
2	1.0405	3.6206	1.0459	3.4138	1.0517	3.2303	1.0578	3.0664	58
3	1.0406	3.6169	1.0460	3.4106	1.0518	3.2274	1.0579	3.0638	57
4	1.0406	3.6133	1.0461	3.4073	1.0519	3.2245	1.0580	3.0612	56
5	1.0407	3.6096	1.0461	3.4041	1.0520	3.2216	1.0581	3.0586	55
6	1.0408	3.6060	1.0462	3.4009	1.0521	3.2188	1.0582	3.0561	54
7	1.0409	3.6024	1.0463	3.3977	1.0522	3.2159	1.0584	3.0535	53
8	1.0410	3.5987	1.0464	3.3945	1.0523	3.2131	1.0585	3.0509	52
9	1.0411	3.5951	1.0465	3.3913	1.0524	3.2102	1.0586	3.0484	51
10	1.0412	3.5915	1.0466	3.3881	1.0525	3.2074	1.0587	3.0458	50
11	1.0413	3.5879	1.0467	3.3849	1.0526	3.2045	1.0588	3.0433	49
12	1.0413	3.5843	1.0468	3.3817	1.0527	3.2017	1.0589	3.0407	48
13	1.0414	3.5807	1.0469	3.3785	1.0528	3.1989	1.0590	3.0382	47
14	1.0415	3.5772	1.0470	3.3754	1.0529	3.1960	1.0591	3.0357	46
15	1.0416	3.5736	1.0471	3.3722	1.0530	3.1932	1.0592	3.0331	45
16	1.0417	3.5700	1.0472	3.3690	1.0531	3.1904	1.0593	3.0306	44
17	1.0418	3.5665	1.0473	3.3659	1.0532	3.1876	1.0594	3.0281	43
18	1.0419	3.5629	1.0474	3.3627	1.0533	3.1848	1.0595	3.0256	42
19	1.0420	3.5594	1.0475	3.3596	1.0534	3.1820	1.0596	3.0231	41
20	1.0420	3.5559	1.0476	3.3565	1.0535	3.1792	1.0598	3.0206	40
21	1.0421	3.5523	1.0477	3.3534	1.0536	3.1764	1.0599	3.0181	39
22	1.0422	3.5488	1.0478	3.3502	1.0537	3.1736	1.0600	3.0156	38
23	1.0423	3.5453	1.0478	3.3471	1.0538	3.1708	1.0601	3.0131	37
24	1.0424	3.5418	1.0479	3.3440	1.0539	3.1681	1.0602	3.0106	36
25	1.0425	3.5383	1.0480	3.3409	1.0540	3.1653	1.0603	3.0081	35
26	1.0426	3.5348	1.0481	3.3378	1.0541	3.1625	1.0604	3.0056	34
27	1.0427	3.5313	1.0482	3.3347	1.0542	3.1598	1.0605	3.0031	33
28	1.0428	3.5279	1.0483	3.3316	1.0543	3.1570	1.0606	3.0007	32
29	1.0428	3.5244	1.0484	3.3286	1.0544	3.1543	1.0607	2.9982	31
30	1.0429	3.5209	1.0485	3.3255	1.0545	3.1515	1.0608	2.9957	30
31	1.0430	3.5175	1.0486	3.3224	1.0546	3.1488	1.0609	2.9933	29
32	1.0431	3.5140	1.0487	3.3194	1.0547	3.1461	1.0611	2.9908	28
33	1.0432	3.5106	1.0488	3.3163	1.0548	3.1433	1.0612	2.9884	27
34	1.0433	3.5072	1.0489	3.3133	1.0549	3.1406	1.0613	2.9859	26
35	1.0434	3.5037	1.0490	3.3102	1.0550	3.1379	1.0614	2.9835	25
36	1.0435	3.5003	1.0491	3.3072	1.0551	3.1352	1.0615	2.9810	24
37	1.0436	3.4969	1.0492	3.3042	1.0552	3.1325	1.0616	2.9786	23
38	1.0437	3.4935	1.0493	3.3011	1.0553	3.1298	1.0617	2.9762	22
39	1.0438	3.4901	1.0494	3.2981	1.0554	3.1271	1.0618	2.9738	21
40	1.0438	3.4867	1.0495	3.2951	1.0555	3.1244	1.0619	2.9713	20
41	1.0439	3.4833	1.0496	3.2921	1.0556	3.1217	1.0620	2.9689	19
42	1.0440	3.4799	1.0497	3.2891	1.0557	3.1190	1.0622	2.9665	18
43	1.0441	3.4766	1.0498	3.2861	1.0558	3.1163	1.0623	2.9641	17
44	1.0442	3.4732	1.0499	3.2831	1.0559	3.1137	1.0624	2.9617	16
45	1.0443	3.4698	1.0500	3.2801	1.0560	3.1110	1.0625	2.9593	15
46	1.0444	3.4665	1.0501	3.2772	1.0561	3.1083	1.0626	2.9569	14
47	1.0445	3.4632	1.0502	3.2742	1.0562	3.1057	1.0627	2.9545	13
48	1.0446	3.4598	1.0503	3.2712	1.0563	3.1030	1.0628	2.9521	12
49	1.0447	3.4565	1.0504	3.2683	1.0565	3.1004	1.0629	2.9497	11
50	1.0448	3.4532	1.0505	3.2653	1.0566	3.0977	1.0630	2.9474	10
51	1.0448	3.4498	1.0506	3.2624	1.0567	3.0951	1.0632	2.9450	9
52	1.0449	3.4465	1.0507	3.2594	1.0568	3.0925	1.0633	2.9426	8
53	1.0450	3.4432	1.0508	3.2565	1.0569	3.0898	1.0634	2.9402	7
54	1.0451	3.4399	1.0509	3.2535	1.0570	3.0872	1.0635	2.9379	6
55	1.0452	3.4366	1.0510	3.2506	1.0571	3.0846	1.0636	2.9355	5
56	1.0453	3.4334	1.0511	3.2477	1.0572	3.0820	1.0637	2.9332	4
57	1.0454	3.4301	1.0512	3.2448	1.0573	3.0793	1.0638	2.9308	3
58	1.0455	3.4268	1.0513	3.2419	1.0574	3.0767	1.0639	2.9285	2
59	1.0456	3.4236	1.0514	3.2390	1.0575	3.0741	1.0641	2.9261	1
60	1.0457	3.4203	1.0515	3.2361	1.0576	3.0715	1.0642	2.9238	0
/	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	/
	73°		72°		71°		70°		

# NATURAL SECANTS AND CO-SECANTS

'	20°		21°		22°		23°		'
	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	
0	1.0642	2.9238	1.0711	2.7904	1.0785	2.6695	1.0864	2.5593	60
1	1.0643	2.9215	1.0713	2.7883	1.0787	2.6675	1.0865	2.5575	59
2	1.0644	2.9191	1.0714	2.7862	1.0788	2.6656	1.0866	2.5558	58
3	1.0645	2.9168	1.0715	2.7841	1.0789	2.6637	1.0868	2.5540	57
4	1.0646	2.9145	1.0716	2.7820	1.0790	2.6618	1.0869	2.5523	56
5	1.0647	2.9122	1.0717	2.7799	1.0792	2.6599	1.0870	2.5506	55
6	1.0648	2.9098	1.0719	2.7778	1.0793	2.6580	1.0872	2.5488	54
7	1.0650	2.9075	1.0720	2.7757	1.0794	2.6561	1.0873	2.5471	53
8	1.0651	2.9052	1.0721	2.7736	1.0795	2.6542	1.0874	2.5453	52
9	1.0652	2.9029	1.0722	2.7715	1.0797	2.6523	1.0876	2.5436	51
10	1.0653	2.9006	1.0723	2.7694	1.0798	2.6504	1.0877	2.5419	50
11	1.0654	2.8983	1.0725	2.7674	1.0799	2.6485	1.0878	2.5402	49
12	1.0655	2.8960	1.0726	2.7653	1.0801	2.6466	1.0880	2.5384	48
13	1.0656	2.8937	1.0727	2.7632	1.0802	2.6447	1.0881	2.5367	47
14	1.0658	2.8915	1.0728	2.7611	1.0803	2.6428	1.0882	2.5350	46
15	1.0659	2.8892	1.0729	2.7591	1.0804	2.6410	1.0884	2.5333	45
16	1.0660	2.8869	1.0731	2.7570	1.0806	2.6391	1.0885	2.5316	44
17	1.0661	2.8846	1.0732	2.7550	1.0807	2.6372	1.0886	2.5299	43
18	1.0662	2.8824	1.0733	2.7529	1.0808	2.6353	1.0888	2.5281	42
19	1.0663	2.8801	1.0734	2.7509	1.0810	2.6335	1.0889	2.5264	41
20	1.0664	2.8778	1.0736	2.7488	1.0811	2.6316	1.0891	2.5247	40
21	1.0666	2.8756	1.0737	2.7468	1.0812	2.6297	1.0892	2.5230	39
22	1.0667	2.8733	1.0738	2.7447	1.0813	2.6279	1.0893	2.5213	38
23	1.0668	2.8711	1.0739	2.7427	1.0815	2.6260	1.0895	2.5196	37
24	1.0669	2.8688	1.0740	2.7406	1.0816	2.6242	1.0896	2.5179	36
25	1.0670	2.8666	1.0742	2.7386	1.0817	2.6223	1.0897	2.5163	35
26	1.0671	2.8644	1.0743	2.7366	1.0819	2.6205	1.0899	2.5146	34
27	1.0673	2.8621	1.0744	2.7346	1.0820	2.6186	1.0900	2.5129	33
28	1.0674	2.8599	1.0745	2.7325	1.0821	2.6168	1.0902	2.5112	32
29	1.0675	2.8577	1.0747	2.7305	1.0823	2.6150	1.0903	2.5095	31
30	1.0676	2.8554	1.0748	2.7285	1.0824	2.6131	1.0904	2.5078	30
31	1.0677	2.8532	1.0749	2.7265	1.0825	2.6113	1.0906	2.5062	29
32	1.0678	2.8510	1.0750	2.7245	1.0826	2.6095	1.0907	2.5045	28
33	1.0679	2.8488	1.0751	2.7225	1.0828	2.6076	1.0908	2.5028	27
34	1.0681	2.8466	1.0753	2.7205	1.0829	2.6058	1.0910	2.5011	26
35	1.0682	2.8444	1.0754	2.7185	1.0830	2.6040	1.0911	2.4995	25
36	1.0683	2.8422	1.0755	2.7165	1.0832	2.6022	1.0913	2.4978	24
37	1.0684	2.8400	1.0756	2.7145	1.0833	2.6003	1.0914	2.4961	23
38	1.0685	2.8378	1.0758	2.7125	1.0834	2.5985	1.0915	2.4945	22
39	1.0686	2.8356	1.0759	2.7105	1.0836	2.5967	1.0917	2.4928	21
40	1.0688	2.8334	1.0760	2.7085	1.0837	2.5949	1.0918	2.4912	20
41	1.0689	2.8312	1.0761	2.7065	1.0838	2.5931	1.0920	2.4895	19
42	1.0690	2.8290	1.0763	2.7045	1.0840	2.5913	1.0921	2.4879	18
43	1.0691	2.8269	1.0764	2.7026	1.0841	2.5895	1.0922	2.4862	17
44	1.0692	2.8247	1.0765	2.7006	1.0842	2.5877	1.0924	2.4846	16
45	1.0694	2.8225	1.0766	2.6986	1.0844	2.5859	1.0925	2.4829	15
46	1.0695	2.8204	1.0768	2.6967	1.0845	2.5841	1.0927	2.4813	14
47	1.0696	2.8182	1.0769	2.6947	1.0846	2.5823	1.0928	2.4797	13
48	1.0697	2.8160	1.0770	2.6927	1.0847	2.5805	1.0929	2.4780	12
49	1.0698	2.8139	1.0771	2.6908	1.0849	2.5787	1.0931	2.4764	11
50	1.0699	2.8117	1.0773	2.6888	1.0850	2.5770	1.0932	2.4748	10
51	1.0701	2.8096	1.0774	2.6869	1.0851	2.5752	1.0934	2.4731	9
52	1.0702	2.8074	1.0775	2.6849	1.0853	2.5734	1.0935	2.4715	8
53	1.0703	2.8053	1.0776	2.6830	1.0854	2.5716	1.0936	2.4699	7
54	1.0704	2.8032	1.0778	2.6810	1.0855	2.5699	1.0938	2.4683	6
55	1.0705	2.8010	1.0779	2.6791	1.0857	2.5681	1.0939	2.4666	5
56	1.0707	2.7989	1.0780	2.6772	1.0858	2.5663	1.0941	2.4650	4
57	1.0708	2.7968	1.0781	2.6752	1.0859	2.5646	1.0942	2.4634	3
58	1.0709	2.7947	1.0783	2.6733	1.0861	2.5628	1.0943	2.4618	2
59	1.0710	2.7925	1.0784	2.6714	1.0862	2.5610	1.0945	2.4602	1
60	1.0711	2.7904	1.0785	2.6695	1.0864	2.5593	1.0946	2.4586	0
'	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	'
	69°		68°		67°		66°		

# NATURAL SECANTS AND CO-SECANTS

/	24°		25°		26°		27°		/
	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	
0	1.0946	2.4586	1.1034	2.3662	1.1126	2.2812	1.1223	2.2027	60
1	1.0948	2.4570	1.1035	2.3647	1.1127	2.2798	1.1225	2.2014	59
2	1.0949	2.4554	1.1037	2.3632	1.1129	2.2784	1.1226	2.2002	58
3	1.0951	2.4538	1.1038	2.3618	1.1131	2.2771	1.1228	2.1989	57
4	1.0952	2.4522	1.1040	2.3603	1.1132	2.2757	1.1230	2.1977	56
5	1.0953	2.4506	1.1041	2.3588	1.1134	2.2744	1.1231	2.1964	55
6	1.0955	2.4490	1.1043	2.3574	1.1135	2.2730	1.1233	2.1952	54
7	1.0956	2.4474	1.1044	2.3559	1.1137	2.2717	1.1235	2.1939	53
8	1.0958	2.4458	1.1046	2.3544	1.1139	2.2703	1.1237	2.1927	52
9	1.0959	2.4442	1.1047	2.3530	1.1140	2.2690	1.1238	2.1914	51
10	1.0961	2.4426	1.1049	2.3515	1.1142	2.2676	1.1240	2.1902	50
11	1.0962	2.4411	1.1050	2.3501	1.1143	2.2663	1.1242	2.1889	49
12	1.0963	2.4395	1.1052	2.3486	1.1145	2.2650	1.1243	2.1877	48
13	1.0965	2.4379	1.1053	2.3472	1.1147	2.2636	1.1245	2.1865	47
14	1.0966	2.4363	1.1055	2.3457	1.1148	2.2623	1.1247	2.1852	46
15	1.0968	2.4347	1.1056	2.3443	1.1150	2.2610	1.1248	2.1840	45
16	1.0969	2.4332	1.1058	2.3428	1.1151	2.2596	1.1250	2.1828	44
17	1.0971	2.4316	1.1059	2.3414	1.1153	2.2583	1.1252	2.1815	43
18	1.0972	2.4300	1.1061	2.3399	1.1155	2.2570	1.1253	2.1803	42
19	1.0973	2.4285	1.1062	2.3385	1.1156	2.2556	1.1255	2.1791	41
20	1.0975	2.4269	1.1064	2.3371	1.1158	2.2543	1.1257	2.1778	40
21	1.0976	2.4254	1.1065	2.3356	1.1159	2.2530	1.1258	2.1766	39
22	1.0978	2.4238	1.1067	2.3342	1.1161	2.2517	1.1260	2.1754	38
23	1.0979	2.4222	1.1068	2.3328	1.1163	2.2503	1.1262	2.1742	37
24	1.0981	2.4207	1.1070	2.3313	1.1164	2.2490	1.1264	2.1730	36
25	1.0982	2.4191	1.1072	2.3299	1.1166	2.2477	1.1265	2.1717	35
26	1.0984	2.4176	1.1073	2.3285	1.1167	2.2464	1.1267	2.1705	34
27	1.0985	2.4160	1.1075	2.3271	1.1169	2.2451	1.1269	2.1693	33
28	1.0986	2.4145	1.1076	2.3256	1.1171	2.2438	1.1270	2.1681	32
29	1.0988	2.4130	1.1078	2.3242	1.1172	2.2425	1.1272	2.1669	31
30	1.0989	2.4114	1.1079	2.3228	1.1174	2.2411	1.1274	2.1657	30
31	1.0991	2.4099	1.1081	2.3214	1.1176	2.2398	1.1275	2.1645	29
32	1.0992	2.4083	1.1082	2.3200	1.1177	2.2385	1.1277	2.1633	28
33	1.0994	2.4068	1.1084	2.3186	1.1179	2.2372	1.1279	2.1620	27
34	1.0995	2.4053	1.1085	2.3172	1.1180	2.2359	1.1281	2.1608	26
35	1.0997	2.4037	1.1087	2.3158	1.1182	2.2346	1.1282	2.1596	25
36	1.0998	2.4022	1.1088	2.3143	1.1184	2.2333	1.1284	2.1584	24
37	1.1000	2.4007	1.1090	2.3129	1.1185	2.2320	1.1286	2.1572	23
38	1.1001	2.3992	1.1092	2.3115	1.1187	2.2307	1.1287	2.1560	22
39	1.1003	2.3976	1.1093	2.3101	1.1189	2.2294	1.1289	2.1548	21
40	1.1004	2.3961	1.1095	2.3087	1.1190	2.2282	1.1291	2.1536	20
41	1.1005	2.3946	1.1096	2.3073	1.1192	2.2269	1.1293	2.1525	19
42	1.1007	2.3931	1.1098	2.3059	1.1193	2.2256	1.1294	2.1513	18
43	1.1008	2.3916	1.1099	2.3046	1.1195	2.2243	1.1296	2.1501	17
44	1.1010	2.3901	1.1101	2.3032	1.1197	2.2230	1.1298	2.1489	16
45	1.1011	2.3886	1.1102	2.3018	1.1198	2.2217	1.1299	2.1477	15
46	1.1013	2.3871	1.1104	2.3004	1.1200	2.2204	1.1301	2.1465	14
47	1.1014	2.3856	1.1106	2.2990	1.1202	2.2192	1.1303	2.1453	13
48	1.1016	2.3841	1.1107	2.2976	1.1203	2.2179	1.1305	2.1441	12
49	1.1017	2.3826	1.1109	2.2962	1.1205	2.2166	1.1306	2.1430	11
50	1.1019	2.3811	1.1110	2.2949	1.1207	2.2153	1.1308	2.1418	10
51	1.1020	2.3796	1.1112	2.2935	1.1208	2.2141	1.1310	2.1406	9
52	1.1022	2.3781	1.1113	2.2921	1.1210	2.2128	1.1312	2.1394	8
53	1.1023	2.3766	1.1115	2.2907	1.1212	2.2115	1.1313	2.1382	7
54	1.1025	2.3751	1.1116	2.2894	1.1213	2.2103	1.1315	2.1371	6
55	1.1026	2.3736	1.1118	2.2880	1.1215	2.2090	1.1317	2.1359	5
56	1.1028	2.3721	1.1120	2.2866	1.1217	2.2077	1.1319	2.1347	4
57	1.1029	2.3706	1.1121	2.2853	1.1218	2.2065	1.1320	2.1335	3
58	1.1031	2.3691	1.1123	2.2839	1.1220	2.2052	1.1322	2.1324	2
59	1.1032	2.3677	1.1124	2.2825	1.1222	2.2039	1.1324	2.1312	1
60	1.1034	2.3662	1.1126	2.2812	1.1223	2.2027	1.1326	2.1300	0
7	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	7

65°

64°

63°

62°

# NATURAL SECANTS AND CO-SECANTS

'	28°		29°		30°		31°		'
	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	
0	1.1326	2.1300	1.1433	2.0627	1.1547	2.0000	1.1666	1.9416	60
1	1.1327	2.1289	1.1435	2.0616	1.1549	1.9990	1.1668	1.9407	59
2	1.1329	2.1277	1.1437	2.0605	1.1551	1.9980	1.1670	1.9397	58
3	1.1331	2.1266	1.1439	2.0594	1.1553	1.9970	1.1672	1.9388	57
4	1.1333	2.1254	1.1441	2.0583	1.1555	1.9960	1.1674	1.9378	56
5	1.1334	2.1242	1.1443	2.0573	1.1557	1.9950	1.1676	1.9369	55
6	1.1336	2.1231	1.1445	2.0562	1.1559	1.9940	1.1678	1.9360	54
7	1.1338	2.1219	1.1446	2.0551	1.1561	1.9930	1.1681	1.9350	53
8	1.1340	2.1208	1.1448	2.0540	1.1562	1.9920	1.1683	1.9341	52
9	1.1341	2.1196	1.1450	2.0530	1.1564	1.9910	1.1685	1.9332	51
10	1.1343	2.1185	1.1452	2.0519	1.1566	1.9900	1.1687	1.9322	50
11	1.1345	2.1173	1.1454	2.0508	1.1568	1.9890	1.1689	1.9313	49
12	1.1347	2.1162	1.1456	2.0498	1.1570	1.9880	1.1691	1.9304	48
13	1.1349	2.1150	1.1458	2.0487	1.1572	1.9870	1.1693	1.9295	47
14	1.1350	2.1139	1.1459	2.0476	1.1574	1.9860	1.1695	1.9285	46
15	1.1352	2.1127	1.1461	2.0466	1.1576	1.9850	1.1697	1.9276	45
16	1.1354	2.1116	1.1463	2.0455	1.1578	1.9840	1.1699	1.9267	44
17	1.1356	2.1104	1.1465	2.0444	1.1580	1.9830	1.1701	1.9258	43
18	1.1357	2.1093	1.1467	2.0434	1.1582	1.9820	1.1703	1.9248	42
19	1.1359	2.1082	1.1469	2.0423	1.1584	1.9811	1.1705	1.9239	41
20	1.1361	2.1070	1.1471	2.0413	1.1586	1.9801	1.1707	1.9230	40
21	1.1363	2.1059	1.1473	2.0402	1.1588	1.9791	1.1709	1.9221	39
22	1.1365	2.1048	1.1474	2.0392	1.1590	1.9781	1.1712	1.9212	38
23	1.1366	2.1036	1.1476	2.0381	1.1592	1.9771	1.1714	1.9203	37
24	1.1368	2.1025	1.1478	2.0370	1.1594	1.9761	1.1716	1.9193	36
25	1.1370	2.1014	1.1480	2.0360	1.1596	1.9752	1.1718	1.9184	35
26	1.1372	2.1002	1.1482	2.0349	1.1598	1.9742	1.1720	1.9175	34
27	1.1373	2.0991	1.1484	2.0339	1.1600	1.9732	1.1722	1.9166	33
28	1.1375	2.0980	1.1486	2.0329	1.1602	1.9722	1.1724	1.9157	32
29	1.1377	2.0969	1.1488	2.0318	1.1604	1.9713	1.1726	1.9148	31
30	1.1379	2.0957	1.1489	2.0308	1.1606	1.9703	1.1728	1.9139	30
31	1.1381	2.0946	1.1491	2.0297	1.1608	1.9693	1.1730	1.9130	29
32	1.1382	2.0935	1.1493	2.0287	1.1610	1.9683	1.1732	1.9121	28
33	1.1384	2.0924	1.1495	2.0276	1.1612	1.9674	1.1734	1.9112	27
34	1.1386	2.0912	1.1497	2.0266	1.1614	1.9664	1.1737	1.9102	26
35	1.1388	2.0901	1.1499	2.0256	1.1616	1.9654	1.1739	1.9093	25
36	1.1390	2.0890	1.1501	2.0245	1.1618	1.9645	1.1741	1.9084	24
37	1.1391	2.0879	1.1503	2.0235	1.1620	1.9635	1.1743	1.9075	23
38	1.1393	2.0868	1.1505	2.0224	1.1622	1.9625	1.1745	1.9066	22
39	1.1395	2.0857	1.1507	2.0214	1.1624	1.9616	1.1747	1.9057	21
40	1.1397	2.0846	1.1508	2.0204	1.1626	1.9606	1.1749	1.9048	20
41	1.1399	2.0835	1.1510	2.0194	1.1628	1.9596	1.1751	1.9039	19
42	1.1401	2.0824	1.1512	2.0183	1.1630	1.9587	1.1753	1.9030	18
43	1.1402	2.0812	1.1514	2.0173	1.1632	1.9577	1.1756	1.9021	17
44	1.1404	2.0801	1.1516	2.0163	1.1634	1.9568	1.1758	1.9013	16
45	1.1406	2.0790	1.1518	2.0152	1.1636	1.9558	1.1760	1.9004	15
46	1.1408	2.0779	1.1520	2.0142	1.1638	1.9549	1.1762	1.8995	14
47	1.1410	2.0768	1.1522	2.0132	1.1640	1.9539	1.1764	1.8986	13
48	1.1411	2.0757	1.1524	2.0122	1.1642	1.9530	1.1766	1.8977	12
49	1.1413	2.0746	1.1526	2.0111	1.1644	1.9520	1.1768	1.8968	11
50	1.1415	2.0735	1.1528	2.0101	1.1646	1.9510	1.1770	1.8959	10
51	1.1417	2.0725	1.1530	2.0091	1.1648	1.9501	1.1772	1.8950	9
52	1.1419	2.0714	1.1531	2.0081	1.1650	1.9491	1.1775	1.8941	8
53	1.1421	2.0703	1.1533	2.0071	1.1652	1.9482	1.1777	1.8932	7
54	1.1422	2.0692	1.1535	2.0061	1.1654	1.9473	1.1779	1.8924	6
55	1.1424	2.0681	1.1537	2.0050	1.1656	1.9463	1.1781	1.8915	5
56	1.1426	2.0670	1.1539	2.0040	1.1658	1.9454	1.1783	1.8906	4
57	1.1428	2.0659	1.1541	2.0030	1.1660	1.9444	1.1785	1.8897	3
58	1.1430	2.0648	1.1543	2.0020	1.1662	1.9435	1.1787	1.8888	2
59	1.1432	2.0637	1.1545	2.0010	1.1664	1.9425	1.1790	1.8879	1
60	1.1433	2.0627	1.1547	2.0000	1.1666	1.9416	1.1792	1.8871	0
7	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	7
	61°		60°		59°		58°		

# NATURAL SECANTS AND CO-SECANTS

'	32°		33°		34°		35°		'
	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	
0	1.1792	1.8871	1.1924	1.8361	1.2062	1.7883	1.2208	1.7434	60
1	1.1794	1.8862	1.1926	1.8352	1.2064	1.7875	1.2210	1.7427	59
2	1.1796	1.8853	1.1928	1.8344	1.2067	1.7867	1.2213	1.7420	58
3	1.1798	1.8844	1.1930	1.8336	1.2069	1.7860	1.2215	1.7413	57
4	1.1800	1.8836	1.1933	1.8328	1.2072	1.7852	1.2218	1.7405	56
5	1.1802	1.8827	1.1935	1.8320	1.2074	1.7844	1.2220	1.7398	55
6	1.1805	1.8818	1.1937	1.8311	1.2076	1.7837	1.2223	1.7391	54
7	1.1807	1.8809	1.1939	1.8303	1.2079	1.7829	1.2225	1.7384	53
8	1.1809	1.8801	1.1942	1.8295	1.2081	1.7821	1.2228	1.7377	52
9	1.1811	1.8792	1.1944	1.8287	1.2083	1.7814	1.2230	1.7369	51
10	1.1813	1.8783	1.1946	1.8279	1.2086	1.7806	1.2233	1.7362	50
11	1.1815	1.8775	1.1948	1.8271	1.2088	1.7798	1.2235	1.7355	49
12	1.1818	1.8766	1.1951	1.8263	1.2091	1.7791	1.2238	1.7348	48
13	1.1820	1.8757	1.1953	1.8255	1.2093	1.7783	1.2240	1.7341	47
14	1.1822	1.8749	1.1955	1.8246	1.2095	1.7776	1.2243	1.7334	46
15	1.1824	1.8740	1.1958	1.8238	1.2098	1.7768	1.2245	1.7327	45
16	1.1826	1.8731	1.1960	1.8230	1.2100	1.7760	1.2248	1.7319	44
17	1.1828	1.8723	1.1962	1.8222	1.2103	1.7753	1.2250	1.7312	43
18	1.1831	1.8714	1.1964	1.8214	1.2105	1.7745	1.2253	1.7305	42
19	1.1833	1.8706	1.1967	1.8206	1.2107	1.7738	1.2255	1.7298	41
20	1.1835	1.8697	1.1969	1.8198	1.2110	1.7730	1.2258	1.7291	40
21	1.1837	1.8688	1.1971	1.8190	1.2112	1.7723	1.2260	1.7284	39
22	1.1839	1.8680	1.1974	1.8182	1.2115	1.7715	1.2263	1.7277	38
23	1.1841	1.8671	1.1976	1.8174	1.2117	1.7708	1.2265	1.7270	37
24	1.1844	1.8663	1.1978	1.8166	1.2119	1.7700	1.2268	1.7263	36
25	1.1846	1.8654	1.1980	1.8158	1.2122	1.7693	1.2270	1.7256	35
26	1.1848	1.8646	1.1983	1.8150	1.2124	1.7685	1.2273	1.7249	34
27	1.1850	1.8637	1.1985	1.8142	1.2127	1.7678	1.2276	1.7242	33
28	1.1852	1.8629	1.1987	1.8134	1.2129	1.7670	1.2278	1.7234	32
29	1.1855	1.8620	1.1990	1.8126	1.2132	1.7663	1.2281	1.7227	31
30	1.1857	1.8611	1.1992	1.8118	1.2134	1.7655	1.2283	1.7220	30
31	1.1859	1.8603	1.1994	1.8110	1.2136	1.7648	1.2286	1.7213	29
32	1.1861	1.8595	1.1997	1.8102	1.2139	1.7640	1.2288	1.7206	28
33	1.1863	1.8586	1.1999	1.8094	1.2141	1.7633	1.2291	1.7199	27
34	1.1866	1.8578	1.2001	1.8086	1.2144	1.7625	1.2293	1.7192	26
35	1.1868	1.8569	1.2004	1.8078	1.2146	1.7618	1.2296	1.7185	25
36	1.1870	1.8561	1.2006	1.8070	1.2149	1.7610	1.2298	1.7178	24
37	1.1872	1.8552	1.2008	1.8062	1.2151	1.7603	1.2301	1.7171	23
38	1.1874	1.8544	1.2010	1.8054	1.2153	1.7596	1.2304	1.7164	22
39	1.1877	1.8535	1.2013	1.8047	1.2156	1.7588	1.2306	1.7157	21
40	1.1879	1.8527	1.2015	1.8039	1.2158	1.7581	1.2309	1.7151	20
41	1.1881	1.8519	1.2017	1.8031	1.2161	1.7573	1.2311	1.7144	19
42	1.1883	1.8510	1.2020	1.8023	1.2163	1.7566	1.2314	1.7137	18
43	1.1886	1.8502	1.2022	1.8015	1.2166	1.7559	1.2316	1.7130	17
44	1.1888	1.8493	1.2024	1.8007	1.2168	1.7551	1.2319	1.7123	16
45	1.1890	1.8485	1.2027	1.7999	1.2171	1.7544	1.2322	1.7116	15
46	1.1892	1.8477	1.2029	1.7992	1.2173	1.7537	1.2324	1.7109	14
47	1.1894	1.8468	1.2031	1.7984	1.2175	1.7529	1.2327	1.7102	13
48	1.1897	1.8460	1.2034	1.7976	1.2178	1.7522	1.2329	1.7095	12
49	1.1899	1.8452	1.2036	1.7968	1.2180	1.7514	1.2332	1.7088	11
50	1.1901	1.8443	1.2039	1.7960	1.2183	1.7507	1.2335	1.7081	10
51	1.1903	1.8435	1.2041	1.7953	1.2185	1.7500	1.2337	1.7075	9
52	1.1906	1.8427	1.2043	1.7945	1.2188	1.7493	1.2340	1.7068	8
53	1.1908	1.8418	1.2046	1.7937	1.2190	1.7485	1.2342	1.7061	7
54	1.1910	1.8410	1.2048	1.7929	1.2193	1.7478	1.2345	1.7054	6
55	1.1912	1.8402	1.2050	1.7921	1.2195	1.7471	1.2348	1.7047	5
56	1.1915	1.8394	1.2053	1.7914	1.2198	1.7463	1.2350	1.7040	4
57	1.1917	1.8385	1.2055	1.7906	1.2200	1.7456	1.2353	1.7033	3
58	1.1919	1.8377	1.2057	1.7898	1.2203	1.7449	1.2355	1.7027	2
59	1.1921	1.8369	1.2060	1.7891	1.2205	1.7442	1.2358	1.7020	1
60	1.1922	1.8361	1.2062	1.7883	1.2208	1.7434	1.2361	1.7013	0

Co-sec.

57°

Co-sec.

56°

Co-sec.

55°

Co-sec.

54°

Sec.

# NATURAL SECANTS AND CO-SECANTS

°	36°		37°		38°		39°		°
	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	
0	1.2361	1.7013	1.2521	1.6616	1.2690	1.6243	1.2867	1.5890	60
1	1.2363	1.7006	1.2524	1.6610	1.2693	1.6237	1.2871	1.5884	59
2	1.2366	1.6999	1.2527	1.6603	1.2696	1.6231	1.2874	1.5879	58
3	1.2368	1.6993	1.2530	1.6597	1.2699	1.6224	1.2877	1.5873	57
4	1.2371	1.6986	1.2532	1.6591	1.2702	1.6218	1.2880	1.5867	56
5	1.2374	1.6979	1.2535	1.6584	1.2705	1.6212	1.2883	1.5862	55
6	1.2376	1.6972	1.2538	1.6578	1.2707	1.6206	1.2886	1.5856	54
7	1.2379	1.6965	1.2541	1.6572	1.2710	1.6200	1.2889	1.5850	53
8	1.2382	1.6959	1.2543	1.6565	1.2713	1.6194	1.2892	1.5845	52
9	1.2384	1.6952	1.2546	1.6559	1.2716	1.6188	1.2895	1.5839	51
10	1.2387	1.6945	1.2549	1.6552	1.2719	1.6182	1.2898	1.5833	50
11	1.2389	1.6938	1.2552	1.6546	1.2722	1.6176	1.2901	1.5828	49
12	1.2392	1.6932	1.2554	1.6540	1.2725	1.6170	1.2904	1.5822	48
13	1.2395	1.6925	1.2557	1.6533	1.2728	1.6164	1.2907	1.5816	47
14	1.2397	1.6918	1.2560	1.6527	1.2731	1.6159	1.2910	1.5811	46
15	1.2400	1.6912	1.2563	1.6521	1.2734	1.6153	1.2913	1.5805	45
16	1.2403	1.6905	1.2565	1.6514	1.2737	1.6147	1.2916	1.5799	44
17	1.2405	1.6898	1.2568	1.6508	1.2739	1.6141	1.2919	1.5794	43
18	1.2408	1.6891	1.2571	1.6502	1.2742	1.6135	1.2922	1.5788	42
19	1.2411	1.6885	1.2574	1.6496	1.2745	1.6129	1.2926	1.5783	41
20	1.2413	1.6878	1.2577	1.6489	1.2748	1.6123	1.2929	1.5777	40
21	1.2416	1.6871	1.2579	1.6483	1.2751	1.6117	1.2932	1.5771	39
22	1.2419	1.6865	1.2582	1.6477	1.2754	1.6111	1.2935	1.5766	38
23	1.2421	1.6858	1.2585	1.6470	1.2757	1.6105	1.2938	1.5760	37
24	1.2424	1.6851	1.2588	1.6464	1.2760	1.6099	1.2941	1.5755	36
25	1.2427	1.6845	1.2591	1.6458	1.2763	1.6093	1.2944	1.5749	35
26	1.2429	1.6838	1.2593	1.6452	1.2766	1.6087	1.2947	1.5743	34
27	1.2432	1.6831	1.2596	1.6445	1.2769	1.6081	1.2950	1.5738	33
28	1.2435	1.6825	1.2599	1.6439	1.2772	1.6077	1.2953	1.5732	32
29	1.2437	1.6818	1.2602	1.6433	1.2775	1.6070	1.2956	1.5727	31
30	1.2440	1.6812	1.2605	1.6427	1.2778	1.6064	1.2960	1.5721	30
31	1.2443	1.6805	1.2607	1.6420	1.2781	1.6058	1.2963	1.5716	29
32	1.2445	1.6798	1.2610	1.6414	1.2784	1.6052	1.2966	1.5710	28
33	1.2448	1.6792	1.2613	1.6408	1.2787	1.6046	1.2969	1.5705	27
34	1.2451	1.6785	1.2616	1.6402	1.2790	1.6040	1.2972	1.5699	26
35	1.2453	1.6779	1.2619	1.6396	1.2793	1.6034	1.2975	1.5694	25
36	1.2456	1.6772	1.2622	1.6389	1.2795	1.6029	1.2978	1.5688	24
37	1.2459	1.6766	1.2624	1.6383	1.2798	1.6023	1.2981	1.5683	23
38	1.2461	1.6759	1.2627	1.6377	1.2801	1.6017	1.2985	1.5677	22
39	1.2464	1.6752	1.2630	1.6371	1.2804	1.6011	1.2988	1.5672	21
40	1.2467	1.6746	1.2633	1.6365	1.2807	1.6005	1.2991	1.5666	20
41	1.2470	1.6739	1.2636	1.6359	1.2810	1.6000	1.2994	1.5661	19
42	1.2472	1.6733	1.2639	1.6352	1.2813	1.5994	1.2997	1.5655	18
43	1.2475	1.6726	1.2641	1.6346	1.2816	1.5988	1.3000	1.5650	17
44	1.2478	1.6720	1.2644	1.6340	1.2819	1.5982	1.3003	1.5644	16
45	1.2480	1.6713	1.2647	1.6334	1.2822	1.5976	1.3006	1.5639	15
46	1.2483	1.6707	1.2650	1.6328	1.2825	1.5971	1.3010	1.5633	14
47	1.2486	1.6700	1.2653	1.6322	1.2828	1.5965	1.3013	1.5628	13
48	1.2488	1.6694	1.2656	1.6316	1.2831	1.5959	1.3016	1.5622	12
49	1.2490	1.6687	1.2659	1.6309	1.2834	1.5953	1.3019	1.5617	11
50	1.2494	1.6681	1.2661	1.6303	1.2837	1.5947	1.3022	1.5611	10
51	1.2497	1.6674	1.2664	1.6297	1.2840	1.5942	1.3025	1.5606	9
52	1.2499	1.6668	1.2667	1.6291	1.2843	1.5936	1.3029	1.5600	8
53	1.2502	1.6661	1.2670	1.6285	1.2846	1.5930	1.3032	1.5595	7
54	1.2505	1.6655	1.2673	1.6279	1.2849	1.5924	1.3035	1.5590	6
55	1.2508	1.6648	1.2676	1.6273	1.2852	1.5919	1.3038	1.5584	5
56	1.2510	1.6642	1.2679	1.6267	1.2855	1.5913	1.3041	1.5579	4
57	1.2513	1.6636	1.2681	1.6261	1.2858	1.5907	1.3044	1.5573	3
58	1.2516	1.6629	1.2684	1.6255	1.2861	1.5901	1.3048	1.5568	2
59	1.2519	1.6623	1.2687	1.6249	1.2864	1.5896	1.3051	1.5563	1
60	1.2521	1.6616	1.2690	1.6243	1.2867	1.5890	1.3054	1.5557	0
°	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	°
	53°		52°		51°		50°		

# NATURAL SECANTS AND CO-SECANTS

°	40°		41°		42°		43°		°
	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	Sec.	Co-sec.	
0	1.3054	1.5557	1.3250	1.5242	1.3456	1.4945	1.3673	1.4663	60
1	1.3057	1.5552	1.3253	1.5237	1.3460	1.4940	1.3677	1.4658	59
2	1.3060	1.5546	1.3257	1.5232	1.3463	1.4935	1.3681	1.4654	58
3	1.3064	1.5541	1.3260	1.5227	1.3467	1.4930	1.3684	1.4649	57
4	1.3067	1.5536	1.3263	1.5222	1.3470	1.4925	1.3688	1.4644	56
5	1.3070	1.5530	1.3267	1.5217	1.3474	1.4921	1.3692	1.4640	55
6	1.3073	1.5525	1.3270	1.5212	1.3477	1.4916	1.3695	1.4635	54
7	1.3076	1.5520	1.3274	1.5207	1.3481	1.4911	1.3699	1.4631	53
8	1.3080	1.5514	1.3277	1.5202	1.3485	1.4906	1.3703	1.4626	52
9	1.3083	1.5509	1.3280	1.5197	1.3488	1.4901	1.3707	1.4622	51
10	1.3086	1.5503	1.3284	1.5192	1.3492	1.4897	1.3710	1.4617	50
11	1.3089	1.5498	1.3287	1.5187	1.3495	1.4892	1.3714	1.4613	49
12	1.3092	1.5493	1.3290	1.5182	1.3499	1.4887	1.3718	1.4608	48
13	1.3096	1.5487	1.3294	1.5177	1.3502	1.4882	1.3722	1.4604	47
14	1.3099	1.5482	1.3297	1.5171	1.3506	1.4877	1.3725	1.4599	46
15	1.3102	1.5477	1.3301	1.5166	1.3509	1.4873	1.3729	1.4595	45
16	1.3105	1.5471	1.3304	1.5161	1.3513	1.4868	1.3733	1.4590	44
17	1.3109	1.5466	1.3307	1.5156	1.3517	1.4863	1.3737	1.4586	43
18	1.3112	1.5461	1.3311	1.5151	1.3520	1.4858	1.3740	1.4581	42
19	1.3115	1.5456	1.3314	1.5146	1.3524	1.4854	1.3744	1.4577	41
20	1.3118	1.5450	1.3318	1.5141	1.3527	1.4849	1.3748	1.4572	40
21	1.3121	1.5445	1.3321	1.5136	1.3531	1.4844	1.3752	1.4568	39
22	1.3125	1.5440	1.3324	1.5131	1.3534	1.4839	1.3756	1.4563	38
23	1.3128	1.5434	1.3328	1.5126	1.3538	1.4835	1.3759	1.4559	37
24	1.3131	1.5429	1.3331	1.5121	1.3542	1.4830	1.3763	1.4554	36
25	1.3134	1.5424	1.3335	1.5116	1.3545	1.4825	1.3767	1.4550	35
26	1.3138	1.5419	1.3338	1.5111	1.3549	1.4821	1.3771	1.4545	34
27	1.3141	1.5413	1.3342	1.5106	1.3552	1.4816	1.3774	1.4541	33
28	1.3144	1.5408	1.3345	1.5101	1.3556	1.4811	1.3778	1.4536	32
29	1.3148	1.5403	1.3348	1.5096	1.3560	1.4806	1.3782	1.4532	31
30	1.3151	1.5398	1.3352	1.5092	1.3563	1.4802	1.3786	1.4527	30
31	1.3154	1.5392	1.3355	1.5087	1.3567	1.4797	1.3790	1.4523	29
32	1.3157	1.5387	1.3359	1.5082	1.3571	1.4792	1.3794	1.4518	28
33	1.3161	1.5382	1.3362	1.5077	1.3574	1.4788	1.3797	1.4514	27
34	1.3164	1.5377	1.3366	1.5072	1.3578	1.4783	1.3801	1.4510	26
35	1.3167	1.5371	1.3369	1.5067	1.3581	1.4778	1.3805	1.4505	25
36	1.3170	1.5366	1.3372	1.5062	1.3585	1.4774	1.3809	1.4501	24
37	1.3174	1.5361	1.3376	1.5057	1.3589	1.4769	1.3813	1.4496	23
38	1.3177	1.5356	1.3379	1.5052	1.3592	1.4764	1.3816	1.4492	22
39	1.3180	1.5351	1.3383	1.5047	1.3596	1.4760	1.3820	1.4487	21
40	1.3184	1.5345	1.3386	1.5042	1.3600	1.4755	1.3824	1.4483	20
41	1.3187	1.5340	1.3390	1.5037	1.3603	1.4750	1.3828	1.4479	19
42	1.3190	1.5335	1.3393	1.5032	1.3607	1.4746	1.3832	1.4474	18
43	1.3193	1.5330	1.3397	1.5027	1.3611	1.4741	1.3836	1.4470	17
44	1.3197	1.5325	1.3400	1.5022	1.3614	1.4736	1.3839	1.4465	16
45	1.3200	1.5319	1.3404	1.5018	1.3618	1.4732	1.3843	1.4461	15
46	1.3203	1.5314	1.3407	1.5013	1.3622	1.4727	1.3847	1.4457	14
47	1.3207	1.5309	1.3411	1.5008	1.3625	1.4723	1.3851	1.4452	13
48	1.3210	1.5304	1.3414	1.5003	1.3629	1.4718	1.3855	1.4448	12
49	1.3213	1.5299	1.3418	1.4998	1.3633	1.4713	1.3859	1.4443	11
50	1.3217	1.5294	1.3421	1.4993	1.3636	1.4709	1.3863	1.4439	10
51	1.3220	1.5289	1.3425	1.4988	1.3640	1.4704	1.3867	1.4435	9
52	1.3223	1.5283	1.3428	1.4983	1.3644	1.4699	1.3870	1.4430	8
53	1.3227	1.5278	1.3432	1.4979	1.3647	1.4695	1.3874	1.4426	7
54	1.3230	1.5273	1.3435	1.4974	1.3651	1.4690	1.3878	1.4422	6
55	1.3233	1.5268	1.3439	1.4969	1.3655	1.4686	1.3882	1.4417	5
56	1.3237	1.5263	1.3442	1.4964	1.3658	1.4681	1.3886	1.4413	4
57	1.3240	1.5258	1.3446	1.4959	1.3662	1.4676	1.3890	1.4408	3
58	1.3243	1.5253	1.3449	1.4954	1.3666	1.4672	1.3894	1.4404	2
59	1.3247	1.5248	1.3453	1.4949	1.3669	1.4667	1.3898	1.4400	1
60	1.3250	1.5242	1.3456	1.4945	1.3673	1.4663	1.3902	1.4395	0

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48°

47°

46°

# NATURAL SECANTS AND CO-SECANTS

44°			
/	Sec.	Co-sec.	/
0	1.3902	1.4395	60
1	1.3905	1.4391	59
2	1.3909	1.4387	58
3	1.3913	1.4382	57
4	1.3917	1.4378	56
5	1.3921	1.4374	55
6	1.3925	1.4370	54
7	1.3929	1.4365	53
8	1.3933	1.4361	52
9	1.3937	1.4357	51
10	1.3941	1.4352	50
11	1.3945	1.4348	49
12	1.3949	1.4344	48
13	1.3953	1.4339	47
14	1.3957	1.4335	46
15	1.3960	1.4331	45
16	1.3964	1.4327	44
17	1.3968	1.4322	43
18	1.3972	1.4318	42
19	1.3976	1.4314	41
20	1.3980	1.4310	40
21	1.3984	1.4305	39
22	1.3988	1.4301	38
23	1.3992	1.4297	37
24	1.3996	1.4292	36
25	1.4000	1.4288	35
26	1.4004	1.4284	34
27	1.4008	1.4280	33
28	1.4012	1.4276	32
29	1.4016	1.4271	31
30	1.4020	1.4267	30
31	1.4024	1.4263	29
32	1.4028	1.4259	28
33	1.4032	1.4254	27
34	1.4036	1.4250	26
35	1.4040	1.4246	25
36	1.4044	1.4242	24
37	1.4048	1.4238	23
38	1.4052	1.4233	22
39	1.4056	1.4229	21
40	1.4060	1.4225	20
41	1.4065	1.4221	19
42	1.4069	1.4217	18
43	1.4073	1.4212	17
44	1.4077	1.4208	16
45	1.4081	1.4204	15
46	1.4085	1.4200	14
47	1.4089	1.4196	13
48	1.4093	1.4192	12
49	1.4097	1.4188	11
50	1.4101	1.4183	10
51	1.4105	1.4179	9
52	1.4109	1.4175	8
53	1.4113	1.4171	7
54	1.4117	1.4167	6
55	1.4122	1.4163	5
56	1.4126	1.4159	4
57	1.4130	1.4154	3
58	1.4134	1.4150	2
59	1.4138	1.4146	1
60	1.4142	1.4142	0
/	Co-sec.	Sec.	/

45°

**TABLE XVI**  
**FUNCTIONS OF NUMBERS**

No.	Square	Cube	Square Root	Cube Root	No.	Square	Cube	Square Root	Cube Root
1	1	1	1.	1.	51	2601	132651	7.1414	3.7084
2	4	8	1.4142	1.2599	52	2704	140608	7.2111	3.7325
3	9	27	1.7321	1.4422	53	2809	148877	7.2801	3.7563
4	16	64	2.0000	1.5874	54	2916	157464	7.3485	3.7798
5	25	125	2.2361	1.7100	55	3025	166375	7.4162	3.8030
6	36	216	2.4495	1.8171	56	3136	175616	7.4833	3.8259
7	49	343	2.6458	1.9129	57	3249	185193	7.5498	3.8485
8	64	512	2.8284	2.0000	58	3364	195112	7.6158	3.8709
9	81	729	3.0000	2.0801	59	3481	205379	7.6811	3.8930
10	100	1000	3.1623	2.1544	60	3600	216000	7.7460	3.9149
11	121	1331	3.3166	2.2240	61	3721	226981	7.8102	3.9365
12	144	1728	3.4641	2.2894	62	3844	238328	7.8740	3.9579
13	169	2197	3.6056	2.3513	63	3969	250047	7.9373	3.9791
14	196	2744	3.7417	2.4101	64	4096	262144	8.	4.
15	225	3375	3.8730	2.4662	65	4225	274625	8.0623	4.0207
16	256	4096	4.	2.5198	66	4356	287496	8.1240	4.0412
17	289	4913	4.1231	2.5713	67	4489	300763	8.1854	4.0615
18	324	5832	4.2426	2.6207	68	4624	314432	8.2462	4.0817
19	361	6859	4.3589	2.6684	69	4761	328509	8.3066	4.1016
20	400	8000	4.4721	2.7144	70	4900	343000	8.3666	4.1213
21	441	9261	4.5826	2.7589	72	5041	357911	8.4261	4.1408
22	484	10648	4.6904	2.8020	72	5184	373248	8.4853	4.1602
23	529	12167	4.7958	2.8439	73	5329	389017	8.5440	4.1793
24	576	13824	4.8990	2.8845	74	5476	405224	8.6023	4.1983
25	625	15625	5.	2.9240	75	5625	421875	8.6603	4.2172
26	676	17576	5.0990	2.9625	76	5776	438976	8.7178	4.2358
27	729	19683	5.1962	3.0000	77	5929	456533	8.7750	4.2543
28	784	21952	5.2915	3.0366	78	6084	474552	8.8318	4.2727
29	841	24389	5.3852	3.0723	79	6241	493039	8.8882	4.2908
30	900	27000	5.4772	3.1072	80	6400	512000	8.9443	4.3089
31	961	29791	5.5678	3.1414	81	6561	531441	9.	4.3267
32	1024	32768	5.6569	3.1748	82	6724	551368	9.0554	4.3445
33	1089	35937	5.7446	3.2075	83	6889	571787	9.1104	4.3621
34	1156	39304	5.8310	3.2396	84	7056	592704	9.1652	4.3795
35	1225	42875	5.9161	3.2711	85	7225	614125	9.2195	4.3968
36	1296	46656	6.	3.3019	86	7396	636056	9.2736	4.4140
37	1369	50653	6.0828	3.3322	87	7569	658503	9.3274	4.4310
38	1444	54872	6.1644	3.3620	88	7744	681472	9.3808	4.4480
39	1521	59319	6.2450	3.3912	89	7921	704969	9.4340	4.4647
40	1600	64000	6.3246	3.4200	90	8100	729000	9.4868	4.4814
41	1681	68921	6.4031	3.4482	91	8281	753571	9.5394	4.4979
42	1764	74088	6.4807	3.4760	92	8464	778688	9.5917	4.5144
43	1849	79507	6.5574	3.5034	93	8649	804357	9.6437	4.5307
44	1936	85184	6.6332	3.5303	94	8836	830584	9.6954	4.5468
45	2025	91125	6.7082	3.5569	95	9025	857375	9.7468	4.5629
46	2116	97336	6.7823	3.5830	96	9216	884736	9.7980	4.5789
47	2209	103823	6.8557	3.6088	97	9409	912673	9.8489	4.5947
48	2304	110592	6.9282	3.6342	98	9604	941192	9.8995	4.6104
49	2401	117649	7.	3.6593	99	9801	970299	9.9499	4.6261
50	2500	125000	7.0711	3.6840	100	10000	1000000	10.	4.6416

**TABLE XVI**  
**FUNCTIONS OF NUMBERS—Continued**

No.	Square	Cube	Square Root	Cube Root	No.	Square	Cube	Square Root	Cube Root
101	10201	1030301	10.0499	4.6570	151	22801	3442951	12.2882	5.3251
102	10404	1061208	10.0995	4.6723	152	23104	3511808	12.3288	5.3368
103	10609	1092727	10.1489	4.6875	153	23409	3581577	12.3693	5.3485
104	10816	1124864	10.1980	4.7027	154	23716	3652264	12.4097	5.3601
105	11025	1157625	10.2470	4.7177	155	24025	3723875	12.4499	5.3717
106	11236	1191016	10.2956	4.7326	156	24336	3796416	12.4900	5.3832
107	11449	1225043	10.3441	4.7475	157	24649	3869893	12.5300	5.3947
108	11664	1259712	10.3923	4.7622	158	24964	3944312	12.5698	5.4061
109	11881	1295029	10.4403	4.7769	159	25281	4019679	12.6095	5.4175
110	12100	1331000	10.4881	4.7914	160	25600	4096000	12.6491	5.4288
111	12321	1367631	10.5357	4.8059	161	25921	4173281	12.6886	5.4401
112	12544	1404928	10.5830	4.8203	162	26244	4251528	12.7279	5.4514
113	12769	1442897	10.6301	4.8346	163	26569	4330747	12.7671	5.4626
114	12996	1481544	10.6771	4.8488	164	26896	4410944	12.8062	5.4737
115	13225	1520875	10.7238	4.8629	165	27225	4492125	12.8452	5.4848
116	13456	1560896	10.7703	4.8770	166	27556	4574296	12.8841	5.4959
117	13689	1601613	10.8167	4.8910	167	27889	4657463	12.9228	5.5069
118	13924	1643032	10.8628	4.9049	168	28224	4741632	12.9615	5.5178
119	14161	1685159	10.9087	4.9187	169	28561	4826809	13.	5.5288
120	14400	1728000	10.9545	4.9324	170	28900	4913000	13.0384	5.5397
121	14641	1771561	11.	4.9461	171	29241	5000211	13.0767	5.5505
122	14884	1815848	11.0454	4.9597	172	29584	5088448	13.1149	5.5613
123	15129	1860867	11.0905	4.9732	173	29929	5177717	13.1529	5.5721
124	15376	1906624	11.1355	4.9866	174	30276	5268024	13.1909	5.5828
125	15625	1953125	11.1803	5.	175	30625	5359375	13.2288	5.5934
126	15876	2000376	11.2250	5.0133	176	30976	5451776	13.2665	5.6041
127	16129	2048383	11.2694	5.0265	177	31329	5545233	13.3041	5.6147
128	16384	2097152	11.3137	5.0397	178	31684	5639752	13.3417	5.6252
129	16641	2146689	11.3578	5.0528	179	32041	5735339	13.3791	5.6357
130	16900	2197000	11.4018	5.0658	180	32400	5832000	13.4164	5.6462
131	17161	2248091	11.4455	5.0788	181	32761	5929741	13.4536	5.6567
132	17424	2299968	11.4891	5.0916	182	33124	6028568	13.4907	5.6671
133	17689	2352637	11.5326	5.1045	183	33489	6128487	13.5277	5.6774
134	17956	2406104	11.5758	5.1172	184	33856	6229504	13.5647	5.6877
135	18225	2460375	11.6190	5.1299	185	34225	6331625	13.6015	5.6980
136	18496	2515456	11.6619	5.1426	186	34596	6434856	13.6382	5.7083
137	18769	2571353	11.7047	5.1551	187	34969	6539203	13.6748	5.7185
138	19044	2628072	11.7473	5.1676	188	35344	6644672	13.7113	5.7287
139	19321	2685619	11.7898	5.1801	189	35721	6751269	13.7477	5.7388
140	19600	2744000	11.8322	5.1925	190	36100	6859000	13.7840	5.7489
141	19881	2803221	11.8743	5.2048	191	36481	6967871	13.8203	5.7590
142	20164	2863288	11.9164	5.2171	192	36864	7077888	13.8564	5.7690
143	20449	2924207	11.9583	5.2293	193	37249	7189057	13.8924	5.7790
144	20736	2985984	12.	5.2415	194	37636	7301384	13.9284	5.7890
145	21025	3048625	12.0416	5.2536	195	38025	7414875	13.9642	5.7989
146	21316	3112136	12.0830	5.2656	196	38416	7529536	14.	5.8088
147	21609	3176523	12.1244	5.2776	197	38809	7645373	14.0357	5.8186
148	21904	3241792	12.1655	5.2896	198	39204	7762392	14.0712	5.8285
149	22201	3307949	12.2066	5.3015	199	39601	7880599	14.1067	5.8383
150	22500	3375000	12.2474	5.3133	200	40000	8000000	14.1421	5.8480

**TABLE XVI**  
**FUNCTIONS OF NUMBERS—Continued**

No.	Square	Cube	Square Root	Cube Root	No.	Square	Cube	Square Root	Cube Root
201	40401	8120601	14.1774	5.8578	251	63001	15813251	15.8430	6.3080
202	40804	8242408	14.2127	5.8675	252	63504	16003008	15.8745	6.3164
203	41209	8365427	14.2478	5.8771	253	64009	16194277	15.9060	6.3247
204	41616	8489664	14.2829	5.8868	254	64516	16387064	15.9374	6.3330
205	42025	8615125	14.3178	5.8964	255	65025	16581375	15.9687	6.3413
206	42436	8741816	14.3527	5.9059	256	65536	16777216	16.	6.3496
207	42849	8869743	14.3875	5.9155	257	66049	16974593	16.0312	6.3579
208	43264	8998912	14.4222	5.9250	258	66564	17173512	16.0624	6.3661
209	43681	9129329	14.4568	5.9345	259	67081	17373979	16.0935	6.3743
210	44100	9261000	14.4914	5.9439	260	67600	17576000	16.1245	6.3825
211	44521	9393931	14.5258	5.9533	261	68121	17779581	16.1555	6.3907
212	44944	9528128	14.5602	5.9627	262	68644	17984728	16.1864	6.3988
213	45369	9663597	14.5945	5.9721	263	69169	18191447	16.2173	6.4070
214	45796	9800344	14.6287	5.9814	264	69696	18399744	16.2481	6.4151
215	46225	9938375	14.6629	5.9907	265	70225	18609625	16.2788	6.4232
216	46656	10077696	14.6969	6.	266	70756	18821096	16.3095	6.4312
217	47089	10218313	14.7309	6.0092	267	71289	19034163	16.3401	6.4393
218	47524	10360232	14.7648	6.0185	268	71824	19248832	16.3707	6.4473
219	47961	10503459	14.7986	6.0277	269	72361	19465109	16.4012	6.4553
220	48400	10648000	14.8324	6.0368	270	72900	19683000	16.4317	6.4633
221	48841	10793861	14.8661	6.0459	271	73441	19902511	16.4621	6.4713
222	49284	10941048	14.8997	6.0550	272	73984	20123648	16.4924	6.4792
223	49729	11089567	14.9332	6.0641	273	74529	20346417	16.5227	6.4872
224	50176	11239424	14.9666	6.0732	274	75076	20570824	16.5529	6.4951
225	50625	11390625	15.	6.0822	275	75625	20796875	16.5831	6.5030
226	51076	11543176	15.0333	6.0912	276	76176	21024576	16.6132	6.5108
227	51529	11697083	15.0665	6.1002	277	76729	21253933	16.6433	6.5187
228	51984	11852352	15.0997	6.1091	278	77284	21484952	16.6733	6.5265
229	52441	12008989	15.1327	6.1180	279	77841	21717639	16.7033	6.5343
230	52900	12167000	15.1658	6.1269	280	78400	21952000	16.7332	6.5421
231	53361	12326391	15.1987	6.1358	281	78961	22188041	16.7631	6.5499
232	53824	12487168	15.2315	6.1446	282	79524	22425768	16.7929	6.5577
233	54289	12649337	15.2643	6.1534	283	80089	22665187	16.8226	6.5654
234	54756	12812904	15.2971	6.1622	284	80656	22906304	16.8523	6.5731
235	55225	12977875	15.3297	6.1710	285	81225	23149125	16.8819	6.5808
236	55696	13144256	15.3623	6.1797	286	81796	23393656	16.9115	6.5885
237	56169	13312053	15.3948	6.1885	287	82369	23639903	16.9411	6.5962
238	56644	13481272	15.4272	6.1972	288	82944	23887872	16.9706	6.6039
239	57121	13651919	15.4596	6.2058	289	83521	24137569	17.	6.6115
240	57600	13824000	15.4919	6.2145	290	84100	24389000	17.0294	6.6191
241	58081	13997521	15.5242	6.2231	291	84681	24642171	17.0587	6.6267
242	58564	14172488	15.5563	6.2317	292	85264	24897088	17.0880	6.6343
243	59049	14348907	15.5885	6.2403	293	85849	25153757	17.1172	6.6419
244	59536	14526784	15.6205	6.2488	294	86436	25412184	17.1464	6.6494
245	60025	14706125	15.6525	6.2573	295	87025	25672375	17.1756	6.6569
246	60516	14886936	15.6844	6.2658	296	87616	25934336	17.2047	6.6644
247	61009	15069223	15.7162	6.2743	297	88209	26198073	17.2337	6.6719
248	61504	15252992	15.7480	6.2828	298	88804	26463592	17.2627	6.6794
249	62001	15438249	15.7797	6.2912	299	89401	26730899	17.2916	6.6869
250	62500	15625000	15.8114	6.2996	300	90000	27000000	17.3205	6.6943

**TABLE XVI**  
**FUNCTIONS OF NUMBERS—Continued**

No.	Square	Cube	Square Root	Cube Root	No.	Square	Cube	Square Root	Cube Root
301	90601	27270901	17.3494	6.7018	351	123201	43243551	18.7350	7.0540
302	91204	27543608	17.3781	6.7092	352	123904	43614208	18.7617	7.0607
303	91809	27818127	17.4069	6.7166	353	124609	43986977	18.7883	7.0674
304	92416	28094464	17.4356	6.7240	354	125316	44361864	18.8149	7.0740
305	93025	28372625	17.4642	6.7313	355	126025	44738875	18.8414	7.0807
306	93636	28652616	17.4929	6.7387	356	126736	45118016	18.8680	7.0873
307	94249	28934443	17.5214	6.7460	357	127449	45499293	18.8944	7.0940
308	94864	29218112	17.5499	6.7533	358	128164	45882712	18.9209	7.1006
309	95481	29503629	17.5784	6.7606	359	128881	46268279	18.9473	7.1072
310	96100	29791000	17.6068	6.7679	360	129600	46656000	18.9737	7.1138
311	96721	30080231	17.6352	6.7752	361	130321	47045881	19.	7.1204
312	97344	30371328	17.6635	6.7824	362	131044	47437928	19.0263	7.1269
313	97969	30664297	17.6918	6.7897	363	131769	47832147	19.0526	7.1335
314	98596	30959144	17.7200	6.7969	364	132496	48228544	19.0788	7.1400
315	99225	31255875	17.7482	6.8041	365	133225	48627125	19.1050	7.1466
316	99856	31554496	17.7764	6.8113	366	133956	49027896	19.1311	7.1531
317	100489	31855013	17.8045	6.8185	367	134689	49430863	19.1572	7.1596
318	101124	32157432	17.8326	6.8256	368	135424	49836032	19.1833	7.1661
319	101761	32461759	17.8606	6.8328	369	136161	50243409	19.2094	7.1726
320	102400	32768000	17.8885	6.8399	370	136900	50653000	19.2354	7.1791
321	103041	33076161	17.9165	6.8470	371	137641	51064811	19.2614	7.1855
322	103684	33386248	17.9444	6.8541	372	138384	51478848	19.2873	7.1920
323	104329	33698267	17.9722	6.8612	373	139129	51895117	19.3132	7.1984
324	104976	34012224	18.	6.8683	374	139876	52313624	19.3391	7.2048
325	105625	34328125	18.0278	6.8753	375	140625	52734375	19.3649	7.2112
326	106276	34645976	18.0555	6.8824	376	141376	53157376	19.3907	7.2177
327	106929	34965783	18.0831	6.8894	377	142129	53582633	19.4165	7.2240
328	107584	35287552	18.1108	6.8964	378	142884	54010152	19.4422	7.2304
329	108241	35611289	18.1384	6.9034	379	143641	54439939	19.4679	7.2368
330	108900	35937000	18.1659	6.9104	380	144400	54872000	19.4936	7.2432
331	109561	36264691	18.1934	6.9174	381	145161	55306341	19.5192	7.2495
332	110224	36594368	18.2209	6.9244	382	145924	55742968	19.5448	7.2558
333	110889	36926037	18.2483	6.9313	383	146689	56181887	19.5704	7.2622
334	111556	37259704	18.2757	6.9382	384	147456	56623104	19.5959	7.2685
335	112225	37595375	18.3030	6.9451	385	148225	57066625	19.6214	7.2748
336	112896	37933056	18.3303	6.9521	386	148996	57512456	19.6469	7.2811
337	113569	38272753	18.3576	6.9589	387	149769	57960603	19.6723	7.2874
338	114244	38614472	18.3848	6.9658	388	150544	58411072	19.6977	7.2936
339	114921	38958219	18.4120	6.9727	389	151321	58863869	19.7231	7.2999
340	115600	39304000	18.4391	6.9795	390	152100	59319000	19.7484	7.3061
341	116281	39651821	18.4662	6.9864	391	152881	59776471	19.7737	7.3124
342	116964	40001688	18.4932	6.9932	392	153664	60236288	19.7990	7.3186
343	117649	40353607	18.5203	7.	393	154449	60698457	19.8242	7.3248
344	118336	40707584	18.5472	7.0068	394	155236	61162984	19.8494	7.3310
345	119025	41063625	18.5742	7.0136	395	156025	61629875	19.8746	7.3372
346	119716	41421736	18.6011	7.0203	396	156816	62099136	19.8997	7.3434
347	120409	41781923	18.6279	7.0271	397	157609	62570773	19.9249	7.3496
348	121104	42144192	18.6548	7.0338	398	158404	63044792	19.9499	7.3558
349	121801	42508549	18.6815	7.0406	399	159201	63521199	19.9750	7.3619
350	122500	42875000	18.7083	7.0473	400	160000	64000000	20.	7.3681

**TABLE XVI**  
**FUNCTIONS OF NUMBERS—Continued**

No.	Square	Cube	Square Root	Cube Root	No.	Square	Cube	Square Root	Cube Root
401	160801	64481201	20.2050	7.3742	451	203401	91733851	21.2368	7.6688
402	161604	64964808	20.0499	7.3803	452	204304	92345408	21.2603	7.6744
403	162409	65450827	20.0749	7.3864	453	205209	92959677	21.2838	7.6801
404	163216	65939264	20.0998	7.3925	454	206116	93576664	21.3073	7.6857
405	164025	66430125	20.1246	7.3986	455	207025	94196375	21.3307	7.6914
406	164836	66923416	20.1494	7.4047	456	207936	94818816	21.3542	7.6970
407	165649	67419143	20.1742	7.4108	457	208849	95443993	21.3776	7.7026
408	166464	67917312	20.1990	7.4169	458	209764	96071912	21.4009	7.7082
409	167281	68417929	20.2237	7.4229	459	210681	96702579	21.4243	7.7138
410	168100	68921000	20.2485	7.4290	460	211600	97336000	21.4476	7.7194
411	168921	69426531	20.2731	7.4350	461	212521	97972181	21.4709	7.7250
412	169744	69934528	20.2978	7.4410	462	213444	98611128	21.4942	7.7306
413	170569	70444997	20.3224	7.4470	463	214369	99252847	21.5174	7.7362
414	171396	70957944	20.3470	7.4530	464	215296	99897344	21.5407	7.7418
415	172225	71473375	20.3715	7.4590	465	216225	100544625	21.5639	7.7473
416	173056	71991296	20.3961	7.4650	466	217156	101194696	21.5870	7.7529
417	173889	72511713	20.4206	7.4710	467	218089	101847563	21.6102	7.7584
418	174724	73034632	20.4450	7.4770	468	219024	102503232	21.6333	7.7639
419	175561	73560059	20.4695	7.4829	469	219961	103161709	21.6564	7.7695
420	176400	74088000	20.4939	7.4889	470	220900	103823000	21.6795	7.7750
421	177241	74618461	20.5183	7.4948	471	221841	104487111	21.7025	7.7805
422	178084	75151448	20.5426	7.5007	472	222784	105154048	21.7256	7.7860
423	178929	75686967	20.5670	7.5067	473	223729	105823817	21.7486	7.7915
424	179776	76225024	20.5913	7.5126	474	224676	106496424	21.7715	7.7970
425	180625	76765625	20.6155	7.5185	475	225625	107171875	21.7945	7.8025
426	181476	77308776	20.6398	7.5244	476	226576	107850176	21.8174	7.8079
427	182329	77854483	20.6640	7.5302	477	227529	108531333	21.8403	7.8134
428	183184	78402752	20.6882	7.5361	478	228484	109215352	21.8632	7.8188
429	184041	78953589	20.7123	7.5420	479	229441	109902239	21.8861	7.8243
430	184900	79507000	20.7364	7.5478	480	230400	110592000	21.9089	7.8297
431	185761	80062991	20.7605	7.5537	481	231361	111284641	21.9317	7.8352
432	186624	80621568	20.7846	7.5595	482	232324	111980168	21.9545	7.8406
433	187489	81182737	20.8087	7.5654	483	233289	112678587	21.9773	7.8460
434	188356	81746504	20.8327	7.5712	484	234256	113379904	22.	7.8514
435	189225	82312875	20.8567	7.5770	485	235225	114084125	22.0227	7.8568
436	190096	82881856	20.8806	7.5828	486	236196	114791256	22.0454	7.8622
437	190969	83453453	20.9045	7.5886	487	237169	115501303	22.0681	7.8676
438	191844	84027672	20.9284	7.5944	488	238144	116214272	22.0907	7.8730
439	192721	84604519	20.9523	7.6001	489	239121	116930169	22.1133	7.8784
440	193600	85184000	20.9762	7.6059	490	240100	117649000	22.1359	7.8837
441	194481	85766121	21.	7.6117	491	241081	118370771	22.1585	7.8891
442	195364	86350888	21.0238	7.6174	492	242064	119095488	22.1811	7.8944
443	196249	86938307	21.0476	7.6232	493	243049	119823157	22.2036	7.8998
444	197136	87528384	21.0713	7.6289	494	244036	120553784	22.2261	7.9051
445	198025	88121125	21.0950	7.6346	495	245025	121287375	22.2486	7.9105
446	198916	88716536	21.1187	7.6403	496	246016	122023936	22.2711	7.9158
447	199809	89314623	21.1424	7.6460	497	247009	122763473	22.2935	7.9211
448	200704	89915392	21.1660	7.6517	498	248004	123505992	22.3159	7.9264
449	201601	90518849	21.1896	7.6574	499	249001	124251499	22.3383	7.9317
450	202500	91125000	21.2132	7.6631	500	250000	125000000	22.3607	7.9370

**TABLE XVI**  
**FUNCTIONS OF NUMBERS—Continued**

No.	Square	Cube	Square Root	Cube Root	No.	Square	Cube	Square Root	Cube Root
501	251001	125751501	22.3830	7.9423	551	303601	167284151	23.4734	8.1982
502	252004	126506008	22.4054	7.9476	552	304704	168196608	23.4947	8.2031
503	253009	127263527	22.4277	7.9528	553	305809	169112377	23.5160	8.2081
504	254016	128024064	22.4499	7.9581	554	306916	170031464	23.5372	8.2130
505	255025	128787625	22.4722	7.9634	555	308025	170953875	23.5584	8.2180
506	256036	129554216	22.4944	7.9686	556	309136	171879616	23.5797	8.2229
507	257049	130323843	22.5167	7.9739	557	310249	172808693	23.6008	8.2278
508	258064	131096512	22.5389	7.9791	558	311364	173741112	23.6220	8.2327
509	259081	131872729	22.5610	7.9843	559	312481	174676879	23.6432	8.2377
510	260100	132651000	22.5832	7.9896	560	313600	175616000	23.6643	8.2426
511	261121	133432831	22.6053	7.9948	561	314721	176558481	23.6854	8.2475
512	262144	134217728	22.6274	8.	562	315844	177504328	23.7065	8.2524
513	263169	135005697	22.6495	8.0052	563	316969	178453547	23.7276	8.2573
514	264196	135796744	22.6716	8.0104	564	318096	179406144	23.7487	8.2621
515	265225	136590875	22.6936	8.0156	565	319225	180362125	23.7697	8.2670
516	266256	137388096	22.7156	8.0208	566	320356	181321496	23.7908	8.2719
517	267289	138188413	22.7376	8.0260	567	321489	182284263	23.8118	8.2768
518	268324	138991832	22.7596	8.0311	568	322624	183250432	23.8328	8.2816
519	269361	139798359	22.7816	8.0363	569	323761	184220009	23.8537	8.2865
520	270400	140608000	22.8035	8.0415	570	324900	185193000	23.8747	8.2913
521	271441	141420761	22.8254	8.0466	571	326041	186169411	23.8956	8.2962
522	272484	142236664	22.8473	8.0517	572	327184	187149248	23.9165	8.3010
523	273529	143055667	22.8692	8.0569	573	328329	188132517	23.9374	8.3059
524	274576	143877824	22.8910	8.0620	574	329476	189119224	23.9583	8.3107
525	275625	144703125	22.9129	8.0671	575	330625	190109375	23.9792	8.3155
526	276676	145531576	22.9347	8.0723	576	331776	191102976	24.	8.3203
527	277729	146363183	22.9565	8.0774	577	332929	192100033	24.0208	8.3251
528	278784	147197952	22.9783	8.0825	578	334084	193100552	24.0416	8.3300
529	279841	148035889	23.	8.0876	579	335241	194104539	24.0624	8.3348
530	280900	148877000	23.0217	8.0927	580	336400	195112000	24.0832	8.3396
531	281961	149721291	23.0434	8.0978	581	337561	196122941	24.1039	8.3443
532	283024	150568768	23.0651	8.1028	582	338724	197137376	24.1247	8.3491
533	284089	151419437	23.0868	8.1079	583	339889	198155287	24.1454	8.3539
534	285156	152273304	23.1084	8.1130	584	341056	199176704	24.1661	8.3587
535	286225	153130375	23.1301	8.1180	585	342225	200201625	24.1868	8.3634
536	287296	153990656	23.1517	8.1231	586	343396	201230056	24.2074	8.3682
537	288369	154854153	23.1733	8.1281	587	344569	202262003	24.2281	8.3730
538	289444	155720872	23.1948	8.1332	588	345744	203297472	24.2487	8.3777
539	290521	156590819	23.2164	8.1382	589	346921	204336479	24.2693	8.3825
540	291600	157464000	23.2379	8.1433	590	348100	205379000	24.2899	8.3872
541	292681	158340421	23.2594	8.1483	591	349281	206425071	24.3105	8.3919
542	293764	159220088	23.2809	8.1533	592	350464	207474688	24.3311	8.3967
543	294849	160103007	23.3024	8.1583	593	351649	208527857	24.3516	8.4014
544	295936	160989184	23.3238	8.1633	594	352836	209584584	24.3721	8.4061
545	297025	161878625	23.3452	8.1683	595	354025	210644875	24.3926	8.4108
546	298116	162771336	23.3666	8.1733	596	355216	211708736	24.4131	8.4155
547	299209	163667323	23.3880	8.1783	597	356409	212776173	24.4336	8.4202
548	300304	164566592	23.4094	8.1833	598	357604	213847192	24.4540	8.4249
549	301401	165469149	23.4307	8.1882	599	358801	214921799	24.4745	8.4296
550	302500	166375000	23.4521	8.1932	600	360000	216000000	24.4949	8.4343

**TABLE XVI**  
**FUNCTIONS OF NUMBERS—Continued**

No.	Square	Cube	Square Root	Cube Root	No.	Square	Cube	Square Root	Cube Root
601	361201	217081801	24.5153	8.4390	651	423801	275894451	25.5147	8.6668
602	362404	218167208	24.5357	8.4437	652	425104	277167808	25.5343	8.6713
603	363609	219252627	24.5561	8.4484	653	426409	278445077	25.5539	8.6757
604	364816	220348864	24.5764	8.4530	654	427716	279722664	25.5734	8.6801
605	366025	221445125	24.5967	8.4577	655	429025	281011375	25.5930	8.6845
606	367236	222545016	24.6171	8.4623	656	430336	282300416	25.6125	8.6890
607	368449	223648543	24.6374	8.4670	657	431649	283593393	25.6320	8.6934
608	369664	224755712	24.6577	8.4716	658	432964	284890312	25.6515	8.6978
609	370881	225866529	24.6779	8.4763	659	434281	286191179	25.6710	8.7022
610	372100	226981000	24.6982	8.4809	660	435600	287496000	25.6905	8.7066
611	373321	228099131	24.7184	8.4856	661	436921	288804781	25.7099	8.7110
612	374544	229220928	24.7386	8.4902	662	438244	290117528	25.7294	8.7154
613	375769	230346397	24.7588	8.4948	663	439569	291434247	25.7488	8.7198
614	376996	231475544	24.7790	8.4994	664	440896	292754944	25.7682	8.7241
615	378225	232608375	24.7992	8.5040	665	442225	294079625	25.7876	8.7285
616	379456	233744896	24.8193	8.5086	666	443556	295408296	25.8070	8.7329
617	380689	234885113	24.8395	8.5132	667	444889	296740963	25.8263	8.7373
618	381924	236029032	24.8596	8.5178	668	446224	298077632	25.8457	8.7416
619	383161	237176659	24.8797	8.5224	669	447561	299418309	25.8650	8.7460
620	384400	238328000	24.8998	8.5270	670	448900	300763000	25.8844	8.7503
621	385641	239483061	24.9199	8.5316	671	450241	302111711	25.9037	8.7547
622	386884	240641848	24.9399	8.5362	672	451584	303464448	25.9230	8.7590
623	388129	241804367	24.9600	8.5408	673	452929	304821217	25.9422	8.7634
624	389376	242970624	24.9800	8.5453	674	454276	306182024	25.9615	8.7677
625	390625	244140625	25.	8.5499	675	455625	307546875	25.9808	8.7721
626	391876	245314376	25.0200	8.5544	676	456976	308915776	26.	8.7764
627	393129	246491883	25.0400	8.5590	677	458329	310288733	26.0192	8.7807
628	394384	247673152	25.0599	8.5635	678	459684	311665752	26.0384	8.7850
629	395641	248858189	25.0799	8.5681	679	461041	313046839	26.0576	8.7893
630	396900	250047000	25.0998	8.5726	680	462400	314432000	26.0768	8.7937
631	398161	251239591	25.1197	8.5772	681	463761	315821241	26.0960	8.7980
632	399424	252435968	25.1396	8.5817	682	465124	317214568	26.1151	8.8023
633	400689	253636137	25.1595	8.5862	683	466489	318611987	26.1343	8.8066
634	401956	254840104	25.1794	8.5907	684	467856	320013504	26.1534	8.8109
635	403225	256047875	25.1992	8.5952	685	469225	321419125	26.1725	8.8152
636	404496	257259456	25.2190	8.5997	686	470596	322828856	26.1916	8.8194
637	405769	258474853	25.2389	8.6043	687	471969	324242703	26.2107	8.8237
638	407044	259694072	25.2587	8.6088	688	473344	325660672	26.2298	8.8280
639	408321	260917119	25.2784	8.6132	689	474721	327082769	26.2488	8.8323
640	409600	262144000	25.2982	8.6177	690	476100	328509000	26.2679	8.8366
641	410881	263374721	25.3180	8.6222	691	477481	329939371	26.2869	8.8408
642	412164	264609288	25.3377	8.6267	692	478864	331373888	26.3059	8.8451
643	413449	265847707	25.3574	8.6312	693	480249	332812557	26.3249	8.8493
644	414736	267089984	25.3772	8.6357	694	481636	334255384	26.3439	8.8536
645	416025	268336125	25.3969	8.6401	695	483025	335702375	26.3629	8.8578
646	417316	269586136	25.4165	8.6446	696	484416	337153536	26.3818	8.8621
647	418609	270840023	25.4362	8.6490	697	485809	338608873	26.4008	8.8663
648	419904	272097792	25.4558	8.6535	698	487204	340068392	26.4197	8.8706
649	421201	273359449	25.4755	8.6579	699	488601	341532099	26.4386	8.8748
650	422500	274625000	25.4951	8.6624	700	490000	343000000	26.4575	8.8790

**TABLE XVI**  
**FUNCTIONS OF NUMBERS—Continued**

No.	Square	Cube	Square Root	Cube Root	No.	Square	Cube	Square Root	Cube Root
701	491401	344472101	26.4764	8.8833	751	564001	423564751	27.4044	9.0896
702	492804	345948408	26.4953	8.8875	752	565504	425259008	27.4226	9.0937
703	494209	347428927	26.5141	8.8917	753	567009	426957777	27.4408	9.0977
704	495616	348913664	26.5330	8.8959	754	568516	428661064	27.4591	9.1017
705	497025	350402625	26.5518	8.9001	755	570025	430368875	27.4773	9.1057
706	498436	351895816	26.5707	8.9043	756	571536	432081216	27.4955	9.1098
707	499849	353393243	26.5895	8.9085	757	573049	433798093	27.5136	9.1138
708	501264	354894912	26.6083	8.9127	758	574564	435519512	27.5318	9.1178
709	502681	356400829	26.6271	8.9169	759	576081	437245479	27.5500	9.1218
710	504100	357911000	26.6458	8.9211	760	577600	438976000	27.5681	9.1258
711	505521	359425431	26.6646	8.9253	761	579121	440711081	27.5862	9.1298
712	506944	360944128	26.6833	8.9295	762	580644	442450728	27.6043	9.1338
713	508369	362467097	26.7021	8.9337	763	582169	444194947	27.6225	9.1378
714	509796	363994344	26.7208	8.9378	764	583696	445943744	27.6405	9.1418
715	511225	365525875	26.7395	8.9420	765	585225	447697125	27.6586	9.1458
716	512656	367061696	26.7582	8.9462	766	586756	449455096	27.6767	9.1498
717	514089	368601813	26.7769	8.9503	767	588289	451217663	27.6948	9.1537
718	515524	370146232	26.7955	8.9545	768	589824	452984832	27.7128	9.1577
719	516961	371694959	26.8142	8.9587	769	591361	454756609	27.7308	9.1617
720	518400	373248000	26.8328	8.9628	770	592900	456533000	27.7489	9.1657
721	519841	374805361	26.8514	8.9670	771	594441	458314011	27.7669	9.1696
722	521284	376367048	26.8701	8.9711	772	595984	460099648	27.7849	9.1736
723	522729	377933067	26.8887	8.9752	773	597529	461889917	27.8029	9.1775
724	524176	379503424	26.9072	8.9794	774	599076	463684824	27.8209	9.1815
725	525625	381078125	26.9258	8.9835	775	600625	465484375	27.8388	9.1855
726	527076	382657176	26.9444	8.9876	776	602176	467288576	27.8568	9.1894
727	528529	384240583	26.9629	8.9918	777	603729	469097433	27.8747	9.1933
728	529984	385828352	26.9815	8.9959	778	605284	470910952	27.8927	9.1973
729	531441	387420489	27.	9.	779	606841	472729139	27.9106	9.2012
730	532900	389017000	27.0185	9.0041	780	608400	474552000	27.9285	9.2052
731	534361	390617891	27.0370	9.0082	781	609961	476379541	27.9464	9.2091
732	535824	392223168	27.0555	9.0123	782	611524	478211768	27.9643	9.2130
733	537289	393832837	27.0740	9.0164	783	613089	480048687	27.9821	9.2170
734	538756	395446904	27.0924	9.0205	784	614656	481890304	28.	9.2209
735	540225	397065375	27.1109	9.0246	785	616225	483736625	28.0179	9.2248
736	541696	398688256	27.1293	9.0287	786	617796	485587656	28.0357	9.2287
737	543169	400315553	27.1477	9.0328	787	619369	487443403	28.0535	9.2326
738	544644	401947272	27.1662	9.0369	788	620944	489303872	28.0713	9.2365
739	546121	403583419	27.1846	9.0410	789	622521	491169069	28.0891	9.2404
740	547600	405224000	27.2029	9.0450	790	624100	493039000	28.1069	9.2443
741	549081	406869021	27.2213	9.0491	791	625681	494913671	28.1247	9.2482
742	550564	408518488	27.2397	9.0532	792	627264	496793088	28.1425	9.2521
743	552049	410172407	27.2580	9.0572	793	628849	498677257	28.1603	9.2560
744	553536	411830784	27.2764	9.0613	794	630436	500566184	28.1780	9.2599
745	555025	413493625	27.2947	9.0654	795	632025	502459875	28.1957	9.2638
746	556516	415160936	27.3130	9.0694	796	633616	504358336	28.2135	9.2677
747	558009	416832723	27.3313	9.0735	797	635209	506261573	28.2312	9.2716
748	559504	418508992	27.3496	9.0775	798	636804	508169592	28.2489	9.2754
749	561001	420189749	27.3679	9.0816	799	638401	510082399	28.2666	9.2793
750	562500	421875000	27.3861	9.0856	800	640000	512000000	28.2843	9.2832

**TABLE XVI**  
**FUNCTIONS OF NUMBERS—Continued**

No.	Square	Cube	Square Root	Cube Root	No.	Square	Cube	Square Root	Cube Root
801	641601	513922401	28.3019	9.2870	851	724201	616295051	29.1719	9.4764
802	643204	515849608	28.3196	9.2909	852	725904	618470708	29.1890	9.4801
803	644809	517781627	28.3373	9.2948	853	727609	620650477	29.2062	9.4838
804	646416	519718464	28.3549	9.2986	854	729316	622835864	29.2233	9.4875
805	648025	521660125	28.3725	9.3025	855	731025	625026375	29.2404	9.4912
806	649636	523606616	28.3901	9.3063	856	732736	627222016	29.2575	9.4949
807	651249	525557943	28.4077	9.3102	857	734449	629422793	29.2746	9.4986
808	652864	527514112	28.4253	9.3140	858	736164	631628712	29.2916	9.5023
809	654481	529475129	28.4429	9.3179	859	737881	633839779	29.3087	9.5060
810	656100	531441000	28.4605	9.3217	860	739600	636056000	29.3258	9.5097
811	657721	533411731	28.4781	9.3255	861	741321	638277381	29.3428	9.5134
812	659344	535387328	28.4956	9.3294	862	743044	640503928	29.3598	9.5171
813	660969	537367797	28.5132	9.3332	863	744769	642735647	29.3769	9.5207
814	662596	539353144	28.5307	9.3370	864	746496	644972544	29.3939	9.5244
815	664225	541343375	28.5482	9.3408	865	748225	647214625	29.4109	9.5281
816	665856	543338496	28.5657	9.3447	866	749956	649461896	29.4279	9.5317
817	667489	545338513	28.5832	9.3485	867	751689	651714363	29.4449	9.5354
818	669124	547343432	28.6007	9.3523	868	753424	653972032	29.4618	9.5391
819	670761	549353259	28.6182	9.3561	869	755161	656234909	29.4788	9.5427
820	672400	551368000	28.6356	9.3599	870	756900	658503000	29.4958	9.5464
821	674041	553387661	28.6531	9.3637	871	758641	660776311	29.5127	9.5501
822	675684	555412248	28.6705	9.3675	872	760384	663054848	29.5296	9.5537
823	677329	557441767	28.6880	9.3713	873	762129	665338617	29.5466	9.5574
824	678976	559476224	28.7054	9.3751	874	763876	667627624	29.5635	9.5610
825	680625	561515625	28.7228	9.3789	875	765625	669921875	29.5804	9.5647
826	682276	563559976	28.7402	9.3827	876	767376	672221376	29.5973	9.5683
827	683929	565609283	28.7576	9.3865	877	769129	674526133	29.6142	9.5719
828	685584	567663552	28.7750	9.3902	878	770884	676836152	29.6311	9.5756
829	687241	569722789	28.7924	9.3940	879	772641	679151439	29.6479	9.5792
830	688900	571787000	28.8097	9.3978	880	774400	681472000	29.6648	9.5828
831	690561	573856191	28.8271	9.4016	881	776161	683797841	29.6816	9.5865
832	692224	575930368	28.8444	9.4053	882	777924	686128968	29.6985	9.5901
833	693889	578009537	28.8617	9.4091	883	779689	688465387	29.7153	9.5937
834	695556	580093704	28.8791	9.4129	884	781456	690807104	29.7321	9.5973
835	697225	582182875	28.8964	9.4166	885	783225	693154125	29.7489	9.6010
836	698896	584277056	28.9137	9.4204	886	784996	695506456	29.7658	9.6046
837	700569	586376253	28.9310	9.4241	887	786769	697864103	29.7825	9.6082
838	702244	588480472	28.9482	9.4279	888	788544	700227072	29.7993	9.6118
839	703921	590589719	28.9655	9.4316	889	790321	702595369	29.8161	9.6154
840	705600	592704000	28.9828	9.4354	890	792100	704969000	29.8329	9.6190
841	707281	594823321	29.	9.4391	891	793881	707347971	29.8496	9.6226
842	708964	596947688	29.0172	9.4429	892	795664	709732288	29.8664	9.6262
843	710649	599077107	29.0345	9.4466	893	797449	712121957	29.8831	9.6298
844	712336	601211584	29.0517	9.4503	894	799236	714516984	29.8998	9.6334
845	714025	603351125	29.0689	9.4541	895	801025	716917375	29.9166	9.6370
846	715716	605495736	29.0861	9.4578	896	802816	719323136	29.9333	9.6406
847	717409	607645423	29.1033	9.4615	897	804609	721734273	29.9500	9.6442
848	719104	609800192	29.1204	9.4652	898	806404	724150792	29.9666	9.6477
849	720801	611960049	29.1376	9.4690	899	808201	726572699	29.9833	9.6513
850	722500	614125000	29.1548	9.4727	900	810000	729000000	30.	9.6549

**TABLE XVI**  
**FUNCTIONS OF NUMBERS—Continued**

No.	Square	Cube	Square Root	Cube Root	No.	Square	Cube	Square Root	Cube Root
901	811801	731432701	30.0167	9.6585	951	904401	860085351	30.8383	9.8339
902	813604	733870808	30.0333	9.6620	952	906304	862801408	30.8545	9.8374
903	815409	736314327	30.0500	9.6656	953	908209	865523177	30.8707	9.8408
904	817216	738763264	30.0666	9.6692	954	9'0116	868250664	30.8869	9.8443
905	819025	741217625	30.0832	9.6727	955	912025	870983875	30.9031	9.8477
906	820836	743677416	30.0998	9.6763	956	913936	873722816	30.9192	9.8511
907	822649	746142643	30.1164	9.6799	957	915849	876467493	30.9354	9.8546
908	824464	748613312	30.1330	9.6834	958	917764	879217912	30.9516	9.8580
909	826281	751089429	30.1496	9.6870	959	919681	881974079	30.9677	9.8614
910	828100	753571000	30.1662	9.6905	960	921600	884736000	30.9839	9.8648
911	829921	756058031	30.1828	9.6941	961	923521	887503681	31.	9.8683
912	831744	758550528	30.1993	9.6976	962	925444	890277128	31.0161	9.8717
913	833569	761048497	30.2159	9.7012	963	927369	893056347	31.0322	9.8751
914	835396	763551944	30.2324	9.7047	964	929296	895841344	31.0483	9.8785
915	837225	766060875	30.2490	9.7082	965	931225	898632125	31.0644	9.8819
916	839056	768575296	30.2655	9.7118	966	933156	901428696	31.0805	9.8854
917	840889	771095213	30.2820	9.7153	967	935089	904231063	31.0966	9.8888
918	842724	773620632	30.2985	9.7188	968	937024	907039232	31.1127	9.8922
919	844561	776151559	30.3150	9.7224	969	938961	909853209	31.1288	9.8956
920	846400	778688000	30.3315	9.7259	970	940900	912673000	31.1448	9.8990
921	848241	781229961	30.3480	9.7294	971	942841	915498611	31.1609	9.9024
922	750084	783777448	30.3645	9.7329	972	944784	918330048	31.1769	9.9058
923	851929	786330467	30.3809	9.7364	973	946729	921167317	31.1929	9.9092
924	853776	788889024	30.3974	9.7400	974	948676	924010424	31.2090	9.9126
925	855625	791453125	30.4138	9.7435	975	950625	926859375	31.2250	9.9160
926	857476	794022776	30.4302	9.7470	976	952576	929714176	31.2410	9.9194
927	859329	796597983	30.4467	9.7505	977	954529	932574833	31.2570	9.9227
928	861184	799178752	30.4631	9.7540	978	956484	935441352	31.2730	9.9261
929	863041	801765089	30.4795	9.7575	979	958441	938313739	31.2890	9.9295
930	864900	804357000	30.4959	9.7610	980	960400	941192000	31.3050	9.9329
931	866761	806954491	30.5123	9.7645	981	962361	944076141	31.3209	9.9363
932	868624	809557568	30.5287	9.7680	982	964324	946966168	31.3369	9.9396
933	870489	812166237	30.5450	9.7715	983	966289	949862087	31.3528	9.9430
934	872356	814780504	30.5614	9.7750	984	968256	952763904	31.3688	9.9464
935	874225	817400375	30.5778	9.7785	985	970225	955671625	31.3847	9.9497
936	876096	820025856	30.5941	9.7819	986	972196	958585256	31.4006	9.9531
937	877969	822656953	30.6105	9.7854	987	974169	961504803	31.4166	9.9565
938	879844	825293672	30.6268	9.7889	988	976144	964430272	31.4325	9.9598
939	881721	827936019	30.6431	9.7924	989	978121	967361669	31.4484	9.9632
940	883600	830584000	30.6594	9.7959	990	980100	970299000	31.4643	9.9666
941	885481	833237621	30.6757	9.7993	991	982081	973242271	31.4802	9.9699
942	887364	835896888	30.6920	9.8028	992	984064	976191488	31.4960	9.9733
943	889249	838561807	30.7083	9.8063	993	986049	979146657	31.5119	9.9766
944	891136	841232384	30.7246	9.8097	994	988036	982107784	31.5278	9.9800
945	893025	843908625	30.7409	9.8132	995	990025	985074875	31.5436	9.9833
946	894916	846590536	30.7571	9.8167	996	992016	988047936	31.5595	9.9866
947	896809	849278123	30.7734	9.8201	997	994009	991026973	31.5753	9.9900
948	898704	851971392	30.7896	9.8236	998	996004	994011992	31.5911	9.9933
949	900601	854670349	30.8058	9.8270	999	998001	997002999	31.6070	9.9967
950	902500	857375000	30.8221	9.8305	1000	1000000	1000000000	31.6228	10.

# CRISS CROSS METHOD OF COMPUTING ROADWAY CROSS SECTIONS

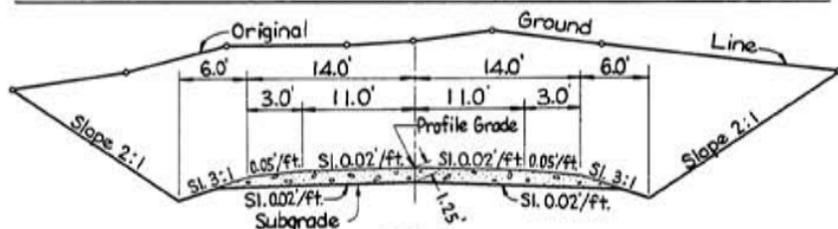


FIG. I

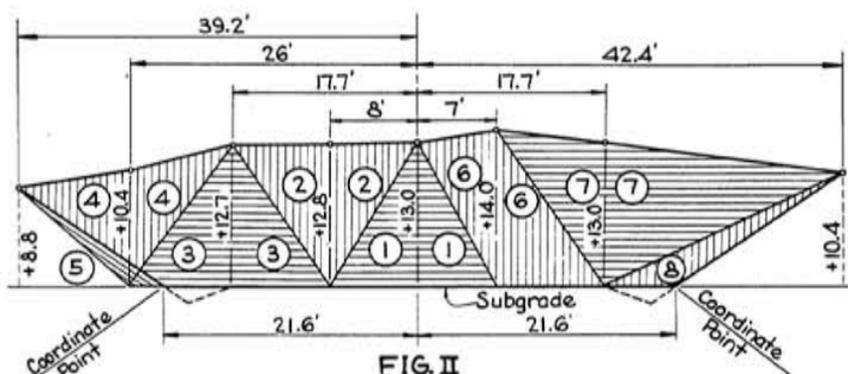


FIG. II

5	4	3	2	1	6	7	8		
0	+8.8	+10.4	+12.7	+12.8	+13.0	+14.0	+13.0	+10.4	0
21.6	39.2	26	17.7	8	0	7	17.7	42.4	21.6

Figure I shows a typical roadway section as it would appear on the contract plans for a project. An original ground line has been added to illustrate the roadway section in full cut.

Figure II is basically the same section, and shows the various triangles involved in computing the area of the section by the "Criss Cross" method. Below Figure II the cross section is shown as it would be recorded in the cross section field notes. Each step in the criss cross method of computation is numbered to show the relationship between the computation and the triangles involved, bearing that same number.

Compu- tation No.	Compu- tation No.
1 $13.0 \times (8 + 7) = 195.00$	5 $8.8 \times (26 - 21.6) = 38.72$
2 $12.8 \times (17.7 - 0) = 226.56$	Minus
3 $12.7 \times (26 - 8) = 228.60$	6 $14.0 \times (17.7 - 0) = 247.80$
4 $10.4 \times (39.2 - 17.7) = 223.60$	7 $13.0 \times (42.4 - 7) = 460.20$
	8 $10.4 \times (21.6 - 17.7) = 40.56$

Double Area = 1583.60  
 Area of Prism = 791.80  
 Sq. Ft.

## CRISS CROSS METHOD OF COMPUTING ROADWAY CROSS SECTION (Cont.)

In taking cross sections in the field for construction purposes, readings with level and rod are taken to the left and right of center line to show the relationship of the original ground to the grade of the roadway to be constructed. These readings are recorded in the cross section notes as cuts (+) and fills (-).

It is apparent from Figure I that this roadway section will have to be constructed to the ground below the surfacing, which will be known as "grading grade" or "subgrade." It is further apparent that the crown will have to be built in, as will superelevation, where curves are introduced. The readings between the grading shoulder lines must, therefore, be adjusted for any crown or superelevation at the time they are taken in the field, and before readings are recorded in the cross section notes (in this case 17.7' left and 17.7' right of center line) and requires that readings be taken and recorded at the center line, for each grading shoulder, for any point where the ground line and the subgrade coincide, and for all variations, or breaks of the ground line. The cross section may then be illustrated as in Figure II as being taken from a horizontal plane.

The distance right and left of center line representing the points where the roadway slopes meet subgrade, known as the coordinate points of the subgrade, must be computed before the slope stakes can be figured and set. A reading on the original ground at the coordinate points is not required in computing the cross section, but the distance to them should be recorded as the last entry, left and right, of the completed cross section.

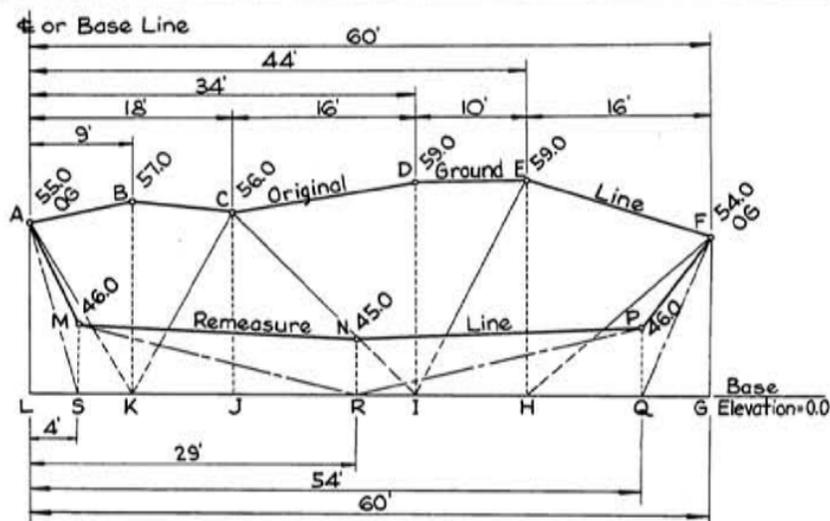
With the cross section recorded in the manner illustrated, the product of the bases and altitudes are additive each direction from center line so long as the distances from center line are progressively larger. When this distance becomes smaller, there is indicated an area being computed which is outside the roadway prism, and, therefore, must be subtracted (area 5). As a general rule, either in cut sections or fill sections, whenever readings are taken and recorded which are outside of the coordinate point of the subgrade, there will be a subtractive computation.

In computing the various triangles involved in the "criss cross" method, each triangle will have a base and an altitude. It will be noted that in many instances two triangles are computed simultaneously. The computations are a summation of the products of the bases and altitudes of the various triangles, and since the area of a triangle is actually one-half the product of the base and the altitude, the sum must be divided by two to obtain the correct area of the prism.

After the area of the prism in excavation has been obtained, the ditch areas and the area for Class A slope treatment should be added to the result so as to give the full excavated area.

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## CRISS CROSS METHODS FOR DETERMINING THE AREA OF ANY PRISM



The above figure may represent a cross-section of a roadway, a cross-section of a borrow area or a prism on a horizontal plane; in each case the area of the prism being desired. It has been divided into triangles in order to explain the procedure in the method of computation. There are two methods that can be used: One, by computing gross area from common ordinates and abscissas and deducting areas outside the area being measured; the other, by a rotating calculation around the limits of the area being measured. Both of the following methods are predicated on the figure shown as being a borrow cross-section, on which the original ground line and remeasure line are shown by elevations.

**Method No. 1:** In this problem the ordinate lies through one extreme point of the borrow section, A, and the abscissa is a horizontal line, or base elevation, which is common to both the original section and remeasure section. The area of the remeasured prism is subtracted from the area of the original prism, and would be represented in the field notes in the following manner:

Original Ground	0.0	55.0	57.0	56.0	59.0	59.0	54.0	0.0	
	0	0	9	18	34	44	60	60	Area = 3426.5
		1		2		3		4	
		5		6					
Remeasure	0.0	55.0	46.0	45.0	46.0	54.0	0.0		
	0	0	4	29	54	60	60	Area = 2777.0	
		7		8		9		10	
		11							
		Net Area 649.5							

## CRISS CROSS METHODS FOR DETERMINING THE AREA OF ANY PRISM (Cont.)

This can be explained by the following combination of triangles, the net value of which must be divided by 2 since no recognition has been given in the computations to the formula

for the area of a triangle or  $\frac{bh}{2}$ .

### Orig. Ground

Triangle AKL	No. 1	$55.0 \times (9 - 0) = 495.0$	
Triangles ABK & BCK	2	$57.0 \times (18 - 0) = 1026.0$	
Triangles KCJ & JCI	3	$56.0 \times (34 - 9) = 1400.0$	
Triangles CDI & DEI	4	$59.0 \times (44 - 18) = 1534.0$	
Triangles IEH & EHF	5	$59.0 \times (60 - 34) = 1534.0$	
Triangle HFG	6	$54.0 \times (60 - 44) = 864.0$	
		Total	6853.0
		<u>6853.0</u>	
		$\frac{\quad}{2} = 3426.5$ Area in Sq. Ft.	

### Remeasure

Triangle AML	No. 7	$55.0 \times (4 - 0) = 220.0$	
Triangles LMS & SMR	8	$46.0 \times (29 - 0) = 1334.0$	
Triangles MNR & RNP	9	$45.0 \times (54 - 4) = 2250.0$	
Triangles RPQ & PQG	10	$46.0 \times (60 - 29) = 1426.0$	
Triangle GPF	11	$54.0 \times (60 - 54) = 324.0$	
		Total	5554.0
		<u>5554.0</u>	
		$\frac{\quad}{2} = 2777.0$ Area in Sq. Ft.	
		Net Area	649.5 Sq. Ft.

As illustrated, the area of the prism bounded by the original ground, the two extreme ordinates and the base elevation or abscissa is computed from which is deducted the prism bounded by the remeasure line, the two extreme ordinates and the base elevation. In order to include all of the area in each case, the horizontal distance from the extreme elevation to the base elevation, or zero, must be indicated. In the field notes above,

this is represented by  $\frac{0.0}{0}$  and  $\frac{0.0}{60}$ .

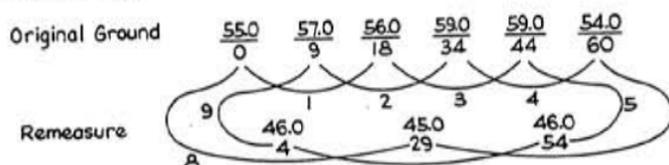
The ordinates and abscissas may be located in any convenient position as long as all elevations or distances are normal to them.

This method may also be used for computing volumes of borrow pits; first by computing the volume above an assumed plane; and later by computing and subtracting the remeasured volume above that plane. By computing volumes in this manner, it is not mandatory that the intermediate points of remeasure be taken at the same points or sections as the originals.

## CRISS CROSS METHODS FOR DETERMINING THE AREA OF ANY PRISM (Cont.)

In the use of this method it is necessary to remember that the extremities of a plane figure or the horizontal boundaries of a borrow pit must be identical, both for the original measure and for the remeasure, interpolation in some instances being required.

**Method No. 2:** The ordinate and abscissa may be established the same as for method 1. In this method, however, the original and remeasure elevations are combined into a single step in the determination of the area. The extremities of the section may have to be interpolated if original ground elevations were not taken at those points. Field notes would be recorded as follows for this method:



This is explained by the following combination of triangles, the net value of which must be divided by 2, as explained in method 1.

Triangles ABK & BCK	No. 1	$57.0 \times (18 - 0)$	(Plus)	= + 1026.0
Triangles KCJ & CJI	2	$56.0 \times (34 - 9)$	(Plus)	= + 1400.0
Triangles CDI & DEI	3	$59.0 \times (44 - 18)$	(Plus)	= + 1534.0
Triangles IEH & EFH	4	$59.0 \times (60 - 34)$	(Plus)	= + 1534.0
Triangle HFQ	5	$54.0 \times (54 - 44)$	(Plus)	= + 540.0
Triangles QPF & RPQ	6	$46.0 \times (60 - 29)$	(Minus)	= - 1426.0
Triangles MNR & RNP	7	$45.0 \times (54 - 4)$	(Minus)	= - 2250.0
Triangles SMR & AMS	8	$46.0 \times (29 - 0)$	(Minus)	= - 1334.0
Triangle AKS	9	$55.0 \times (9 - 4)$	(Plus)	= + 275.0

Total	1299.0
1299.0	
2	= 649.5 Area in Sq. Ft

In computing the area of a prism by this method, the following rules should be observed:

1. Be sure to supply the original ground readings at the outer terminals of the original elevations and rule out any other original elevations beyond these outer terminals.

2. Record all of the remeasure elevations inside of the outer terminal points directly below the original elevations.

3. Go entirely around the section to form a complete closure; that is, use every elevation in the complete section as a base for the computation of the triangles once, and only once.

## CRISS CROSS METHODS FOR DETERMINING THE AREA OF ANY PRISM (Cont.)

4. When the base line, or center line, lies at or outside of an outer terminal point, begin the computations at the point of least recorded distance. Proceed in the direction the distances are increasing and go completely around the section in that direction. As the distances are increasingly larger, the product of the base and altitudes will be additive, and when the distances are decreasing, that product will be subtractive.

5. When the base line, or center line, lies within the area involved, commence at the centerline elevation of the original elevations which will be additive, proceed in one direction from centerline and around the section in that direction until the centerline distance on the remeasure elevations has been reached. Continue the computations from the centerline of the original elevations in the other direction and around that side of the section until the remeasure centerline has been reached. Complete the closure of the section across centerline of the remeasure elevations, which is a subtractive computation. Excepting for the first computation across centerline of the original elevations, and the closing computation across the remeasure centerline, the rule in each direction from the starting point remains the same, that is, when the distances are increasing, the product of the base and altitudes will be additive, and when the distances are decreasing, that product will be subtractive.

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## TRIANGULATION TO CIRCUMVENT AN OBSTRUCTION USING AN ISOSCELES TRIANGLE

### Example

$$a = b$$

$$c = \cos \Delta (a) 2$$

Given:

A = Sta. 120+00 P.O.T.

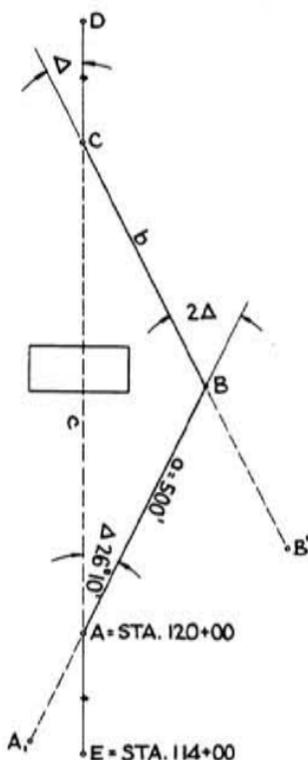
E = Sta. 114+00 P.O.T.

a = 500 ft. = b

$\Delta = 26^{\circ} 10'$

$$c = \cos 26^{\circ} 10' (500.0) 2 = 897.52 \text{ ft.}$$

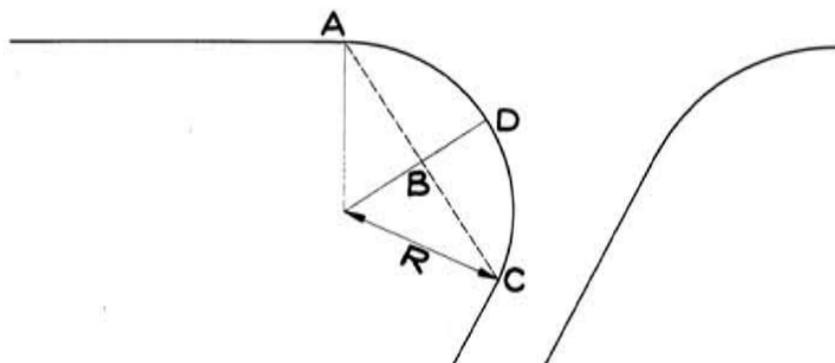
$$C = (\text{Sta. } 120+00) + (8+97.52) = \text{Sta. } 128+97.52$$



With plunged transit set up on point A and backsighting on point E, turn a sufficient angle to get by the obstruction with a clear view of point B from points A and C. In the above example, an angle of  $26^{\circ} 10'$  was found to satisfy this condition. Distance a was found to be 500.0 ft. and a point was set at point B.

Set plunged transit up on point B and backsight on point A or on point A' if possible to obtain a longer backsight. Turn twice the angle of point A,  $2(26^{\circ} 10') = 52^{\circ} 20'$ , and set point C, measuring 500.0 from point B to point C. Set plunged transit up on point C and backsight on point B or on point B' if possible to obtain a longer backsight. Turn the angle of point A ( $26^{\circ} 10'$ ) to return to original bearing, measure approximately 500 ft. and set foresight at point D. Compute a value for  $c = \cos \Delta (a) 2$  and add to the station value of point A giving the station value of point C.

## DETERMINING RADII OF SHARP CURVES BY FIELD MEASUREMENTS



FORMULA:

$$R = \frac{BC^2}{2BD} + \frac{BD}{2}$$

EXAMPLE:

Step 1. Chain the chord length from A to C

$$AC = 53.8' \quad BC = \frac{AC}{2} = 26.9'$$

NOTE: Points A and C may be any two points on the curve.

Step 2. Chain the middle ordinate length from D to B

$$DB = 10.4'$$

Step 3. Compute radius

$$R = \frac{26.9^2}{20.8} + \frac{10.4}{2} = 40.0 \text{ Ft.}$$

## EXAMPLE OF TRANSIT NOTES

Sta.	Point	Defl.	Curve Data	Calc. Course	Magnetic Course				
260+12.5	P.O.T.			N 17° 27' E	N 17° 30' E				
248+95.2	P.T.	7° 42.5'							
248+50		6° 31.9'	PI. 247+48.1						
248+00		5° 13.8'	Δ 15° 25' Lt.						
247+81.3	P.O.C.	4° 44.6'	R 1100.0'						
247+50		3° 55.6'	T 1489'						
247+00		2° 37.5'	L 296.0'						
246+50		1° 19.4'							
246+00		0° 01.3'							
245+99.2	P.C.	0° 00'							
230+00	P.O.T.			N 32° 52' E	N 32° 40' E				

PI. 247+48.1  
Hub & Tack

PI. 247+48.1  
Hub & Tack







## EXAMPLE OF STRUCTURE NOTES FOR DRAINAGE

			Page 95	☐ - Smith ☒ - Jones
STATION 517+00				
SCHEDULE A CULVERT PIPE				
18" DIAMETER				
M-LINE				
F.L. 743				F.L. 75.1
+0.2 74	0.0 33	+0.1 5	+1.2 0	
QUANTITIES				
SCHEDULE A CULVERT PIPE 18" DIAM. 72 LIN. FT.				
STRUCTURE EXCAVATION			1.3 CU. YDS.	
MECHANICAL TAMPER			1.5 HRS.	
CARRIED TO DRAINAGE ITEM SUMMARY - PAGE 99				