

Select Custom Function/Macro Reference

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	A	B	C	D	E	F	G	H
6	Trigonometry Functions							
7	Functions included in this category are the same as Excel functions with the same							
8	names but without an underscore, except they work with the angles in decimal							
9	degrees (Excel functions operate on the angles in radians)							
10								
11	cos_(ang)							
12	sin_(ang)							
13	tan_(ang)							
14	acos_(number)							
15	asin_(number)							
16	atan_(number)							
17	atan2_(number1,number2)							
18								
19	<u>Examples:</u>							
20	ang =		30					
21	num =		0.5					
22	sin_(ang) =		0.5		=sin_(C20)			
23	asin_(num) =		30		=asin_(C21)			
24	tan_(45.7) =		1.024738		=tan_(45.7)			
25								
26								

	A	B	C	D	E	F	G	H
27	Triangle Geometry Function							
28	Included function trngl() takes three known angles/sides and returns							
29	specified remaining angle/side or area of triangle.							
30								
31	trngl(<i>code_given</i>, <i>code_return</i>, <i>par1</i>, <i>par2</i>, <i>par3</i>)							
32								
33	Known Parameters	<i>code_given</i>	<i>code_return</i>	<i>par1</i>	<i>par2</i>	<i>par3</i>	Case	
34								
35	a, b, c	"abc"	"A"	a-value	b-value	c-value	All three sides are known	
36			"B"					
37			"C"					
38			"area"					
39	a, A, B	"aAB"	"b"	a-value	A-value	B-value	One out of two known angles is opposite to known side	
40			"c"					
41			"C"					
42			"area"					
43	a, b, A	"abA"	"c"	a-value	b-value	A-value	Known angle is opposite to one out of two known sides	
44			"B"					
45			"C"					
46			"area"					
47	a, b, C	"abC"	"c"	a-value	b-value	C-value	Known sides are two legs of known angle	
48			"A"					
49			"B"					
50			"area"					
51	<ul style="list-style-type: none"> Function returns value of parameter specified in <i>code_return</i>. Function argument and returned angles are in degrees. Codes are case sensitive and should include enclosed quotation marks if entered directly in the formula. Triangle side and angle symbology used herein is meant to represent relative side/angle positioning within a triangle and should be applied in a context of specific case. 							
52								
53								
54								
55								
56								
57								
58								
59	<u>Examples:</u>							
60								
61	Given:		Find:					
62	a =	26.1339	A =	70.000	=trngl("abc","A",B62,B63,B64)			
63	b =	25	B =	64.017	=trngl("abc","B",B62,B63,B64)			
64	c =	20	C =	45.983	=trngl("abc","C",B62,B63,B64)			
65								
66	Given:		Find:					
67	a =	26.1339	b =	25.000	=trngl("aAB","b",B67,B68,B69)			
68	A =	70	c =	20.000	=trngl("aAB","c",B67,B68,B69)			
69	B =	64.0167	area =	234.924	=trngl("aAB","area",B67,B68,B69)			

	A	B	C	D	E	F	G	H
70								
71	Given:		Find:					
72	a =	26.1339	c =	20.000		=trngl("abA","c",B72,B73,B74)		
73	b =	25	B =	64°-1'-0"		=dms(trngl("abA","B",\$B\$72,\$B\$73,\$B\$74))		
74	A =	70	C =	45°-59'-0"		=dms(trngl("abA","C",\$B\$72,\$B\$73,\$B\$74))		
75								
76	Given:		Calculate angle A, triangle perimeter and area:					
77	a =	26.1339	A	70.000		=trngl("abC",C77,\$B\$77,\$B\$78,\$B\$79)		
78	b =	25	Perimeter =	71.134		=B77+B78+trngl("abC","c",B77,B78,B79)		
79	C =	45.983	area	234.922		=trngl("abC",C79,\$B\$77,\$B\$78,\$B\$79)		
80								
81								

	A	B	C	D	E	F	G	H
82	Vertical Curve Functions							
83	Four functions included in this category take profile grade (PG) as an argument. PG data							
84	and functions that take it must be placed on the same worksheet. Note that spreadsheet							
85	doesn't validate integrity of the entered PG data.							
86	PG data consists of one or more vertically stacked vertical curve (VC) records. Each VC							
87	record has six data fields entered in adjacent cells as follows:							
88								
89	1	2	3	4	5	6		
90	id	PVI Sta	PVI EI	VCL	G1(%)	G2(%)		
91	id - positive integer number, unique for each VC							
92								
93	<i>Functions:</i>							
94								
95	pg_el(<i>s ta</i>, <i>pg_rng</i>)			returns PG elevation @ <i>sta</i>				
96								
97	pg_sl(<i>sta</i>, <i>pg_rng</i>)			returns PG slope @ <i>sta</i>				
98								
99	pg_hi_pt(<i>lt_sta</i>, <i>rt_sta</i>, <i>pg_rng</i>)			returns PG sta corresponding to highest PG				
100	elevation found between <i>lt_sta</i> & <i>rt_sta</i>							
101	pg_lo_pt(<i>lt_sta</i>, <i>rt_sta</i>, <i>pg_rng</i>)			returns PG sta corresponding to lowest PG				
102	elevation found between <i>lt_sta</i> & <i>rt_sta</i>							
103	pg_rng			cell range reference to PG data				
104								
105								
106	<i>Examples:</i>							
107								
108	PG Data:							
109	VC id	PVI Sta	PVI EI	VCL	G1(%)	G2(%)		
110	1	8+00.00	350.00	200.00	2.00	-3.00		
111	2	31+00.00	281.00	600.00	-3.00	-1.00		
112	3	75+00.00	237.00	1000.00	-1.00	2.50		
113								
114	Calculate PG elevations at given stations:							
115								
116	Sta	PG Elev						
117	5+00.00	344.00	=Pg_el(A117,\$A\$110:\$F\$112)					
118	8+50.00	348.19	=Pg_el(A118,\$A\$110:\$F\$112)					
119	29+50.00	285.88	=Pg_el(A119,\$A\$110:\$F\$112)					
120	75+00.00	241.38	=Pg_el(A120,\$A\$110:\$F\$112)					
121	80+00.00	249.50	=Pg_el(A121,\$A\$110:\$F\$112)					
122								

	A	B	C	D	E	F	G	H
123	Calculate PG slopes at given stations:							
124								
125	Sta	PG Slope						
126	5+00.00	0.0200		=pg_sl(A117,\$A\$110:\$F\$112)				
127	8+50.00	-0.0175		=pg_sl(A118,\$A\$110:\$F\$112)				
128	29+50.00	-0.0250		=pg_sl(A119,\$A\$110:\$F\$112)				
129	75+00.00	0.0075		=pg_sl(A120,\$A\$110:\$F\$112)				
130	80+00.00	0.0250		=pg_sl(A121,\$A\$110:\$F\$112)				
131								
132	Find lowest and highest elevation within PG segment bounded by rt_sta and lt_sta:							
133								
134	lt sta =	5+00.00						
135	rt sta =	40+00.00						
136								
137	<u>High Point</u>							
138	sta =	7+80.00		=pg_hi_pt(\$B\$134,\$B\$135,\$A\$110:\$F\$112)				
139	EI =	348.80		=Pg_el(B138,\$A\$110:\$F\$112)				
140								
141	<u>Low Point</u>							
142	sta =	40+00.00		=pg_lo_pt(\$B\$134,\$B\$135,\$A\$110:\$F\$112)				
143	EI =	272.00		=Pg_el(B142,\$A\$110:\$F\$112)				
144								
145								







	A	B	C	D	E	F	G	H
146	Interpolation Functions							
147	Interpolation functions are divided in three categories: direct, indirect and indexed.							
148	Direct and indirect interpolation functions interpolate/extrapolate value at specified location							
149	and calculate location corresponding to specified value from the pair of given locations							
150	and values.							
151	Indexed interpolation function interpolates/extrapolates value at specified location from							
152	series of value sets.							
153								
154	<u>Direct Interpolation Functions</u>							
155	intrpl_val (<i>loc, L1, L2, V1, V2</i>)		returns <i>value @ loc</i>					
156	intrpl_loc (<i>value, L1, L2, V1, V2</i>)		returns <i>loc</i> corresponding to <i>value</i>					
157								
158	<u>Example:</u>							
159	L1	L2	V1	V2				
160	100	200	9	87				
161								
162	Location	Value						
163	50	-30	=intrpl_val(A163,\$A\$160,\$B\$160,\$C\$160,\$D\$160)					
164	125	28.5	=intrpl_val(A164,\$A\$160,\$B\$160,\$C\$160,\$D\$160)					
165	200	87	=intrpl_val(A165,\$A\$160,\$B\$160,\$C\$160,\$D\$160)					
166	275	145.5	=intrpl_val(A166,\$A\$160,\$B\$160,\$C\$160,\$D\$160)					
167								
168	Value	Location						
169	-30	50	=intrpl_loc(A169,\$A\$160,\$B\$160,\$C\$160,\$D\$160)					
170	28.5	125	=intrpl_loc(A170,\$A\$160,\$B\$160,\$C\$160,\$D\$160)					
171	87	200	=intrpl_loc(A171,\$A\$160,\$B\$160,\$C\$160,\$D\$160)					
172	145.5	275	=intrpl_loc(A172,\$A\$160,\$B\$160,\$C\$160,\$D\$160)					
173								
174	<u>Indirect Interpolation Functions</u>							
175	These functions take <i>L1, L2, V1 & V2</i> (in this order) entered in the adjacent cells on the							
176	same row anywhere on the worksheet.							
177								
178	intrpl_val_indr (<i>loc, rng</i>)		returns <i>value @ loc</i>					
179	intrpl_loc_indr (<i>value, rng</i>)		returns <i>loc</i> corresponding to <i>value</i>					
180	<i>rng</i>		cell range reference to <i>L1, L2, V1 & V2</i> (e.g. c2:k2)					
181								
182								
183	<u>Example:</u>							
184	L1	L2	V1	V2				
185	100	200	9	80				
186	200	300	80	-20				
187								
188	Location	Value						
189	50	-26.5	=intrpl_val_indr(A189,\$A\$185:\$D\$185)					
190	125	26.75	=intrpl_val_indr(A190,\$A\$185:\$D\$185)					
191	200	80	=intrpl_val_indr(A191,\$A\$185:\$D\$185)					
192	275	5	=intrpl_val_indr(A192,\$A\$186:\$D\$186)					
193	350	-70	=intrpl_val_indr(A193,\$A\$186:\$D\$186)					
194								

	A	B	C	D	E	F	G	H
195	Value	Location						
196	-26.5	50		=intrpl_loc_indr(A196,\$A\$185:\$D\$185)				
197	26.75	125		=intrpl_loc_indr(A197,\$A\$185:\$D\$185)				
198	80	200		=intrpl_loc_indr(A198,\$A\$185:\$D\$185)				
199	5	275		=intrpl_loc_indr(A199,\$A\$186:\$D\$186)				
200	-70	350		=intrpl_loc_indr(A200,\$A\$186:\$D\$186)				
201								
202	<u>Indexed Interpolation Function</u>							
203	This function operates on series of value sets entered in the adjacent columns anywhere							
204	on the worksheet. The first column contains locations arranged in the ascending order.							
205	Remaining columns contain values. The function references value-columns by index. The							
206	first value-column has index 1, second column has index 2 and so on.							
207								
208								
209	indx_intrpl(<i>loc, idx, rng</i>)			returns interpolated value from value set in <i>idx</i> -column				
210				@ <i>loc</i>				
211	<i>rng</i>			cell range reference to cells containing data columns				
212				(e.g. c2:h13)				
213	<u>Example:</u>							
214	Superelevation Transition Data:							
215		Lt Gutter	Rdwy	Rt Gutter				
216	sta	SL_1	SL_2	SL_3				
217	74+21.00	-5.0000	-5.0000	-5.0000				
218	74+40.00	-5.0000	-5.0000	-5.0000				
219	75+01.50	-3.1250	-3.1250	-3.1250				
220	75+31.50	-2.0830	-2.0830	-3.1250				
221	75+80.00	0.0000	-2.0830	-3.1250				
222	76+10.00	1.6700	-2.0830	-3.1250				
223								
224	Calculate x_slopes:							
225	sta	SL_1	SL_2	SL_3	SL_3 formula			
226	74+00.00	-5.0000	-5.0000	-5.0000	=indx_intrpl(7400,3,\$A\$217:\$D\$222)			
227	74+50.00	-4.6951	-4.6951	-4.6951	=indx_intrpl(7450,3,\$A\$217:\$D\$222)			
228	75+00.00	-3.1707	-3.1707	-3.1707	=indx_intrpl(7500,3,\$A\$217:\$D\$222)			
229	75+50.00	-1.2885	-2.0830	-3.1250	=indx_intrpl(7550,3,\$A\$217:\$D\$222)			
230	76+00.00	1.1133	-2.0830	-3.1250	=indx_intrpl(7600,3,\$A\$217:\$D\$222)			
231	76+50.00	3.8967	-2.0830	-3.1250	=indx_intrpl(7650,3,\$A\$217:\$D\$222)			
232								
233								

	A	B	C	D	E	F	G	H
234	Cell Formula Function							
235	Cell formula function pr_frml() returns an expanded version of the cell formula with cell							
236	references replaced by the corresponding values.							
237	<u>Notes:</u>							
238	1. Range references that include a colon (:) (e.g. K219:L220) are not expanded (some							
239	COGO and Vertical Curve functions are exception).							
240	2. References to external spreadsheets are expanded only if these spreadsheets are							
241	opened concurrently with the workbook containing the reference.							
242								
243	pr_frml(<i>cell_ref</i>)	returns an expanded version of the formula contained in the target cell						
244	<i>cell_ref</i>	reference to target cell (e.g. a16)						
245								
246	<u>Examples:</u>							
247	a =	3.797						
248	b =	1.90						
249	c =	0.168755						=1.7*sin_(C248+C247)
250	c =	=1.7*sin_(1.9+3.797)						=pr_frml(C249)
251								
252								

	A	B	C	D	E	F	G	H
253	Feet-Inch Conversion Functions							
254	The functions in this category convert/round numbers to specified format. The fraction accuracy of inches in fi() function is specified by the denominator. The resulting fraction is an equivalent fraction with the smallest denominator. For example 0.5 with specified denominator of 8 equal to 4/8 transformed to 1/2 .							
255								
256								
257								
258								
259	fi(num, denom)	converts decimal number into feet-inch text string. Text string must be converted into a decimal number with fd() function when used in math operations.						
260								
261								
262	<i>num</i>	decimal number						
263	<i>denom</i>	optional positive integer equal to the fraction denominator of the inch-part. Default: 16.						
264								
265								
266	fd(ft-in)	converts feet-inch text string into decimal number						
267	<i>ft-in</i>	text string in feet-inch format (ft-in must be previously obtained using fi() function).						
268								
269	<i>Examples:</i>							
270	num1 =	-30.6789						
271	A = num1_ft_in_8 =	-30'-8 1/8"				=fi(C270,8)		
272	A - 6.7 =	-37'-4 1/2"				=fi(fd(C271)-6.7)		
273	A_dec =	-30.6771				=fd(C271)		
274	C =	4'-0 7/16"				=fi(4+7/16/12)		
275								
276								

	A	B	C	D	E	F	G	H
277	Cell Inspector Macro (F2 default key)							
278	Press F2 to display active cell formula and its expanded version with the cell references replaced by the corresponding values. Notes: 1. Range references that include a colon (:) (e.g. K219:L220) are not expanded (some COGO and Vertical Curve functions are exception). 2. References to external spreadsheets are expanded only if these spreadsheets are opened concurrently with the workbook containing reference.							
279								
280								
281								
282								
283								
284								
285								
286								
287								

	A	B	C	D	E	F	G	H
288	Cell Range Linker/Transformer Macro (F3 default key)							
289	Cell Range Linker/Transformer creates a new cell range that is linked to the target							
290	range. The pattern of the new range is derived from the target range based on the							
291	chosen transformation option. Press F3 to launch the Cell Range Linker/Transformer ,							
292	and follow instructions.							
293								
294	<i>Examples:</i>							
295								
296	Target Range							
297	1	5						
298	2	6						
299	3	7						
300	4	8						
301								
302	Range linked to Target Range with Option  → 							
303	1	2	3	4				
304	5	6	7	8				
305								
306	Range linked to Target Range with Option  → 							
307	5	1						
308	6	2						
309	7	3						
310	8	4						
311								
312	Range linked to Target Range with Option  → 							
313	4	8						
314	3	7						
315	2	6						
316	1	5						