Exploring the Values of the Trigonometry Ratios

Task:

What relationships or patterns can you find in the table of trigonometric values on the next page? Write a statement for each, and try to explain why it is true.

Additional Questions:

1. What values can sine, cosine, and tangent be? Why?

2. What happens to the values of the ratios as the angle measure increases?

3. What do you think their values will be when the angle is 90°? Why?

4. Do you notice any values that repeat in the table? Try to describe the patterns precisely, using x to represent the measure of an angles, and explain why the patterns work.

5. What fractions are tan(14°) and tan(76°) close to? What pattern might this suggest? Test it out to see if it works for other values, then describe it using x to represent one of the angles. Why does it work?

6. Additional patterns you can consider follow. Describe each using x to represent an angle, and try to explain why it works.

   a. Look at tan(45°) and tan(60°). Compare them to the cosine and sine values for the angles. What pattern does this suggest?

   b. Calculate $(\cos(29°))^2+(\sin(29°))^2$. What do you notice?

   c. Will cos(60°) be exactly $\frac{1}{2}$? Why or why not?

Table of Trigonometric Values

Angle measure	Cosine ratio	Sine ratio	Tangent ratio
0°	1.000000	0.000000	0.000000
1°	0.999848	0.017452	0.017455
2°	0.999391	0.034899	0.034921
3°	0.998630	0.052336	0.052408
4°	0.997564	0.069756	0.069927
5°	0.996195	0.087156	0.087489
6°	0.994522	0.104528	0.105104
7°	0.992546	0.121869	0.122785
8°	0.990268	0.139173	0.140541
9°	0.987688	0.156434	0.158384
10°	0.984808	0.173648	0.176327
11°	0.981627	0.190809	0.194380
12°	0.978148	0.207912	0.212557
13°	0.974370	0.224951	0.230868
14°	0.970296	0.241922	0.249328
15°	0.965926	0.258819	0.267949
16°	0.961262	0.275637	0.286745
17°	0.956305	0.292372	0.305731
18°	0.951057	0.309017	0.324920
19°	0.945519	0.325568	0.344328
20°	0.939693	0.342020	0.363970
21°	0.933580	0.358368	0.383864
22°	0.927184	0.374607	0.404026
23°	0.920505	0.390731	0.424475
24°	0.913545	0.406737	0.445229
25°	0.906308	0.422618	0.466308
26°	0.898794	0.438371	0.487733
27°	0.891007	0.453990	0.509525
28°	0.882948	0.469472	0.531709
29°	0.874620	0.484810	0.554309
30°	0.866025	0.500000	0.577350
31°	0.857167	0.515038	0.600861
32°	0.848048	0.529919	0.624869
33°	0.838671	0.544639	0.649408
34°	0.829038	0.559193	0.674509
35°	0.819152	0.573576	0.700208
36°	0.809017	0.587785	0.726543
37°	0.798636	0.601815	0.753554
38°	0.788011	0.615661	0.781286
39°	0.777146	0.629320	0.809784
40°	0.766044	0.642788	0.839100
41°	0.754710	0.656059	0.869287
42°	0.743145	0.669131	0.900404
43°	0.731354	0.681998	0.932515
44°	0.719340	0.694658	0.965689

Angle measure	Cosine ratio	Sine ratio	Tangent ratio
45°	0.707107	0.707107	1.000000
46°	0.694658	0.719340	1.035530
47°	0.681998	0.731354	1.072369
48°	0.669131	0.743145	1.110613
49°	0.656059	0.754710	1.150368
50°	0.642788	0.766044	1.191754
51°	0.629320	0.777146	1.234897
52°	0.615661	0.788011	1.279942
53°	0.601815	0.798636	1.327045
54°	0.587785	0.809017	1.376382
55°	0.573576	0.819152	1.428148
56°	0.559193	0.829038	1.482561
57°	0.544639	0.838671	1.539865
58°	0.529919	0.848048	1.600335
59°	0.515038	0.857167	1.664279
60°	0.500000	0.866025	1.732051
61°	0.484810	0.874620	1.804048
62°	0.469472	0.882948	1.880726
63°	0.453990	0.891007	1.962611
64°	0.438371	0.898794	2.050304
65°	0.422618	0.906308	2.144507
66°	0.406737	0.913545	2.246037
67°	0.390731	0.920505	2.355852
68°	0.374607	0.927184	2.475087
69°	0.358368	0.933580	2.605089
70°	0.342020	0.939693	2.747477
71°	0.325568	0.945519	2.904211
72°	0.309017	0.951057	3.077684
73°	0.292372	0.956305	3.270853
74°	0.275637	0.961262	3.487414
75°	0.258819	0.965926	3.732051
76°	0.241922	0.970296	4.010781
77°	0.224951	0.974370	4.331476
78°	0.207912	0.978148	4.704630
79°	0.190809	0.981627	5.144554
80°	0.173648	0.984808	5.671282
81°	0.156434	0.987688	6.313752
82°	0.139173	0.990268	7.115370
83°	0.121869	0.992546	8.144346
84°	0.104528	0.994522	9.514364
85°	0.087156	0.996195	11.430052
86°	0.069756	0.997564	14.300666
87°	0.052336	0.998630	19.081137
88°	0.034899	0.999391	28.636253
89°	0.017452	0.999848	57.289962