

# **The Small Angle Approximation for the Motion of a Simple Pendulum**

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The attached table reports angles out to 45 degrees in both degrees and radians, as well as their sine, tangent and the percentage difference between the angle in radians and its sine and tangent. The difference between the tangent of an angle and the angle in radians is 10% at 30 degrees, while the difference between the angle and its sine is 10% at 45 degrees. Angles less than 45 degrees can therefore be considered as “small” for approximating the motion of a simple pendulum as Simple Harmonic Motion (SHM).

theta (Deg)	theta (Rad)	sin(theta)	(theta-sin(theta))/theta	tan(theta)	(theta-tan(theta))/theta
5	0.087266	0.087156	0.001269	0.087489	-0.002546
10	0.174533	0.173648	0.005069	0.176327	-0.010279
15	0.261799	0.258819	0.011384	0.267949	-0.023491
20	0.349066	0.34202	0.020184	0.36397	-0.042698
25	0.436332	0.422618	0.03143	0.466308	-0.068698
30	0.523599	0.5	0.04507	0.57735	-0.102658
35	0.610865	0.573576	0.061043	0.700208	-0.146255
40	0.698132	0.642788	0.079275	0.8391	-0.201922
45	0.785398	0.707107	0.099684	1	-0.27324