Calculating sine of an angle

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How do you calculate sine of an angle. Formula for calculating sine of an angle. How to do sine of an angle. How do you find sine of an angle.

These formulas relate to lengths and areas of particular circles or triangles. On the next page you will find the identities. The identities do not refer to particular geometric figures but apply to all angles. You can easily find both the length of an arc and the area of a sector for an angle is Î§ in a circle of radius r. Length of an arc. The length of the arc is just the radius r multiplied by the angle is Î§ where the angle is measured in radians. To convert from degrees to radians, multiply the number of degrees by Ï/180. Area of a sector. The area of the sector is half the square of the radius for the angle, where, once again, the angle is measured in radians. Formulas for Rectangular Triangles The most important formulas for trigonometry are those for a right triangle. If this is one of the acute angles of a triangle, then the sine of theta is the ratio between the opposite side and the hypotenuse, the cosine is the ratio between the adjacent side and the hypotenuse, and the tangent is the ratio between the opposite side and the adjacent side. These three formulas are known collectively from the mnemonic SohCahToa. In addition to these, there is the very important Pythagorean formula which says that the square of the hypotenuse is equal to the sum of the squares of the other two sides. Besides the awareness that the two acute angles are complementary, that is, add up to 90Â°, it is possible to solve any right triangle: if you know two of the three sides, you can find the third side and both acute angles. If you know one acute angle and one of the three sides, you can find the other acute angle and the other two sides. Formulas for oblique triangles These formulas work for any triangle whether acute, obtuse or straight. We will use the standard notation where the three vertices of the triangle are indicated with the capital letters A, B and C, while the three opposite sides are indicated with the lower case letters a, b and c respectively. There are two important formulas for oblique triangles. They're called the law of cosines and the law of sines. The law of cosines generalizes the Pythagorean formula to all triangles. It says that c2, the square of one side of the triangle, is equal to 2 + b2, the sum of the squares of the other two sides, minus 2ab so C, twice their product times the cosine of the opposite angle. When angle C is right, it becomes the Pythagorean formula. The law of sinuses says that the ratio between the sine of an angle and the opposite side is the same ratio for all three angles. With these two formulas you can solve any triangle: If you know two angles and one side, you can find the third angle and the other two sides. If you know two sides and the included angle, you can find the third side and both other angles. If you know two sides and the opposite angle to one of them, there are two possibilities for the opposite angle to the other (one sharp and one dull), and for both possibilities you can determine the remaining angle and the remaining side. Formula area Triangles There are three different formulas useful for the area of a triangle, and which one you use depends on what information you have. Half of the time base height. This is the usual to use since it is simpler and you usually have such information. Pick a side to call base b. So if H is the distance from the vertex opposite B, then the area is half of BH. Heron's formula. This is useful when you know the three sides A, B and C of the triangle, and all you want to know is the area. Be half of their sum, called half-perimeter. So the area is the square root of the product of S, SÃ¢'Ã¢ A, SÃ¢ÂÂ¢, and SÃ¢ÂÂ¢ c. Angular side formula. Use this when you know two sides, A and B and the included angle, C. The area is half the product of the two sides times the sine of the included angle. As noted in one commentary, there are equations that you can write for the trigonometric functions of the rational portions of a right angle (and thus for the sine of any rational number of degrees) without using $\PI$ or any trigonometric function. To actually use these equations might prove a bit cumbersome, however. Instead of trying a formula for an arbitrary integer or a rational number of degrees, let me address the desire to evaluate $$ ewcommand {\ Sin} {\ Sin}}} mathrm {sin}}} ewcommand {\ cos} {\ mathop { \ mathrm {cos}}}} {n}}} lim_ {n \ to \ In ffty} n \ left \ (\ frac {180} {n} \ right) $$ where $ \ Sin $ is the function SINE that takes its parameter in degrees , e.g. $ \ Sin (90) = 1 $. Just look at the following limit for integer values of $ K $: $$ \ LIM_ {K \ to \ INFTY} 2 ^ K \ LIN \ LEFT (\ FRAC {180} { 2 ^ K} \ RIGHT). $$ The amount $ \ without \ left (\ frac {180} {2 ^ k} \ right) $ is easy to calculate (at least, it is easy compared to such values as $\sine (1) $). Let $\cos (x) $ be the function cosine for x measured in degrees; Then apply the half-angle formula to the ribs of corners in the range of $0 $ to $180 $ degrees, including: $$ \ cos \ left (\ frac {x} {2} \ right) = \ sqrt {\ frac {1 + \ Cos x} {2}}. $$ if $ X = \ DFFRAC {180} {2 ^ M} $, then $ \ DFFRAC X2 = \ DFFRAC {180} {2 ^ {M + 1}} $ And the half-angle formula just says $$ \ Cos \ left (\ frac {180} {2 ^ {m + 1}}} right) = \ sqrt {\ frac {1 + \ cos \ left (\ frac {180} {2 ^ m} \ right) } {2}. $$ you can find the value for any $ K $ starting from $ M = 1 $ and applying the half-angle formula repeatedly to $ m = 2,3, \ ldots, k $: \ begin {align} \ cos \ left (\ frac {180} {2} \ right) & = \ cos (90) = 0, \\ cos \ left (\ frac {180} {4} \ right) & = \ sqrt {\ frac {1 + \ Cos \ left (\ frac {180} {2} \ right) } {2}} = \ sqrt {\ frac {1 + 0} {2}} = \ frac {1} {\ sqrt 2}, \ \ \ Cos \ left (\ frac {180} {8} \ right) & = \ sqrt {\ frac {1 + \ cos \ left (\ frac {180} {4} \ right) } {2}} = \ sqrt {\ {1 + FRAC {SQRT 2}}}}}} (sqrt 2}, \ frc \ fro (frac {frac } {16}) & = \ frac {frac {rac})}}}}}}}} \ Frac {\ sqrt 2 + 1}}}}}}}}} + \ sqrt 2} + \ sqrt {\ sqrt 2 + 1}}}}} Sqrt {2 \ sqrt 2}}, \\ \\ \nt \nd {alligna} e cos'en via obtain For $ k $ great as desired. So get the Sine of $$ sin left (frac {180} {2 ^ k} right) = sqrt {1 - left (so left (Right) Right) ^ 2}. $$ I would suggest a less well-known method that generalizes well to many other functions and can be efficient enough even when you need to do all hand calculations: the pair $ (C, s) = (so x, sin x) $ (In Radians, of course!) It can be interpreted as the unique solution for the ordinary differential equation $$ BRAC {mathrm {D}} {mathrm {d} x} beegin {pmatrix} c s f} = pmatrix} = The idea is to start from scratch and then bring the destination value by step by step, effectively using a Taylor expansion around each point. Because the steps are small, the Taylor expansion converges much faster here than if you put it directly into the destination value. Because this is particularly convenient for manual calculation: you can choose step lengths in a way so that the numbers remain reasonably beautiful in decimal, as long as you make sure the steps are small and add to the point where You want to go. I will use the Heun scheme, which is the simplest of these iterative solurrors that actually actually usable. It is based on a taylor expansion of the second order. So let's say you want to calculate $ sin (45 ^ circ) = sin (_prac more) $. We know it should come out as $ SQRT2 / $ 2, but let's see. Choose '0.2 as a predefined step-size. # Let's Go: $ x_0 = 0 $, $ C_0 = 1 $, $ S_0 = 0 $$ Begin {align} H_1 = & 0.2 x1 = & 0.2 Tilde C_1 = & C0_1 Time S_0 = 1 Time 0.9 c = 0.9 c = 0.9 c = 0.9 c = 0.9 c = 0.9 c = 0.9 c = 0.9 c = 0.9 0.92 + 0 , 92 + 0.20 Ok, if now we did another step of 0.2, we ended at 0.8, but $ / 4 more € 0.7854. So we will only make a step of 0.1. And then I'll start to round after the decimal fifth. 0.83 = 0.8 = 0.8 = 0.6824 = 0.8 = 0.8 0.76258 - 0.08\times 0.64491 \approx 0.71099 \\\\\\\\\\\\\\\\\\\\\\\\\\\\tilde s_5 =&\ldots = 0.64491 + 0.08\times 0.76258\approx 0.70592\\\\c_5=\ldots = 0,76258 - 0.04\times 1.47357\approx 0.70364\ Okay, now we're pretty close to $\tfrac\pi4$, and it's already nice to see how the values for $\cos$ and $\sin$ become very similar, since the theory says $\sin(\tfrac\pi4) = \cos(\tfrac\pi4) = \tfrac{\sqrt2}2$. We can confirm it further quickly: $0.70364^2 \approx 0.495$. Reasonably close to 0.5. Not great, but also I did only five non-that-small steps (because the Heun scheme is 2nd accurate order, making the steps a little smaller really give a greater precision) and – this is the main advantage – all involved only very simple multiplications, because I could choose the step size so that it would be convenient, unlike a direct evaluation of Taylor-series. This is also the basic idea behind the CORDIC method which has already been mentioned in the comments. This uses extra properties of sine and cosine to achieve better efficiency, but this is not really necessary. Many functions that are defined by an ODE are efficiently evaluated by a Runge-Kutta solver; often the fourth-order version is preferred that gives even better convergence. In practice, this method is still superior to direct Taylor if you need more function values. Then it is very good because a) you make a table of values while you go on b) you calculate both sine and cosine, which can then be combined using the properties of symmetry/periodity. property.

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