

in radical or rational form				
α	$\sin \alpha$	$\cos \alpha$	$\tan \alpha$	$\cot \alpha$
30°				
45°				
60°				

in decimal form, from calculator				
α	$\sin \alpha$	$\cos \alpha$	$\tan \alpha$	$\cot \alpha$
30°				
45°				
60°				

9 Getting the degree measure of an angle from its sine

Example 26 What is the degree measure of the smaller acute angle of a right triangle with sides 3, 4, and 5?

Solution. We could draw a very accurate diagram, and use a very accurate protractor to answer this question. But again, mathematicians have developed methods that do not depend on the accuracy of our instruments. Your calculator uses these methods, but you must know how the buttons work.

The sine of the angle we want is $3/5 = .6$. Enter the number .6, then look for the button marked “arcsin” or “ \sin^{-1} ” (for some calculators, you must press this button first, then enter .6). You will find that pushing this button gives a number close to 36° . This is the angle whose sine is .6. \square

On a calculator, you can read the symbol “arcsin” or “ \sin^{-1} ” as “the angle whose sine is ...” Similarly, “arccos” means “the angle whose cosine is ...” and “ \tan^{-1} ” means “the angle whose tangent is ...”

Exercises

1. In the text, we found an estimate for the degree-measure of the smaller acute angle in a 3-4-5 triangle. Using your calculator, find, to the nearest degree, the measure of the larger angle. Using your estimate, does the sum of the angles of such a triangle equal 180 degrees?

2. Using your calculator, find
 - a) $\arcsin 1$.
 - b) $\arccos 0.7071067811865$.
3. Using your calculator, find the angle whose cosine is .8 .
4. Using your calculator, find the angle whose sine is .6 .
5. We know that $\sin 30^\circ = .5$. Write down your estimate for $\sin 15^\circ$, then check your estimate with the value from a table or calculator.
6. Suppose $\sin x = .3$. Use your calculator to get the degree-measure of x . Now check your answer by taking the sine of the angle you found.
7. Suppose $\arcsin x = 53^\circ$. Use your calculator to get an estimate for the value of x . Now check your answer by taking the arcsin of the number you found.
8. If $\arcsin x = 60^\circ$, find x , without using a calculator.
9. Using your calculator, find $\arcsin (\sin 17^\circ)$.
10. Using your calculator, find $\sin (\arcsin 0.4)$.
11. Find $\arcsin (\sin 30^\circ)$ without using your calculator. Then find $\sin (\arcsin 1/2)$, without using the calculator. Explain your results.
12. With a calculator, check that $\cos^2 A + \sin^2 A = 1$ if A equals 20° and if A equals 80° .
13. With a calculator, check that $\tan A = \sin A / \cos A$ if A equals 20° and if A equals 80° .
14. Using a calculator to get numerical values, draw a graph of the value of $\sin x$ as x varies from 0° to 90° .