Common Trigonometry Mistakes
Example: Value of inverse tangent

Some problems provide the opportunity for more than one mistake.

The Goal

Find:

$$\tan^{-1}(1)$$

The Mistakes

Find the mistakes:

1.

$$\tan^{-1}(1) = \frac{1}{\tan(1)}$$

Need a hint? Look carefully at the red part:

$$\tan^{-1}(1) = \frac{1}{\tan(1)}$$

2.

$$\tan^{-1}(1) = 45$$

Need a hint? Look carefully at the red part:

$$\tan^{-1}(1) = 45$$

The Correction

$$\tan^{-1}(1) = \frac{\pi}{4}$$

Explanations

In the first mistake the notation $\tan^{-1}(x)$ has been misunderstood to mean $1/\tan(x)$. That interpretation might seem to be a natural extension of notation such as $\tan^2(x)$, which does mean $(\tan(x))^2$, and $\tan^{-2}(x)$, which does mean $1/(\tan(x))^2$. However, for any function f(x), *by convention* when we write $f^{-1}(x)$, we mean instead the *inverse function* for f(x). So $\tan^{-1}(x)$ means *the inverse tangent of x*, that is, the function that *undoes* the tangent function.

In the second mistake the answer was given in degrees without specifying that degree measure is intended. The inverse trigonometric functions are most usefully defined with the range in *radian* measure. Doing so makes calculus formulas (derivatives and integrals) simpler. If degree measure is to be used, then the value of the inverse trigonometric function must clearly indicate that choice by giving (in this example) the answer as 45°.

Using a calculator with the angle mode set to "degrees" may have been the source of the mistake. Students should know the values of the inverse trigonometric functions at nice values - visit Trigonometric Facts to help learn these values.