Sometimes, Always, Never True Trigonometric Statements

This activity requires students to decide whether the statements given are sometimes, always or never true. Students decide which category to assign each statement to and stick it down on a large sheet of paper along with some justification for their decision.

The activity can be used before or after introducing the trigonometric identities involving squares. If used before, then students should use values to test the statements and make sure that they test 'special' values such as 0, 90 and 180.

Using graph plotting software will enable students to reason graphically. Alternatively, a spreadsheet could be used to test a wide range of values of x without too much effort. The follow up can be the algebraic formulation of the identities and the solving of the equations. If the identities have been introduced then some of the justifications can be algebraic and this may be used before any numerical investigation. The discussion afterwards, in both cases, can include which should be written as = and which should be written as $\equiv$ and why.

$\sin^2 x + \cos^2 x = 1$	$\tan x = \dfrac{\cos x}{\sin x}$
$\cot^2 x = 1 + \operatorname{cosec}^2 x$	$\cot^2 x + 2\cot x + 7 = 0$
$\sec^2 x + \operatorname{cosec}^2 x = 1$	$\tan^2 x + 1 = \sec^2 x$
$\tan x \cot x = 1$	$\sec x = \sin x$
$\sec^2 x = 4$	$\sec x \tan x = \cot x$
$\sin(-x) = \sin x$	$\cos(-x) = \cos x$
$\operatorname{cosec}^2 x = \operatorname{cosec} x + \cot^2 x$	$\operatorname{cosec}^2 x - 4\operatorname{cosec} x + 3 = 0$
$\cot x = \dfrac{\operatorname{cosec} x}{\sec x}$	$\operatorname{cosec} x \geq \cot x$