1. Given $0° \leq x < 360°$, and $\tan x = 2\sin x$, find all solutions for x.

   Solution: We write $\tan x = \frac{\sin x}{\cos x} = 2\sin x$, so either $\sin x = 0$ or $\frac{1}{\cos x} = 2$. In the first case, we get the solutions $x = 0°$ and $x = 180°$. In the second case, we get $\cos x = 1/2$, so drawing the unit circle, we get $x = 60°$ and $x = 300°$. These are the four solutions, <u>after checking for division by zero</u>.

2. Given $0° \leq x < 360°$ and $\sin 3x \cos 2x = 1 - \cos 3x \sin 2x$, find the <u>sum</u> of all solutions for x.

   Solution: We move all trigonometric terms to the left and recognize the sine addition formula, $\sin(a + b) = \sin a \cos b + \sin b \cos a$, with $a = 3x$ and $b = 2x$, so $\sin 5x = 1$. From the restricted range of x, $0° \leq 5x < 1800°$. Since $\sin 5x = 1$, $5x = 90°, 450°, 810°, 1170°, 1530°$. This gives us the five solutions $x = 18°, 90°, 162°, 234°, 306°$, and their sum is 810.

3. Given $\sin(90° + x)\cos(180° + x) + \sec 300° \cos(270° + x) = \csc 210° \csc(x - 180°)$ and $0° \leq x < 360°$, find all solutions for x.

   Solution: We use the unit circle to deduce that $\sin(90° + x) = \cos x$, $\cos(180° + x) = -\cos x$, $\sec 300° = 2$, $\cos(270° + x) = \sin x$, $\csc 210° = -2$, and $\csc(x - 180°) = -1/\sin x$, so the equation becomes $-\cos^2 x + 2\sin x = 2/\sin x$. Moving the $2\sin x$ term to the right, we get the equation $-\cos^2 x = 2\left(\frac{1}{\sin x} - \sin x\right) = 2\left(\frac{1-\sin^2 x}{\sin x}\right) = 2\cos^2 x \,/\sin x$, so either $\cos^2 x = 0$ or $-1 = 2/\sin x$. In the first case, using the unit circle, we get the solutions $x = 90°$ and $x = 270°$. In the second case, we get $\sin x = -2$, which is impossible since $|\sin x| \leq 1$. The two solutions in the first case are thus the only two solutions, <u>after checking for division by zero</u>.