Using these relations in the above formulae for determining the Fourier coefficients, a_n and b_n we obtain, after much algebra and using the fact that $sin(3n\pi/2) = -sin(n\pi/2)$, that:

$$a_n = 0 \text{ for } all\ n > 0$$

and:

$$b_n = 2*(2/n\pi)^2\, sin(n\pi/2)$$

The *even* Fourier coefficients, $b_n = 0$ for n = 2, 4, 6, 8, ... etc.

The *odd* Fourier coefficients, $b_n = +2*(2/n\pi)^2$ for n = 1, 5, 9, 13, ... etc.

The *odd* Fourier coefficients, $b_n = -2*(2/n\pi)^2$ for n = 3, 7, 11, 15, ... etc.

Thus, the Fourier series for the symmetrical, bipolar triangle wave of *unit* amplitude, as shown in the above figure is given by:

$$f(\theta)\big|_{\substack{triangle\\-wave}} = \frac{a_0}{2} + \sum_{n=1}^{n=\infty} a_n \cos\theta_n + \sum_{n=1}^{n=\infty} b_n \sin\theta_n = 2\sum_{\substack{n=1\\odd-n}}^{n=\infty} (-1)^{(n-1)/2}\left(\tfrac{2}{n\pi}\right)^2 \sin(n\theta)$$

Using the replacement: $n_{odd} = 2m - 1$, m = 1, 2, 3, 4, ... in the above summation, we can alternatively write the Fourier series expansion for this triangle wave as:

$$f(\theta)\big|_{\substack{triangle\\-wave}} = 2\sum_{m=1}^{m=\infty} (-1)^{m-1}\left(\tfrac{2}{(2m-1)\pi}\right)^2 \sin[(2m-1)\theta] = \tfrac{8}{\pi^2}\left\{\sin\theta - \tfrac{1}{9}\sin 3\theta + \tfrac{1}{25}\sin 5\theta - \tfrac{1}{49}\sin 7\theta + ...\right\}$$

Note that the *magnitudes* of the non-zero amplitudes of the harmonics, $|r_n| = |b_n| = 8/(n\pi)^2$, as shown in the figure(s) below for the first 20 harmonics.