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WebSights features reviews of select sites presenting physics teaching strategies, as well as shorter announcements of sites of interest to physics teachers. All sites are copyrighted by the authors. This column is available as a clickable web page at http://PhysicsEd.BuffaloState.Edu/pubs/WebSights. If you have successfully used a site to teach physics that you feel is outstanding and appropriate for *WebSights*, please email me the URL and describe how you use it to teach. The person submitting the best site monthly will receive a T-shirt.

Vibrating Guitar Strings Activity using website data: The D'Addario guitar string manufacturer company has a considerable set of technical resources available from their website http://www.daddario.com, including a string tension table at http://www.daddariostrings.com/Resources/JDCDAD/images/tension_chart.pdf. J. Lynch of Wheeling Jesuit University Physics describes how he uses this table for teaching resonance in strings as part of his introductory physics course:

The manufacturer has provided a table with the string gauges d (in mils) and the string tensions F_T (in pounds) for a number of frequencies. The last three digits in the item numbers indicate string gauge. The plain steel strings are made of steel alone, which our textbook indicates has a density of $D = 7800$ kg/m^3. Wound strings are avoided because their linear density cannot be obtained from the available information. My students are given the assignment of deriving, with some help, the expression for the fundamental frequency f_1

$$f_1 = \sqrt{\frac{F_T}{\pi \rho d^2 L^2}}$$

of a vibrating guitar string. On most guitars, the length of the stretched string L is exactly 25.5 in.

A brief list of plain steel guitar strings and string tensions are given to the students who are assigned to calculate the frequencies. The strings and tensions are chosen to correspond to standard tuning where the first, second, and third strings are tuned to the notes of **e'** (f_1 = 329.63 Hz), **b** (f_1 = 246.94 Hz), and **g** (f_1 = 196.00 Hz), respectively. The fourth, fifth, and sixth strings on a guitar are wound.

The calculated frequencies always agree very closely with the values in the table because these values are obtained from the same equation.

Kepler's Third Law Activity using the NASA J-SAT website to collect data: Lynch also teaches with the NASA satellite tracking page at http://science.nasa.gov/Realtime/JTrack/3D/AppletFrame.html, which visually tracks about 700 satellites out of thousands swarming about our Earth. Click and drag to change your point of view. Zoom in by selecting **Zoom in** from the **View** submenu. Pick a satellite by either clicking on the satellite or choosing **Select** from the **Satellite** submenu. To watch the satellite move, speed it up by selecting **Timing** from the **Options** submenu. Raise the update rate by selecting **Update Rate** from the **Options** submenu. A little time is needed to gain familiarity with JTrack-3D's features.

Students are given the assignment of calculating the quantity T^2/R^3 for a list of satellites, where T is the orbital period and R is the semimajor axis. It is recommended that the list cover a range of satellites—from low-orbit to geosynchronous, from circular to highly eccentric. Include one of the x-ray observatories—XMM or Chandra—for curiosity.

The orbital periods are obtained directly by selecting **Satellite Position** from the **View** submenu. The altitudes at perigee and apogee, h_{min} and h_{max}, respectively, can be obtained with some effort by watching the satellites orbit at a higher time scale. Just before recording altitude, one must slow the satellites down. Once these are obtained then R_r is calculated from $R = R_E + ½(h_{min} + h_{max})$, where R_E is the mean radius of the Earth.

Students will notice that most satellites orbiting the Earth fall into one of three types: low orbit like the space station ($T \approx 1½$ hr), GPS ($T \approx 12$ hr), or geosynchronous (T ≈ 24 hr). The variety of orbits notwithstanding, the quantity T^2/R^3 is roughly the same for most of them: 9.9×101^{-14} s^2/m^3.

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