

Sunrise in Dallas

Lesson for IB Math SL I (Pre-calculus)

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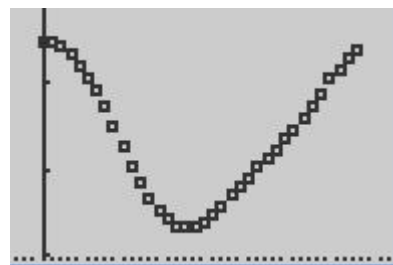
Wilson Magnet High School

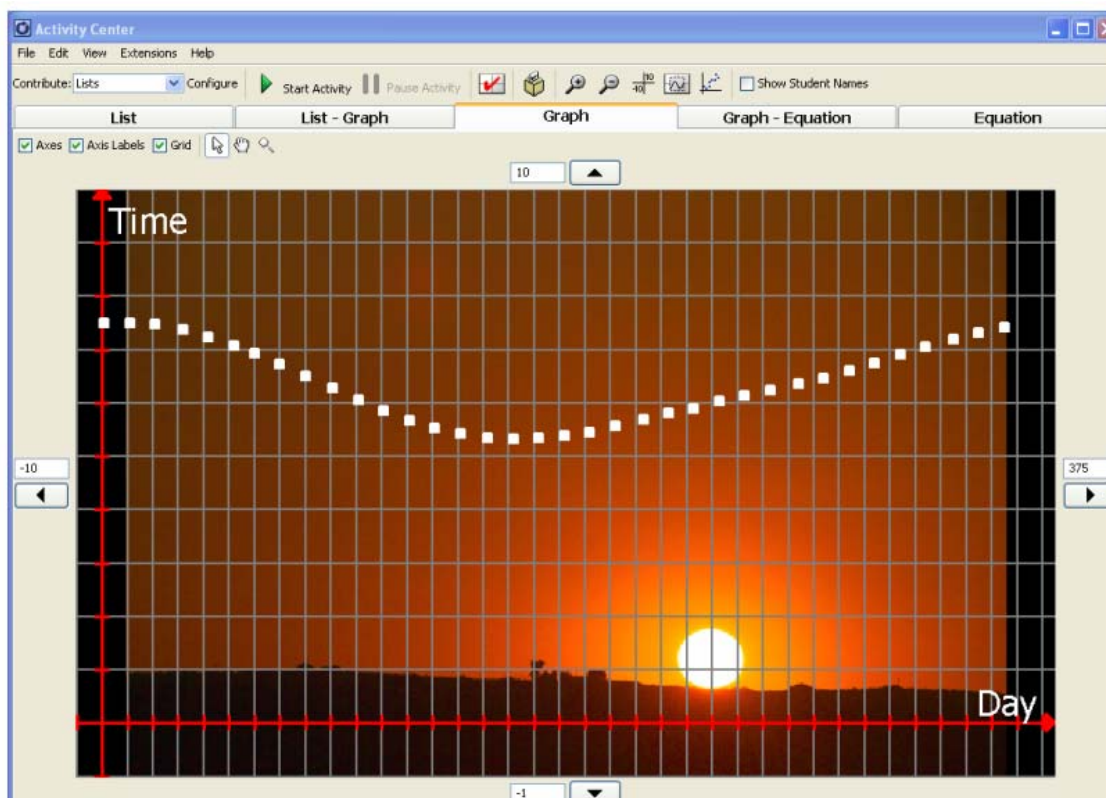
Rochester, NY

Some of the objectives of my pre-calculus class are for students to transform periodic functions and model functions to given data. One type of data that is periodic is sunrise and sunset times. At <http://aa.usno.navy.mil/> the website for the U.S. Naval Observatory sunrise and sunset data can be gathered for any city for any year. I gathered the sunrise times for the 1st, 11th, and 21st of each month in 2007 in Dallas, TX and organized the dates and times into lists on the TI-84 calculator. In order to enter the data easily I created a program to send the data to L₁ and L₂ on the calculator.

Location: N096 47, N32 47		DALLAS, TEXAS Rise and Set for the Sun for 2007 Central Standard Time												Astronomical Applicat U. S. Naval Observator Washington, DC 20392-		
Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.					
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
01	0730	1732	0722	1800	0655	1824	0616	1847	0540	1909	0520	1930	0523	1939	0541	1926
02	0730	1733	0722	1801	0654	1825	0614	1848	0539	1909	0520	1931	0523	1939	0542	1925
03	0730	1733	0721	1801	0653	1826	0613	1849	0538	1910	0520	1931	0523	1939	0542	1924
04	0730	1734	0720	1802	0652	1827	0612	1849	0537	1911	0519	1932	0524	1939	0543	1923
05	0730	1735	0719	1803	0650	1827	0610	1850	0536	1912	0519	1932	0524	1939	0544	1922
06	0730	1736	0719	1804	0649	1828	0609	1851	0535	1912	0519	1933	0525	1939	0544	1921
07	0730	1737	0718	1805	0648	1829	0608	1851	0535	1913	0519	1933	0525	1939	0545	1920
08	0730	1737	0717	1806	0647	1830	0607	1852	0534	1914	0519	1934	0526	1938	0546	1920
09	0730	1738	0716	1807	0645	1830	0605	1853	0533	1915	0519	1934	0526	1938	0546	1919
10	0730	1739	0715	1808	0644	1831	0604	1854	0532	1915	0519	1935	0527	1938	0547	1918
11	0730	1740	0714	1809	0643	1832	0603	1854	0531	1916	0519	1935	0527	1938	0548	1917
12	0730	1741	0713	1810	0642	1833	0602	1855	0531	1917	0519	1936	0528	1937	0548	1916
13	0730	1742	0712	1811	0640	1833	0600	1856	0530	1918	0519	1936	0529	1937	0549	1915
14	0730	1743	0712	1812	0639	1834	0559	1856	0529	1918	0519	1936	0529	1937	0550	1913
15	0730	1744	0711	1812	0638	1835	0558	1857	0528	1919	0519	1937	0530	1936	0550	1912
16	0730	1745	0710	1813	0637	1836	0557	1858	0528	1920	0519	1937	0530	1936	0551	1911
17	0729	1745	0709	1814	0635	1836	0556	1859	0527	1920	0519	1937	0531	1935	0552	1910
18	0729	1746	0708	1815	0634	1837	0554	1859	0526	1921	0519	1938	0532	1935	0552	1909
19	0729	1747	0707	1816	0633	1838	0553	1900	0526	1922	0519	1938	0532	1934	0553	1908
20	0728	1748	0705	1817	0631	1839	0552	1901	0525	1922	0519	1938	0533	1934	0554	1907
21	0728	1749	0704	1818	0630	1839	0551	1901	0525	1923	0520	1938	0534	1933	0554	1906
22	0728	1750	0703	1818	0629	1840	0550	1902	0524	1924	0520	1939	0534	1933	0555	1905
23	0727	1751	0702	1819	0627	1841	0549	1903	0524	1925	0520	1939	0535	1932	0556	1903
24	0727	1752	0701	1820	0626	1841	0548	1904	0523	1925	0520	1939	0535	1932	0556	1902
25	0726	1753	0700	1821	0625	1842	0546	1904	0523	1926	0521	1939	0536	1931	0557	1901
26	0726	1754	0659	1822	0623	1843	0545	1905	0522	1926	0521	1939	0537	1930	0558	1900
27	0725	1755	0658	1823	0622	1844	0544	1906	0522	1927	0521	1939	0537	1930	0558	1859

Using TI-Navigator the program can be sent out to the class. Students should exit Navigator run the program, check their lists, and begin to analyze the data. Once the data is in the calculator students should set up a scatter plot to view the data. After analyzing the data students should try to come up with a trigonometric model function by trying to calculate the appropriate amplitude, period, vertical translation, and horizontal translation (if necessary).





Activity Center

It is now necessary for the teacher to open Activity Center and open the Activity Setting “Sunrise”. After starting the activity it will be the students’ job to submit their model function into the blank for $y =$. Students who are having difficulty can get assistance and resubmit their function until it comes close to matching the data points. By seeing how closely the function models the data you can see how well they understand the concepts of amplitude and period.