Period	Age (years)	Days per year	Hours per day
Current	0	365	
Upper Cretaceous	70 million	370	
Upper Triassic	220 million	372	
Pennsylvanian	290 million	383	
Mississippian	340 million	398	
Upper Devonian	380 million	399	
Middle Devonian	395 million	405	
Lower Devonian	410 million	410	
Upper Silurian	420 million	400	
Middle Silurian	430 million	413	
Lower Silurian	440 million	421	
Upper Ordovician	450 million	414	
Middle Cambrian	510 million	424	
Ediacarin	600 million	417	
Cryogenian	900 million	486	

We learn that an 'Earth Day' is 24 hours long, and that more precisely it is 23 hours 56 minutes and 4 seconds long. But this hasn't always been the case. Detailed studies of fossil shells, and the banded deposits in certain sandstones, reveal a much different length of day in past eras! These bands in sedimentation and shell-growth follow the lunar month and have individual bands representing the number of days in a lunar month. By counting the number of bands, geologists can work out the number of days in a year, and from this the number of hours in a day when the shell was grown, or the deposits put down. The table above shows the results of one of these studies.

Problem 1 - Complete the table by calculating the number of hours in a day during the various geological eras. It is assumed that Earth orbits the sun at a fixed orbital period, based on astronomical models that support this assumption.

Problem 2 - Plot the number of hours lost compared to the modern '24 hours' value, versus the number of years before the current era.

Problem 3 - By finding the slope of a straight line through the points can you estimate by how much the length of the day has increased in seconds per century?

Answer Key

Period	Age (years)	Days per year	Hours per day
Current	0	365	24.0
Upper Cretaceous	70 million	370	23.7
Upper Triassic	220 million	372	23.5
Pennsylvanian	290 million	383	22.9
Mississippian	340 million	398	22.0
Upper Devonian	380 million	399	22.0
Middle Devonian	395 million	405	21.6
Lower Devonian	410 million	410	21.4
Upper Silurian	420 million	400	21.9
Middle Silurian	430 million	413	21.2
Lower Silurian	440 million	421	20.8
Upper Ordovician	450 million	414	21.2
Middle Cambrian	510 million	424	20.7
Ediacarin	600 million	417	21.0
Cryogenian	900 million	486	18.0

Problem 1 - Answer; See table above. Example for last entry: 486 days implies 24 hours x (365/486) = 18.0 hours in a day.

Problem 2 - Answer; See figure below

Problem 3 - Answer: From the line indicated in the figure below, the slope of this line is m = (y2 - y1)/ (x2 - x1) = 6 hours / 900 million years or 0.0067 hours/million years. Since there are 3,600 seconds/ hour and 10,000 centuries in 1 million years (Myr), this unit conversion yields 0.0067 hr/Myr x (3600 sec/hr) x (1 Myr / 10,000 centuries) = 0.0024 seconds/century. This is normally cited as 2.4 milliseconds per century.