

Year	Month	X (meters)	Y (meters)
2008	1	-3	+8
2008	2	-4	+10
2008	3	-4	+13
2008	4	-2	+15
2008	5	+1	+16
2008	6	+4	+16
2008	7	+7	+15
2008	8	+9	+13
2008	9	+9	+10
2008	10	+8	+7
2008	11	+6	+5
2008	12	+3	+4
2009	1	0	+4
2009	2	-3	+6
2009	3	-4	+9
2009	4	-4	+12
2009	5	-2	+15
2009	6	+1	+16
2009	7	+4	+16
2009	8	+7	+15

The Earth rotates on its axis once every 24 hours (23 hours 56 minutes and 4 seconds more-accurately!), but like a bobbing, spinning top, the direction doesn't point exactly at an angle of $23 \frac{1}{5}$ degrees.

For over 200 years, careful measurements of the rotation axis have shown that it moves slightly. The data in the table to the left gives the axis location of the North Pole as it passes through Earth's surface. The X-axis runs East-West and the Y-axis runs North-South. The units are in meters measured on the ground.

Problem 1 - On a Cartesian graph, plot the location of the North Pole during the time span indicated by the table.

Problem 2 - About how long, in days, does it take the North Pole to return to its starting position based on this data?

Problem 3 - About what is the average speed of this Polar Wander in meters per day?

Problem 4 - Based on your plot, does it look like the motion will exactly repeat itself in space during the next cycle?

Problem 5 - About what is the X and Y location of the center of the movement pattern?

Problem 6 - What would you use as the best location of the North Pole?

Answer Key

Problem 1 - Answer; See below.

Problem 2 - Answer; About 14 months or 420 days. This is called the Chandler Period.

Problem 3 - Answer: In one month the point moves on the circle about 3 meters, so the speed is about 3 meters/30 days or 0.1 meter/day.

Problem 4 - Answer; Not exactly. The new cycle points do not follow the circle of the older cycle. This motion is called the Chandler Wobble.

Problem 5 - Answer; $X = + 2$ meters, $Y = +10$ meters.

Problem 6 - Answer: Probably the point at the center of the circle, because it is about equidistant from all of the other points.

