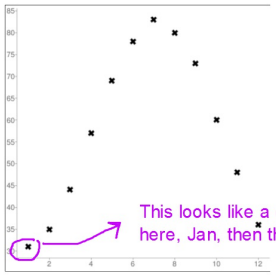
A lot of things in the real-world are cyclic (Periodic).

- Tides
- Temperatures
- Amount of Sunlight
- position of a piston in an engine

Average Montly Temperature
Detroit, Michigan

Make a scatter plot on the graphing calculator of this data.

L_1 Month	L_2 Average High Temp °F
Jan → 1	31 Min
Feb → 2	35
March → 3	44
April → 4	57
May → 5	69
June → 6	78
July → 7	83 Max
Aug → 8	80
Sept → 9	73
Oct → 10	60
Nov → 11	48
Dec → 12	36



This looks like a cosine graph. If you start here, Jan, then the phase shift is 1 month right.

this temperature data repeats every 12 months so the period = 12. $b = 2\pi/\text{period} = 2\pi/12$ $b = \pi/6$

amplitude = $\frac{\text{Max} - \text{Min}}{2} = \frac{83 - 31}{2} = 26$

midline: $\frac{\text{Max} + \text{Min}}{2} = \frac{83 + 31}{2}$ $k = 57$

Phase shift: 1 month right (x-1)

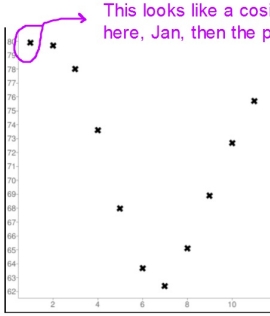
Since we choose a minimum to start at the graph is upside down and $a = -26$

EQ: $y = -26\cos(\pi/6(x-1)) + 57$

Average Montly Temperature
Sydney, Australia

Make a scatter plot on the graphing calculator of this data.

L_1 Month	L_2 Average High Temp °F
Jan → 1	79.9 Max
Feb → 2	79.7
March → 3	78
April → 4	73.6
May → 5	68
June → 6	63.7
July → 7	62.4 Min
Aug → 8	65.1
Sept → 9	68.9
Oct → 10	72.7
Nov → 11	75.7
Dec → 12	78.6



This looks like a cosine graph. If you start here, Jan, then the phase shift is 1 month right.

this temperature data repeats every 12 months so the period = 12. $b = 2\pi/\text{period} = 2\pi/12$ $b = \pi/6$

amplitude = $\frac{\text{Max} - \text{Min}}{2} = \frac{79.9 - 62.4}{2} = 8.75$

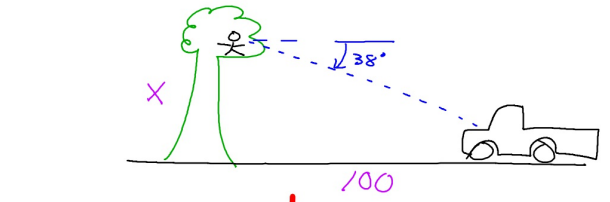
midline: $\frac{\text{Max} + \text{Min}}{2} = \frac{79.9 + 62.4}{2}$ $k = 71.15$

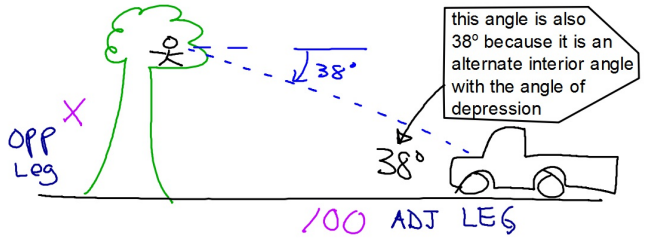
Phase shift: 1 month right (x-1)

Since we choose a maximum to start at the graph is not upside down and $a = +8.75$

EQ: $y = 8.75\cos(\pi/6(x-1)) + 71.15$

A tree trimmer is up in a tree and sees his truck with an angle of depression of 38°. If his truck is parked 100 feet from the tree, how high up in the tree is he? Round to the nearest tenth.





SOHCAHTOA

$\tan 38° = \frac{x}{100}$

$x = 100 \cdot \tan 38°$

$x = 78.1$ ft