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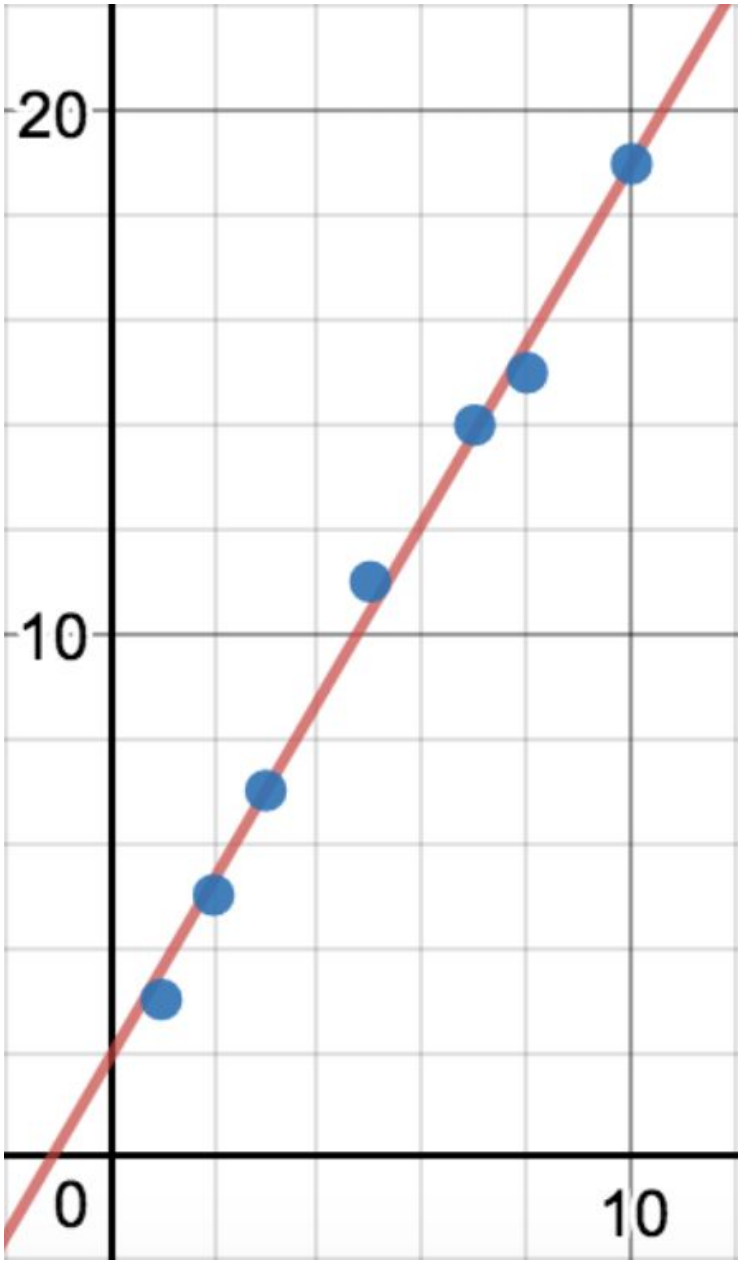
Problem 1:
General Problem with constraints and objective:

$$r_i = |ax_i + b - y_i|$$
$$\min a, b \sum_{i=1}^{n} r_i$$
$$r_i \geq ax_i + b - y_i$$
$$-r_i \leq ax_i + b - y_i$$

```
from pulp import *

points = [(1, 3), (2, 5), (3, 7), (5, 11), (7, 14), (8, 15), (10,
19)]

prob = LpProblem("problem", LpMinimize)

a = LpVariable("slope")
b = LpVariable("intercept")
r = LpVariable("absolute deviation")

prob += r

for point in points:
    (x, y) = point
    prob += r >=   a*x + b - y
    prob += r >= -(a*x + b - y)

status = prob.solve()

print "The slope of the line is", value(a)
print "The intercept of the line is", value(b)
print "The maximum absolute deviation from the line is", value(r)

print "The solution is " + LpStatus[status]
```

Solution:
The slope (a) of the line is 1.7142857
The intercept (b) of the line is 1.8571429

The maximum absolute deviation from the line (r) is 0.57142857
The solution is Optimal



Problem 2 (Warming Up):

```
import math
from pulp import *

f = iter(open("Corvallis.csv"))

temps = []

f.next()

for entry in f:
    entry = entry.split(";")
    temps.append((int(entry[-1]), float(entry[-2])))

prob = LpProblem("problem", LpMinimize)

x0 = LpVariable("x0")
x1 = LpVariable("x1")
x2 = LpVariable("x2")
x3 = LpVariable("x3")
x4 = LpVariable("x4")
x5 = LpVariable("x5")
r = LpVariable("absolute deviation")

prob += r

for i in xrange(len(temps)):
    (d, t) = temps[i]
    T = x0 + x1*d + x2*math.cos(2*math.pi*d/365.25) +
x3*math.sin(2*math.pi*d/365.25) +
x4*math.cos(2*math.pi*d/(365.25*10.7)) +
x5*math.sin(2*math.pi*d/(365.25*10.7))

    prob += r >=   T - t
    prob += r >= -(T - t)
```

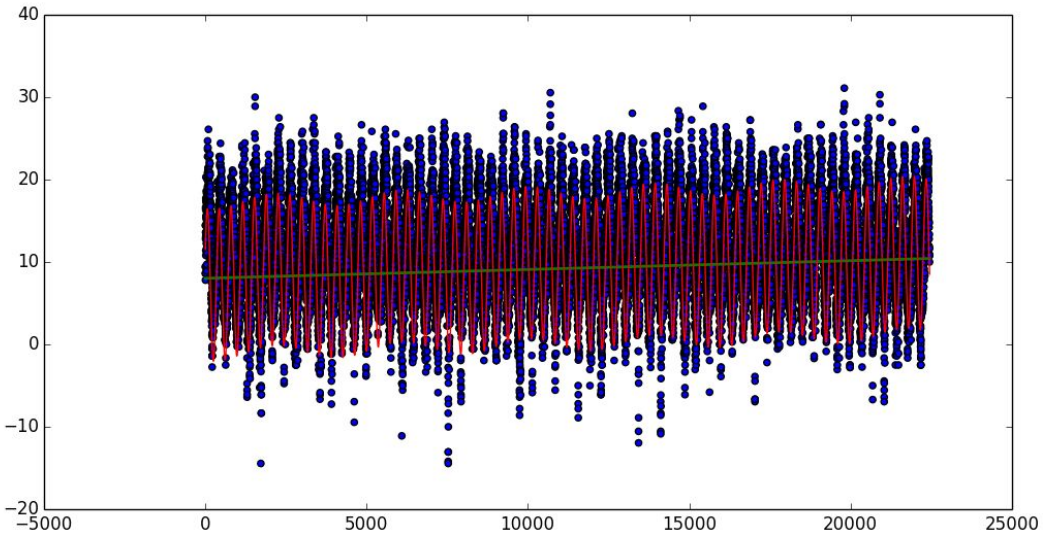
```
status = prob.solve()

print "x0:", value(x0)
print "x1:", value(x1)
print "x2:", value(x2)
print "x3:", value(x3)
print "x4:", value(x4)
print "x5:", value(x5)

print "The maximum absolute deviation from the line is",
value(r)

print "The solution is " + LpStatus[status]
```

Description:

T = x0 + x1*d[i] + x2*cos(2*pi*d[i]/365.25) + x3*sin(2*pi*d[i]/365.25) + x4*cos(2*pi*d[i]/(365.25*10.7)) + x5*sin(2*pi*d[i]/(365.25*10.7))

```
Minimize R;
R >= T - temperature[i]
R >= -(T - temperature[i])
```

Graph:



Optimal Solutions:

R = 14.23554
X0 = 8.0214197
X1 = 0.00010694836
X2 = 4.2808907
X3 = 8.1868578
X4 = -0.79063079
X5 = -0.29536021

Change per century:

Based on the value of x1, which is the daily change in temperature in Corvallis, the amount of degrees Corvallis is getting warmer per century is 3.906288849° Celsius, This is a warming trend, as the amount is positive.