days ← p + f

-4.5 -9

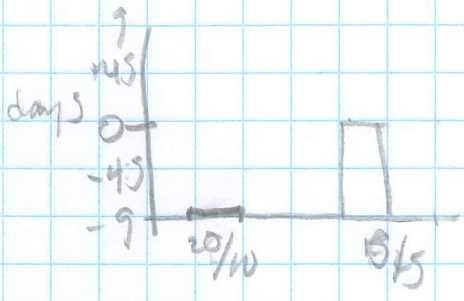
f: 20/10 (T1), 15/5 (T2)

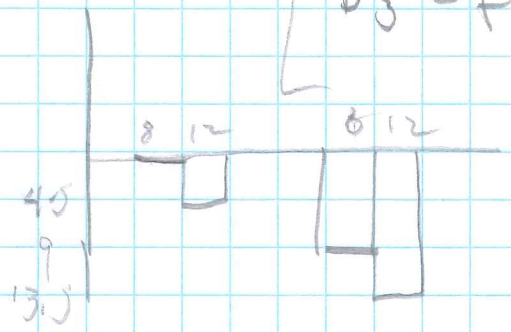
p: 8, 12 (L1, L2)

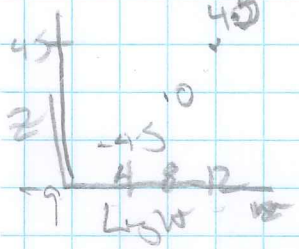
See Last Page for Summary

$D_1 = f(T_1) + P(L_1)$
$D_2 = f(T_2) + P(L_2)$
$D_3 = f(T_1) + P(L_2)$

Assume f & p are additive & linear
no interaction





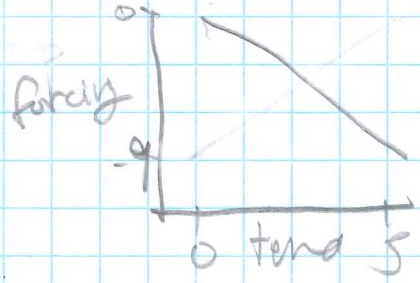


estimated $\hat{p} = \hat{f}_1 + \hat{p}_1$

true $p = f_1 + p_1$

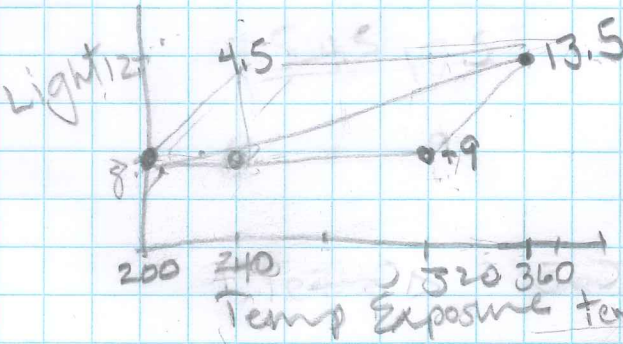
$\hat{f} = f + \hat{p}$

days/4hr@



$f = a + -9\,temp$

$p =$



-9	20*8 + 10*16	= 320
0	15*8 + 5*16	= 200
-13.5	20*12 + 10*12	= 360
	15*12 + 5*12	= 240

$Days(L,T) = \left[\frac{9\ days}{120\ T}\right]T + \left[\frac{4.5\ day}{4\ L}\right]L$

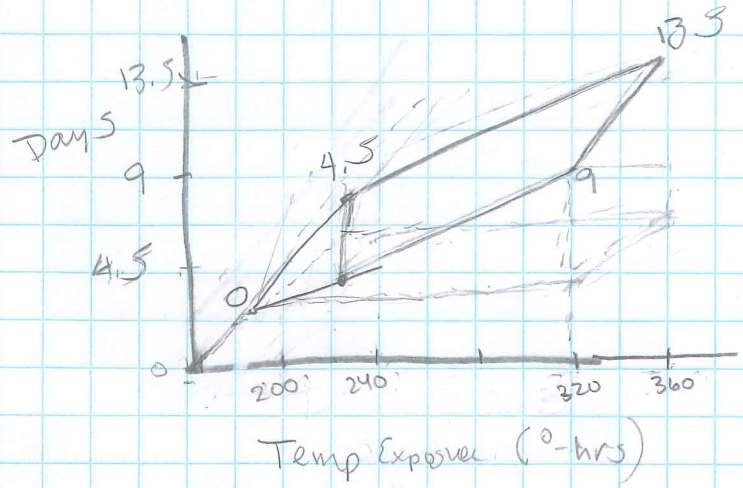
$+$

$\frac{9}{120} + 240 + \frac{4.5\ day}{4L}\ 8$

$ax + by + cz + d = 0$

$z = \frac{ax + by + d}{c}$

$z = \frac{a}{c}x + \frac{b}{c}y + \frac{d}{c}$



Intercept is where z when x=y=0

x y z

A = (200, 8, 0)
B = (240, 12, 4.5)
C = (320, 8, 9)
D = (360, 12, 13.5)

$a200 + b8 + \cancel{c0} + d = 0$ (1)
$a240 + b12 + c4.5 + d = 0$ (2)
$a320 + b8 + c9 + d = 0$ (3)

$d = -200a - 8b$ (using 1)

$c = \frac{-40}{4.5}a - \frac{4}{4.5}b$

$a = \frac{8}{40}b$

$c = \frac{8}{40}b\left(\frac{-40}{4.5}\right) - \frac{4}{4.5}b$

$= \frac{-12}{4.5}b$

$d = -200\left(\frac{8}{40}b\right) - 8b$

$= -48b$

$a = \frac{1}{5}b$

$b = b$

$c = -\frac{12}{4.5}b$

$d = -48b$

$a200 + b8 = a240 + b12 + c4.5$

$a(-40) = b(4) + c(4.5)$

$a = -0.1b - .1125c$

$320(-0.1b - 0.1125c) + b8 + c9 + d = 0$

$-24b - 27c + d = 0$

$d = 24b + 27c$

using 2 + soln for d

$a240 + b12 + c4.5 + -200a - 8b = 0$

$c = \frac{-40}{4.5}a - \frac{4}{4.5}b$

using 3 + soln's c, d

$a320 + b8 \underbrace{- 80a - 8b}_{9c} \underbrace{- 200a - 8b}_{d} = 0$

$40a - 8b = 0$

$a = \frac{8}{40}b$

$ax + by + cz + d = 0$

$\frac{1}{5}bx + by - \frac{8}{3}bz - 48b = 0$

$\frac{1}{5}x + y - \frac{8}{3}z - 48 = 0$

$z = \left(\frac{1}{5}x + y - 48\right)\frac{3}{8}$

Days T L

mistake should be 18

$z = \frac{3}{40}x + \frac{3}{8}y - 24$

Lizzie wants to know the dy June b/t

240 @ 8L

& 240 @ 12L ← measured @ 4.5

Take 2

$d = -200a - 8b$ (using 2) $240a + 12b + 4.5c - 200a - 8b$

$c = \frac{-40}{4.5}a - \frac{4}{4.5}b$

$4.5c = 200a + 8b - 240a - 12b$

$= -40a - 4b$

$c = \frac{-40}{4.5}a - \frac{4}{4.5}b$

$a = 8/40b$

(using 3) $320a + 8b + 9\left(\frac{-40}{4.5}a - \frac{4}{4.5}b\right) - 200a - 8b$

$320a + 8b - 80a - 8b - 200a - 8b$

$40a - 8b = 0$

$a = 8/40b$

$c = -40/4.5\left(8/40b\right) - 4/4.5(b)$

$= -12/4.5\,b = 8/3\,b$

$c = 8/3b$

$d = -200(8/40b) - 8b$

$d = -48b$

$a = 1/5b$

$c = -8/3b$

$d = -48b$

$1/5\,bx + by - 8/3bz - 48b$

@ 240 T & 8L = +3

$1/5\,x + y - 8/3z - 48$

$z = \left(1/8\,x + y - 48\right)3/8$

$z = 3/40\,x + 3/8y - 18$

force x photo

20°/10° 15°/5° 8hr 12hr

Temp x photo co-vary

main effect of f = -9 (actually -8.82)

" of p = -4.5

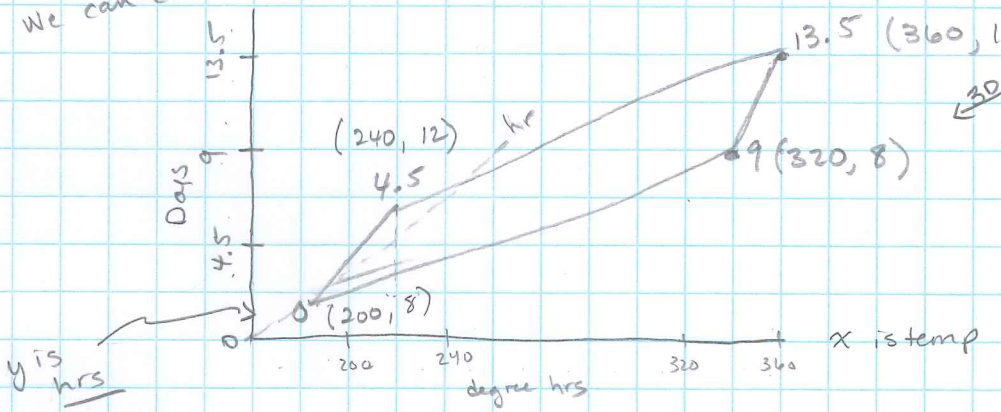
interxn of f x p = 0 (effectively)

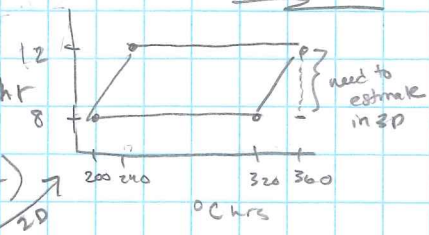
for ease we'll say 4.5 and 9 (and flip sign later)

Convert to degree-hours:

(20°)(8h) + (10°)(16h) = 320	(9)	+
(15°)(8h) + (5°)(16h) = 200	(0)	
(20°)(12h) + (10)(12h) = 360	(13.5)	+
(15°)(12h) + (5)(12h) = 240	(4.5)	

this forms a plane that we can estimate:





30 20

So We solve for change in days given no change in temp. E.g. we know 200 @ 8h = 0, what is 200 @ 12h?

Solve a plane given 3 sets of coordinates: ⇒ Solve for d using eqn 1:

$ax + by + cz + d = 0$ [$d = -200a - 8b$]

eqn 1: $200a + 8b + 0 + d = 0$

eqn 2: $240a + 12b + 4.5c + d = 0$

eqn 3: $320a + 8b + 9c + d = 0$

⇒ Solve for c using eqn 2 + d sol'n:

$240a + 12b + 4.5c - 200a - 8b$

$c = (-240a - 12b + 200a + 8b)/4.5$

[$c = -40/4.5\,a + 4/4.5\,b$]

⇒ Solve for a using eqn 3, d, c:

$320a + 8b + 9(-40/4.5\,a + 4/4.5\,b) - 200a - 8b$

[$a = 8/40\,b$]

$a = 1/5\,b$

$c = -8/3b$

$d = -48b$

⇒ Now finish c: $c = \frac{-40}{4.5}\left(\frac{8}{40}b\right) + \frac{4}{4.5}b$

[$c = -8/3b$]

⇒ finish d:

[$d = -200(8/40)b - 8b = -48b$]

$ax + by + cz + d = 0$

$1/5\,bx + by - 8/3bz - 48b = 0$ → divide both sides by b

$1/5\,x + y - 8/3\,z - 48$ ⇒ Solve for z (days)

$z = (1/5\,x + y - 48)(3/8)$ ⇒ $z = 3/40\,x + 3/8\,y - 18$

So: $3/40(200) + 3/8(8) - 18 = 0$ (we knew that)

$3/40(200) + 3/8(12) - 18 = 3$ ← true effect of photo is -3 of -4.5 days

Equally:

$3/40(240) + 3/8(18) - 18 = 3$

$3/40(360) + 3/8(8) - 18 = 12$ ← false effect always!