1. (a) 2 (b) 3 (c) 1

2. It means you are predicting a y-value at an x-value "beyond" the x-values contained in your data — either with $x < x_{min}$, or $x > x_{max}$. It is safer to interpolate than to extrapolate, because it is quite possible our linear association between y and x is invalid/inappropriate outside of our sampled x-values.

3. (a) Choose the cell with minimal row/column totals: (Case, Pet Store)

   (b)
$$\frac{(216)(40)}{662} \doteq 13.05$$

   (c) That all expected counts should be ≥ 5. It is met here.

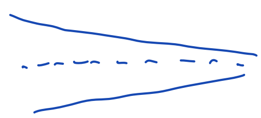
4. (a) $R^2 = 0.1988$, which we interpret to say that 19.88% of the variability in sampled IBI-values is explained by our linear model.

   (b) $r = \sqrt{0.1988} \doteq 0.4459$ (choosing positive root since $b_1 > 0$)

   This coefficient addresses the strength of the linear model. It is neither terribly strong nor horribly weak.

   (c)
$$\widehat{IBI} = 52.92 + 0.4602(\text{Area})$$

   (d) Noteworthy(?)

   - Some large residuals, and small residuals may not be more numerous than large ones the way they should be to call them Norm(0, 1).
   - There may be a "fan" shape 

   To the extent these are not artifacts of sampling, the cast some doubt on the validity of the model.

   (e) This t^* is appropriate for a 90% confidence level. The interval is

$$b_1 \pm (t^*)(SE_{b_1}) = 0.4602 \pm (1.6779)(0.1347), \text{ or}$$

$$(0.234, 0.686)$$

(f) It is $t = \dfrac{b_1}{SE_{b_1}} = \dfrac{0.4602}{0.1347} \doteq 3.416$. It can be computed as $r\dfrac{\sqrt{n-2}}{\sqrt{1-r^2}}$, too.

(g) $[1 - \text{pt}(3.416, \text{df} = 47)] * 2$, or $1 - \text{pf}(11.67, 1, 47)$

5. (a) $H_0: p_M = 0.013,\ p_F = 0.051,\ p_R = 0.360,\ p_A = 0.576$

Category	Observed	Expected
Murder	5	6.5 = (500)(0.013)
F rape	23	25.5 = (500)(0.051)
Robbery	206	180 = (500)(0.36)
Assault	266	288 = (500)(0.576)

$$\chi^2 = \frac{(5-6.5)^2}{6.5} + \frac{(23-25.5)^2}{25.5} + \frac{(206-180)^2}{180} + \frac{(266-288)^2}{288} \doteq 6.027$$

(b) $1 - \text{pchisq}(6.027, \text{df} = 3)$

(c) A significant P-value means we reject that the California population of crimes follows the proportions of national crime.

(d) If not significant, then the data is consistent with the national proportions.

6. (a) Let μ, with subscripts indicating flux type, be population mean hardness. $H_0: \mu_A = \mu_B = \mu_C = \mu_D$, and H_a: at least two group means are unequal.

(b) The rule of thumb, $2 \geq \dfrac{s_{max}}{s_{min}} = \dfrac{9.757}{5.403}$ is met.

(c)

df	SS	MS	F
3	743.4		3.873
16	1023.6	63.975	
19			

(d) t (2-sample t)

(e) $1 - \text{pf}(3.873, 3, 16)$

(f) We conclude at least two group means are different.

(g) TukeyHSD( )

Looking over the pairwise comparisons, The only one for which the adjusted P-value is under 5% is the one comparing means for flux A and flux C. We conclude $\mu_A - \mu_C \neq 0$. We are unable to conclude that any other group mean pairs are different.