Stat 330
Homework 10

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1)

(a) Mean = 56.9
Median = 50.5
Q1 = 44.5, Q3 = 58, IQR = 13.5
Variance = 632.49, Stand. Dev. = 25.15

(b) The only number outside of the range is 130.

(c) Mean = 48.8
Median = 50
Q1 = 44, Q3 = 55, IQR = 11
Variance = 43.01, Stand. Dev. = 6.56

(d) An outlier will greatly skew the mean and standard deviation, but will not have much effect on the median or IQR.

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2)

(a) The histogram is exponential, with the vast majority of diamonds in the lower price range, and a sloping decrease of the number of diamonds as the price increases.

(b) Exponential, as the decrease in diamond price follows an exponential curve.

(c) As diamond carat increases, the price increases linearly, and the variability increases as well.

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3) $\frac{1}{n-1}(n\mathbb{E}(X^2) - n\mathbb{E}(\bar{X}^2)) = \frac{1}{n-1}n(\mathbb{E}(X^2) - \mathbb{E}(\bar{X}^2)) =$
$\frac{1}{n-1}n(Var(x) + \mathbb{E}(X)^2 - Var(x) - \mathbb{E}(\bar{X})^2) = \frac{1}{n-1}n(\mathbb{E}(X)^2 - \mathbb{E}(\bar{X})^2) =$
$\frac{1}{n-1}n(\mathbb{E}(X)^2 - \mathbb{E}(\bar{X})^2) = ? = \sigma^2$

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4)

(a) $\mathrm{E}(\frac{X_1+X_2+X_3+X_4}{4}) = \frac{E(X_1)+E(X_2)+E(X_3)+E(X_4)}{4} = \frac{4\mu}{4} = \mu$

$\mathrm{E}(\frac{X_1+2X_2+X_3}{4}) = \frac{E(X_1)+E(X_2)+E(X_2)+E(X_3)}{4} = \frac{4\mu}{4} = \mu$

(b) ?

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5)

(a) E(Y) for Pois(λ) = λ.
$\mu_1 = E(Y) = \bar{Y} = m_1 \quad \Rightarrow \quad \lambda = \bar{y} \quad \Rightarrow \quad \lambda_{MoM} = \bar{y}$

(b) $\prod_{i=1}^{n} \frac{e^{-\lambda}\lambda^{y_i}}{y_i!} = \frac{e^{-n\lambda}\lambda^{ny_i}}{\prod_{i=1}^{n} y_i!} \Rightarrow$
$l(\lambda) = (-n\lambda + ny\ log(\lambda)) - \sum_{i=1}^{n} log(y_i!)$
$dx * l(\lambda) = -n + \frac{ny}{\lambda} = 0 \Rightarrow \lambda_{MLE} = y$

(c) $\bar{x} = \frac{7+6+7+2+4}{5} = 5.2 =$ MoM

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6) (a) $\mu = E(X) = \int xf(x)dx \Rightarrow \int_0^1 x\theta x^{\theta-1}dx = \frac{\theta}{\theta+1} = \bar{x}$
$\frac{\theta}{\theta+1} = \bar{x} \Rightarrow \theta = \frac{\bar{x}}{1-\bar{x}} \Rightarrow \theta = \frac{.666}{1-.666} = 2$

(b) No idea

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7)