1.

a. $P(apple) = P(red)P(apple|red) + P(blue)P(apple|blue) + P(green)P(apple|green) = 0.1 * \frac{2}{10} + 0.3 * \frac{2}{5} + 0.6 * \frac{4}{10} = 0.38$

b. $P(blue|orange) = \frac{P(orange|blue)P(blue)}{P(orange)} = \frac{\left(\frac{3}{5}*0.3\right)}{0.4} = 0.45$

i. $P(orange) = P(red)P(orange|red) + P(blue)P(orange|blue) + P(green)P(orange|green) = 0.1 * \frac{4}{10} + 0.3 * \frac{3}{5} + 0.6 * \frac{3}{10} = 0.4$

2. $L(\sigma) = log f(x_1 \dots x_n|\sigma) = log \prod_{i=1}^{n} \frac{1}{2\sigma} * \exp\left(-\frac{|x_i|}{\sigma}\right) = \sum_{i=1}^{n}(-log2 - log\sigma) - \frac{\sum_{i=1}^{n}|x_i|}{\sigma}$

a. $\frac{d}{d\sigma}L(\sigma) = -\frac{n}{\sigma} + \frac{\sum_{i=1}^{n}|x_i|}{\sigma^2}, \frac{d^2}{d\sigma^2}L(\sigma) = -\frac{n}{\sigma^2} - \frac{2\sum_{i=1}^{n}|x_i|}{\sigma^2}$

b. $because\ L'\left(\frac{1}{n}\sum_{i=1}^{n}|x_i|\right) = 0\ and\ L''\left(\frac{1}{n}\sum_{i=1}^{n}|x_i|\right) < 0$

c. $so\ L(\sigma) = L\left(\frac{1}{n}\sum_{i=1}^{n}|x_i|\right), which\ means\ that\ the\ maximum\ likelihood\ estimate\ of\ \sigma = \frac{1}{n}\sum_{i=1}^{n}|x_i|$