1. a. $\frac{{}_{13}C_3}{{}_{20}C_3} \approx 0.251$ **OR** $\frac{13}{20} \cdot \frac{12}{19} \cdot \frac{11}{18} \approx 0.251.$

b. $\frac{13}{20} \cdot \frac{12}{19} \cdot \frac{7}{18} \approx 0.160$ Note: $\frac{{}_{13}C_2 \cdot {}_7C_1}{{}_{20}C_3}$ doesn't make the boy's name $\underline{3^{rd}}$.

2. Expected value for one gallon =

(1.10)(0.3) + (0.9)(0.38) + (0.7)(0.2) + (0.4)(0.06) + (0)(0.04) – (0.10(0.02) = 0.834

so for 25,000 gallons the expected profit is $20,850.

3. $P(\text{R and E}) = \frac{1}{8}$, $P(\text{R}) = \frac{4}{8}$, $P(\text{E}) = \frac{2}{8}$. Since $P(\text{R and E}) = P(\text{R}) \cdot P(\text{E})$, the events are independent.

OR $P(\text{R}) = \frac{4}{8}$, $P(\text{R} \mid \text{E}) = \frac{1}{2}$. Since $P(\text{R}) = P(\text{R} \mid \text{E})$, the result of event E does not change the probability of event R, so the events are independent.

OR $P(\text{E}) = \frac{2}{8}$, $P(\text{E} \mid \text{R}) = \frac{1}{4}$. Since $P(\text{E}) = P(\text{E} \mid \text{R})$, the result of event R does not change the probability of event E, so the events are independent.

4. $P(\text{R and G}) = \frac{0}{8} = 0$; $P(\text{R or G}) = \frac{6}{8} = 0.75$.

5. $P(\text{E} \mid \text{G}) = \frac{0}{2} = 0$, because there are 0 evens among the 2 greens.

$P(\text{E} \mid \text{G}^C) = \frac{2}{6} \approx 0.333$, because there are 2 evens among the 6 non-greens.

6. a. ${}_8C_8(0.7)^8(0.3)^0 = (0.7)^8 \approx 0.058.$

b. $1 - {}_8C_0(0.7)^0(0.3)^8 - {}_8C_1(0.7)^1(0.3)^7 - {}_8C_2(0.7)^2(0.3)^6 \approx 0.989.$

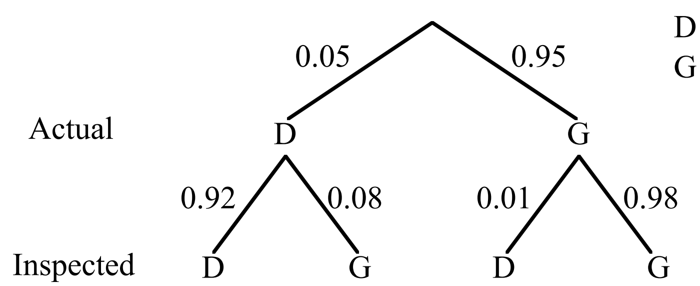
7. The estimated probability of a car turning left is $\frac{53}{200} = 0.265$. So, the estimated probability that the next two cars observed will both turn left is $\frac{53}{200} \cdot \frac{53}{200} \approx 0.070.$

Also acceptable: If you considered the 201st car as part of the data used to predict how the 202nd car will turn, then the answer would be $\frac{53}{200} \cdot \frac{54}{201} \approx 0.071.$

8. a. when A and B are independent.

b. when A and B are mutually exclusive.

9. a.



D = event that sneakers are defective
G = event that sneakers are good

b. $P(DG) + P(GG) = (0.05)(0.08) + (0.95)(0.99) = 0.004 + 0.9405 = 0.9445 \approx 94.5\%$

c. $P(\textit{defect} \mid \textit{passes}) = \frac{P(D \text{ and } \textit{passes})}{P(\textit{passes})} = \frac{0.004}{0.9445} \approx 0.00423$