HW #2

2.17, 2.22, 2.35, 2.39

2.17

$$10 \times 10 \times 10 \times 26 \times 26 \times 26 = 17{,}576{,}000$$

2.22

$$\binom{11}{3} \times \binom{7}{3} \times \binom{3}{3} = \frac{11!}{3!\,(8)!} \times \frac{7!}{3!\,(4)!} \times 1$$

$$= 165 \times 35 \times 1$$

$$= \underline{\underline{5775}}$$

or

$$\frac{\binom{12}{4} \times \binom{8}{4} \times \binom{4}{4}}{3 \times 2 \times 1} = \frac{\frac{12!}{4!\,(8)!} \times \frac{8!}{4!\,(4)!} \times 1}{6}$$

$$= \frac{12!}{4!\,4!\,4!} / 6 = \frac{34650}{6}$$

$$= \underline{\underline{5775}}$$

Note: $\binom{12}{4} = \frac{12!}{4!\,(8)!} = 495$ but only $\binom{11}{3} = \frac{11!}{3!\,(8)!} = 165$ are distinct.

ENCE 3300

Prob. – 2.35

Given; 3 def. trans } in a lot
7 good trans }

2 trans. are selected at random
Given that the sample contains a defective trans, what is prob. that both are def?

Soln. #1 (Using formula at bottom of page 59)

$$\text{Prob(Event wanted)} = \frac{\#(\text{Event wanted}) \ (\text{frequency})}{\#(\text{all possible events})}$$

$$\#\ \text{Event wanted} = \{\text{def}, \text{def}\} = C_{3,2} = 3$$

(note given that one is def)

$$\#(\text{all possible events}) = \{\text{def}, \text{good}\}, \{\text{def}, \text{def}\}, \{\text{good}, \text{def}\}$$

$$= 7 + 3 + 7$$

$$= 24$$

$$\text{Prob(wanted)} = \frac{3}{24} = \frac{1}{8}$$

Define   **Soln. #2 for Prob. 2.35**

A = Event that both are def. $= \{(d, d)\}$

B = Event that sample contains at least one def. $\{(d,g); (d,d); (g,d)\}$

want $P(A|B) = \dfrac{P(A \cap B)}{P(B)}$

$$P(B) = P(d,g) + P(d,d) + P(g,d)$$
$$= \frac{3}{10} \cdot \frac{7}{9} + \frac{3}{10} \cdot \frac{2}{9} + \frac{7}{10} \cdot \frac{3}{9}$$
$$= \frac{21}{90} + \frac{6}{90} + \frac{21}{90} = \frac{48}{90} = \frac{24}{45}$$

$$P(B) = \frac{24}{45}$$

$P(A \cap B) = P($Event that both are def $\cap$ Event that at least 1 def$)$

$= P($Event that both are def$)$

$= P(A)$

$$P(A) = \frac{3}{10} \cdot \frac{2}{9} = \frac{6}{90} = \frac{3}{45}$$

$$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{P(A)}{P(B)} = \frac{3/45}{24/45} = \frac{3}{24}$$

$$P(A|B) = \frac{1}{8}$$

2.39

(a) $0.98 \times 0.95 = 0.931$

(b) $1 - 0.931 = 0.069$