Combinatorics Example Problems

In each example, state which of the following is represented

- independent event
- permutation
- combination

Then, solve the problem and answer the question.

1. How many ways can 4 letters be delivered to 7 mailboxes, if there are no restrictions on the number of letters in a box?

Indep

$$\boxed{7} \cdot \boxed{7} \cdot \boxed{7} \cdot \boxed{7} = 2401$$

2. How many ways can 4 letters be delivered to 7 boxes if no box can have more than one letter?

perm

$$\boxed{7} \cdot \boxed{6} \cdot \boxed{5} \cdot \boxed{4} = 840$$

3. In how many ways can the letters of the word "IRRITATION" be arranged?

comb. or distinguishable perm.

I : 3 A : 1
R : 2 O : 1
T : 2 N : 1

$$\frac{10!}{3!\,2!\,2!\,1!\,1!\,1!} = 151{,}200$$

4. How many 3 digit house numbers can be formed from the digits 1, 2, 3, 4, and 5 if repetition is allowed?

Ind.

$$\boxed{5}\,\boxed{5}\,\boxed{5} = 125$$

5. How many 3 digit house numbers can be formed from the digits 1, 2, 3, 4, and 5 if repetition is not allowed?

perm

$$\boxed{5}\,\boxed{4}\,\boxed{3} = 60$$

Math 101 – Exam 3 Review Solutions

1. $\boxed{1} \cdot \boxed{7} \cdot \boxed{7} = 49$

2. $_{12}P_3 = \dfrac{12!}{9!} = \dfrac{12 \cdot 11 \cdot 10 \cdot \cancel{9!}}{\cancel{9!}} = 1320$

3. a) $P(Q \cup R) = P(Q) + P(R) - P(Q \cap R)$
$= 4/52 + 26/52 - 2/52 = 28/52 = 7/13$

b) $O(Q) = 4/48 = 1/12$

4.

	N	N
N	NN	NN
t	Nt	Nt

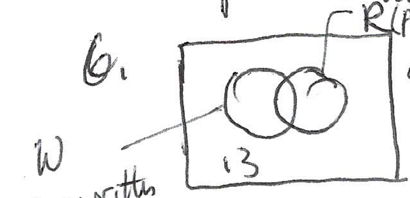
$2/4 = 1/2$ NN – normal
$2/4 = 1/2$ Nt – carrier

a) P(Tay Sachs) = 0
b) P(carrier) = $1/2$ = 50%
c) P(no disease, not carrier) = $1/2$ = 50%

5. (Expected value is delayed until the Final)

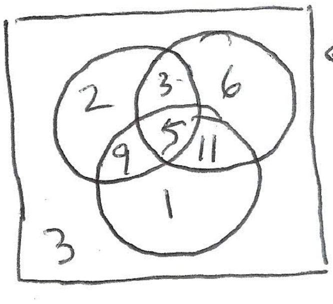
Amt	Prob	Product
0	0.3	0
\$30	0.4	12
50	.2	10
80	.1	8
		\$30

Expected value: \$30. "On average", a customer spends \$30.

6. 

a) Prob(fail both) = 1 – Prob(pass at least one)
$= 1 - .7 = .3$

b) P(pass both) = $P(W \cap R)$
$P(W \cup R) = P(W) + P(R) - P(W \cap R)$
$0.7 = .45 + .35 - P(W \cap R)$
$0.7 = 0.8 - P(W \cap R)$; $P(W \cap R) = 0.1$

7. 

a)
b) 3
c) $25/40 = 62.5\%$
d) $31/40 = 77.5\%$