Section 5.4 Extra Examples

Ex1

An urn contains 6 blue balls and 5 orange balls. In how many ways can we select 4 blue balls and 4 orange balls from the urn?

$$c(6,4) \cdot c(5,4)$$

Ex2

In how many ways can 7 hearts be chosen if 12 cards are chosen from a well shuffled deck of 52 playing cards?

13 Hearts	+	39 NotHearts		
7	+	5	=	12

$$c(13,7) \cdot C(39,5) = \text{Answer}$$

Ex3

A business organization needs to make up an 8 member fundraising committee. The organization has 6 accounting majors and 9 finance majors. In how many ways can the fundraising committee be formed if at least 4 account majors are on the committee?

≥ 4 or More Acct

6 Acct	9 Fin		
4	4	→	$c(6,4)\,c(9,4) = x$
5	3	→	$c(6,5)\,c(9,3) = y$
6	2	→	$c(6,6)\,c(9,2) = z$
~~7~~	~~1~~		
~~8~~	~~0~~		

Add

Answer $x + y + z$

Complement

6 Acct	9 Fin	
0	8	$c(6,0)\,c(9,8) = a$
1	7	$c(6,1)\,c(9,7) = b$
2	6	$c(6,2)\,c(9,6) = c$
3	5	$c(6,3)\,c(9,5) = d$

Add these

Total/Universe: $c(15,8)$

Answer = Total − Complement

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Ex4

55

A firm has 27 senior and 28 junior partners. A committee of three partners is selected at random to represent the firm at a conference. In how many ways can at least one of the junior partners be chosen to be on the committee?

↳ Use the Complement
0 Jr partners

27 S	28 J
3	0

$\rightarrow C(27,3)\cdot C(28,0) = X$

Total : $C(55,3)$

Answer : $\boxed{C(55,3) - X}$

Ex5

A classroom of children has 19 boys and 20 girls in which five students are chosen to do presentations. In how many ways can the five students be chosen so that more girls than boys are selected?

20 G	19 B
3	2
4	1
5	0

$\rightarrow$
$C(20,3)\,C(19,2) = x$
$C(20,4)\,C(19,1) = y$
$C(20,5)\,C(19,0) = z$

Complement

2	3
1	4
0	5

$\boxed{x + y + z}$

Ex6

An electronics store receives a shipement of 37 graphing calculators, including 5that are defective. Eight calculators are chosen at random to be sent to a local high school. How many ways can at least 4 defective calculator be chosen to be sent to the high school? **Should one use the complement to solve this problem?**

5 D	32 G
4	4
5	3

3	5
2	6
1	7
0	8

No; Complement is More work

Popper 5: A committee of 16 people, 7 women and 9 men, is forming a subcommittee that is to be made up of 6 women and 6 men. In how many ways can the subcommittee be formed? How would you set up this problem?

a. C(16,12)
b. C(7,6)*C(6,6)
c. C(7,6)*C(9,6)
d. C(6,6)*C(9,6)

Math 1313 Section 6.1

Section 6.1: Experiments, Events, and Sample Spaces

An **experiment** is an activity with observable results (outcomes).

A **sample point** is an outcome of an experiment.

A **sample space** is a set consisting of all possible sample points of an experiment. "Universe"

A **Finite Sample Space** is a sample space with finitely many outcomes.

An **event** is a subset of a sample space of an experiment.

Given two events, E and F:
The **union** of E and F is denoted by $E \cup F$.

The **intersection** of E and F is denoted by $E \cap F$.

If $E \cap F = \emptyset$ then E and F are called **mutually exclusive**. (An event is mutually exclusive also means that two events that cannot happen at the same time, such as getting a head and a tail on the same toss of a coin).

The **complement** of an event is E^c and is the set of all outcomes in a sample space that is not in E.

Example 1: Consider the experiment of tossing a die.
a. Describe the sample space, S, of this experiment.

$S = \{1, 2, 3, 4, 5, 6\}$

b. Let E be the event that an even number is tossed and F be the event that a prime number is tossed. Describe E and F in set notation then find the following:

$E = \{2, 4, 6\}$ $F = \{2, 3, 5\}$

$E \cup F =$ $= \{2, 3, 4, 5, 6\}$

Union → Merge

$E \cap F =$ $\{2\}$

In Common

$E^c =$ Not in E $= \{1, 3, 5\}$

$(E \cup F^c)^c =$ Apply DeMorgan's Law $= E^c \cap F$

$= \{1, 3, 5\} \cap \{2, 3, 5\}$

$\{3, 5\}$

Example 2: A sample of 3 apples taken from a fruit stand is examined to determine whether they are good or rotten. The sample space S = {GGG, GGR, GRG, GRR, RGG, RGR, RRG, RRR}. Let E be the event that at least 1 apple is good and let F be the event that exactly 2 apples are rotten. Find the events.

E = {GGG, GGR, GRG, GRR, RGG, RGR, RRG}

F = {GRR, RGR, RRG}

Example 3: An experiment consists of selecting a letter at random from the letters in the word COMMUNICATION and observing the outcomes.

a. What is an appropriate sample space for this experiment?

S = {C, O, M, U, N, I, A, T}

b. Describe the event "the letter selected is a vowel."

F = {O, U, I, A}

Example 4: Describe a sample space associated with the experiment of tossing 2 fair coins.

$S = \{H_1H_2, H_1T_2, T_1H_2, T_1T_2\}$

Describe the event of having the same outcome on each coin.

$E = \{H_1H_2, T_1T_2\}$

Popper 3: Given the following sample space, describe the event of selecting a prime number.

$$S = \{1, 2, 3, 4, 6, 8, 9, 11, 12, 15, 16, 18, 19, 20\}$$

a. E = {2, 4, 8, 16}
b. E = {1, 2, 3, 9, 11, 19}
c. E = {2, 3, 11, 19}
d. E = {1, 3, 9, 11, 15, 19}
e. None of the above