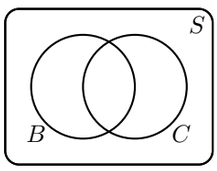
Name: _____ Business Data Analysis
Date: 201-316-VA

Solutions to In Class Exercise # 7: Introduction to Probability

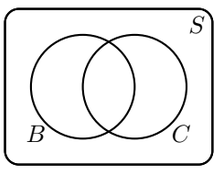
1. Military Hardware for Dairy Products

According to a book on New Zealand farming, Moscow offered to give NZ a nuclear submarine, MiG jets and tanks to help settle Russia's debt for dairy products. When told that NZ had a nuclear-free policy, Moscow's response was: "tie it up in some port and connect it to the national grid"[1].

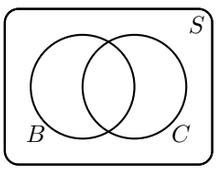
Residents in Auckland were asked if they had purchased NZ butter, or NZ cheese, or both within the last week. Let B and C represent the events that a resident bought butter or cheese respectively. Shade in the areas which match the set notation.



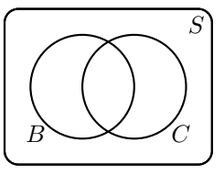
$B \cup C$



$B \cap C'$

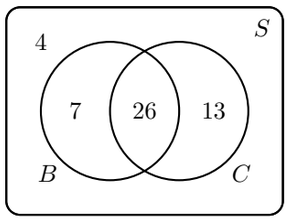


$B \cap C$



$B' \cap C'$

We are now given that there are **50** inhabitants in total and they responded as follows:



$P(B) = \frac{33}{50}$

$P(C) = \frac{39}{50}$

$P(B \cup C) = \frac{46}{50}$

$P(B \cap C) = \frac{26}{50}$

$P(B \cap C') = \frac{7}{50}$

$P(B' \cap C) = \frac{13}{50}$

$P(B' \cap C') = \frac{4}{50}$

$P(B' \cup C') = \frac{24}{50}$

2. Swiss Army

Shortly before World War I, the German Kaiser was the guest of the Swiss government to observe military maneuvers. The Kaiser asked a Swiss militiaman: "You are 500,000 and you shoot well, but if we attack with 1,000,000 men what will you do?" The soldier replied: "Shoot twice and go home"[2].

At the beginning of their training, all army recruits for the Swiss Army are given a test on marksmanship. The score out of 100 for a group of recruits is shown in the table below.

Score on Test	Number of Recruits
$0 \leq x < 20$	12
$20 \leq x < 40$	18
$40 \leq x < 60$	23
$60 \leq x < 80$	37
$80 \leq x \leq 100$	10
	100

(a) What is the probability that a randomly selected recruit earned at least 60 on the test? $\frac{47}{100}$

(b) What is the probability that a randomly selected recruit scored less than 40 on the test? $\frac{30}{100}$

(c) What is the probability that a randomly selected recruit earned either less than 20 or at least 80 on the test? $\frac{22}{100}$

[1] https://www.theguardian.com/world/2013/oct/15/russia-offered-newzealand-military-hardware
[2] https://www.reuters.com/article/us-swiss-bunkers-widerimage/a-room-without-a-view-second-life-for-swiss-army-bunkers-idUSKBN0UL1I220160107

3. **Dice**

The dots on a die are called "pips", and certain combinations have specific names attached to them. If you roll two dice, and get a ones on both of them, then you would have hit "snake eyes"; a double six is known as "midnight", while matching fives are "puppy paws". Roll two fours and you'll have a square pair, two times three are "Brooklyn forest", and matching twos are called ballerinas (because they wear tutus)![3]

Two fair dice are rolled together, and the sum of their dots are observed. To help you work it out the sums, fill out the table below:

+	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

(a) How many elements are in the sample space, S? 36

(b) What is the probability the sum of the two dice is seven? $\frac{6}{36}$

(c) What is the probability the sum of the two dice is two or twelve? $\frac{2}{36}$

(d) What is the probability the sum of the two dice is five and ten? 0

[3] https://vitalvegas.com/colorful-nicknames-dice-combinations-craps/