HW 2.1 Key

1. Townsville High School has official teams for two sports: baseball and soccer. You are given the following information regarding student participation in these sports:
   - 48% of students play baseball.
   - 38% of students play soccer.
   - 40% of students play neither sport.

   Determine the percentage of students that play exactly one sport.

A) 34%
B) 29%
C) 30%
D) 31%
E) 33%

$P(B) = 0.48 \quad P(S) = 0.38 \quad P[(B \cup S)^c] = 0.4$

$P(B \cup S) = 0.6 = 0.48 + 0.38 - P(B \cap S)$

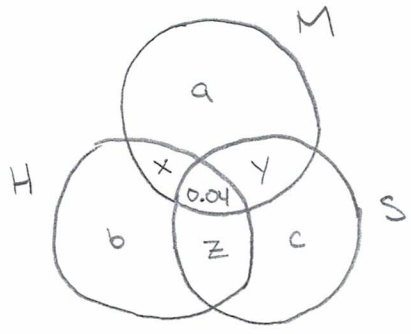
$P(B \cap S) = 0.26$

$P(\text{ex. one}) = P(B \cup S) - P(B \cap S) = \boxed{0.34}$

2. Townsville High School has three academic clubs: History, Math, and Science. You are given the following information regarding student participation in these clubs:
   - 27% of students participate in History Club.
   - 32% of students participate in Math Club.
   - 28% of students participate in Science Club.
   - 4% of students participate in all three clubs.
   - 39% of students participate in no clubs.

   Determine the percentage of students that participate in more than one club.

A) 22%
B) 19%
C) 21%
D) 23%
E) 25%



$P(H) = 0.27$
$P(M) = 0.32$
$P(S) = 0.28$
$P(H \cap M \cap S) = 0.04$
$P[\neg(H \cup M \cup S)] = 0.39$
$P[H \cup M \cup S] = 0.61$

We want: $x + y + z + 0.04$

① $(a+b+c) + (x+y+z) + 0.04 = 0.61$

② $P(H) + P(M) + P(S) = (a+b+c) + 2(x+y+z) + 3(0.04) = 0.27 + 0.32 + 0.28$

① $\Rightarrow (a+b+c) + (x+y+z) = 0.57$
② $\Rightarrow (a+b+c) + 2(x+y+z) = 0.75$
$\Rightarrow x + y + z = 0.18$

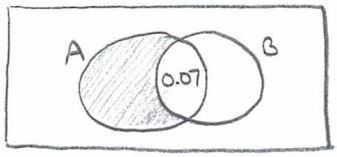
Answer = $\boxed{0.22}$

3. Assume that events *A* and *B* satisfy the following properties:
   - The probability of event *A* occurring is 1.4 times the probability of event *B* occurring.
   - The probability of at least one of the events occurring is 0.41.
   - The probability of both events occurring is 0.07.

   Determine the probability of Event A occurring and Event B not occurring.

A) 0.210
B) 0.172
C) 0.185
D) 0.197
E) 0.223

$P(A) = 1.4\,P(B)$
$P(A \cup B) = 0.41$
$P(A \cap B) = 0.07$



$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$0.41 = 1.4\,P(B) + P(B) - 0.07$

$0.48 = 2.4\,P(B)$

$P(B) = 0.2$

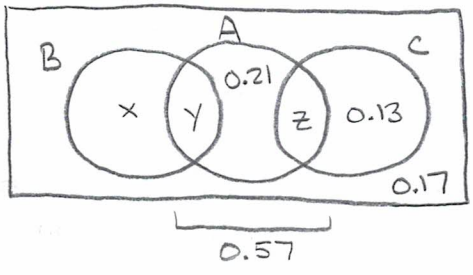
$P(A) = 0.28$

$P(A \cap B^c) = 0.28 - 0.07 = \boxed{0.21}$

4. You are given the following information about events *A*, *B*, and *C*.
   - The probability of event *A* occurring is 0.57.
   - The probability of only event *A* occurring is 0.21.
   - Events *B* and *C* are mutually exclusive.
   - The probability of *C* occurring is 1.5 times the probability of *B* occurring.
   - The probability of none of the events occurring is 0.17.
   - The probability C occurring and A not occurring 0.13.

   Find the probability of event B NOT occurring.

A) 0.752
B) 0.684
C) 0.707
D) 0.729
E) 0.775



① $y + z = 0.57 - 0.21 = 0.36$

② $z + 0.13 = 1.5(x + y)$

③ $x + y + z = 0.83 - 0.21 - 0.13 = 0.49$

③ minus ① $\Rightarrow$ $x = 0.49 - 0.36 = 0.13$

② $\Rightarrow$ $z + 0.13 = 1.5(0.13 + y) \Rightarrow 1.5y - z = -0.065$

$1.5y - z = -0.065$
$y + z = 0.36$
$\Rightarrow 2.5y = 0.295$
$y = 0.118$

$P(B) = x + y = 0.248$

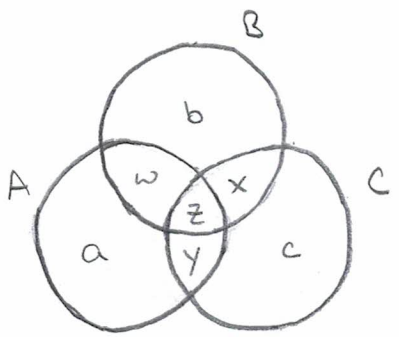
$P(B^c) = \boxed{0.752}$

5. You are given the following information about events *A*, *B*, and *C*.

1 • The probability of *A* occurring is 0.35.
2 • The probability of *B* occurring is 0.37.
3 • The probability of *C* occurring is 0.3.
4 • The probability of at least two of the events occurring is 0.29.
5 • The probability of *B* and *C* occurring is 0.16.
6 • The probability of *A* and *B* occurring is 0.03 greater than the probability of A and C occurring.
7 • The probability of only *A* occurring is 0.03 greater than the probability of only C occurring.

Find the probability of exactly one of the three events occurring.

A) 0.34
B) 0.33
C) 0.35
D) 0.36
E) 0.37



④ $w+x+y+z=0.29$
⑤ $x+z=0.16$
$\rightarrow w+y=0.13$

⑥ $w+z=y+z+0.03 \rightarrow w-y=0.03$

$w=0.08$
$y=0.05$

⑦ $0.35-w-z-y=(0.3-x-z-y)+0.03$

$0.35-0.08=0.33-x$

$x=0.06$

④ $0.08+0.06+0.05+z=0.29 \rightarrow z=0.10$

① $a+0.08+0.10+0.05=0.35 \rightarrow a=0.12$
② $b+0.08+0.10+0.06=0.37 \rightarrow b=0.13$
③ $c+0.05+0.10+0.06=0.3 \rightarrow c=0.09$

$a+b+c=\boxed{0.34}$