STAT 416
Fall 2021
September 9, 2021

1. For students in Stat 416, 50% are Statistics majors, 25% are Computer Science majors, and 40% are not majoring in either Statistics or Computer Science.

   Determine the probability that a student has a double major in Statistics and Computer Science.

   Solution:

   Let S be that a student is a Statistics major and let C be that a student is a ComputerScience major.

   We need $P[(S \cap C)]$. We know that $P[(S \cup C)] = P[S] + P[C] - P[(S \cap C)]$

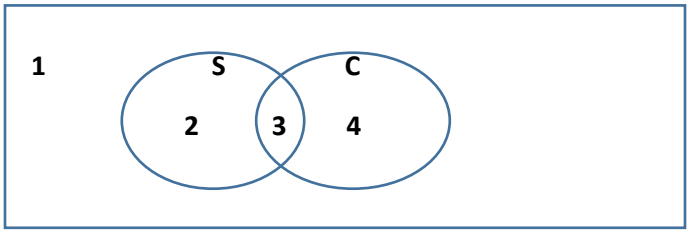
   $P(S \cup C) = 1 - P[(S \cup C)^C] = 1 - 0.40 = 0.60 \quad ==> 0.60 = 0.5 + 0.25 - P[(S \cap C)]$

   $==> Answer = P[(S \cap C)] = 0.50 + 0.25 - 0.60 = 0.15$

or

	$P[S] = 0.5$ given	$P[S^C] = 1 - P[S] = 1 - 0.5 = 0.5$
$P[C] = 0.25$ given	$P[S \cap C] = P[S] - P[(S \cap C^C)]$ $= 0.5 - 0.35 = 0.15$	
$P[C^C]$ $= 1 - P[C] = 1 - 0.25 = 0.75$	$P[S \cap C^C]$ $= P[C^C] - P[S^C \cap C^C] = 0.75 - 0.4 = 0.35$	$P[S^C \cap C^C]$ $= P[S^C] - P[S^C \cap C] = 0.4$ given

Or



Area 2+Area 3 = 0.50 Area 3 + Area 4 = 0.25 Area 1 = 0.40

Area 1 + Area 2 + Area 3 + Area 4 = 1

Need Area 3

Area 1 + Area 2 + Area 3 + Area 3 + Area 4 = 1 +Area 3

0.4 + 0.5 + 0.25 = 1 + Area 3 ➔ Area 3 = 1.15 – 1 = 0.15

2. A standard deck of 52 playing cards has four suites – hearts, diamonds, clubs, or spades. Each suite has 13 cards.

   What is the probability of randomly drawing five cards without replacement from the deck and having all five be the same suite? (This is known as a flush in poker.)

   Solution:

$$Answer = \frac{\binom{13}{5}(4)}{\binom{52}{5}} = \frac{(13)(12)(11)(10)(9)(4)}{(52)(51)(50)(49)(48)} =$$

3. A bowl has six balls in it. Three balls are red, two balls are purple, and one ball is blue. You select three balls at random without replacement.

   Calculate the probability that all three balls are red.

   Solution:

$$Answer = \frac{\binom{3}{3}}{\binom{6}{3}} = \frac{1}{\frac{(6)(5)(4)}{(3)(2)(1)}} = \frac{1`}{20} = 0.05$$

Or

$$\left(\frac{3}{6}\right)\left(\frac{2}{5}\right)\left(\frac{1}{4}\right) = \frac{1`}{20} = 0.05$$