

**S.CP.A.2: Theoretical Probability**

- 1 Given events  $A$  and  $B$ , such that  $P(A) = 0.6$ ,  $P(B) = 0.5$ , and  $P(A \cup B) = 0.8$ , determine whether  $A$  and  $B$  are independent or dependent.
  
- 2 In contract negotiations between a local government agency and its workers, it is estimated that there is a 50% chance that an agreement will be reached on the salaries of the workers. It is estimated that there is a 70% chance that there will be an agreement on the insurance benefits. There is a 20% chance that no agreement will be reached on either issue. Find the probability that an agreement will be reached on *both* issues. Based on this answer, determine whether the agreement on salaries and the agreement on insurance are independent events. Justify your answer.

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### Answer Section

1 ANS:

$$P(A \cup B) = P(A) + P(B) - P(A \cap B) \quad A \text{ and } B \text{ are independent since } P(A \cap B) = P(A) \cdot P(B)$$

$$0.8 = 0.6 + 0.5 - P(A \cap B)$$

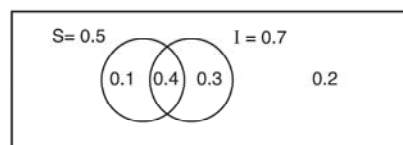
$$0.3 = 0.6 \cdot 0.5$$

$$P(A \cap B) = 0.3$$

$$0.3 = 0.3$$

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2 ANS:



This scenario can be modeled with a Venn Diagram:

Since

$P(S \cup I)^c = 0.2$ ,  $P(S \cup I) = 0.8$ . Then,  $P(S \cap I) = P(S) + P(I) - P(S \cup I)$  If  $S$  and  $I$  are independent, then the

$$= 0.5 + 0.7 - 0.8$$

$$= 0.4$$

Product Rule must be satisfied. However,  $(0.5)(0.7) \neq 0.4$ . Therefore, salary and insurance have not been treated independently.

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