
Applied Statistics; Probability Basics

Rules

1- Intersect (And)

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

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

$$P(A \cap (B \cup C)) = P((A \cap B) \cup (A \cap C)) \text{ or } P(A \cap B) + P(A \cap C) - P(A \cap B \cap C)$$

2- Union (Or)

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

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

$$P(A \cup (B \cap C)) = P(A \cup B) + P(A \cup C) - P(A \cup B \cup C) \text{ or } P(A) + P(B \cap C) - P(A \cap B \cap C)$$

3- Difference

$$(A \text{ but not } B), (Only A) = P(A - B) = P(A) - P(A \cap B)$$

$$(B \text{ but not } A), (Only B) = P(B - A) = P(B) - P(B \cap A)$$

4- Complement

$$P(\bar{A}) = 1 - P(A)$$

$$P(A) = 1 - P(\bar{A})$$

$$P(\overline{A \cap B}) = 1 - P(A \cap B)$$

$$P(\overline{A \cup B}) = 1 - P(A \cup B)$$

$$P(A \cap \bar{B}) = P(A - B)$$

$$P(\bar{A} \cap B) = P(B \cap \bar{A}) = P(B - A)$$

$$P(\bar{A} \cap \bar{B}) = P(\overline{A \cup B}) = 1 - P(A \cup B)$$

$$P(\bar{A} \cup \bar{B}) = \overline{(A \cap B)} = 1 - P(A \cap B)$$

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Q1: Let A and B are two events of sample space, knowing It $P(A) = 0.5$, $P(B) = 0.7$, $P(A \cup B) = 0.9$. Find the following

1. The occurrence of A and B (Both A and B)
2. The occurrence of A only
3. The occurrence of B only
4. The non occurrence of A or B together
5. The non occurrence of A and B together
6. Neither A nor B
7. Either A nor B

Q2: Let A and B are two event of a sample space S and let $P(A) = 0.5$, $P(B) = 0.7$ and $P(A \cup B) = 0.9$ Find the probability of B but not A

Q3: Let A and B are two event of a sample space S and let $P(A) = 0.5$, $P(B) = 0.7$ and $P(A \cap B) = 0.3$ Find the probability The non occurrence of A and B together

Q4: A couple has three children. Find the probability. All boys

Q5: A single die is rolled: What is the probability that a 3 will show face up?

Q6: Two dice are rolled: What is the probability that a two-spot will show face up?

Q7: If two dice are rolled one time, find the probability of getting these results.

1. A sum of 9
2. A sum of 7 or 11
3. Doubles
4. A sum less than or equal 9
5. A sum greater than 10

Q8: A couple has a three children, Find probability

1. All boys
2. All girls or all boys
3. Exactly two boys or two girls
4. At least one child of each gender

Q9: A survey of 34 students at wall college of business showed the following majors
Accounting 10, Finance 5, Economics 3, Management 6, Marketing 10

1. What is probability he or she is management?
2. What probability you choose to make your estimation?

Q10: If $P(\bar{A}) = 3/8$, $P(B) = 3/5$, $P(A \cap B) = 2/5$, Find each of the following

1. The occurrence of A
2. The non occurrence of B
3. The occurrence of A or B
4. The non occurrence of A or B together
5. The occurrence of A Only
6. The non occurrence of A or B together

Q11: If $P(A \cap \bar{B}) = 1/12$, $P(B - A) = 5/12$, $P(\bar{A} \cap \bar{B}) = 1/4$, Find each of the following

1. $P(A)$
2. $P(B)$
3. $P(A \cap B)$

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Q12: If $P(A) = 1/2$, $P(B) = 0.6$, $P(B \cap A) = 0.3$, $P(A \cap C) = P(B \cap C) = 0.2$ and $P(A \cap B \cap C) = 0.1$ calculate

1. $P(A \cup B)$
2. $P(A \cup (B \cap C))$
3. $P(A \cap (B \cup C))$
4. $P(A \cup B \cup C)$

Q13: If $P(A) = 0.6$, $P(B) = 0.1$, and both probability with 0.02. find the following probabilities

1. A or B
2. B but not A