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Probability of Compound Events

Unit 12 Lesson 8

Students will be able to:

Understand the and solve problem involving compound event.

Key Vocabulary:

- Sample space
- Union
- Event
- Intersection
- Probability

Probability in the Union and Intersection of Events

You will now consider probabilities of events that are combined as union or as intersection. Denote the probability in the union of the two events E_1 and E_2 as $P(E_1 \bigcup E_2)$ and the probability in the intersection of events E_1 and E_2 as $P(E_1 \bigcap E_2)$.

Probability in the Union and Intersection of Events

If E_1 and E_2 are any events in the samples space S, then

$$P(E_1 \cup E_2) = P(E_1) + P(E_2) - P(E_1 \cap E_2)$$

Addition Law of Probability

Probability in the Union and Intersection of Events

If E_1 and E_2 are sets with no intersection or $E_1 \cap E_2 = \varnothing$ then

$$P(E_1 \cup E_2) = P(E_1) + P(E_2)$$

Sets or events that have no interactions are called disjoint sets and are said to be mutually exclusive events.

Sample Problem 1. Solve Problem involving compound events.

1. A card is drawn from a deck of cards. Find the probability that the card is an ace or a heart.

Solution:

Let E_1 = events of getting an ace 4/52

E_2 = events of getting a heart 13/52

$P(E_1 \cap E_2)$ = event of getting an ace of hearts 1/52

$$P(E_1 \cup E_2) = P(E_1) + P(E_2) - P(E_1 \cap E_2)$$

$$= \frac{4}{52} + \frac{13}{52} - \frac{1}{52} = \frac{4}{13}$$

Sample Problem 1. Solve Problem involving compound events.

2. Two men are players in a car race. The probability that player A will win is 3/10 and the probability that player B will win 1/5. What is the probability that player A or player B will win if the two events are mutually exclusive?

Solution: P(A) = 3/10

P(B) =1/5

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

$$= \frac{3}{10} + \frac{1}{5} \quad = \frac{1}{2}$$

Sample Problem 1. Solve Problem involving compound events.

3. What is the probability of getting a 9 or 10 when a pair of dice is tossed once?

Solution:

Let A= event that a 9 occurs = {(3, 6), (6, 3), (4, 5), (5, 4)}

B= event that a 10 occurs = {(4, 6), (6, 4), (5, 5)}

n(A)= 4; n(B)= 3; n(S)= 36

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

$$= \frac{4}{36} + \frac{3}{36} = \frac{7}{36}$$

Sample Problem 1. Solve Problem involving compound events.

4. The contingent table below shows the number of male and female enrollees in three disciplines.

Gender/ Discipline	Information Technology (A)	Computer Science (B)	Computer Engineering (C)	Total
Male (M)	25	15	31	71
Female (F)	28	34	14	76
Total	53	49	45	147

If a student's is selected at random, find the probability of selecting students as indicated:

A. P(M U F) B.P (A U C) C. P(M U B)

Sample Problem 1. Solve Problem involving compound events.

4. The contingent table below shows the number of male and female enrollees in three disciplines.

Gender/ Discipline	Information Technology (A)	Computer Science (B)	Computer Engineering (C)	Total
Male (M)	25	15	31	71
Female (F)	28	34	14	76
Total	53	49	45	147

$A. P(M \cup F)$

Solution:

$$P(M \cup F) = P(M) + P(F)$$

$$= \frac{71}{147} + \frac{76}{147} = 1$$

Sample Problem 1. Solve Problem involving compound events.

4. The contingent table below shows the number of male and female enrollees in three disciplines.

Gender/ Discipline	Information Technology (A)	Computer Science (B)	Computer Engineering (C)	Total
Male (M)	25	15	31	71
Female (F)	28	34	14	76
Total	53	49	45	147

$B. P(A \cup C)$

Solution:

$$P(A \cup C) = P(A) + P(C)$$

$$= \frac{53}{147} + \frac{45}{147} = \frac{98}{147}$$

Sample Problem 1. Solve Problem involving compound events.

4. The contingent table below shows the number of male and female enrollees in three disciplines.

Gender/ Discipline	Information Technology (A)	Computer Science (B)	Computer Engineering (C)	Total
Male (M)	25	15	31	71
Female (F)	28	34	14	76
Total	53	49	45	147

$C.P(M \cup B)$

Solution:

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

$$= \frac{71}{147} + \frac{49}{147} - \frac{15}{147} = \frac{105}{147}$$