

Statistics: Conditional Probability — Dependent Events



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DIRECTIONS

Use the conditional probability formula $P(A|B) = P(A \cap B) / P(B)$ and the multiplication rule $P(A \cap B) = P(A|B) \cdot P(B)$. For dependent events (without replacement), adjust counts after each draw.

1 Find $P(A|B)$:

$$P(A \cap B) = 0.12, \quad P(B) = 0.30$$

Answer: _____

2 Find $P(A \cap B)$:

$$P(A|B) = 0.60, \quad P(B) = 0.50$$

Answer: _____

3 Bag: 5 red, 3 blue. Draw 2 without replacement. Find:

$P(\text{both red})$

Answer: _____

4 Find $P(B|A)$:

$$P(A \cap B) = 0.18, \quad P(A) = 0.60$$

Answer: _____

5 Find $P(A \cap B)$:

$$P(A) = 0.40, \quad P(B|A) = 0.50$$

Answer: _____

6 Deck of 52 cards. Draw 2 without replacement. Find:

$P(\text{both Aces})$

Answer: _____

7 In a class: 40% study math, 30% study both math and science. Find:

$P(\text{science} | \text{math})$

Answer: _____

8 Box: 4 defective, 6 good items. Draw 2 without replacement. Find:

$P(\text{2nd defective} | \text{1st defective})$

Answer: _____

Answer Key & Solutions

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TEACHER NOTES

Key formulas: $P(A|B) = P(A \cap B) / P(B)$; $P(A \cap B) = P(A|B) \cdot P(B)$. Dependent events: the outcome of the first trial changes the sample space for the next. Without replacement = always dependent.

1 Find $P(A|B)$:

$$P(A \cap B) = 0.12, \quad P(B) = 0.30$$

$$= P(A|B) = \frac{0.12}{0.30} = 0.40$$

Use $P(A|B) = P(A \cap B) / P(B) = 0.12 / 0.30 = 0.40$.

2 Find $P(A \cap B)$:

$$P(A|B) = 0.60, \quad P(B) = 0.50$$

$$= P(A \cap B) = 0.60 \times 0.50 = 0.30$$

Multiplication rule: $P(A \cap B) = P(A|B) \cdot P(B) = 0.60 \times 0.50 = 0.30$.

3 Bag: 5 red, 3 blue. Draw 2 without replacement. Find:

$$P(\text{both red})$$

$$= \frac{5}{8} \cdot \frac{4}{7} = \frac{20}{56} = \frac{5}{14}$$

After 1st draw, only 4 red remain in 7 total — events are dependent.

4 Find $P(B|A)$:

$$P(A \cap B) = 0.18, \quad P(A) = 0.60$$

$$= P(B|A) = \frac{0.18}{0.60} = 0.30$$

Swap the conditioning: $P(B|A) = P(A \cap B) / P(A) = 0.18 / 0.60 = 0.30$.

5 Find $P(A \cap B)$:

$$P(A) = 0.40, \quad P(B|A) = 0.50$$

$$= P(A \cap B) = 0.40 \times 0.50 = 0.20$$

$P(A \cap B) = P(B|A) \cdot P(A) = 0.50 \times 0.40 = 0.20$.

6 Deck of 52 cards. Draw 2 without replacement. Find:

$$P(\text{both Aces})$$

$$= \frac{4}{52} \cdot \frac{3}{51} = \frac{12}{2652} = \frac{1}{221}$$

After drawing 1 Ace, 3 remain out of 51 cards — dependent events.

- 7 In a class: 40% study math, 30% study both math and science. Find:

$$P(\text{science} \mid \text{math})$$

$$= P(\text{sci} \mid \text{math}) = \frac{0.30}{0.40} = 0.75$$

$$P(\text{science} \mid \text{math}) = P(\text{both}) / P(\text{math}) = 0.30 / 0.40 = 0.75.$$

- 8 Box: 4 defective, 6 good items. Draw 2 without replacement. Find:

$$P(\text{2nd defective} \mid \text{1st defective})$$

$$= \frac{3}{9} = \frac{1}{3}$$

After removing 1 defective, 3 defective remain out of 9 total.