12-4 Multiplying Probabilities

AND

Probability of Two Independent Events

If two events, A and B, are independent, then the probability of both events occurring is P(A and B) = P(A) x P(B).

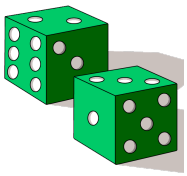
with replacement

Ex1. At a picnic, Julio reaches into an ice-filled cooler containing 8 regular soft drinks and 5 diet soft drinks. He removes a can, then decides he is not really thirsty, and puts it back. What is the probability the Julio and the next person to reach into the cooler both randomly select a regular soft drink?

$P(\text{reg and reg}) = \frac{8}{13} \cdot \frac{8}{13} = \frac{64}{169} = .378 \approx .38$

w/replacement

Ex2. In a board game, three dice are rolled to determine the number of moves for the players. What is the probability that the first die shows a 6, the second die shows a 6, and the third die does not?



$P(6, 6, \text{and not a } 6) = \frac{1}{6} \cdot \frac{1}{6} \cdot \frac{5}{6} = \frac{5}{216}$

$= .02$

Probability of Two Dependent Events

If two events, A and B, are dependent, then the probability of both events occurring is

P(A and B) = P(A) x P(B following A). Without replacement

Ex3. The host of a game show is drawing chips from a bag to determine the prizes for which contestants will play. Of the 10 chips in the bag, 6 show television, 3 show vacation, and 1 shows car. If the host draws the chips at random and does not replace them, find each probability.

a. P(a vacation, a car) = $\frac{3}{10} \cdot \frac{1}{9} = \frac{3}{90} = \frac{1}{30} = .0\overline{3}$

(AND)

b. P(two televisions) = P(TV AND TV) = $\frac{6}{10} \cdot \frac{5}{9} = \frac{30}{90} = \frac{1}{3} = .3\overline{3}$

Ex4. Three cards are drawn from a standard deck of cards without replacement. Find the probability of drawing a diamond, a club, and another diamond in that order.

= P(diamond, club, and diamond)

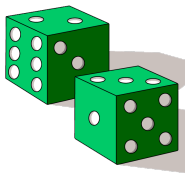
$= \frac{13}{52} \cdot \frac{13}{51} \cdot \frac{12}{50}$

$= \frac{2028}{132{,}600} \approx .02$

Ex5. Gerardo has 9 dimes and 7 pennies in his pocket. He randomly selects one coin, looks at it, and replaces it. He then randomly selects another coin. What is the probability that both of the coins he selects are dimes?

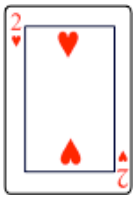
$$P(\text{dime and dime}) = \frac{9}{16} \cdot \frac{9}{16} = \frac{81}{256} = .32$$

Ex6. When three dice are rolled, what is the probability that two dice show a 5 and the third die shows an even number?



$$P(5, 5, \text{an even}) = \frac{1}{6} \cdot \frac{1}{6} \cdot \frac{3}{6} = \frac{3}{216} = .014$$

Ex7. Three cards are drawn from a standard deck of cards without replacement. Find the probability of drawing a heart, another heart, and a spade in that order.



$$P(\text{Heart, Heart, a Spade}) \quad \frac{13}{52} \cdot \frac{12}{51} \cdot \frac{13}{50} = \frac{2028}{132{,}600} = .02$$

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(14) $P(2 \text{ and } 3) = \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36}$

(16) $P(4 \text{ and } 4) = \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36}$

(18) $P(\text{two of the same \#}) = \frac{6}{6} \cdot \frac{1}{6} \cdot \frac{6}{36} = \frac{1}{6}$

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