

10.8: Probability of Independent & Dependent Events

HCPS III

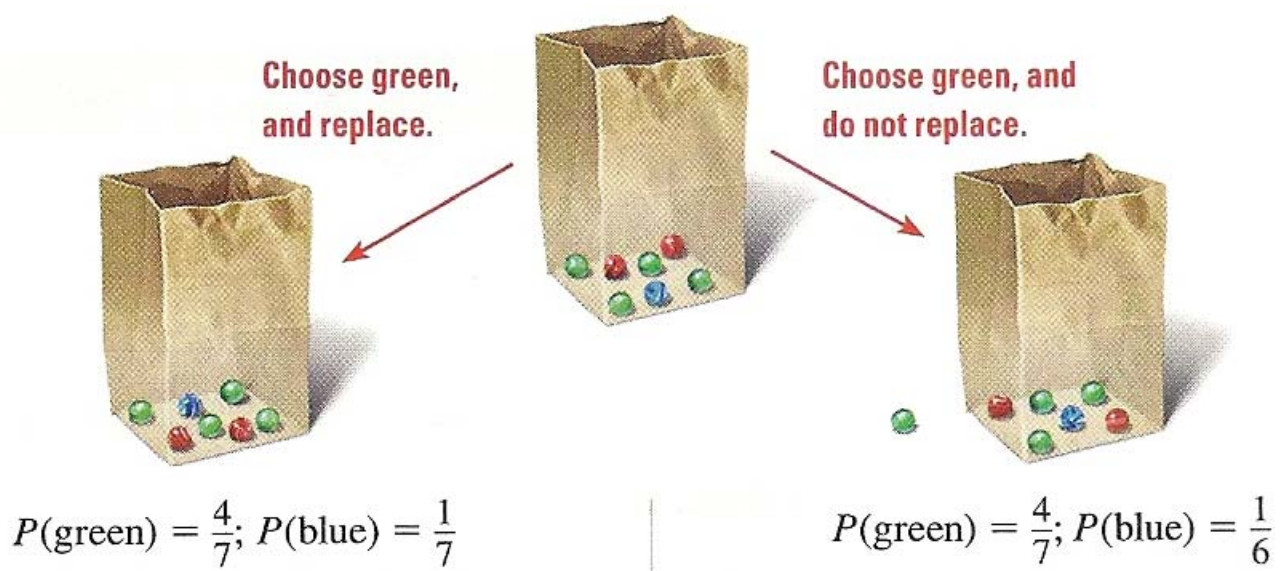
- **Standard 14:** Data Analysis, Statistics, and Probability: PROBABILITY: Understand and apply basic notions of chance and probability.
- **Benchmark MA.All.14.1:** Use the fundamental counting principles for combinations and permutations to determine probability.
- **Benchmark MA.All.14.2:** Calculate probabilities of events under different relationships (e.g., inclusion, disjoint, complementary, independent, dependent, with replacement, without replacement).

Goal: Find the probability of independent and dependent events.

Definition of Independent and Dependent Events

Two events are **independent** if the occurrence of one event *does not* affect the occurrence of the other (e.g., random selection with replacement).

Two events are **dependent** if the occurrence of one event *does* affect the occurrence of the other (e.g., random selection without replacement).



Example 1: Identify Events

Tell whether the events are independent or dependent. Explain.

- a.) You select a card from a deck of 52 cards, replace that card, and select another card.

- b.) Ms. Nakamura chooses students at random to present their projects. She chooses you, and then another student from the remaining students.

- c.) There are 10 winning tickets in a collection of 500 tickets. You select a ticket, put it aside, and select another ticket.

Conditional Probability for Dependent Events

For two dependent events A and B , the probability that B will occur *given that* A has already occurred is the **conditional probability** of B given A , written as $P(B|A)$.

Example 2: Find Conditional Probabilities

The table shows the status of 200 registered college students. A student is randomly selected.

	Part Time	Full Time
Female	80	40
Male	60	20

- a.) What is the probability that the selected student is female?

- b.) What is the probability that a selected female student is a full time student?

Probability of Independent and Dependent Events

Independent Events:

If A and B are independent events, then the probability that both A and B occur is $P(A \text{ and } B) = P(A) \cdot P(B)$

Dependent Events:

If A and B are dependent events, then the probability that both A and B occur is $P(A \text{ and } B) = P(A) \cdot P(B|A)$

Example 3: Independent and Dependent Events



Scrabble has 100 tiles, 98 of which are letters and two of which are blank. The numbers of tiles of each letter are shown in the diagram. Suppose you draw two tiles. Find the probability that both tiles are vowels in the situation described.

a.) You replace the first tile before drawing the second tile.

A	9	H	2	O	8	V	2
B	2	I	9	P	2	W	2
C	2	J	1	Q	1	X	1
D	4	K	1	R	6	Y	2
E	12	L	4	S	4	Z	1
F	2	M	2	T	6		2
G	3	N	6	U	4	Blank	

b.) You do *not* replace the first tile before drawing the second tile.