

(12.1) PROBABILITY OF INDEPENDENT AND DEPENDENT EVENTS, AND CONDITIONAL

“With replacement” means you put the item back.

“Without replacement” means don’t put it back once you remove it.

Independent Event (2 or more events) Event A and Event B are independent if they do _____ affect each other.

- Ex. Landing on heads after tossing a coin AND rolling a 5 on a 6-sided die.
- Ex. Choosing a marble from a jar AND landing on tails after tossing a coin.
- Ex. Getting a 3 from a deck of cards, replacing it, AND THEN choosing an ace.
- Ex. Rolling a 4 on a single 6-sided die, AND then rolling a 1 on a second roll of the die.

Probability of Two Independent Events: $P(A \text{ and } B) = P(A) \cdot P(B)$

“AND” (for multiple events) → _____

Ex: Events *A* and *B* are independent. Find the indicated probability.

- a. $P(A) = 0.3, P(B) = 0.5, P(A \text{ and } B) = ?$

- b. $P(A) = ?, P(B) = 0.9, P(A \text{ and } B) = 0.45$

Ex: Adam goes to the grocery store to buy cereal. The shelves contain 9 boxes of Brand A and 6 boxes of Brand B. He selects one brand at random & then puts it back. Another person does the same thing. What is the probability they both selected Brand A?

Ex. A bag contains 4 green, 3 blue, and 5 yellow marbles. What is the probability of selecting a green marble, replacing it, then selecting a yellow marble?

Dependent Event

Event A and Event B are dependent if Event A affects the probability of Event B.

Ex. Choosing items from a container without replacement

Ex. Choosing people to form a committee

Ex. Choose a 3 from a deck of cards, not replacing it and then choosing an ace as the second card.

Ex. Speeding, and then getting a speeding ticket.

Probability of Two Dependent Events: $P(A \& B) = P(A) \cdot P(B \text{ after } A)$

Figure out the first probability. Figure out the second probability and how it is affected by the first event. Then, multiply them together.

Ex: Tasha's bowl contains 4 red, 6 green and 3 brown candies. She randomly chooses and keeps 3 candies from the bowl. What is the probability she will choose all brown?

Ex: From a standard deck of 52 cards, 2 cards are selected. What is the probability:
with replacement? without replacement?

a) 2 black cards are selected

b) 1 red card and then 1 spade
in that order

Conditional Probability

the probability that B will occur given that A has **already** occurred is written $P(B|A)$
Narrow down your total outcomes from the event that has already occurred. Then take the new probability based on what's left.

Ex: Let n be a randomly selected integer from 1 to 20. Find the indicated probability.

a) n is 2 given that it is even.

b) n is prime given that it has two digits.

c) n is odd given that it is even.

(12.1) WORKSHEET – INDEPENDENT and DEPENDENT EVENTS, CONDITIONAL PROBABILITY

1) Events A and B are independent. Find the indicated probability.

a) $P(A) = 0.21$, $P(B) = 0.34$, $P(A \text{ and } B) = ?$

b) $P(A) = ?$, $P(B) = 0.8$, $P(A \text{ and } B) = 0.40$

2) In a survey at a football game, 50 of 75 male fans and 40 of 50 female fans said that they favor the new team mascot. If 1 male and 1 female are randomly selected, what is the probability that both favor the new mascot?

3) Find the probability of drawing the given cards from a standard deck of 52 cards with replacement and without replacement.

		<u>Numbers</u>	<u>Face Cards</u>
BLACK	Spade	A 2 3 4 5 6 7 8 9 10	J Q K
BLACK	Club	A 2 3 4 5 6 7 8 9 10	J Q K
RED	Heart	A 2 3 4 5 6 7 8 9 10	J Q K
RED	Diamond	A 2 3 4 5 6 7 8 9 10	J Q K

INDEPENDENT
With replacement

DEPENDENT
Without replacement

a) A club, then a spade

b) A queen, then an ace

c) A face card, then a 6

d) A 10, then 2

e) A king, then a queen, then a jack

f) A spade, then a club, then
another spade

f) Three hearts in a row

4) One bag contains 2 green marbles and 4 white marbles, and a second bag contains 3 green marbles and 1 white marble. If Trent randomly draws one marble from each bag, what is the probability that they are both green?

5) On a certain day the chance of rain is 80% in San Francisco and 30% in Sydney. Assume that the chance of rain in the two cities is independent. What is the probability that it will NOT rain in either city? (It will not rain in BOTH cities.)

6) A math teacher is randomly distributing 15 rulers with centimeter labels and 10 rulers without centimeter labels. What is the probability that the first ruler she hands out will have centimeter labels and the second ruler will NOT have labels?

7) CONDITIONAL PROBABILITY: Let n be a randomly selected integer from 1 to 20. Find the indicated probability.

List the integers:

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a) n is 2 given that it is even.

b) n is 5 given that it is less than 8.

c) n is prime given that it has two digits.

d) n is odd given that it is prime.

8) A box contains 7 large red marbles, 5 large yellow marbles, 3 small red marbles, and 5 small yellow marbles. If a marble is drawn at random, what is the probability that it is yellow, given that it is one of the large marbles?