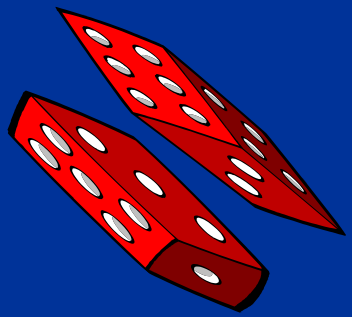
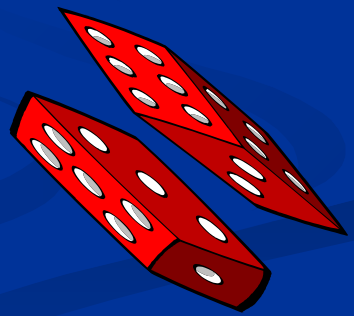
Probability of Compound Events





Probability of Compound Events

Objective:

(1) Students will be able to find the probability of a compound event.

(2) Students will be able to understand the distinction between simple events and compound events.

Essential Question:

(1) How do I find the probability of a compound event?

(2) How can I distinguish between a simple and compound event?

Probability of Compound Events

Vocabulary:

- **Outcome** – one possible result of a probability.
- **Sample Space** – the list of possible outcomes for a probability event.
- **Random** – outcomes that occur at random if each outcome is equally likely to occur.
- **Compound Event** – a specific outcome or type of outcome.
- **Complementary Events** – the events of one outcome happening and that outcomes not happening are complimentary; the sum of the probabilities of complementary events is 1.

Probability of Compound Events

What is a PROBABILITY?

- Previously we looked at probability for simple individual events

- If a simple event involves one, independent event, compound events include two or more simple events

Probability of Compound Events

What is a PROBABILITY?

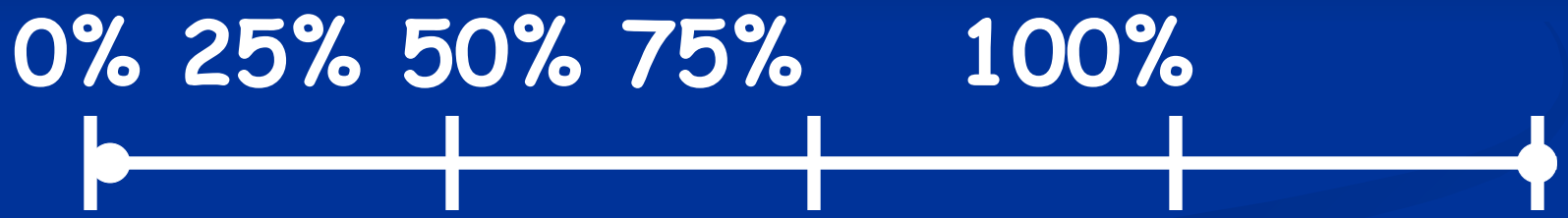
$$P(\text{event}) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$$

Examples that use Probability:

(1) Dice, (2) Spinners, (3) Coins, (4) Deck of Cards, (5) Evens/Odds, (6) Alphabet, Etc.

Probability of Compound Events

What is a PROBABILITY?



$0\frac{1}{4}$ or .25	$\frac{1}{2}$ Or .5	$\frac{3}{4}$ or .75	1	
Impossible Likely	Not Very Likely	Equally Likely	Somewhat	Certain

Probability of Compound Events

Real World Example:

Best Buy is having an IPOD giveaway. They put all the IPOD Shuffles in a bag. Customers may choose an IPOD without looking at the color. Inside the bag are 4 orange, 5 blue, 6 green, and 5 pink IPODS. If Maria chooses one IPOD at random and then her sister chooses one IPOD at random, what is the probability they will both choose an orange IPOD?

Probability of Compound Events

Real World Example:

Best Buy is having an IPOD giveaway. They put all the IPOD Shuffles in a bag. Customers may choose an IPOD without looking at the color. Inside the bag are 4 orange, 5 blue, 6 green, and 5 pink IPODS. If Maria chooses one IPOD at random and then her sister chooses one IPOD at random, what is the probability they will both choose an orange IPOD?

$P(\text{orange, orange}) = \frac{4}{20} \times \frac{3}{19} = \frac{3}{95}$ or 3.2%

Probability of Compound Events

What are COMPOUND EVENTS?

- There are (2) types of compound events:

(1) Independent Events – involves two or more events in which the outcome of one event DOES NOT affect the outcome of any other events

Examples: roll dice, coin flip, problems with replacement

$P(A \text{ and } B) = P(A) \times P(B)$

Probability of Compound Events

What are COMPOUND EVENTS?

- There are (2) types of compound events:

(2) Dependent Events - involves two or more events in which the outcome of one event DOES affect the outcome of any other events

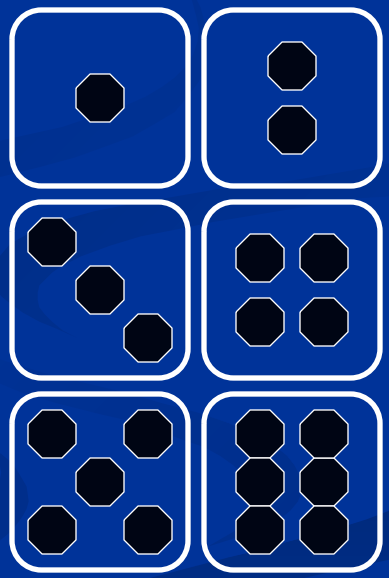
Examples: deck of cards, selecting item from container, problems without replacement

P(A and B) = P(A) x P(B following A)

Probability of Compound Events

Example 1: Roll a dice.

What is the probability of rolling back to back sixes?



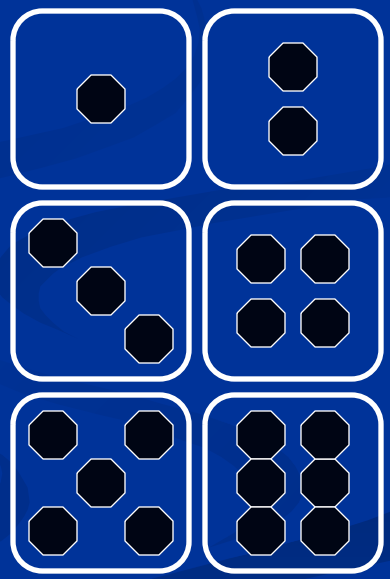
P(6, then 6) =

Probability of Compound Events

Example 1: Roll a dice.

What is the probability of rolling back to back sixes?

1	1	2	1	3	1	4	1	5	1	6	1
1	2	2	2	3	2	4	2	5	2	6	2
1	3	2	3	3	3	4	3	5	3	6	3
1	4	2	4	3	4	4	4	5	4	6	4
1	5	2	5	3	5	4	5	5	5	6	5
1	6	2	6	3	6	4	6	5	6	6	6

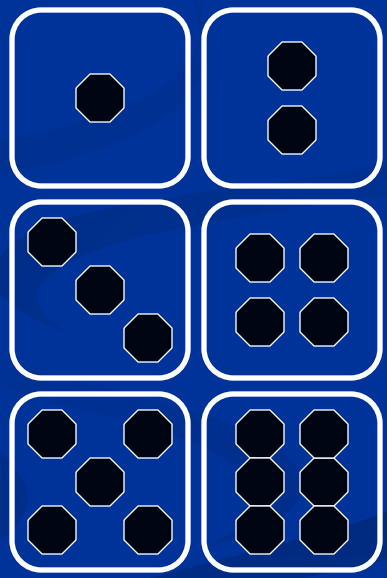


$P(6 \text{ then } 6) = \frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$

Probability of Compound Events

Example 2: Roll a dice.

What is the probability of rolling back to back evens?



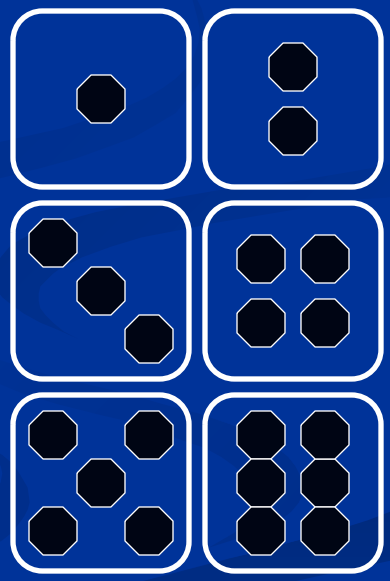
P(even, then even) =

Probability of Compound Events

Example 2: Roll a dice.

What is the probability of rolling back to back evens?

1	1	2	1	3	1	4	1	5	1	6	1
1	2	2	2	3	2	4	2	5	2	6	2
1	3	2	3	3	3	4	3	5	3	6	3
1	4	2	4	3	4	4	4	5	4	6	4
1	5	2	5	3	5	4	5	5	5	6	5
1	6	2	6	3	6	4	6	5	6	6	6



$$P(\text{even, then even}) = \frac{3}{6} \times \frac{3}{6} = \frac{9}{36} = \frac{1}{4}$$

Probability of Compound Events

Example 3: Flip a coin.

What is the probability of flipping back to back heads?

P(head, then head) =

Probability of Compound Events

Example 3: Flip a coin.

What is the probability of flipping back to back heads?

Flip 1:

Flip 2:

Outcomes: TT TH HT HH

P(head, then head) = $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

Probability of Compound Events

Example 4a: Deck of Cards.

What is the probability of drawing 2 hearts (without replacement)?

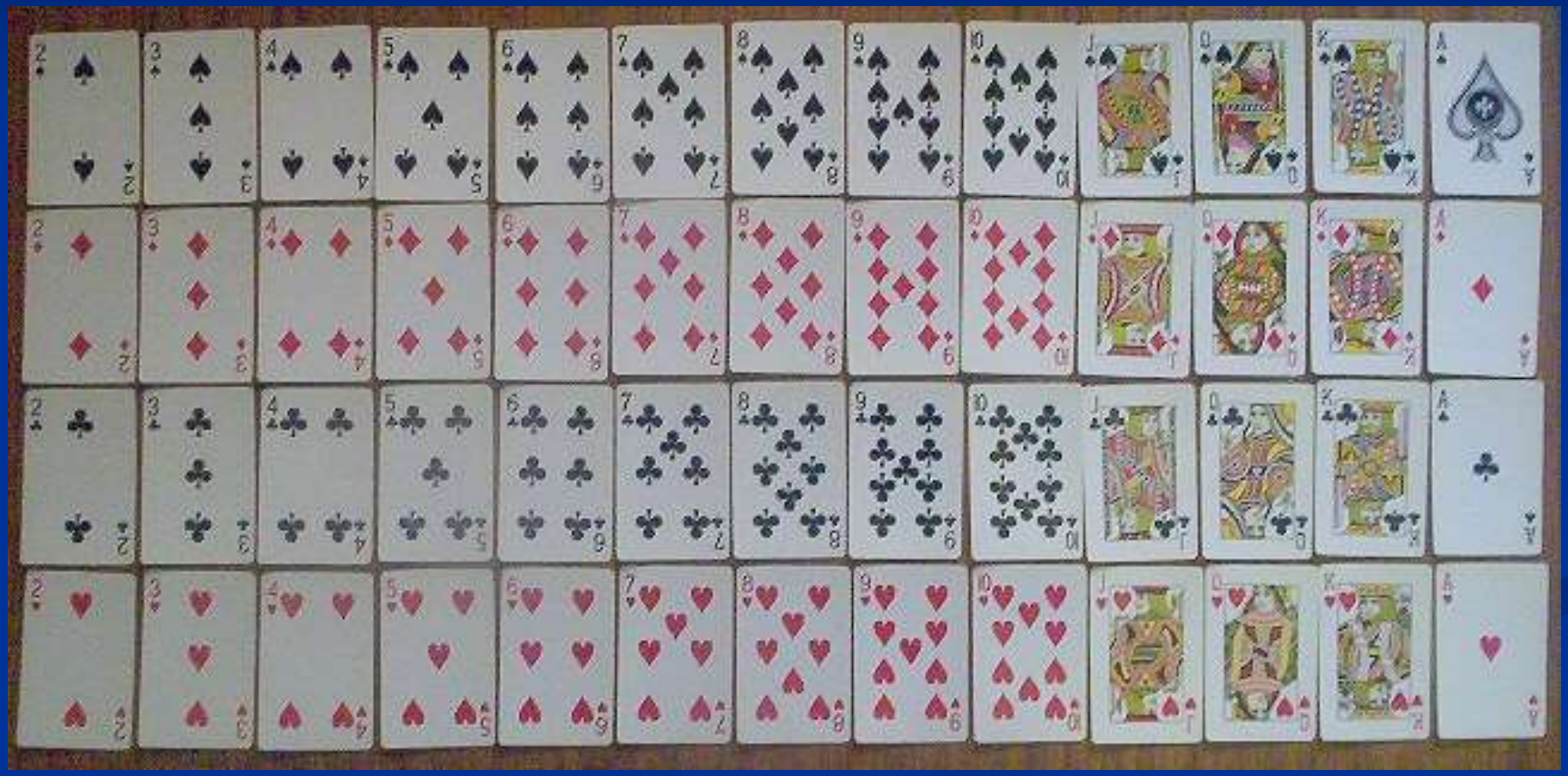
Hint: (1) how many cards are in a deck

(2) how many hearts are in a deck

(3) if you draw a heart how many card are left and how many of those cads are hearts

Probability of Compound Events

Example 4: Deck of Cards.



Probability of Compound Events

Example 4a: Deck of Cards.

What is the probability of drawing 2 hearts (without replacement)?

Hint: (1) how many cards are in a deck (13)

(2) how many hearts are in a deck (52)

(3) if you draw a heart how many card are left and how many of those cads are hearts (12 and 51)

$$P(\text{heart, then heart}) = \frac{13}{52} \times \frac{12}{51} = \frac{1}{17}$$

Probability of Compound Events

Example 4b: Deck of Cards.

What is the probability of drawing 2 hearts (with replacement)?

Hint: (1) how many cards are in a deck

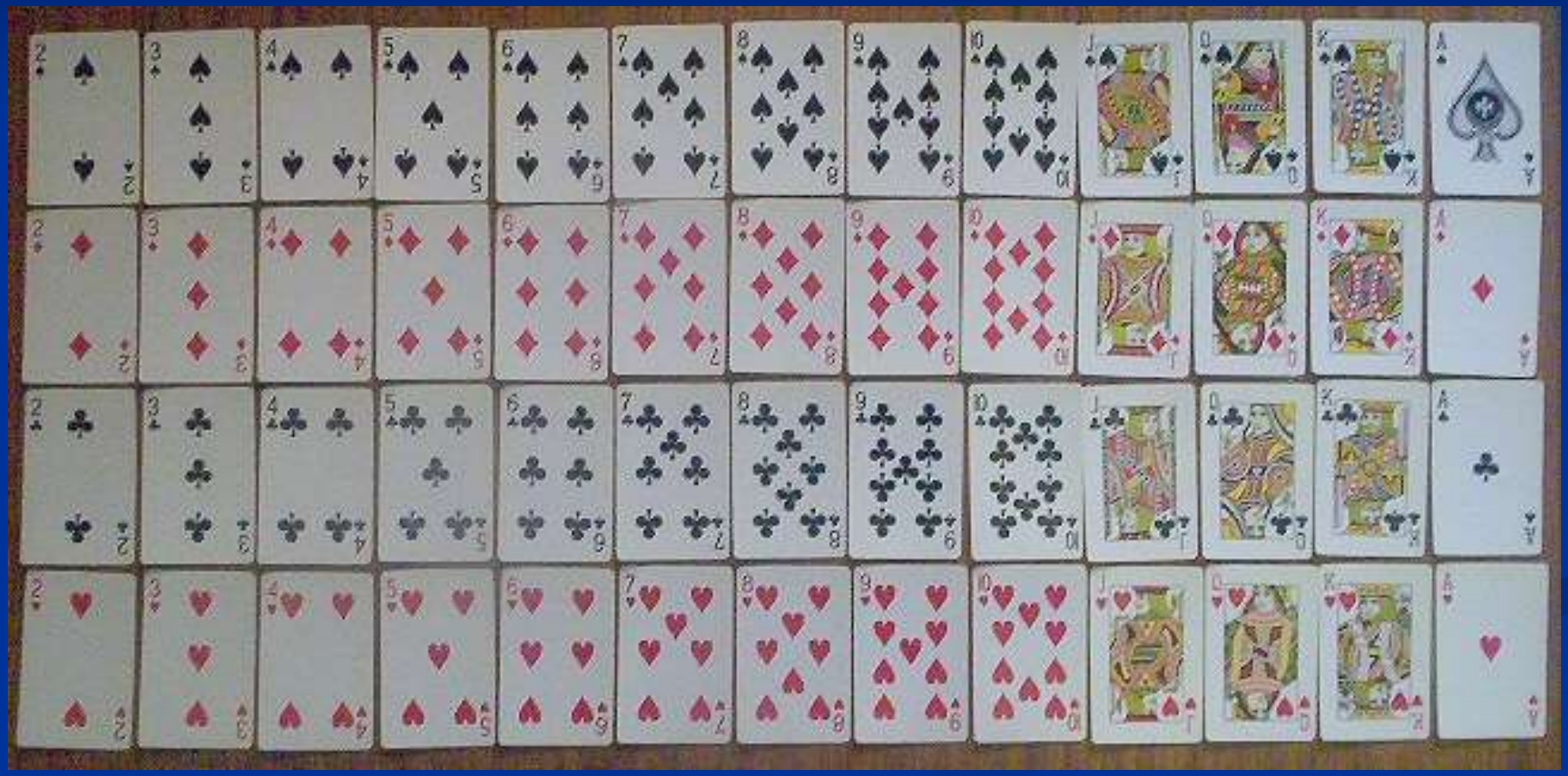
(2) how many hearts are in a deck

(3) if you draw a heart how many card are left and how many of those cads are hearts

P(heart, then heart) =

Probability of Compound Events

Example 4: Deck of Cards.



Probability of Compound Events

Example 4b: Deck of Cards.

What is the probability of drawing 2 hearts (with replacement)?

Hint: (1) how many cards are in a deck (13)

(2) how many hearts are in a deck (52)

(3) if you draw a heart how many card are left and how many of those cads are hearts (13 and 52)

$$P(\text{heart, then heart}) = \frac{13}{52} \times \frac{13}{52} = \frac{1}{16}$$

Probability of Compound Events

Guided Practice: Questions.

(1) Wyatt has four $1 bills in his wallet and three $10 bills in his wallet. What is the probability he will reach into his wallet twice and pull out a $10 bill each time? (Assume he does replace the first bill)

(2) A bag contains 3 green and 2 purple marbles. What is the probability of drawing two purple marbles in a row from the bag if the first marble is not replaced?

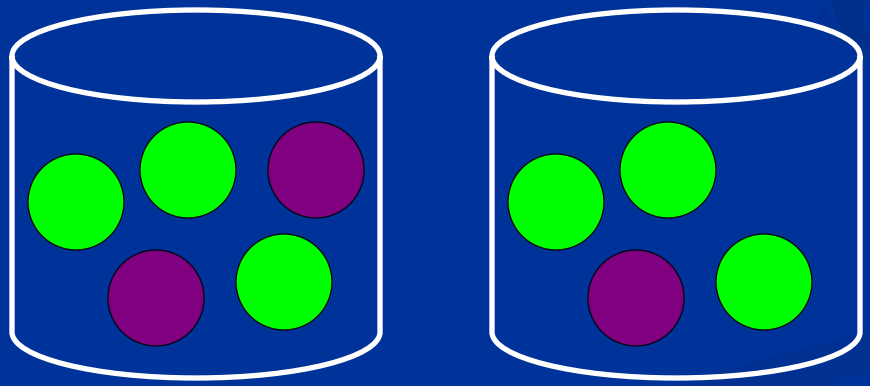
Probability of Compound Events

Guided Practice: Answers.

(1) $1 | $1 | $1 | $1 | $10 | $10 | $10 |

P($10, then $10) = $\frac{3}{7} \times \frac{3}{7} = \frac{9}{49}$

(2)



P(purple, then purple) = 2/5 x 1/4 = 2/20 = 1/10

Probability of Compound Events

Independent Practice: Questions.

(1) Wyatt has four $1 bills in his wallet and three $10 bills in his wallet. What is the probability he will reach into his wallet twice and pull out a $1 bill each time? (Assume he does not replace the first bill)

(2) A bag contains 3 green and 2 purple marbles. What is the probability of drawing two green marbles in a row from the bag if the first marble is replaced?

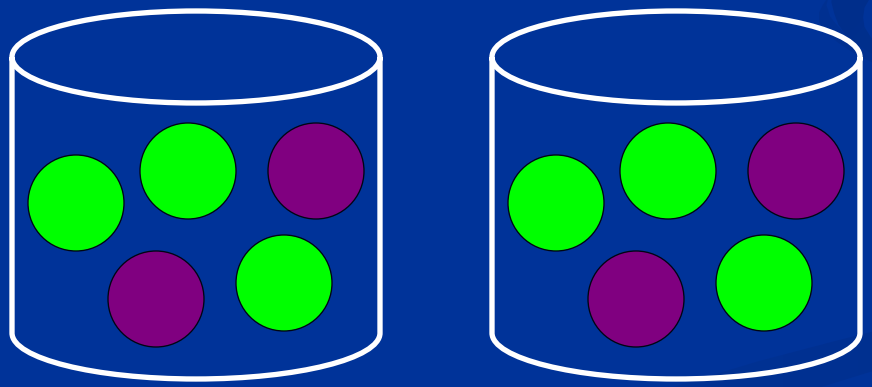
Probability of Compound Events

Independent Practice: Answers.

(1) $1 | $1 | $1 | $1 | $10 | $10 | $10 |

P($1, then $1) = $\frac{4}{7} \times \frac{3}{6} = \frac{12}{42} = \frac{2}{7}$

(2)



P(purple, then purple) = 2/5 x 2/5 = 4/25

Probability of Compound Events

Summary: The difference between simple and compound events:

(1) **simple event** – a specific outcome or type of outcome.

(2) **compound event** – events which consist of two or more simple events.

Probability of Compound Events

Summary: The difference between independent and dependent events:

(1) independent event – two or more simple events in which the outcome of one event DOES NOT affect the outcome of other event(s)

(2) dependent event – two or more simple events in which the outcome of one event DOES affect the outcome of other event(s)

Probability of Compound Events

Real World Example:

Joanna had 3 roses, 4 tulips, and 1 carnation in a vase. She randomly selected one flower, took a photo of it, and put it back. She then repeated the steps. What is the probability that she selected a rose both times?

$$P(\text{rose, then rose}) = \frac{3}{8} \times \frac{3}{8} = \frac{9}{64}$$