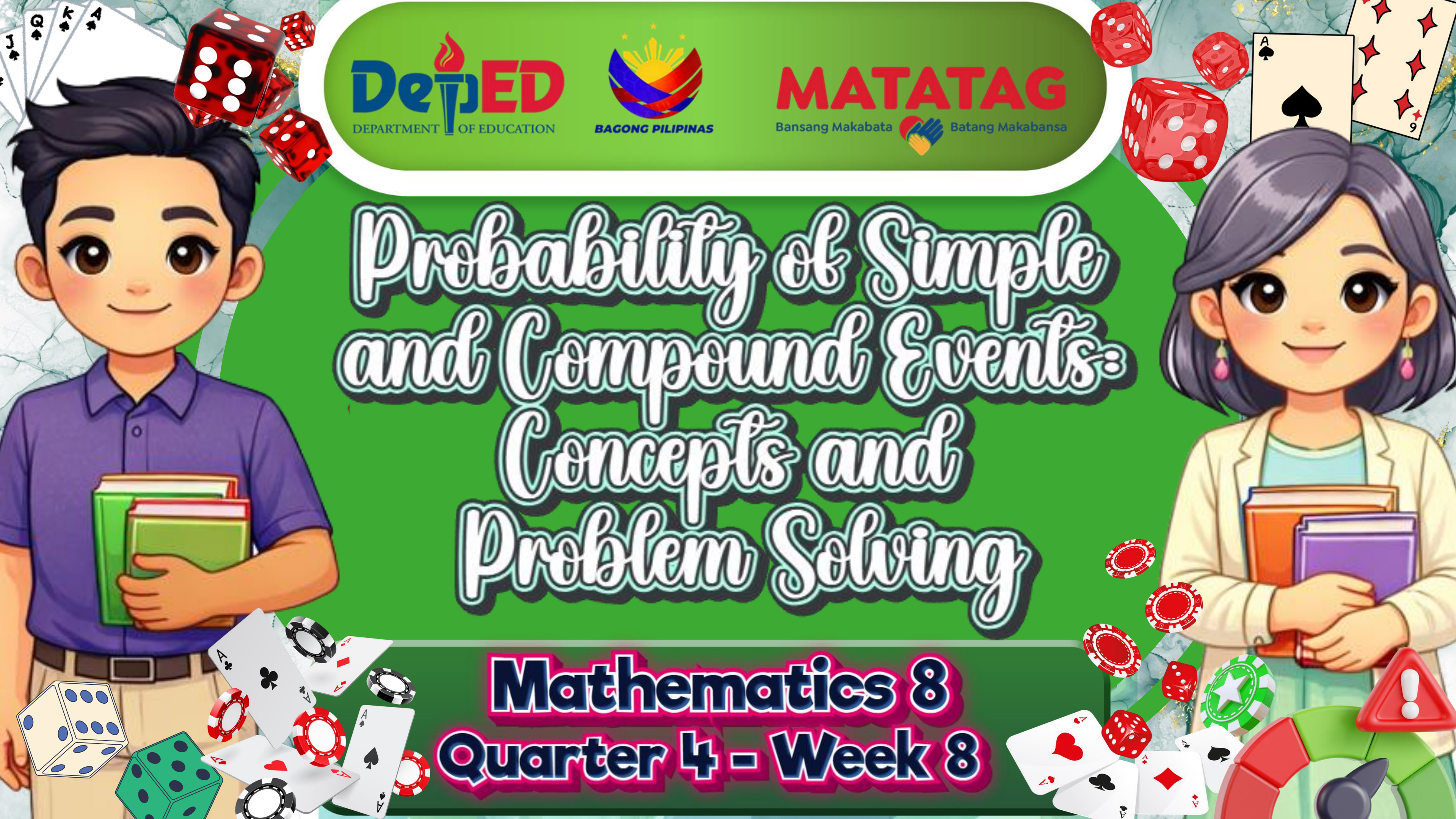




# Probability of Simple and Compound Events: Concepts and Problem Solving

**Mathematics 8**  
**Quarter 4 - Week 8**



# Unlocking Content Vocabulary

**EVENT**

- a subset of a sample  
space



# Unlocking Content Vocabulary

## SIMPLE EVENT

- an event with only one outcome.



# Unlocking Content Vocabulary

## COMPOUND EVENT

- an event that has more than one possible outcome.



# Unlocking Content Vocabulary

## INDEPENDENT EVENT

- two or more simple events in which the outcome of one event does not affect the outcome of other events



# Unlocking Content Vocabulary

## DEPENDENT EVENT

- two or more simple events in which the outcome of one event that does affect the outcome of other events.



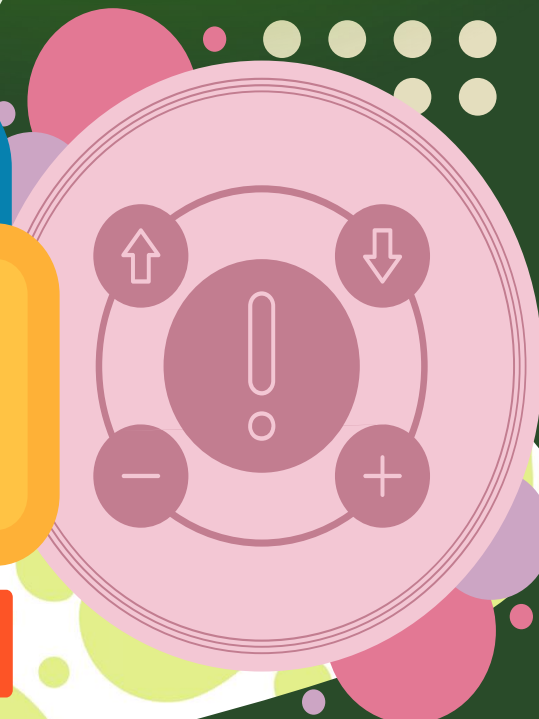
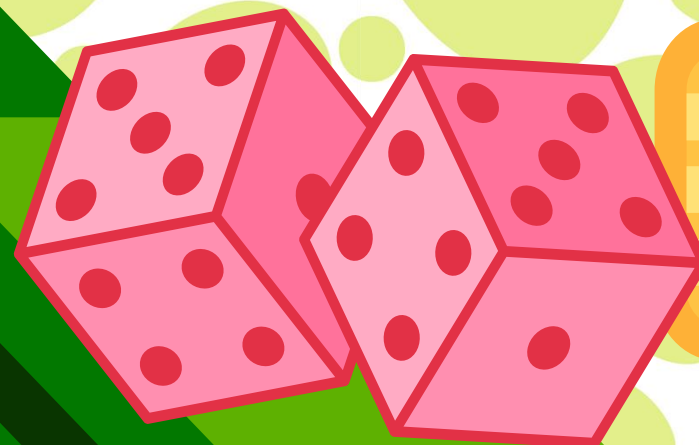
# Unlocking Content Vocabulary

## MUTUALLY EXCLUSIVE EVENTS

- events that cannot occur at the same time.



# SUB-TOPICI DIFFERENTIATE SIMPLE AND COMPOUND EVENTS



# Worked Example

Observe the given pictures.



Picture A shows only one activity. It is tossing a coin. This illustrates a simple event. Picture B, on the other hand, performs two activities. Spinning a bottle and rolling a die are done simultaneously. This shows a compound event.

# Worked Example

## EXAMPLE 18

A white and a red pair of dice are rolled. The following are the events:

$$A = \{(1,2)\}$$

$$B = \{(1,2), (2,1)\}$$

$$C = \{(1,1), (1,2), (1,3), (2,1)\}$$

$$D = \{(1,1), (2,2), (3,3), (4,4), (5,5), (6,6)\}$$

# Worked Example

## Question:

1. Which event illustrates a simple event?

A is a simple event since it has only one outcome.

2. Which event illustrates a compound event?

B, C, and D are compound events. B has 2 outcomes, C has 4 outcomes, and D has 6 outcomes.

# Worked Example

## EXAMPLE 2:

A deck of well-shuffled cards is given. The following are the events:

- A. A black card comes out.
- B. A 5 or black card comes out.
- C. Two face cards come out.
- D. An ace comes out.

# Worked Example

## Question:

1. Which event illustrates a simple event?

A and D are simple events.

2. Which event illustrates a compound event?

B and C are compound events. B has the events getting a 5 or a black card. C has the events getting two face cards.

# Worked Example

Analyze the three sets of events:

A. A fair die is rolled, and an unbiased coin is tossed.

B. Four different colored balls are in a bag. Two balls are to be drawn from the bag in succession (without replacing the first ball before the second ball is drawn).

C. A single card is drawn from a standard 52-card deck. Drawing a card that is both black and a club is possible.

1. Do the events illustrate compound events?

2. How does each event differ from each other?



Questions

# Worked Example

## Compound events can have different kinds.

- ❑ Event A is an example of INDEPENDENT EVENT. It is because the occurrence of one does not affect the probability of the occurrence of the other.
- ❑ Event B illustrates a DEPENDENT EVENT because the occurrence of one does affect the probability of the occurrence of the other. Event C shows a MUTUALLY EXCLUSIVE EVENT because an event cannot happen at the same time.

# Worked Example

## EXAMPLE 3:

A box of chocolates contains five pieces each of milk, dark, and white chocolates. You randomly select and eat three chocolates. The first piece is milk chocolate, the second is dark chocolate, and the third is white chocolate.

1. Is Example 3 a simple or compound event?

**Compound event**

2. If it is a compound event, what kind of compound event does it illustrate?

**Dependent event**



Questions

# Worked Example

## EXAMPLE 4:

A cooler contains ten bottles of sports drinks: four lemon-lime-flavored, three orange-flavored, and three fruit-punch-flavored. Three times, you randomly grab a bottle, return it to the cooler, and then mix up the bottles. The first time, you get a lemon-lime drink. The second and third times, you get a fruit-punch drink.

1. Is Example 4 a simple or compound event?

**Compound event**

2. If it is a compound event, what kind of compound event does it illustrate?

**Independent event**



Questions

# Worked Example

## EXAMPLE 5:

A fair die is rolled. What is the probability that a 2 or a 5 comes out?

### Question:

1. Is Example 4 a simple or compound event?

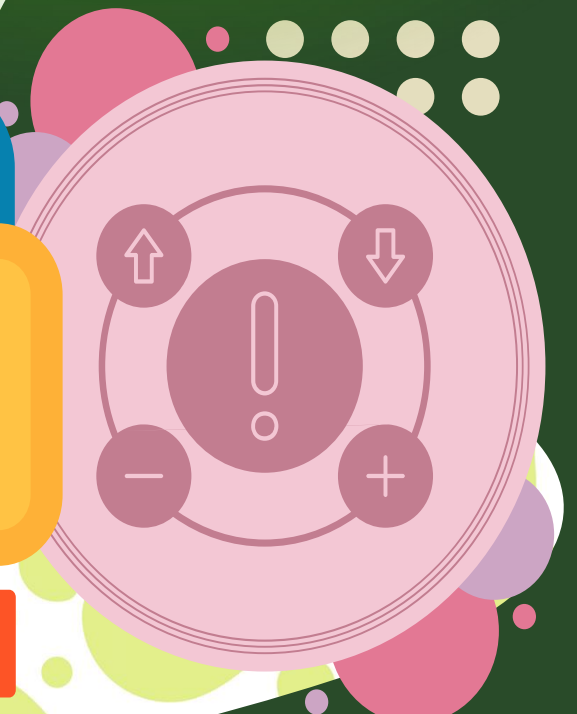
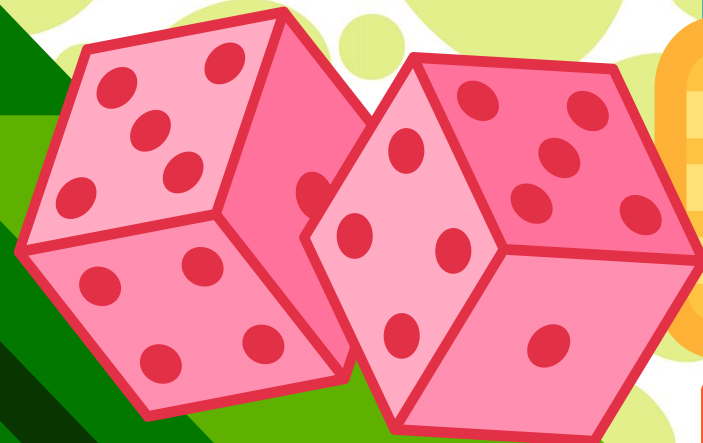
**Compound event**

2. If it is a compound event, what kind of compound event does it illustrate?

**Mutually exclusive**

# SUB-TOPIC 2

## CALCULATING PROBABILITY OF COMPOUND EVENTS



# Worked Example

## EXAMPLE 1:

You flip a coin and then roll a fair six-sided die. What is the probability that a coin lands heads-up and the die shows an even number?

Solution: (Using a Table)

	1	2	3	4	5	6
Head (H)	H1	H2	H3	H4	H5	H6
Tail (T)	T1	T2	T3	T4	T5	T6

# Worked Example

$$n(E) = 3, n(S) = 12$$

$$P(E) = \frac{n(E)}{n(S)}; \mathbf{P(E)} = \frac{3}{12} \text{ or } \frac{1}{4} \mathbf{or 25\% or 0.25}$$

# Worked Example

## EXAMPLE 2:

An unbiased coin is tossed three times.

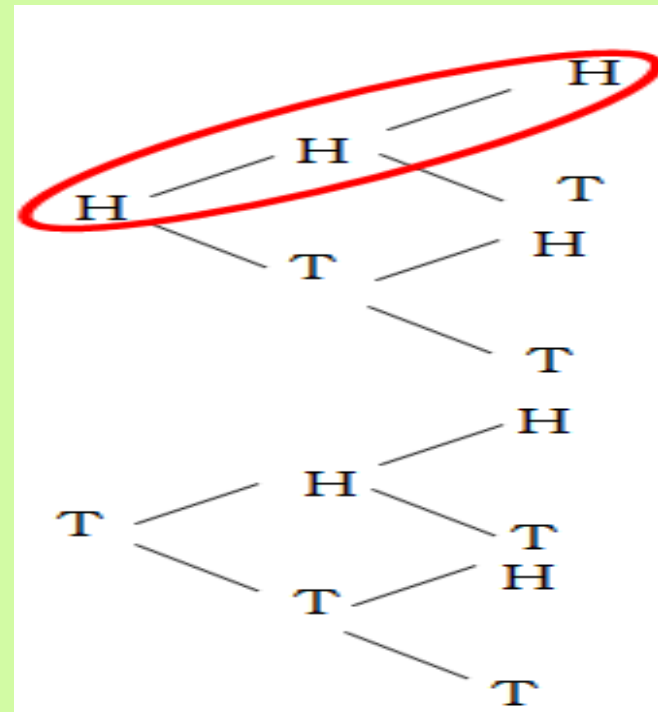
- What is the probability that the coin will land heads 3 times?
- What is the probability that the coin lands head on the first and last toss?

Solution: (Using Tree Diagram)

# Worked Example

Solution: (Using Tree Diagram)

a.

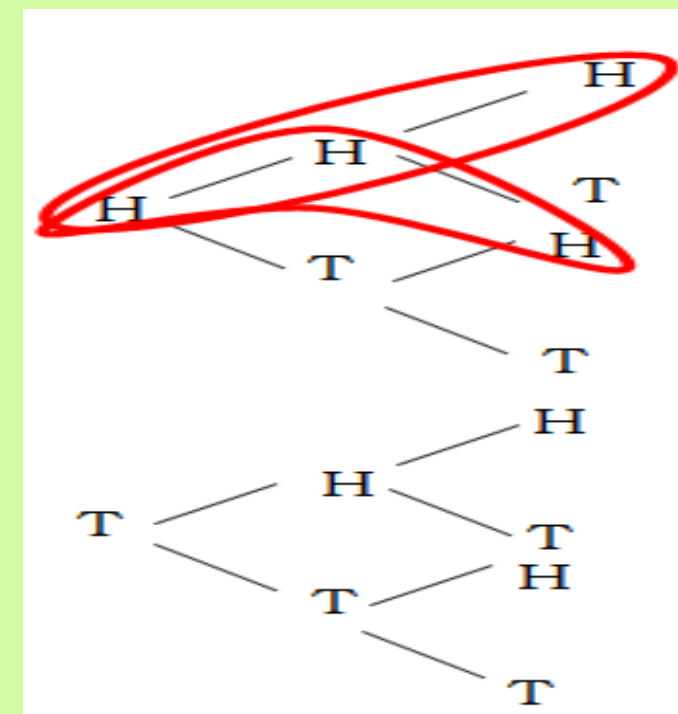


$$n(S) = 8$$

$$n(E) = 1$$

$$P(E) = \frac{n(E)}{n(S)} = \frac{1}{8} \text{ or } 12.5\% \text{ or } 0.125$$

b.



$$n(S) = 8$$

$$n(E) = 2$$

$$P(E) = \frac{n(E)}{n(S)} = \frac{2}{8} \text{ or } \frac{1}{4} \text{ or } 25\% \text{ or } 0.25$$

# Worked Example

## EXAMPLE 3:

When a fair die is rolled, what is the probability that a 3 or a 4 comes out?

Solution:

$$S = \{1, 2, 3, 4, 5, 6\}$$

$$n(S) = 6$$

$$n(E) = 2$$

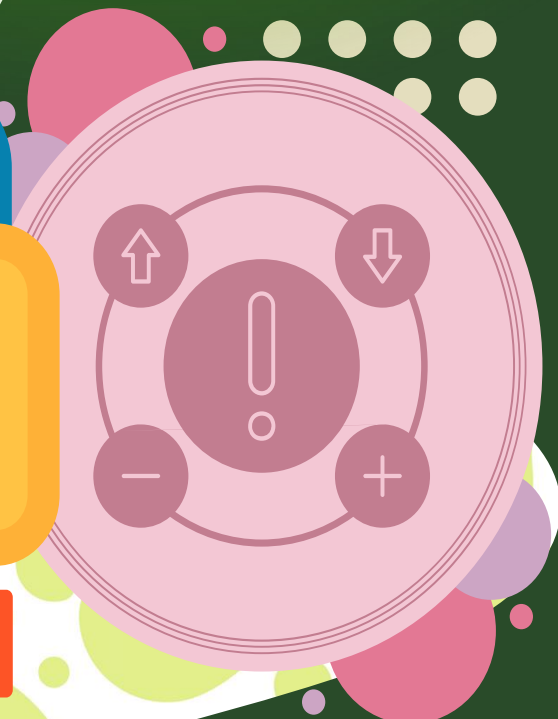
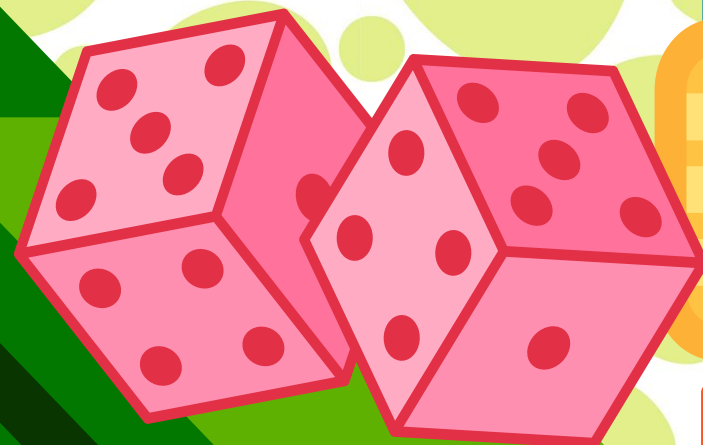
$$P(E) = n(E)/n(S) = 2/6 \text{ or } 1/3 \text{ or } 33.3\% \text{ or } 0.333$$

# SUB-TOPIC 3

## SOLVING PROBLEMS

## INVOLVING PROBABILITY

## OF COMPOUND EVENTS



# Explicitation

- What is the probability of getting 2 hearts without replacement from a standard deck of cards?
- Will it still be easy if you list all the possible outcomes and then choose 2 hearts from the list?

# Explicitation

For compound events:

## INDEPENDENT EVENT

$$P(A \cap B) = P(A) \cdot P(B)$$

The probability of two independent events is found by multiplying the first event's probability by the second event's probability.

# Explicitation

## DEPENDENT EVENT

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

$P(\text{B after A})$  can also be written  
as  $P(\text{B} | \text{A})$

# Explicitation

## MUTUALLY EXCLUSIVE EVENTS

$$P(A \text{ or } B) = P(A) + P(B)$$

If two events A and B are mutually exclusive, then the probability A or B occurs is the sum of their probabilities.

# Worked Example

## EXAMPLE 18

When rolling a die and flipping a coin, what is the probability that a three and a tail come out?

**Solution:** (Independent Event)

$$P(A) = \frac{1}{6} \quad (3 \text{ comes out when a die is rolled})$$

$$P(B) = \frac{1}{2} \quad (\text{a tail comes out when a coin is tossed})$$

$$\mathbf{P(\text{three and a tail}) = \left(\frac{1}{6}\right) \left(\frac{1}{2}\right) = \frac{1}{12} \text{ or } 8.33\% \text{ or } 0.083}$$

# Worked Example

## EXAMPLE 2:

Find the probability of getting a king or queen from a standard deck of cards.

**Solution: (Mutually Exclusive Events)**

$$P(A) = \frac{4}{52} \text{ or } \frac{1}{13} \quad (\text{a king from a deck of 52 cards})$$

$$P(B) = \frac{4}{52} \text{ or } \frac{1}{13} \quad (\text{a queen from a deck of 52 cards})$$

$$\mathbf{P(\text{king or queen})} = P(A) + P(B) = \frac{1}{13} + \frac{1}{13} = \frac{2}{13} \text{ or } \mathbf{15.4\% \text{ or } 0.154}$$

# Worked Example

## EXAMPLE 3:

A set of number cards from 1 to 20 are placed in a bag. Without replacing any card drawn, what is the probability that the first card drawn is an odd number and the second card drawn is an even number?

**Solution: (Dependent Event)**

$$P(A) = \frac{10}{20} \text{ or } \frac{1}{2} \quad (\text{there are 10 odd numbers from 1 to 20})$$

$$P(B) = \frac{10}{19} \quad (\text{there are 10 even numbers from 1 to 20, but one card is already drawn})$$

$$\mathbf{P(\text{odd, then even})} = \frac{1}{2} \cdot \frac{10}{19} = \frac{5}{19} \text{ or } \mathbf{26.3\% \text{ or } 0.263}$$