Counting the Outcomes of Experiments

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Sauyo High School

How to Count the Outcomes of an Experiment?

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1. Table

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1. Table
2. Tree Diagram

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2. Tree Diagram
3. Systematic Listing

How to Count the Outcomes of an Experiment?

1. Table
2. Tree Diagram
3. Systematic Listing
4. Fundamental Counting Principle (FCP)

Example 1

On a Saturday morning, you washed most of your clothes and they are still wet. Your friend invites you to attend his birthday party and you are left with only 2 pants and 3 shirts. In how many different ways can you dress?

Example 1: Using a Table

Example 1: Using a Table

Pants = 2 ways to choose

Example 1: Using a Table

Pants = 2 ways to choose
Shirts = 3 ways to choose

Example 1: Using a Table

Pants = 2 ways to choose
Shirts = 3 ways to choose
$n(S) = ?$

Example 1: Using a Table

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

	Pant 1	**Pant 2**

Example 1: Using a Table

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

	Pant 1	**Pant 2**
Shirt 1	$S_1 P_1$	$S_1 P_2$

Example 1: Using a Table

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

	Pant 1	**Pant 2**
Shirt 1	$S_1 P_1$	$S_1 P_2$
Shirt 2	$S_2 P_1$	$S_2 P_2$

Example 1: Using a Table

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

	Pant 1	**Pant 2**
Shirt 1	$S_1 P_1$	$S_1 P_2$
Shirt 2	$S_2 P_1$	$S_2 P_2$
Shirt 3	$S_3 P_1$	$S_3 P_2$

Example 1: Using a Table

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

	Pant 1	**Pant 2**
Shirt 1	S_1P_1	S_1P_2
Shirt 2	S_2P_1	S_2P_2
Shirt 3	S_3P_1	S_3P_2

$$\therefore n(S) = 6$$

Example 1: Using a Tree Diagram

Pants = 2 ways to choose
Shirts = 3 ways to choose
$n(S) = ?$

Example 1: Using a Tree Diagram

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

P_1

Example 1: Using a Tree Diagram

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

$$P_1 \longrightarrow S_1$$

Example 1: Using a Tree Diagram

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

$$P_1 \longrightarrow S_1 \text{ ——— } P_1 S_1$$

Example 1: Using a Tree Diagram

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

$$\begin{tikzcd} & S_1 \arrow[r, dash] & P_1 S_1 \\ P_1 \arrow[ur] \arrow[r] & S_2 & \end{tikzcd}$$

Example 1: Using a Tree Diagram

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

$$
\begin{tikzcd}
 & S_1 \arrow[r, dash] & P_1S_1 \\
P_1 \arrow[ur] \arrow[r] & S_2 \arrow[r, dash] & P_1S_2
\end{tikzcd}
$$

Example 1: Using a Tree Diagram

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

$$
\begin{tikzcd}[row sep=small]
 & S_1 \arrow[r, dash] & P_1 S_1 \\
P_1 \arrow[ur] \arrow[r] \arrow[dr] & S_2 \arrow[r, dash] & P_1 S_2 \\
 & S_3 &
\end{tikzcd}
$$

Example 1: Using a Tree Diagram

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

$$\begin{tikzcd}
 & S_1 \arrow[r, dash] & P_1 S_1 \\
P_1 \arrow[ur] \arrow[r] \arrow[dr] & S_2 \arrow[r, dash] & P_1 S_2 \\
 & S_3 \arrow[r, dash] & P_1 S_3
\end{tikzcd}$$

Example 1: Using a Tree Diagram

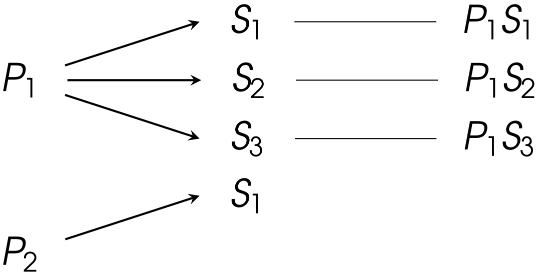
Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

$$\begin{array}{ccccc} & \nearrow & S_1 & \text{———} & P_1 S_1 \\ P_1 & \longrightarrow & S_2 & \text{———} & P_1 S_2 \\ & \searrow & S_3 & \text{———} & P_1 S_3 \end{array}$$

$$P_2$$

Example 1: Using a Tree Diagram

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?



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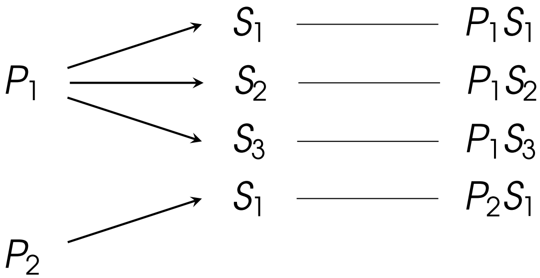

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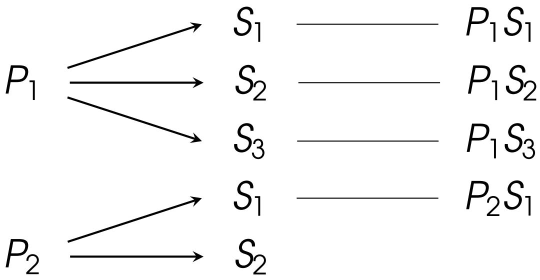
Shirts = 3 ways to choose
n(S) = ?



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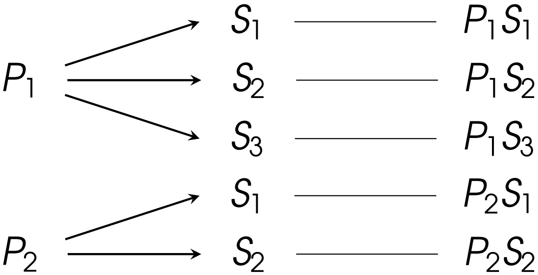

Example 1: Using a Tree Diagram

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

$$
\begin{tikzcd}
 & S_1 \arrow[r, dash] & P_1 S_1 \\
P_1 \arrow[ur] \arrow[r] \arrow[dr] & S_2 \arrow[r, dash] & P_1 S_2 \\
 & S_3 \arrow[r, dash] & P_1 S_3 \\
 & S_1 \arrow[r, dash] & P_2 S_1 \\
P_2 \arrow[ur] \arrow[r] \arrow[dr] & S_2 \arrow[r, dash] & P_2 S_2 \\
 & S_3 &
\end{tikzcd}
$$

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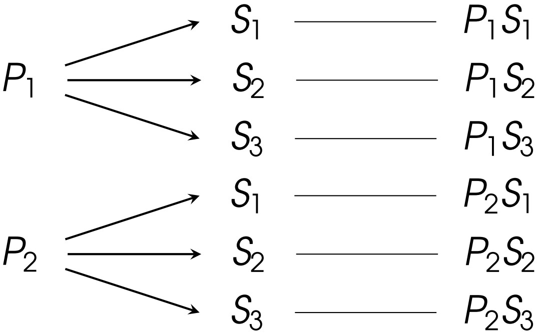
Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?



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Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

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\begin{tikzcd}[row sep=small]
 & S_1 \arrow[r, dash] & P_1S_1 \\
P_1 \arrow[ur] \arrow[r] \arrow[dr] & S_2 \arrow[r, dash] & P_1S_2 \\
 & S_3 \arrow[r, dash] & P_1S_3 \\
 & S_1 \arrow[r, dash] & P_2S_1 \\
P_2 \arrow[ur] \arrow[r] \arrow[dr] & S_2 \arrow[r, dash] & P_2S_2 \\
 & S_3 \arrow[r, dash] & P_2S_3
\end{tikzcd}
$$

$$\therefore n(S) = 6$$

Example 1: Using Systematic Listing

Pants = 2 ways to choose
Shirts = 3 ways to choose
$n(S) = ?$

Example 1: Using Systematic Listing

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

Pant 1 and Shirt 1

Example 1: Using Systematic Listing

Pants = 2 ways to choose
Shirts = 3 ways to choose
$n(S) = ?$

Pant 1 and Shirt 1
Pant 1 and Shirt 2

Example 1: Using Systematic Listing

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

Pant 1 and Shirt 1
Pant 1 and Shirt 2
Pant 1 and Shirt 3

Example 1: Using Systematic Listing

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

Pant 1 and Shirt 1
Pant 1 and Shirt 2
Pant 1 and Shirt 3
Pant 2 and Shirt 1

Example 1: Using Systematic Listing

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

Pant 1 and Shirt 1
Pant 1 and Shirt 2
Pant 1 and Shirt 3
Pant 2 and Shirt 1
Pant 2 and Shirt 2

Example 1: Using Systematic Listing

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

Pant 1 and Shirt 1
Pant 1 and Shirt 2
Pant 1 and Shirt 3
Pant 2 and Shirt 1
Pant 2 and Shirt 2
Pant 2 and Shirt 3

Example 1: Using Systematic Listing

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

Pant 1 and Shirt 1
Pant 1 and Shirt 2
Pant 1 and Shirt 3
Pant 2 and Shirt 1
Pant 2 and Shirt 2
Pant 2 and Shirt 3

$$\therefore n(S) = 6$$

What is the Fundamental Counting Principle?

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- We can find the total number of ways different events can occur by multiplying the number of ways each event can happen.

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- We can find the total number of ways different events can occur by multiplying the number of ways each event can happen.
- If one event can occur in m ways, and a second event can occur in n ways, and a third event can occur in p ways, and so on, then the sequence of events can occur in $m \times n \times p \times \ldots$ ways.

Example 1: Using the Fundamental Counting Principle

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

Example 1: Using the Fundamental Counting Principle

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

$$n(S) = 2 \times 3$$

Example 1: Using the Fundamental Counting Principle

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

$$n(S) = 2 \times 3$$
$$n(S) = 6$$

Example 1: Using the Fundamental Counting Principle

Pants = 2 ways to choose
Shirts = 3 ways to choose
n(S) = ?

$$n(S) = 2 \times 3$$
$$n(S) = 6$$
$\therefore$ there are 6 different ways can you dress

Example 2

Three 5-peso coins are tossed. How many outcomes are possible?

Example 2: Using a Table

Example 2: Using a Table

First coin = 2 outcomes

Example 2: Using a Table

First coin = 2 outcomes
Second coin = 2 outcomes

Example 2: Using a Table

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes

Example 2: Using a Table

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

Example 2: Using a Table

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

Coin 1	**Coin 2**	**Coin 3**	**Outcome**

Example 2: Using a Table

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

Coin 1	**Coin 2**	**Coin 3**	**Outcome**
H	H	H	HHH

Example 2: Using a Table

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

Coin 1	**Coin 2**	**Coin 3**	**Outcome**
H	H	H	HHH
H	H	T	HHT

Example 2: Using a Table

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

Coin 1	**Coin 2**	**Coin 3**	**Outcome**
H	H	H	HHH
H	H	T	HHT
H	T	H	HTH

Example 2: Using a Table

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
$n(S) = ?$

Coin 1	Coin 2	Coin 3	Outcome
H	H	H	HHH
H	H	T	HHT
H	T	H	HTH
H	T	T	HTT

Example 2: Using a Table

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

Coin 1	**Coin 2**	**Coin 3**	**Outcome**
H	H	H	HHH
H	H	T	HHT
H	T	H	HTH
H	T	T	HTT
T	H	H	THH

Example 2: Using a Table

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

Coin 1	Coin 2	Coin 3	Outcome
H	H	H	HHH
H	H	T	HHT
H	T	H	HTH
H	T	T	HTT
T	H	H	THH
T	H	T	THT

Example 2: Using a Table

First coin = 2 outcomes
Second coin = 2 outcomes
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n(S) = ?

Coin 1	**Coin 2**	**Coin 3**	**Outcome**
H	H	H	HHH
H	H	T	HHT
H	T	H	HTH
H	T	T	HTT
T	H	H	THH
T	H	T	THT
T	T	H	TTH

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First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

Coin 1	**Coin 2**	**Coin 3**	**Outcome**
H	H	H	HHH
H	H	T	HHT
H	T	H	HTH
H	T	T	HTT
T	H	H	THH
T	H	T	THT
T	T	H	TTH
T	T	T	TTT

Example 2: Using a Table

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

Coin 1	**Coin 2**	**Coin 3**	**Outcome**
H	H	H	HHH
H	H	T	HHT
H	T	H	HTH
H	T	T	HTT
T	H	H	THH
T	H	T	THT
T	T	H	TTH
T	T	T	TTT

$$\therefore n(S) = 8$$

Example 2: Using a Tree Diagram

Example 2: Using a Tree Diagram

First coin = 2 outcomes

Example 2: Using a Tree Diagram

First coin = 2 outcomes
Second coin = 2 outcomes

Example 2: Using a Tree Diagram

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes

Example 2: Using a Tree Diagram

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
$n(S) = ?$

Example 2: Using a Tree Diagram

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

1st Coin	**2nd Coin**	**3rd Coin**	**Outcome**

Example 2: Using a Tree Diagram

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

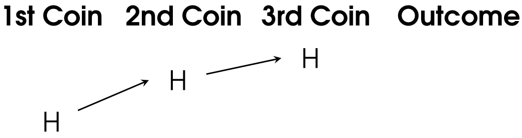
1st Coin	**2nd Coin**	**3rd Coin**	**Outcome**
H			

Example 2: Using a Tree Diagram

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

Example 2: Using a Tree Diagram

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?



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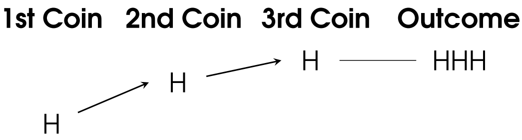
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?



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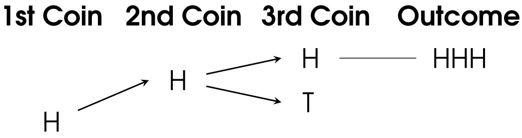

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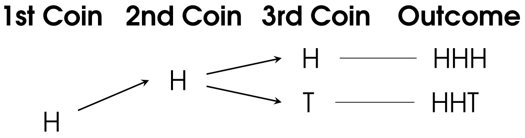
n(S) = ?



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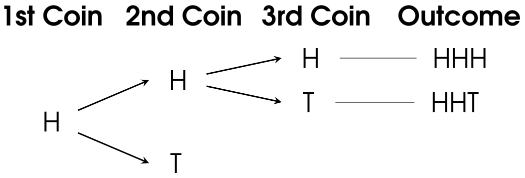
$n(S) = ?$



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First coin = 2 outcomes
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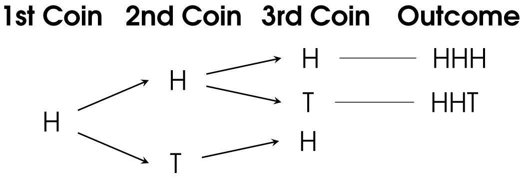
n(S) = ?



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First coin = 2 outcomes
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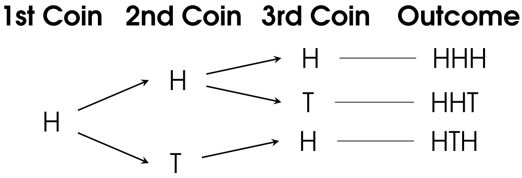
n(S) = ?



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First coin = 2 outcomes
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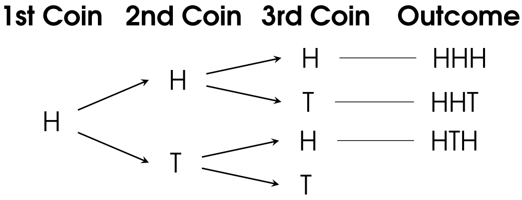
n(S) = ?



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First coin = 2 outcomes
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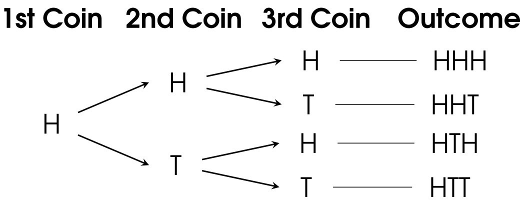
n(S) = ?



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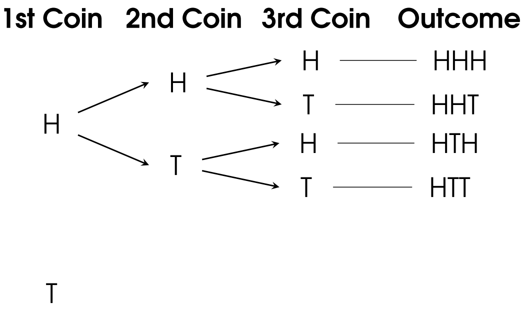

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First coin = 2 outcomes
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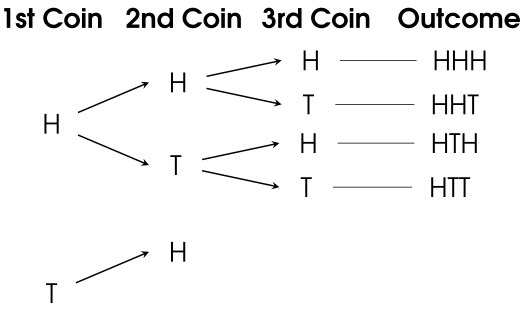

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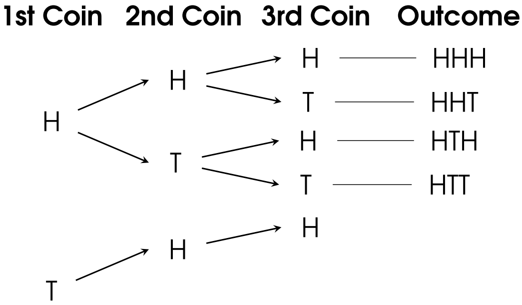

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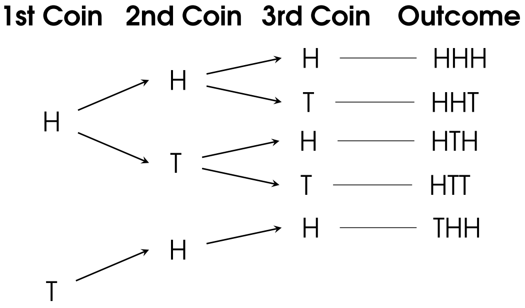

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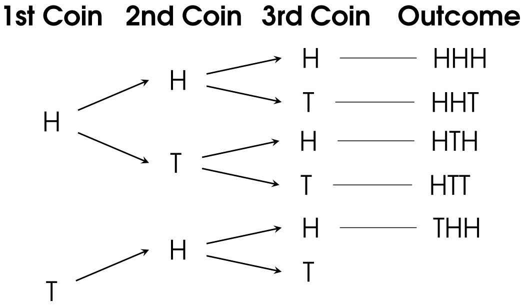

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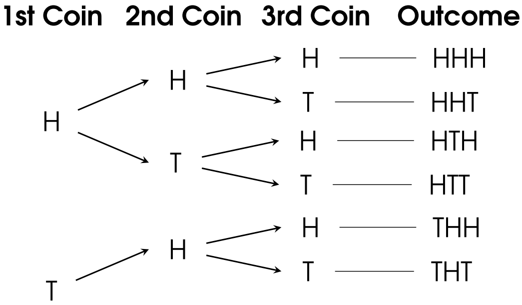

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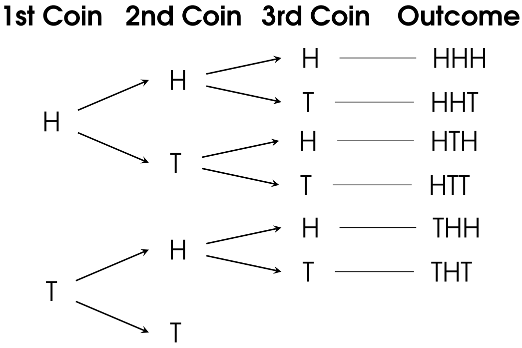

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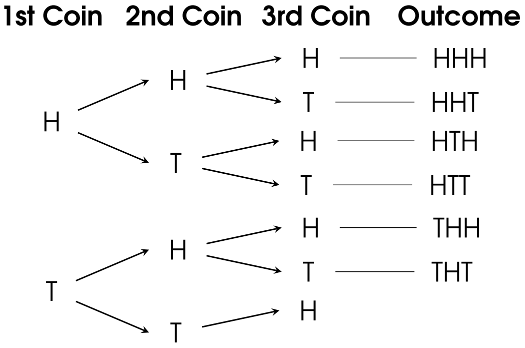

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First coin = 2 outcomes
Second coin = 2 outcomes
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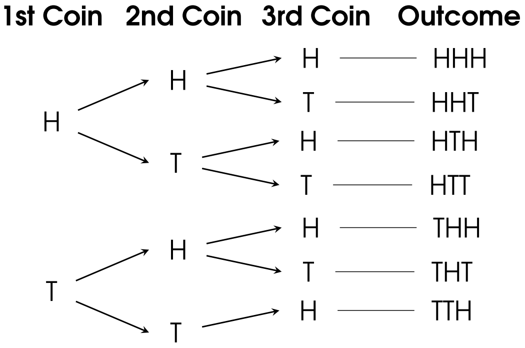
$n(S) = ?$



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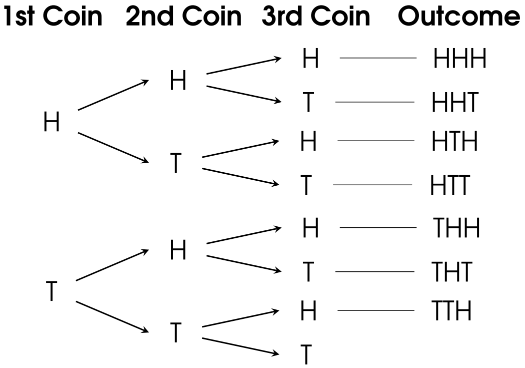

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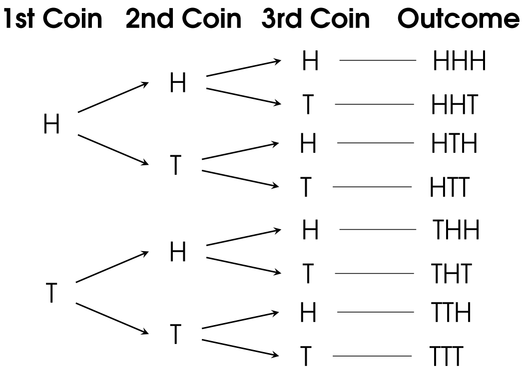

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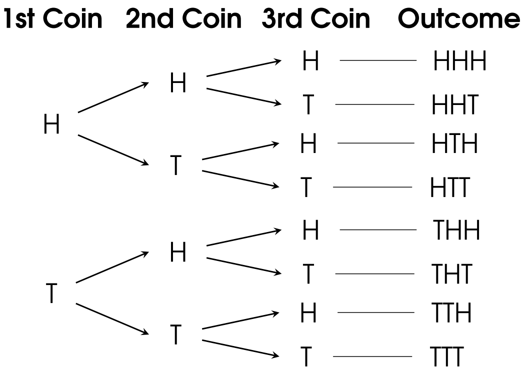


$\therefore n(S) = 8$

Example 2: Using Systematic Listing

Example 2: Using Systematic Listing

First coin = 2 outcomes

Example 2: Using Systematic Listing

First coin = 2 outcomes
Second coin = 2 outcomes

Example 2: Using Systematic Listing

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes

Example 2: Using Systematic Listing

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
$n(S) = ?$

Example 2: Using Systematic Listing

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

HHH

Example 2: Using Systematic Listing

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

HHH
HHT

Example 2: Using Systematic Listing

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

HHH
HHT
HTH

Example 2: Using Systematic Listing

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

HHH
HHT
HTH
HTT

Example 2: Using Systematic Listing

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

HHH	THH
HHT	
HTH	
HTT	

Example 2: Using Systematic Listing

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

HHH	THH
HHT	THT
HTH	
HTT	

Example 2: Using Systematic Listing

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

HHH
HHT
HTH
HTT

THH
THT
TTH

Example 2: Using Systematic Listing

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

HHH	THH
HHT	THT
HTH	TTH
HTT	TTT

Example 2: Using Systematic Listing

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

HHH	THH
HHT	THT
HTH	TTH
HTT	TTT

$$\therefore n(S) = 8$$

Example 2: Using the Fundamental Counting Principle

Example 2: Using the Fundamental Counting Principle

First coin = 2 outcomes

Example 2: Using the Fundamental Counting Principle

First coin = 2 outcomes
Second coin = 2 outcomes

Example 2: Using the Fundamental Counting Principle

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes

Example 2: Using the Fundamental Counting Principle

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
$n(S) = ?$

Example 2: Using the Fundamental Counting Principle

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

$$n(S) = 2 \times 2 \times 2$$

Example 2: Using the Fundamental Counting Principle

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

$$n(S) = 2 \times 2 \times 2$$
$$n(S) = 8$$

Example 2: Using the Fundamental Counting Principle

First coin = 2 outcomes
Second coin = 2 outcomes
Third coin = 2 outcomes
n(S) = ?

$$n(S) = 2 \times 2 \times 2$$
$$n(S) = 8$$
$$\therefore \text{ there are 8 outcomes possible}$$

Example 3

You go to a restaurant to buy some breakfast. The menu says, for food: pancakes, waffles, or french fries; and for drinks: coffee, juice, hot chocolate, and tea. How many different meal choices do you have?

Example 3: Using a Table

Example 3: Using a Table

Food = 3 ways to choose

Example 3: Using a Table

Food = 3 ways to choose
Drink = 4 ways to choose

Example 3: Using a Table

Food = 3 ways to choose
Drink = 4 ways to choose
$n(S) = ?$

Example 3: Using a Table

Food = 3 ways to choose
Drink = 4 ways to choose
$n(S) = ?$

	Coffee (C)	**Juice (J)**	**Hot Choco (H)**	**Tea (T)**

Example 3: Using a Table

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

	Coffee (C)	**Juice (J)**	**Hot Choco (H)**	**Tea (T)**
Pancake (P)	PC	PJ	PH	PT

Example 3: Using a Table

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

	Coffee (C)	**Juice (J)**	**Hot Choco (H)**	**Tea (T)**
Pancake (P)	PC	PJ	PH	PT
Waffles (W)	WC	WJ	WH	WT

Example 3: Using a Table

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

	Coffee (C)	**Juice (J)**	**Hot Choco (H)**	**Tea (T)**
Pancake (P)	PC	PJ	PH	PT
Waffles (W)	WC	WJ	WH	WT
Fries (F)	FC	FJ	FH	FT

Example 3: Using a Table

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

	Coffee (C)	**Juice (J)**	**Hot Choco (H)**	**Tea (T)**
Pancake (P)	PC	PJ	PH	PT
Waffles (W)	WC	WJ	WH	WT
Fries (F)	FC	FJ	FH	FT

$$\therefore n(S) = 12$$

Example 3: Using a Tree Diagram

Example 3: Using a Tree Diagram

Food = 3 ways to choose

Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose

Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

P

Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

$$P \longrightarrow C$$

Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

$$\begin{tikzcd} & C \arrow[r, dash] & PC \\ P \arrow[ur] & & \end{tikzcd}$$

Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

$$\begin{tikzcd} & C \arrow[r, dash] & PC \\ P \arrow[ur] \arrow[r] & J & \end{tikzcd}$$

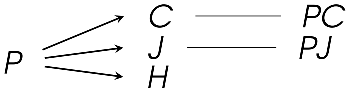
Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

$$\begin{tikzcd} & C \arrow[r, no head] & PC \\ P \arrow[ur] \arrow[r] & J \arrow[r, no head] & PJ \end{tikzcd}$$

Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?



Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

$$\begin{tikzcd}
 & C \arrow[r, dash] & PC \\
P \arrow[ur] \arrow[r] \arrow[dr] & J \arrow[r, dash] & PJ \\
 & H \arrow[r, dash] & PH
\end{tikzcd}$$

Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

$$
\begin{tikzcd}[row sep=tiny]
 & C \arrow[r, dash] & PC \\
 & J \arrow[r, dash] & PJ \\
P \arrow[ur] \arrow[uur] \arrow[r] \arrow[dr] & H \arrow[r, dash] & PH \\
 & T &
\end{tikzcd}
$$

Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

$$\begin{tikzcd}[row sep=tiny] & C \arrow[r, dash] & PC \\ & J \arrow[r, dash] & PJ \\ P \arrow[uur] \arrow[ur] \arrow[r] \arrow[dr] & H \arrow[r, dash] & PH \\ & T \arrow[r, dash] & PT \end{tikzcd}$$

Example 3: Using a Tree Diagram

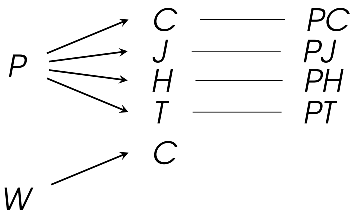
Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

$$
\begin{tikzcd}
 & C \arrow[r, no head] & PC \\
P \arrow[ur] \arrow[r] \arrow[dr] \arrow[ddr] & J \arrow[r, no head] & PJ \\
 & H \arrow[r, no head] & PH \\
 & T \arrow[r, no head] & PT
\end{tikzcd}
$$

W

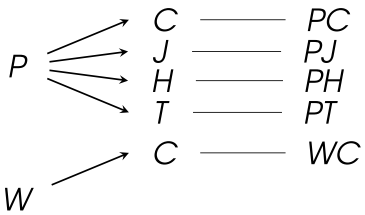
Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?



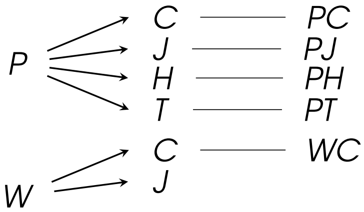
Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?



Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?



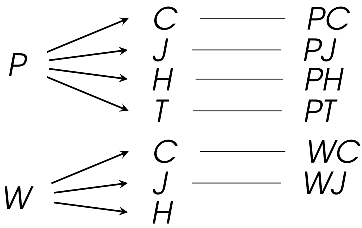
Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

$$
\begin{tikzcd}[row sep=tiny]
 & C \arrow[r, dash] & PC \\
P \arrow[ur] \arrow[r] \arrow[dr] \arrow[ddr] & J \arrow[r, dash] & PJ \\
 & H \arrow[r, dash] & PH \\
 & T \arrow[r, dash] & PT \\
 & C \arrow[r, dash] & WC \\
W \arrow[ur] \arrow[r] & J \arrow[r, dash] & WJ
\end{tikzcd}
$$

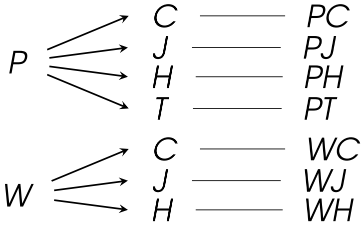
Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?



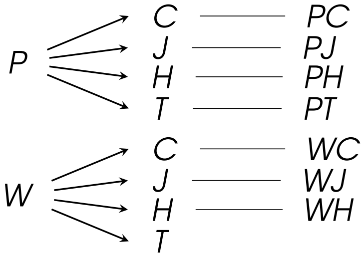
Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?



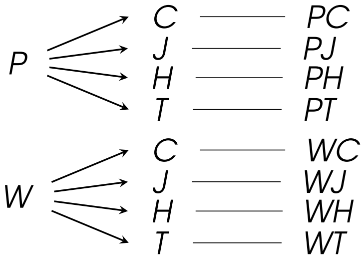
Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?



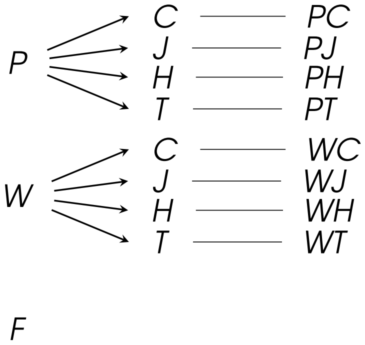
Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?



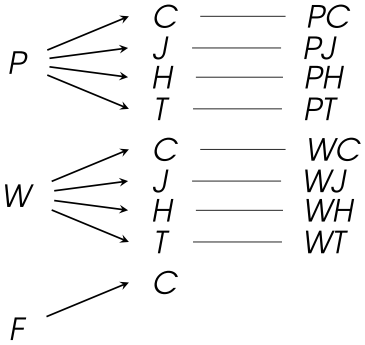
Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?



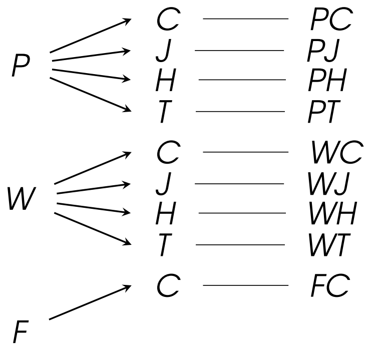
Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?



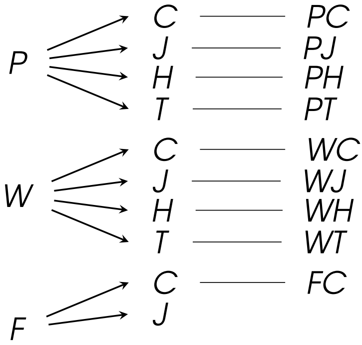
Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?



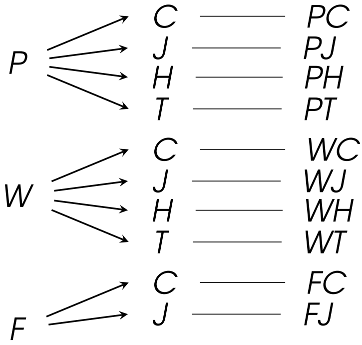
Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?



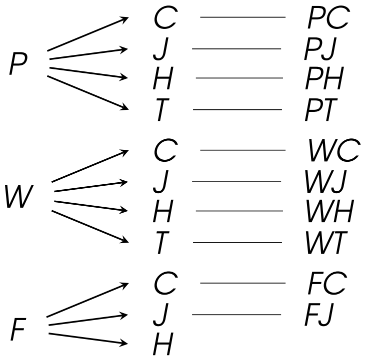
Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?



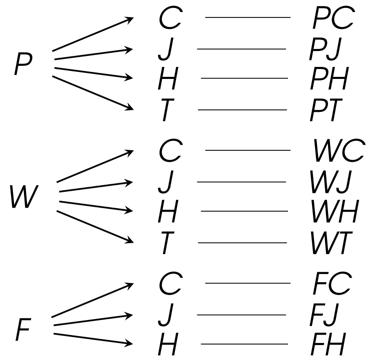
Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?



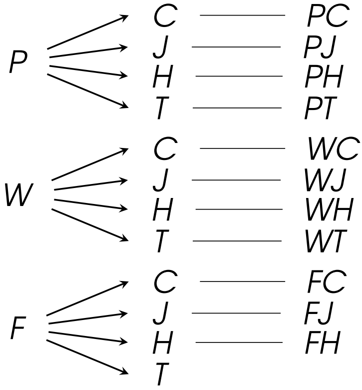
Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?



Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?



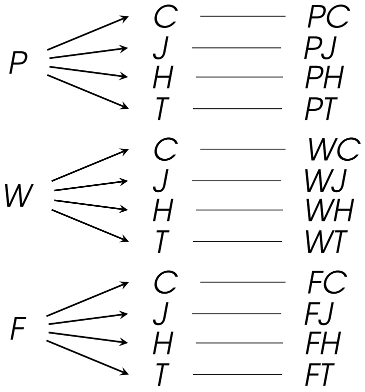
Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

P	C	PC
	J	PJ
	H	PH
	T	PT
W	C	WC
	J	WJ
	H	WH
	T	WT
F	C	FC
	J	FJ
	H	FH
	T	FT

Example 3: Using a Tree Diagram

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?



$$\therefore n(S) = 12$$

Example 3: Using Systematic Listing

Example 3: Using Systematic Listing

Food = 3 ways to choose

Example 3: Using Systematic Listing

Food = 3 ways to choose
Drink = 4 ways to choose

Example 3: Using Systematic Listing

Food = 3 ways to choose
Drink = 4 ways to choose
$n(S) = ?$

Example 3: Using Systematic Listing

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

PC

Example 3: Using Systematic Listing

Food = 3 ways to choose
Drink = 4 ways to choose
$n(S) = ?$

PC
PJ

Example 3: Using Systematic Listing

Food = 3 ways to choose
Drink = 4 ways to choose
$n(S) = ?$

PC
PJ
PH

Example 3: Using Systematic Listing

Food = 3 ways to choose
Drink = 4 ways to choose
$n(S) = ?$

PC
PJ
PH
PT

Example 3: Using Systematic Listing

Food = 3 ways to choose
Drink = 4 ways to choose
$n(S) = ?$

PC	WC
PJ	
PH	
PT	

Example 3: Using Systematic Listing

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

PC	WC
PJ	WJ
PH	
PT	

Example 3: Using Systematic Listing

Food = 3 ways to choose
Drink = 4 ways to choose
$n(S) = ?$

PC	WC
PJ	WJ
PH	WH
PT	

Example 3: Using Systematic Listing

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

PC	WC
PJ	WJ
PH	WH
PT	WT

Example 3: Using Systematic Listing

Food = 3 ways to choose
Drink = 4 ways to choose
$n(S) = ?$

PC	WC	FC
PJ	WJ	
PH	WH	
PT	WT	

Example 3: Using Systematic Listing

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

PC	WC	FC
PJ	WJ	FJ
PH	WH	
PT	WT	

Example 3: Using Systematic Listing

Food = 3 ways to choose
Drink = 4 ways to choose
$n(S) = ?$

PC	WC	FC
PJ	WJ	FJ
PH	WH	FH
PT	WT	

Example 3: Using Systematic Listing

Food = 3 ways to choose
Drink = 4 ways to choose
$n(S) = ?$

PC	WC	FC
PJ	WJ	FJ
PH	WH	FH
PT	WT	FT

Example 3: Using Systematic Listing

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

PC	WC	FC
PJ	WJ	FJ
PH	WH	FH
PT	WT	FT

$$\therefore n(S) = 12$$

Example 3: Using the Fundamental Counting Principle

Example 3: Using the Fundamental Counting Principle

Food = 3 ways to choose

Example 3: Using the Fundamental Counting Principle

Food = 3 ways to choose
Drink = 4 ways to choose

Example 3: Using the Fundamental Counting Principle

Food = 3 ways to choose
Drink = 4 ways to choose
$n(S) = ?$

Example 3: Using the Fundamental Counting Principle

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

$$n(S) = 3 \times 4$$

Example 3: Using the Fundamental Counting Principle

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

$$n(S) = 3 \times 4$$
$$n(S) = 12$$

Example 3: Using the Fundamental Counting Principle

Food = 3 ways to choose
Drink = 4 ways to choose
n(S) = ?

$$n(S) = 3 \times 4$$
$$n(S) = 12$$
$$\therefore \text{ there are 12 different meal choices}$$

Example 4

Find the number of possible outcomes for each scenario using the fundamental counting principle.

1. Boys and girls in a family with two children.

Example 4

Find the number of possible outcomes for each scenario using the fundamental counting principle.

1. Boys and girls in a family with two children.

$n(S) = 2 \times 2$

Example 4

Find the number of possible outcomes for each scenario using the fundamental counting principle.

1. Boys and girls in a family with two children.

$n(S) = 2 \times 2$
$n(S) = 4$ possible outcomes

Example 4

Find the number of possible outcomes for each scenario using the fundamental counting principle.

2. Choosing a 3G or 4G cellphone that comes in black, white, or transparent.

Example 4

Find the number of possible outcomes for each scenario using the fundamental counting principle.

2. Choosing a 3G or 4G cellphone that comes in black, white, or transparent.

$n(S) = 2 \times 3$

Example 4

Find the number of possible outcomes for each scenario using the fundamental counting principle.

2. Choosing a 3G or 4G cellphone that comes in black, white, or transparent.

$n(S) = 2 \times 3$
$n(S) = 6$ possible outcomes

Example 4

Find the number of possible outcomes for each scenario using the fundamental counting principle.

3. A choice of Spanish, muffin or toast bread with coffee, milk, or juice.

Example 4

Find the number of possible outcomes for each scenario using the fundamental counting principle.

3. A choice of Spanish, muffin or toast bread with coffee, milk, or juice.

$n(S) = 3 \times 3$

Example 4

Find the number of possible outcomes for each scenario using the fundamental counting principle.

3. A choice of Spanish, muffin or toast bread with coffee, milk, or juice.

$n(S) = 3 \times 3$
$n(S) = 9$ possible outcomes

Example 4

Find the number of possible outcomes for each scenario using the fundamental counting principle.

4. Elias has a choice of a queen or king with a choice of hearts, diamonds, clubs, or spades.

Example 4

Find the number of possible outcomes for each scenario using the fundamental counting principle.

4. Elias has a choice of a queen or king with a choice of hearts, diamonds, clubs, or spades.

$n(S) = 2 \times 4$

Example 4

Find the number of possible outcomes for each scenario using the fundamental counting principle.

4. Elias has a choice of a queen or king with a choice of hearts, diamonds, clubs, or spades.

$n(S) = 2 \times 4$
$n(S) = 8$ possible outcomes

Example 4

Find the number of possible outcomes for each scenario using the fundamental counting principle.

5. A die is rolled and a coin is tossed.

Example 4

Find the number of possible outcomes for each scenario using the fundamental counting principle.

5. A die is rolled and a coin is tossed.

$n(S) = 6 \times 2$

Example 4

Find the number of possible outcomes for each scenario using the fundamental counting principle.

5. A die is rolled and a coin is tossed.

$n(S) = 6 \times 2$
$n(S) = 12$ possible outcomes

Example 5

Solve each problem completely.

1. In how many ways can 1 out of 4 blue flags, 1 out of 3 red flags, and 1 out of 2 green flags be arranged on a pole?

Example 5

Solve each problem completely.

1. In how many ways can 1 out of 4 blue flags, 1 out of 3 red flags, and 1 out of 2 green flags be arranged on a pole?

$n(S) = 4 \times 3 \times 2$

Example 5

Solve each problem completely.

1. In how many ways can 1 out of 4 blue flags, 1 out of 3 red flags, and 1 out of 2 green flags be arranged on a pole?

$n(S) = 4 \times 3 \times 2$
$n(S) = 24$ ways

Example 5

Solve each problem completely.

2. A lock contains 3 dials, each with ten digits. How many possible sequences of numbers exist?

Example 5

Solve each problem completely.

2. A lock contains 3 dials, each with ten digits. How many possible sequences of numbers exist?

$n(S) = 10 \times 10 \times 10$

Example 5

Solve each problem completely.

2. A lock contains 3 dials, each with ten digits. How many possible sequences of numbers exist?

$n(S) = 10 \times 10 \times 10$
$n(S) = 1,000$ possible sequences of numbers

Example 5

Solve each problem completely.

3. Four students are to be chosen from a group of 9 to fill the positions of president, vice-president, treasurer and secretary. In how many ways can this be accomplished?

Example 5

Solve each problem completely.

3. Four students are to be chosen from a group of 9 to fill the positions of president, vice-president, treasurer and secretary. In how many ways can this be accomplished?

$n(S) = 9 \times 8 \times 7 \; times6$

Example 5

Solve each problem completely.

3. Four students are to be chosen from a group of 9 to fill the positions of president, vice-president, treasurer and secretary. In how many ways can this be accomplished?

$n(S) = 9 \times 8 \times 7\ times6$
$n(S) = 3,024$ ways

Example 5

Solve each problem completely.

4. How many 5-number license plates can be made using the digits 0, 1, 2, 3, 4, 5, if repetitions are allowed?

Example 5

Solve each problem completely.

4. How many 5-number license plates can be made using the digits 0, 1, 2, 3, 4, 5, if repetitions are allowed?

$n(S) = 6 \times 6 \times 6 \times 6 \times 6$

Example 5

Solve each problem completely.

4. How many 5-number license plates can be made using the digits 0, 1, 2, 3, 4, 5, if repetitions are allowed?

$n(S) = 6 \times 6 \times 6 \times 6 \times 6$
$n(S) = 7,776$ license plates

Example 5

Solve each problem completely.

5. How many 5-number license plates can be made using the digits 0, 1, 2, 3, 4, 5, if repetitions are not allowed?

Example 5

Solve each problem completely.

5. How many 5-number license plates can be made using the digits 0, 1, 2, 3, 4, 5, if repetitions are not allowed?

$n(S) = 6 \times 5 \times 4 \times 3 \times 2$

Example 5

Solve each problem completely.

5. How many 5-number license plates can be made using the digits 0, 1, 2, 3, 4, 5, if repetitions are not allowed?

$n(S) = 6 \times 5 \times 4 \times 3 \times 2$
$n(S) = 720$ license plates

Thank you for attending the virtual class.