

MATH 210 FINITE MATHEMATICS

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7.1 Experiments, Sample Spaces, and Events

Definition 1

1. Experiment: **ACTIVITY WITH OBSERVABLE RESULTS**
2. Outcome: **RESULT**
3. Sample Space: **SET OF ALL OUTCOMES**
4. Event: **SUBSET OF OUTCOMES**
5. Mutually Exclusive **E AND F ARE MUTUALLY EXCLUSIVE IF $E \cap F = \emptyset$ "CAN'T HAPPEN AT THE SAME TIME"**

Example 1

1. **TUSS A COIN** $\{H, T\}$
2. **ROLL A DIE** $\{1, 2, 3, 4, 5, 6\}$
3. **CHOOSE CARD FROM A DECK**
4. **PICK CANDY FROM DISH**

Example 2

Consider the experiment of rolling one die.



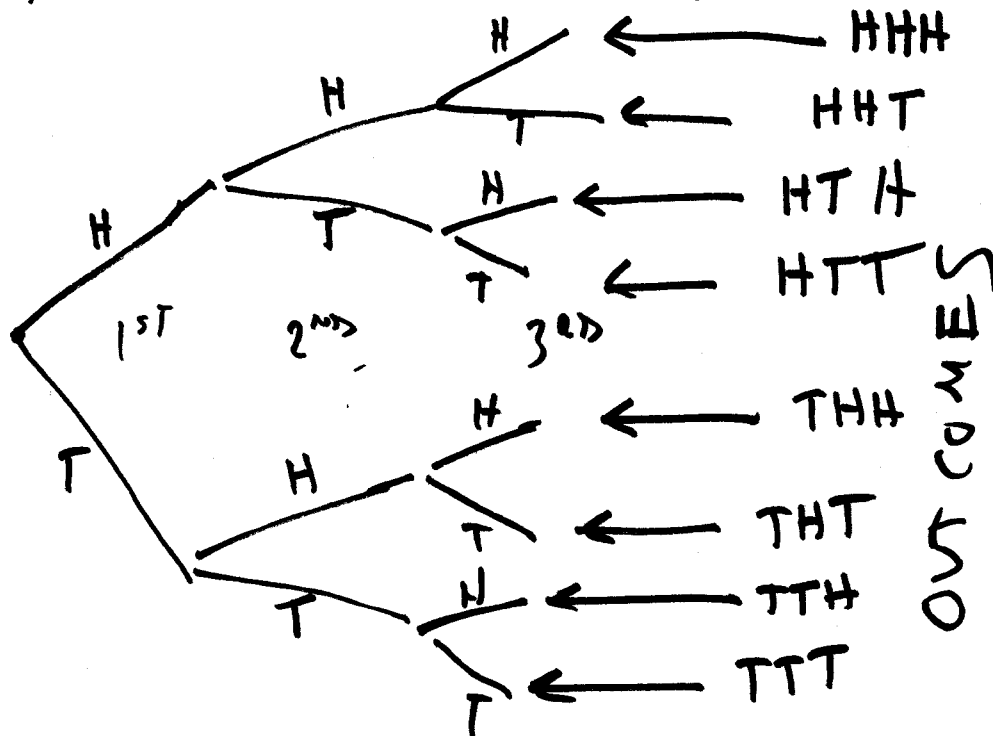
1. What are the outcomes? (Sample Space) $\{1, 2, 3, 4, 5, 6\}$
2. Find the event E where $E = \{x \mid x \text{ is an even number}\}$ $E = \{2, 4, 6\}$
3. Find the event F where $F = \{x \mid x \text{ is a number greater than 3}\}$ $F = \{4, 5, 6\}$

4. Find the event $E \cap F$. $= \{4, 6\}$
5. Find the event $E \cup F$. $= \{2, 4, 6, 5\}$
6. Are E and F mutually exclusive? Explain. NO BECAUSE $E \cap F \neq \emptyset$
7. What is the complement of E ? $E^c = \{1, 3, 5\}$ "ODDS"

Example 3
 Consider the experiment of flipping a fair coin three times and observing the resulting sequence of heads or tails. Determine the sample space.

EX1 HHT ONE OUTCOME

TRY A TREE DIAGRAM



$\{ HHH, HHT, HTH, HTT, THH, THT, TTH, TTT \}$

Example 4

An experiment consists of casting a pair of dice and observing the top number.

1. Determine the sample space

		Second Throw					
		1	2	3	4	5	6
First Throw	1	(1,1)	(1,2)	(1,3)	(1,4)	(1,5)	(1,6)
	2	(2,1)	(2,2)	(2,3)	(2,4)	(2,5)	(2,6)
	3	(3,1)	(3,2)	(3,3)	(3,4)	(3,5)	(3,6)
	4	(4,1)	(4,2)	(4,3)	(4,4)	(4,5)	(4,6)
	5	(5,1)	(5,2)	(5,3)	(5,4)	(5,5)	(5,6)
	6	(6,1)	(6,2)	(6,3)	(6,4)	(6,5)	(6,6)

2. Determine the event that the sum of the numbers is greater than or equal to 7.

$$\left\{ \begin{array}{l} (6,1), (6,2), (6,3), (6,4), (6,5), (6,6) \\ (5,2), (5,3), (5,4), (5,5), (5,6) \\ (4,3), (4,4), (4,5), (4,6), (3,4), (3,5), (3,6) \\ (2,5), (2,6), (1,6) \end{array} \right\}$$

3. Determine the event that at least one die is a 5.

$$\left\{ \begin{array}{l} (5,1), (5,2), (5,3), (5,4), (5,5), (5,6) \\ (1,5), (2,5), (3,5), (4,5), (6,5) \end{array} \right\} \quad ||$$

4. Determine the event that one die is a 2 and the other is less than 3.

$$\left\{ (2,1), (2,2), (1,2) \right\}$$