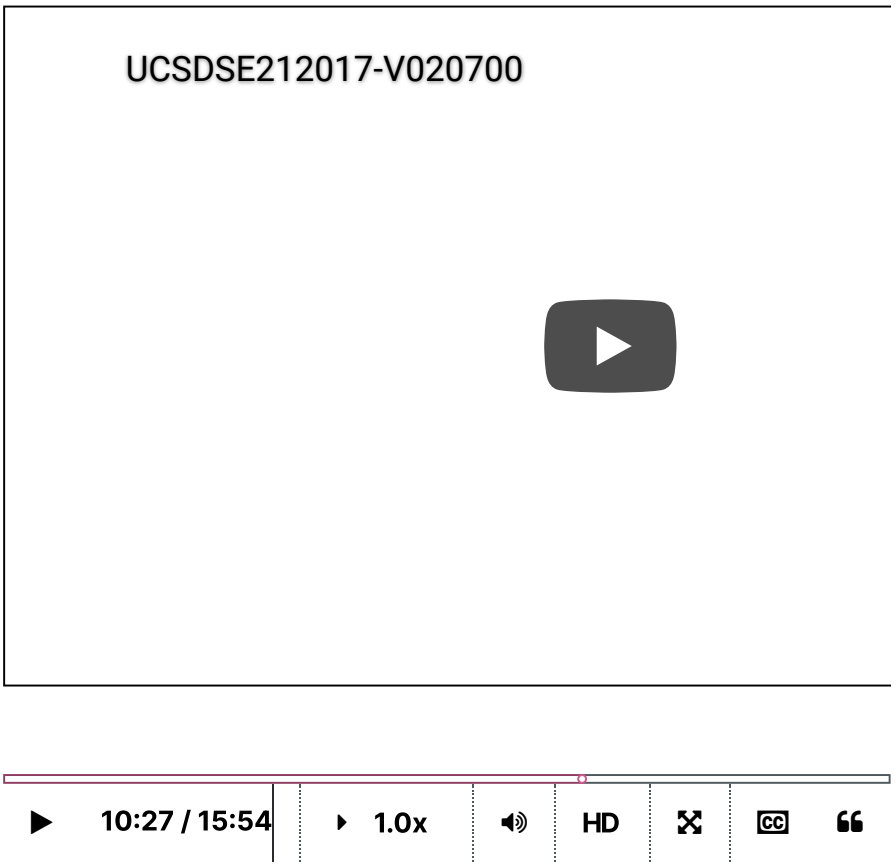
Problem Sets due Jun 1, 2022 17:13 +03

Video



the size of the space.

And the question is whether we can have a simple formula

for the probability of an event.

And the answer is yes, because the probability of an event

in an equiprobable space is, as we saw,

is just the summation of all element probabilities,

all elements in E, in the event.

And because we are talking about a uniform space,

then each probability, the probability of every element

is one over omega, so we are summing over all

5.3_Probability_Events

POLL

What is the probability of drawing a Red Ace from a standard deck of cards?

RESULTS

1/52	**31%**
2/52	**65%**
4/52	**4%**

None of the above 0%

Submit

Results gathered from 26 respondents.

FEEDBACK
Both "heart ace" and "diamond ace" are "red ace". Since the sample space is uniform, the answer is 2/52.

1

0 points possible (ungraded)
Which of the following holds for every event A?

- [x] $P(A) \geq 0$
- [x] $P(A) \leq 1$
- [x] $P(A) + P(A^c) = 1$
- [ ] $P(A) = P(A^c)$
- [x] $A = \emptyset \quad \Rightarrow \quad P(A) = 0$
- [ ] $P(A) = 0 \quad \Rightarrow \quad A = \emptyset$

Explanation
- True. $0 \leq P(A) \leq 1$.
- True. Same as above.
- True.

- False.
- True. Note that $A \cap \emptyset = \emptyset, A \cup \emptyset = \emptyset$ for any A.
$P(A) = P(A \cup \emptyset) = P(A) + P(\emptyset)$, hence $P(\emptyset) = 0$.
- False. Suppose a uniform sample space Ω has infinite number of elements. Then for some events A with finite size (i.e. $|A| is finite$), $P(A) = \frac{|A|}{|\Omega|}$.

Submit You have used 3 of 3 attempts

Answers are displayed within the problem

2

0 points possible (ungraded)
Which of the following always hold for events A and B?

- [x] $A \subseteq B \quad \Rightarrow \quad P(A) \leq P(B)$
- [ ] $P(A) \leq P(B) \quad \Rightarrow \quad A \subseteq B$

Explanation
- True.
- False. Let A be the event of getting a head from a tossed coin, and B be the event of getting a tail. $P(A) = P(B) = \frac{1}{2}$, but $A \nsubseteq B$.

Submit You have used 1 of 3 attempts

Answers are displayed within the problem

3 (Graded)

1/1 point (graded)
Which of the following implies $P(S - T) = P(S) - P(T)$ for events S and T?

- [x] $T \subseteq S$
- [x] $T \subset S$
- [x] $S = T$
- [ ] $S \subseteq T$

✔

Explanation
Note that $P(S - T) = P(S \cup T) - P(T)$.
When $T \subseteq S$, $T \subset S$, and $S = T$, we have $S \cup T = S$, hence $P(S - T) = P(S) - P(T)$.
When $S \subseteq T$, we have $S \cup T = T$, hence $P(S - T) = 0$.

Submit You have used 3 of 3 attempts

Answers are displayed within the problem

4

0 points possible (ungraded)
50% of UCSD students play soccer, 40% play basketball, and 30% play both. What is the probability that a random UCSD student does not play any of the two games.

- ○ 0
- ○ 0.1
- ◉ 0.4
- ○ 0.6

✔

Explanation
Let A be the event that a student play soccer, B be the event that a student play basketball. Then $A \cap B$ is the event that a student play both. We already know $P(A) = 0.5, P(B) = 0.4, P(A \cap B) = 0.3$, hence $P(A \cup B) = P(A) + P(B) - P(A \cap B) = 0.6$. The probability that a random UCSD student does not play any of the two games is $1 - P(A \cup B) = 0.4$.

Submit You have used 1 of 2 attempts

Answers are displayed within the problem

5

0 points possible (ungraded)
Which of the following are events in the sample space $\Omega = \{1, 2, 3, 4, 5\}$?

- [x] $\{1, 2, 3\}$
- [x] $\emptyset$
- [x] Ω
- [x] $\{1\}$
- [ ] $\{0, 3, 4\}$

Explanation
- True.
- True.
- True.
- True.
- False. $\{0, 3, 4\}$ is not a subset of Ω.

Submit

Submit You have used 1 of 3 attempts

Answers are displayed within the problem

6

0 points possible (ungraded)

For the uniform space $\{1, 2, \ldots, 10\}$, find:

- $P(\{\text{primes}\})$,

4/10 **Answer:** 0.4

$\frac{4}{10}$

Explanation

$\{\text{primes}\} = \{2, 3, 5, 7\}$. Its probaility is $P(\{\text{primes}\}) = \frac{|\text{primes}|}{|\Omega|} = 2/5$.

- $P(\{\text{multiples of } 3\})$.

3/10 **Answer:** 0.3

$\frac{3}{10}$

Explanation

$\{\text{primes}\} = \{3, 6, 9\}$. Its probaility is $P(\{\text{multiples of } 3\}) = \frac{|\text{multiples of } 3|}{|\Omega|} = 3/10$.

Submit You have used 2 of 3 attempts

Answers are displayed within the problem

7

0 points possible (ungraded)

A bag contains 5 red and 3 blue balls.

- Pick one ball at random and observe its random color. What is the size of the color sample space.

8 ✖ **Answer:** 2

8

Explanation
The sample space is $\{\text{Red}\ , \text{Blue}\}$.

- What is $P\left(\text{blue}\right)$?

3/8 ✔ **Answer:** 0.375

$\frac{3}{8}$

Explanation
$\frac{|\{\text{blue}\}|}{\Omega} = \frac{3}{8} = 0.375$.

- Two balls added to the bag and now $P\left(\text{blue}\right) = 0.4$. How many of the two balls are blue?

1 ✔ **Answer:** 1

1

Explanation
If a blues balls are added, $P\left(\text{blue}\right) = \frac{3+a}{8+2} = 0.4$. Hence $a = 1$.

- Two balls are removed from the original bag and now $P\left(\text{blue}\right) = 0.5$. How many of the two balls were blue?

0 ✔ **Answer:** 0

0

Explanation
If a blues balls are removed, $\frac{3-a}{8-2} = 0.5$. Hence $a = 0$.

Submit You have used 4 of 4 attempts

Answers are displayed within the problem

8

0 points possible (ungraded)

Six balls are numbered 1, 2, 3, 4, 5, and 6. What is the chance that the numbers on three balls, picked simultaneously and randomly, will sum to a multiple of 3?

- 1/3
- 1/4
- 2/5 ✔
- 4/15 ✖

Explanation

The number of ways to pick 3 balls is $\binom{6}{3} = 20$. 8 of them have their sum as a multiple of 3.

Submit You have used 2 of 2 attempts

Answers are displayed within the problem

9 (Graded)

9/9 points (graded)

A standard poker deck has 52 cards, of 13 ranks $\{A, 2, \ldots, 10, J, Q, K\}$ and 4 suits $\{diamonds, clubs, hearts, spades\}$. What is the probability that a hand of five cards contains:

- a queen of hearts,

0.0962 ✔ **Answer:** 5/52

0.0962

Explanation

The probability that there's no queen of hearts is $\binom{51}{5}/\binom{52}{5} = 47/52$. Thus the probability that there's a queen of hearts is $1 - 47/52 = 5/52$.

- at least one queen,

0.3412 ✔ **Answer:** 0.3412

0.3412

Explanation

Similar to above, probability that there's no queen is $\binom{48}{5}/\binom{52}{5} = 0.65884$. Thus the probability that there's a queen is $1 - 0.65884 = 0.34115$.

- at least one heart?

0.7785 ✔ **Answer:** 0.7785

0.7785

Explanation

Following the same principle, probability that there's a hearts is $1 - \binom{39}{5}/\binom{52}{5} = 0.7785$.

Submit You have used 1 of 4 attempts

Answers are displayed within the problem

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