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Events

Video

Start of transcript. Skip to the end.

- Hello and welcome back.

So, so far, we've talked about single outcomes

and their probabilities.

And now we want to move from single elements to sets.

And we'll call them events.

And we'll talk about what it means for an event to occur,

and what is the probability of an event,

7:08 / 0:00 1.0x

5.3_Probability_Events

POLL

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

RESULTS

○ **2/52**	**68%**
○ **1/52**	**25%**
◉ **4/52**	**6%**
○ **None of the above**	**1%**

Submit

Results gathered from 330 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?

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

Submit You have used 2 of 3 attempts

Correct

3

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 1 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 2 of 2 attempts

Answers are displayed within the problem

5

0 points possible (ungraded)

Which of the following are events in the sample space $\Omega = \{1, 2, 3, 4, 5\}$?

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

✖

Explanation

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

Submit You have used 3 of 3 attempts

Answers are displayed within the problem

6

0 points possible (ungraded)

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

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

0 ✖ **Answer:** 0.4

0

Explanation

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

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

Answer: 0.3

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 3 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.

Answer: 2

Explanation

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

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

0.375

Answer: 0.375

0.375

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?

2

✖ **Answer:** 0

2

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

9.0/9.0 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,

0.09615384615 ✔ **Answer:** 5/52

0.09615384615

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,

0.3411580017 ✔ **Answer:** 0.3412

0.3411580017

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?

0.7784663866 ✔ **Answer:** 0.7785

0.7784663866

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 4 of 4 attempts

Answers are displayed within the problem

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