Section 11-4 Using Addition with Probability

Objectives: Find the probabilities of mutually exclusive events.
Find the probabilities of inclusive events.

Events that cannot occur at the same time are called mutually exclusive.

Inclusive: can happen at same time

Probability of *A or B*

Let A and B represent events in the same sample space.

If A and B are mutually exclusive events, then

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

If A or B are inclusive events, then

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

The compliment of event A, written A^c, consists of all outcomes in the sample space the are not in A. For example, let A be the event in "favor." Then the complement A^c is the event "opposed" *or* "no opinion."

$P(1) = \frac{1}{6}$

$P(1^c) = \frac{5}{6}$

Probability of the Complement of *A*

Let A represent an event in the sample space.

$$P(A) + P(A^c) = 1 \quad P(A) = 1 - P(A^c) \quad P(A^c) = 1 - P(A)$$

$\frac{1}{6} + \frac{5}{6} = \frac{6}{6} = 1$

Use the given probability to find $P(E^c)$.

1. $P(E) = \frac{5}{8}$ $1 - \frac{5}{8} = \frac{3}{8}$
2. $P(E) = 0$ $1 - 0 = 1$
3. $P(E) = .528$ $1 - .528 = .472$
4. $P(E) = 1$ $1 - 1 = 0$

Two number cubes are rolled. The table shows the possible outcomes. Use the table to state whether the events in each pair below are inclusive or mutually exclusive. Then find the probability of each pair of events.

2	3	4	5	6	7
3	4	5	6	7	8
4	5	6	7	8	9
5	6	7	8	9	10
6	7	8	9	10	11
7	8	9	10	11	12

1. a sum of 6 or a sum of 10 — E — $\frac{5}{36} + \frac{3}{36} = \frac{8}{36} = \frac{2}{9}$
2. a sum of 3 or a sum of 7
3. a sum of 9 or a 5
4. a product of 20 or a 6
5. a sum less then 10 or a sum greater than 8
6. a sum of 3 or less, or double ones
7. a product of 5 or less or 6 — $\frac{36}{36} + \frac{10}{36} - \frac{4}{36} = \frac{36}{36} = 1$
8. an even number or a sum of 7
9. an odd number or a product greater than 25
10. a product greater than 20 or a product less than 15

1 or even

M.E.

$\frac{1}{6}+\frac{3}{6}=\frac{4}{6}=\boxed{\frac{2}{3}}$

1, 2, 4, 6

3 or odd

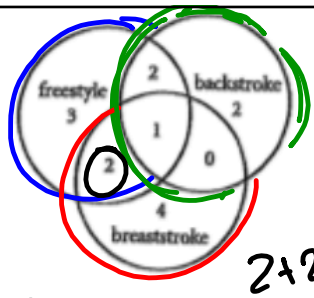
I

$\frac{1}{6}+\frac{3}{6}-\frac{1}{6}=\frac{3}{6}=\boxed{\frac{1}{2}}$

3 AND ODD

3, 1, 5

A swim team with 25 members has 8 swimmers who swim freestyle, 5 swimmers who swim backstroke. Some swimmers participate in more than one event according to the Venn diagram. Find the probability of each event if a swimmer is selected at random.



11. swims freestyle

12. swims exactly 2 events

13. Swims breaststroke and backstroke

14. does not swim backstroke

15. swims freestyle and backstroke

16. does not swim freestyle, breaststroke, or backstroke

A number cube is rolled once, and the number on the top is recorded. Find the probability of each event.

1. 5 or 6
2. odd or even
3. Not even
4. Less than 4 or 1

A card is drawn from a standard 52-card deck. Tell whether the events A and B inclusive or mutually exclusive. Then find P(A or B).

1. A: The card is red.
   B: The card is a 4.

2. A: The card is a face card.
   B: The card is a club.

3. A: The card is black.
   B: The card is red.

4. A: The card is heart or spade.
   B: The card is not a heart.

5. A: The card is less than 10.
   B: The card is a red face card.

6. A: The card is not a face card.
   B: The card is an ace.

7. A: The card is an ace of clubs.
   B: The card is red.

8. A: The card is red.
   B: The card is not a diamond or a heart.

Find the probability of each event.

1. 1 head or 2 tails appearing in 2 tosses of a coin.
2. 3 heads or 1 head appearing in 3 tosses of a coin.
3. At least 2 heads appear in 4 tosses of a coin.

2 3 4 5 6 7 8 9 10 J Q K A

face

High

13 different #

4 suits

52 total