

MATH 1070Q

Section 4.4: Basics of Probability

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Objectives

- ① Understand how to find the probability of an event occurring.
- ② Be able to count elements in events and sample spaces for this purpose.

Probability when rolling a die

We roll a six-sided die and observe its value. The sample space is $S = \{1, 2, 3, 4, 5, 6\}$.

Let E be the event that the value is even, so $E = \{2, 4, 6\}$.

We assume each value is equally likely, so the probability of E occurring is

$$P(E) = \frac{n(E)}{n(S)} = \frac{3}{6} = \frac{1}{2} = 0.5$$

Let F be the event that the value is 10. What is $P(F)$?

Rolling two tetrahedral dice

A tetrahedral die has four sides, labeled 1 through 4. We roll two tetrahedral dice and observe their values. Let E be the event that their sum is 5, and let F be the event that their sum is at least 7.

- (a) Find the sample space S .
- (b) Find $P(E)$.
- (c) Find $P(E \cap F)$.
- (d) Find $P(E \cup F)$.

Tossing a coin

We toss a coin three times and observe whether it is showing head or tails each time. Let E be the event that there is at least one head, and F the event that there is at least one tails.

- (a) Draw a tree diagram and find the sample space.
- (b) Find $P(E)$.
- (c) Find $P(F^C)$.

Drawing a card from a deck

We draw a card from a standard deck. Let E be the event that the card is a King, let F be the event that card is a diamond, and let G be the event that the card is red.

- (a) Find $P(E \cap G)$.
- (b) Find $P(F^C)$.
- (c) Find $P(F \cup G)$.

- 1 To find the probability of an event occurring, we need to know the size of the sample space S , and the size of the event E . Then
$$P(E) = \frac{n(E)}{n(S)}.$$
- 2 We can use what we've learned about set notation and counting to quickly describe specific events and their probabilities.