

L1 Geometric Probability

In any random experiment there are two types of random variables:

Discrete Random Variable: Continuous Random Variable:

If it cannot take on all the possible values of an interval of real numbers. If it can take on all the possible values of an interval of real numbers.

Ex.: We roll two dice and observe the outcome. Ex.: We randomly choose a checkout in a grocery store.

We are interested in the sum of the two outcomes. We are interested in the waiting time for the people in line.

1

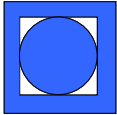
Geometric Probability

There are 3 types of geometric probabilities, one for each of the commonly used dimensions of space; length, area and volume.

1D $P(\text{Target}) = \frac{\text{Target length}}{\text{Total length}}$



2D $P(\text{Target}) = \frac{\text{Target area}}{\text{Total area}}$

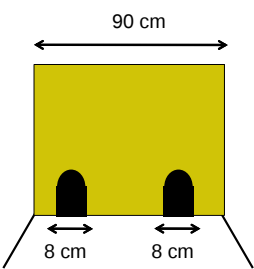


3D $P(\text{Target}) = \frac{\text{Target volume}}{\text{Total volume}}$



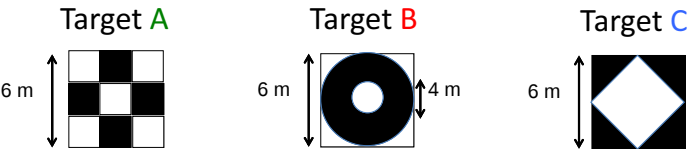
2

Ex 1: What is the probability that the blind mouse will escape into a hole?



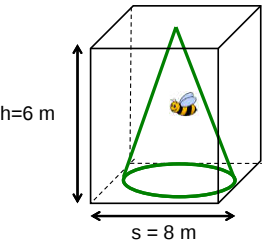
$P(\text{Target}) = \frac{\text{Target length}}{\text{Total length}}$

Ex 2: Which black target is a skydiver most likely to land on?



4

Ex 3: What is the probability the bee is in the laser cone?



Ex 4: The NUT HOUSE factory has two types of containers, a square base prism and a cylinder. Each hour they package 20 of the prism and 25 of the cylinder. Between 2 pm and 3 pm, they had some problem with their machine and lost one of their bolts in one of the containers. What is the probability that it fell in a cylinder container?



Practice:
7.3 # 1-5

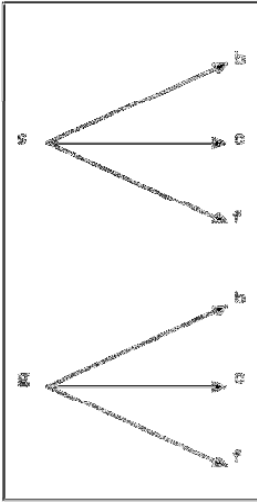


L2 Discrete Probability

EX 1: If the menu at a restaurant has the following choices:

- Appetizer: soup or green salad
- Main course: beef, chicken or fish
- Dessert: pie or ice cream

How many possible outcomes (combinations of meals) are there?



Basic counting principle

EX 1: If the menu at a restaurant has the following choices:

- Appetizer: soup or green salad
- Main course: beef, chicken or fish
- Dessert: pie or ice cream

How many possible outcomes (combinations of meals) are there?

$$\frac{2}{\text{Appetizer}} \times \frac{3}{\text{Main}} \times \frac{2}{\text{Dessert}} = \frac{12}{\text{possible outcomes}}$$

Basic Counting Principle

If there are m ways to do one thing, and n ways to do another, then there are m x n ways of doing both.

EX 2: How many outfits can be worn with 4 different shirts, 3 pants and 3 pairs of shoes.

Ex 3: How many outcomes are there when 

- a) Rolling 1 die
- b) Rolling 2 dice
- c) Rolling 3 dice
- d) Flipping a coin
- e) Flipping a coin 3 x
- f) Flipping a coin 3 x and rolling a dice 2 x

Ex 4: How many possible Quebec license plates start with 3 numbers followed by 3 letters?



How about in Ontario?



How about if no repetition is allowed?

The probability can be a fraction, a decimal (between 0 and 1), or a percentage. (0 being impossible, and 1 being certain)

Theoretical Prob =
$$\frac{\text{\# of desired outcomes}}{\text{total \# of outcomes}}$$

Practice:
7.1 # 1-5; and 7.2 # 1

