AP Statistics – 6.3G2 (revised 2020)	Name:
Goal: Understand Geometric RV's	Date:
I. Geometric Random Variables:	Example: Monopoly

In the board game Monopoly, one way to get out of jail is to roll doubles. How likely is it that someone in jail would roll doubles on his first, second, or third attempt? If this was the only way to get out of jail, how many turns would it take, on average? The random variable of interest in this example is:

Y = # of a Hempts to Roll doubles the

(a) Explain why Y is a Geometric random variable (and not a Binomial RV).

DIFFELENCE BETWEEN GEOM + BIN RV?

Fixed triels versus

B doubles or not doubles

I dice do not have memory

T we count trial until 1 st success

(b) Find the probability that it takes 2 turns to roll doubles.

(c) Find the probability that it takes 3 turns to roll doubles.

$$P(y=3) = {5 \choose 6} {5 \choose 6} {1 \choose 6} = 0.1157$$
F.F. 5

(c) ON FORMULA SHEET :
$$\Rightarrow P(X=x) = (1-p)^{1-x} - p$$

(d) Find the probability that it takes 4 turns to roll doubles.

(e) Summarize the probability distribution of the Random Variable Y in the following table

					(D)		
Value (Y)	1	2	3	4	5 (do later)	6 (do later)	7+ (dolater)
Probability	167	-139	116	.096	0.080	0.067	0,335
7(x=1)			P(x≤6)=0.665				

FOR THIS PAGE USE PROB RULES OR CALC Command

The random variable of interest is:

Y = number of attempts it takes to roll doubles one time

(g) Find the probability that it takes more than 4 turns to roll doubles and interpret this value in context Since there are an infinite number of possible values of Y greater than 4 (i.e. 5, 6, 7, etc.), we will use the INTERPRET complement rule.

P(1>4) = 1-P(1 44) 1- [P(Y=1)+P(Y=2)+ P(Y=3)+P(Y=3) 1- [1/6+ 0.139+ 0.116+0.096]= 6.482

Cale Commends P(Y>4)= 1- P(Y=4) There is a bout a 1-0.51870.482 48% chance geomedf(1/6,4) of getting your 1st doubles 4th after the 4th

(h)In Monopoly, a player can get out of jail rolling doubles with in 3 turns, Find the probability and interpret this value in context.

USING PROB RULES P(Y &3) = P(Y=1)+P(Y=3) P(Y &3) = (0.423) = (0.422

USE CALC COMMONSS = 1/6+0.139+0.116. geomcdf(6,3)

INTER PRET There is a bout a 42% chance that Youwill get doubles in your 1st 3 trys.

Parameters, Mean and Standard Deviation for Geometric Models 11.

1) What parameter(s) are required to describe a Geometric Model

state model w/parameters -> (5 (1/6)

2) From the green sheet write down the formulas Geometric Mean and Standard Deviation

$$E(x) = \mu_x = \frac{1}{p}$$

$$SD(x) = \sigma_x = \frac{\sqrt{1-p}}{p}$$

IN THE LONG RUN, the mean to of rolls toget 1st doubles is 3) For the Monopoly example, find the Mean and Standard Deviation about Grolls and would vory from the mean by 5 mls on overage

6y= 5/6=5 III. Using the Calculator to find Geometric Probabilities

Example: Monopoly(cont.) You may also calculate geometric probabilities with your calculator. However you MUST ALWAYS!

- (1) define RV [Y=number of attempts it takes to roll doubles one time] (2) state model w/parameters G(1/6).
 - a) Explain what the difference between "geometpdf" and "geometcdf" geomet Pdf is for a specific volve of x geome Edf is the comulative probability up to the value 6
 - b) Find the probabilities for a SPECIFIC VALUE using the calc.

c) Find a CUMULATIVE probability using the calc.

- · P(Y≤4) = geomet cdf (1/6,4) = 0.5177
- $P(Y<4) = \frac{\text{geomet Cdf}(1/6,3) = 0.42/3}{1 \text{Geomet Cdf}(1/6,5) = 0.4019}$