Math 300
Fall 2024
Exam 2, October 21

No books, notes, scratch paper, phones.
Please show all your work and clearly mark your answers.

If a problem is too hard, move on to an easier one.
Calculators allowed, please show your work.

Page	Pts	Possible
1		20
2		20
3		20
4		20
5		20
XC		
Total		100

Name (printed): ~~Key~~ Key

Name (signature): _____

Score for the class so far: _____ out of _____ points

Percent: _____ % Approximate letter grade:

1) The population of a city is 38,500 in the year 2000. It grows 1.8% per year.
a) Find an exponential model for the population n years after 2000.
b) What is the population in the year 2038?
c) When will the population be 100,000?

(20 points)

a) $P_n = 38500(1.018)^n$

b) 75836 people

c) $100000 = 38500(1.018)^n$

$2.597 = 1.018^n$

$n = 54$ years $\rightarrow$ 2054

2) The initial value of a car is $28,000. Seven years later, the value is $9,000.
a) Find an exponential model for the value n years after purchase.
b) By what percent does its value decrease each year?
c) What is the value 11 years after purchase?
d) When will the car be worth $1,000?

(20 points)

$P_n = 28000(k)^n$

$9000 = 28000 \cdot k^7$

$0.3214 = k^7$ +5 to here

$k = .85032$

a) $P_n = 28000(.85032)^n$

b) 14.97% +4

c) $4705

d) $1 = 28(.85032)^n$

$.03571 = .85032^n$

21 years

3) A coin is flipped 8 times. Find the probability of: (10 points)

a) getting exactly 0 heads. $\frac{1}{256}$

b) getting exactly 1 head. $\frac{8}{256}$

c) getting exactly 2 heads. $\frac{28}{256}$

d) getting exactly 3 heads. $\frac{56}{256}$

e) getting exactly 4 heads. $\frac{70}{256}$

f) getting exactly 5 heads. $\frac{56}{256}$

g) getting exactly 6 heads. $\frac{28}{256}$

h) getting exactly 7 heads. $\frac{8}{256}$

i) getting exactly 8 heads. $\frac{1}{256}$

4) You roll two 12-sided dice. (10 points)

a) What is the probability that the sum equals 9?

$\frac{8}{144}$

b) What is the probability that the sum equals 20?

8, 12
9, 11
10, 10
11, 9
12, 8

$\frac{5}{144}$

5) You roll three 12-sided dice. What is the probability that the sum is 6? Show work please. (10 points)

123
132
213
231
312
321

411
141
114

222

$\frac{10}{12^3} = \frac{10}{1728}$

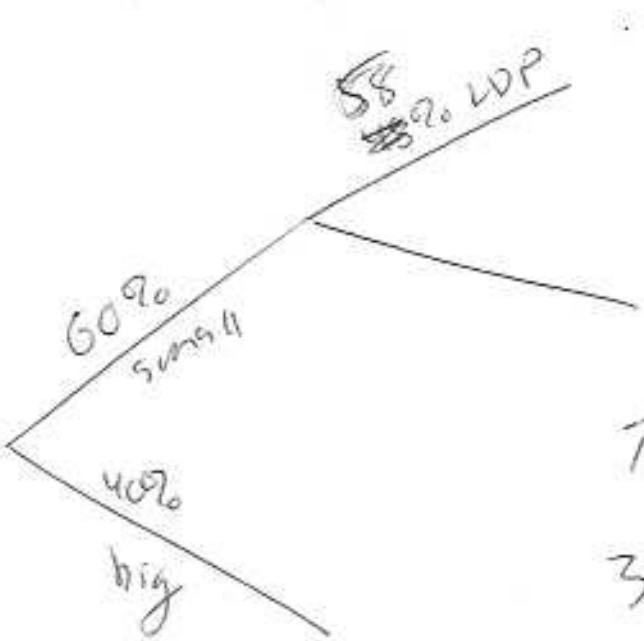
6) Find the sum of the series: $5 + \frac{5}{7} + \frac{5}{49} + \frac{5}{343} + \ldots$. Use the formula $S = \frac{a}{1-r}$. (10 points)

$\frac{5}{1-\frac{1}{7}} = \frac{5}{\frac{6}{7}} = \frac{35}{6}$

7) Suppose that 60% of dogs are small (less than 30 pounds). Suppose further that 48% of small dogs like to go to dog park, whereas 70% of all dogs like to go to dog park.

(20 points)

a) What percent of big dogs (30 pounds or larger) like to go to dog park?
b) What percent of dogs who like to go to dog park are big?



34.8% small and like dog park

70% − 34.8%

35.2% big and like dog park

a) 88% of big dogs like dog park

$\frac{35.2}{70}$ = 50.3% of dogs who like dog park are big

Extra credit:
Find the fraction whose decimal expansion equals 0.83222222222……
Hint: Write the twos as an infinite sum of fractions.

$$\frac{83}{100} + \frac{2}{900}$$

$$\frac{749}{900}$$