

Stat 300
Spring 2024
Exam 2, March 27

No books, scratch paper, phones.
Calculator and formula sheet (3 double-sided pages) allowed.
Please show all your work and clearly mark your answers.
If a problem is too hard, move on to an easier one.
Problems are 8 points each unless noted.

Page	Pts	Possible
1		18
2		16
3		10
4		16
5		8
6		16
7		16
Total		100

Name (printed):

Key

Name (signature):

Score for the
class so far:

_____ out of _____ points

Percent:

_____ %

Approx letter grade:

To earn a grade of _____ I would need about
of the points in the rest of the class.

Write all probability/fraction answers as a fraction, or a decimal to at least 3 significant digits, or a percent to at least 3 significant digits.

- 1) A coin is flipped 8 times. What is the probability of getting: (10 pts)
a) exactly 5 heads?

21.9%

21.875%

binompdf

- b) more than 5 heads?

14.5%

14.453125%

- c) less than 5 heads?

63.671875%

binomcdf upto 4

63.7%

- d) Do your answers to (a)-(c) add to 100%?

close enough

- 2) Suppose that 80% of CRC students live within 10 miles of school. Of these students, 75% usually drive a car to school. Of the other 20% of students, 92% usually drive a car to school.
a) What fraction of all CRC students usually drive a car to school?

Assume 10000 students

8000 live within 10 miles

6000 of them drive a car

2000 don't live within 10 miles

1840 of them drive a car

$$\frac{7840}{10000} = 78.4\%$$

- b) What fraction of CRC students who usually drive a car to school live within 10 miles of school?

$$\frac{6000}{7840} = 76.5\%$$

3) My ticket "number" to last week's Jessica Malone and Late for the Train concert had one digit, followed by 3 letters, followed by 1 digit, followed by 6 letters, followed by 1 digit, followed by 1 letter.

a) How many possible ticket numbers are there that are one digit, followed by 3 letters, followed by 1 digit, followed by 6 letters, followed by 1 digit, followed by 1 letter? Hint: you might want to use scientific notation.

$$26^{10} \cdot 10^3 = 1.4 \times 10^{17}$$

b) There are approximately 8,000,000,000 people on Earth. How would you compare that number of possible ticket numbers in (a) to the number of people on Earth? Circle one.

i) There are not enough ticket numbers for everyone on Earth to have a different number.

ii) There are enough ticket numbers for everyone on Earth, but it's close.

iii) There are so many possible ticket numbers that everyone on Earth could have like 17,000,000 tickets. Why do we need such long ticket numbers?????????

$$\frac{1.4 \times 10^{17}}{8 \text{ billion}} = 17,645,886$$

4) A deck of cards has 52 cards. There are 13 diamonds, 13 hearts, 13 clubs, and 13 spades. Suppose that 3 cards are chosen randomly, without replacement. What is the probability that...

a) the cards are 3 different suits?

$$\frac{52}{52} \cdot \frac{39}{51} \cdot \frac{26}{50} = 39.8\%$$

b) the cards are 2 diamonds and 1 club, in any order?

$$\frac{13}{52} \cdot \frac{13}{51} \cdot \frac{12}{50} + \frac{13}{52} \cdot \frac{12}{51} \cdot \frac{13}{50} + \frac{13}{52} \cdot \frac{13}{51} \cdot \frac{12}{50}$$

$$= 3 \left(\frac{13 \cdot 13 \cdot 12}{52 \cdot 51 \cdot 50} \right) = 4.6\%$$

5) The average weight of dragon fruits is 210 grams, with a standard deviation of 68 grams. Assume the weights are normally distributed.

a) What is the probability that a single dragon fruit weighs between 150 and 210 grams? (One dragon fruit.)

(10 pts)

normalcdf $\sigma = 68$

31.12%

b) What is the probability that a sample of 10 dragon fruits has an average weight between 150 and 210 grams? (Sample of 10 dragon fruits.)

normalcdf $\sigma = \frac{68}{\sqrt{10}}$

49.7%

c) Explain the difference between the answers to (a) and (b). Which probability is larger? Why?

Part (b) is bigger. With a sample of 10, the mean is more likely to be close to the mean than if you use only one dragon fruit.

The interval 150 to 210 is close to the mean.

6) Data for dogs are given in the table below:

Size	Color				
	Brown	White	Black	Other	
under 30 pounds	623	278	199	487	1587
over 30 pounds	933	401	309	639	2282
	1556	679	508	1126	3869

a) What fraction of dogs are over 30 pounds?

$$\frac{2282}{3869} = 59.0\%$$

b) What fraction of dogs are brown?

$$\frac{1556}{3869} = 40.2\%$$

c) What fraction of dogs are white or under 30 pounds?

$$\frac{1587 + 401}{3869} = \frac{1988}{3869} = 51.4\%$$

d) What fraction of dogs are black and over 30 pounds?

$$\frac{309}{3869} = 8.0\%$$

e) What fraction of black dogs are under 30 pounds?

$$\frac{199}{508} = 39.2\%$$

f) What fraction of large dogs (over 30 pounds) are brown?

$$\frac{933}{2282} = 40.9\%$$

7) You go shopping at Marshall's and find 9 tops that you consider buying. They are all about the same price (\$15 each, plus tax), and you want to spend no more than \$75 (plus tax), so you will buy 5 or fewer of the tops. But it is laundry day, so you need to buy at least 2 of them, one for the afternoon, and one for your date tonight. How many possible groups of between 2 and 5 tops (inclusive) might you go home with?

$${}^9C_2 + {}^9C_3 + {}^9C_4 + {}^9C_5$$

$$36 + 84 + 126 + 126$$

$$\boxed{372}$$

See Lab¹³ problem
w/ Go Dogs Gov,
part (b)

8) A large study reveals that 12% of young adults (age 18-29) believe that TikTok should be banned in the US.

a) A sample of 18 young adults is chosen. What is the probability that 3 or fewer think that TikTok should be banned?

binomcdf 3 out of 18

83.8%

b) A sample of 180 young adults is chosen. What is the probability that 30 or fewer think that TikTok should be banned?

30 out of 180

97.5%

c) A sample of 1800 young adults is chosen. What is the probability that 300 or fewer think that TikTok should be banned?

300 out of 1800

99.99999974%

d) Did you notice that even though the 3 fractions: 3 out of 18, 30 out of 180, and 300 out of 1800 are all equal, the answers to (a)-(c) are very different?



Yes


- 9) You roll two 6-sided dice. Each die is numbered 1, 2, 3, 4, 5, 6.
a) What is the probability that the *difference* of the 2 rolls equals 4?

4

$$\begin{array}{l} 1, 5 \\ 2, 6 \\ 5, 1 \\ 6, 2 \end{array} \quad \frac{4}{36}$$

- b) The first die shows a 1.
Now, what is the probability that the *difference* of the 2 rolls equals 4?

4

 $\frac{1}{6} \rightarrow$ You need 5 on the second die

- 10)a) Suppose your community college club has 13 members. You want to choose a president and vice-president. In how many ways can this be done?

$$13 \cdot 12 = 156$$



- b) Your club has 5 tickets to a convention. In how many ways can 5 people can be chosen to go?

$${}_{13}C_5 = 1287$$

2 more on the back

11) Suppose that 60% of California adults are registered to vote.

a) If 22 California adults are chosen randomly, what is the average number (expected number) of them who are registered to vote?

$$\mu = n \cdot p = 22 \cdot (0.6) = 13.2$$

5

b) If 7 California adults are chosen randomly, what is the standard deviation of the number who are registered to vote?

3

$$\sqrt{np(1-p)} = \sqrt{7 \cdot (0.6)(0.4)} = 1.296$$

12) On average you make 32% of your free throws. If you attempt 4, what is the probability that you will make at least one?

$$\text{zero: } (0.68)^4 = 21.4\%$$

at least one: 78.6%