

Math 2311

Bekki George – bekki@math.uh.edu

Office Hours: MW 11am to 12:45pm in 639 PGH

Online Thursdays 4-5:30pm

And by appointment

Class webpage: <http://www.math.uh.edu/~bekki/Math2311.html>

TEST 1 BEGINS THURSDAY 2/13!!!! MAKE SURE YOU HAVE REGISTERED AND RECORDED YOUR TIME. IF YOU ARE LATE, THEY WILL NOT ADMIT YOU.

Math 2311
REVIEW FOR TEST 1

Review for Test 1

7 t/f (4 pts each) and m/c (8 pts each)

3 f/r (either 14 or 16 pts each)

Sections 1.1 – 3.3

Review sheet posted on Homework page

Practice Test under online assignments on CASA

FORMULAS (not necessarily in this order):

$$s^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n-1}$$

$$s = \sqrt{s^2}$$

$$(A \cup B)^c = A^c \cap B^c$$

$$P(E) = \frac{n(E)}{n(S)}$$

$$P(E^c) = 1 - P(E)$$

$$P(E|F) = \frac{P(E \cap F)}{P(F)}$$

$$P(E|F) \cdot P(F) = P(E \cap F)$$

$${}_n P_n = n(n-1)(n-2)\dots 3 \cdot 2 \cdot 1 = n!$$

$$\rightarrow {}_n P_r = \frac{n!}{(n-r)!}$$

$$P = \frac{n!}{r!s!t!}$$

$${}_n C_r = \binom{n}{r} = \frac{n!}{r!(n-r)!}$$

$$P(E \cup F) = P(E) + P(F) - P(E \cap F)$$

$$\rightarrow \mu_X = E[X] = x_1 p_1 + x_2 p_2 + \dots + x_n p_n$$

$10 P_3 = \text{factorial}(10)$
~~fact(7)~~

$$\rightarrow \sigma_x^2 = \text{Var}[X] = (x_1 - \mu_x)^2 p_1 + (x_2 - \mu_x)^2 p_2 + \dots + (x_n - \mu_x)^2 p_n$$

$$= \sum (x_i - \mu_x)^2 p_i$$

$$E[X+Y] = E[X] + E[Y]$$

$$\sigma_{x+y}^2 = \text{Var}[X+Y] = \text{Var}[X] + \text{Var}[Y]$$

$$E[X-Y] = E[X] - E[Y]$$

$$\sigma_{x-y}^2 = \text{Var}[X-Y] = \text{Var}[X] + \text{Var}[Y]$$

$$\mu = E[X] = np$$

$$\sigma^2 = np(1-p)$$

$$E[X] = \mu = \frac{1}{p}$$

$$\sigma^2 = \frac{1-p}{p^2}$$

$$\sigma_x^2 = \text{Var}[X] = E[X^2] - (E[X])^2$$

$$E[W] = E[aX + b] = aE[X] + b$$

$$\sigma_w^2 = \text{Var}[W] = \text{Var}[aX + b] = a^2 \text{Var}[X]$$

$$P(X = k) = \binom{n}{k} p^k (1-p)^{n-k}$$

$$P(X \geq k) = 1 - P(X \leq (k-1))$$

$$P(X = n) = (1-p)^{n-1} p$$

$$P(X > n) = (1-p)^n$$

What is the difference between a sample and a population?

↑
subset
of pop.

↑
everything or
every one we want to
know about

What is the difference between continuous and discrete random variables?



Quantitative

Categorical

Measures of center?

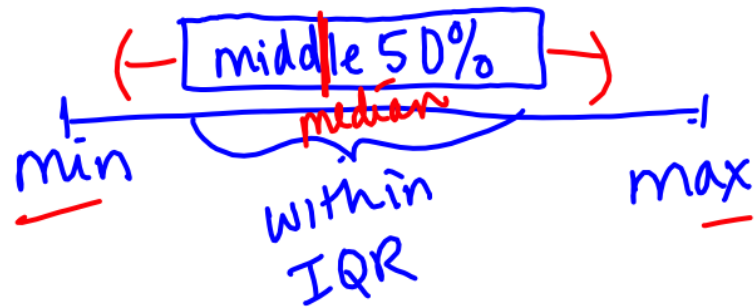
• mean, median, mode



Measures of spread?

range, IQR, s.d., var

What does it mean to be “resistant to outliers?”



IQR + median
are resist. to outliers

How do you find outlier boundaries?

$$Q1 - 1.5(IQR)$$

$$Q3 + 1.5(IQR)$$

Counting techniques –

What is the difference between combinations and permutations?

ABC
BAC

name of list = C (— , — , — , ...)

order matters

function(name of list)

sd
var
mean

if $E \cap F = \emptyset$ or $\{\}$ $\Rightarrow E$ & F Mutually Exclusive

Sets (intersections, unions, complements)

$$A = \{1, 2, 3\}$$

$$A \cap B = \{3\}$$

$$B = \{3, 4, 5\}$$

$$A \cup B = \{1, 2, 3, 4, 5\}$$

$$U \text{ or } S = \{1, 2, 3, 4, 5, 6\}$$

$$A^c \cap B = \{4, 5\}$$

Probability – What formula to use??

$$\frac{n(E)}{n(S)}$$

~~draw~~ 10 light bulbs 3 def.

picking 7

What's prob of at least one defective?

$$\frac{{}^3C_1 \cdot {}^7C_6 + {}^3C_2 \cdot {}^7C_5 + {}^3C_3 \cdot {}^7C_4}{10C_7}$$

Some extra examples:

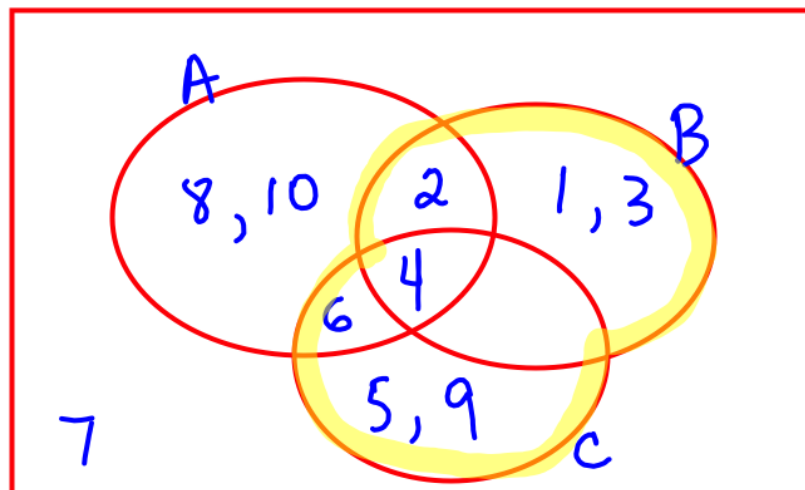
Given:

$$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$$

$$A = \{2, 4, 6, 8, 10\}$$

$$B = \{1, 2, 3, 4\}$$

$$C = \{4, 5, 6, 9\}$$



Find:

$$(B \cup C)^c = \{7, 8, 10\}$$

$$A \cap (B \cup C)^c = A \cap \{7, 8, 10\} = \{8, 10\}$$

$$(A^c \cap C)^c = \{1, 2, 3, 4, 6, 7, 8, 10\}$$

$A \cup C^c = \{1, 3, 5, 9, 7\} \cap \{4, 5, 6, 9\} = \{5, 9\}$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

Suppose $P(A) = 0.25$ and $P(B) = 0.30$. If events A and B are independent then,

$$P(A \cap B) = (.25)(.3) = .075$$

$$\Leftrightarrow P(A)P(B) = P(A \cap B)$$

$$P(A \cup B) = .25 + .3 - .075 = .475$$

$$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{.075}{.3} = .25$$

$$P(A|B) = P(A) \Rightarrow \text{independent}$$

A distribution of grades in an introductory statistics class (where A = 4, B = 3, etc) is:

	x^2	0	1	4	9	16
X		0	1	2	3	4
P(X)		.10	.15	.35	??	.05

$$.1 + .15 + .35 + x + .05 = 1$$

Find $P(X = 3) = .35$

Find $P(1 \leq X < 3) = .15 + .35 = .50$

$$E[X] = 0(.10) + 1(.15) + 2(.35) + 3(.35) + 4(.05) = 2.1$$

$$E[X^2] = 0(.1) + 1(.15) + 4(.35) + 9(.35) + 16(.05) = 5.5$$

$$\text{VAR}[X] = 5.5 - (2.1)^2 = 1.09$$

$$S_x = \sqrt{1.09}$$

Find the lowest grade X_0 such that $P(X \geq X_0) < 0.5$

$$x_0 = 3 \quad P(X \geq 4) = .05$$

$$\Rightarrow P(X \geq 3) = .35 + .05 = .4$$

$$P(X \geq 2) = .35 + .35 + .05 = .75$$

Have questions for me to work from the review sheet or practice test!!!!

Quiz 3

Question 3

A^c

The probability that a student correctly answers on the first try (the event A) is $P(A) = 0.3$. If the student answers incorrectly on the first try, the student is allowed a second try to correctly answer the question (the event B). The probability that the student answers correctly on the second try given that he answered incorrectly on the first try is 0.6. Find the probability that the student correctly answers the question on the first or second try.

$$P(A) = .3 \quad P(A^c) = .7$$

$$P(B|A^c) = .6$$

$$P(A) + P(B \cap A^c)$$

$$.3 + .42$$

$$.72$$

$$P(B|A^c) = \frac{P(B \cap A^c)}{P(A^c)}$$

$$.6 = \frac{P(B \cap A^c)}{.7}$$

$$.42 = P(B \cap A^c)$$

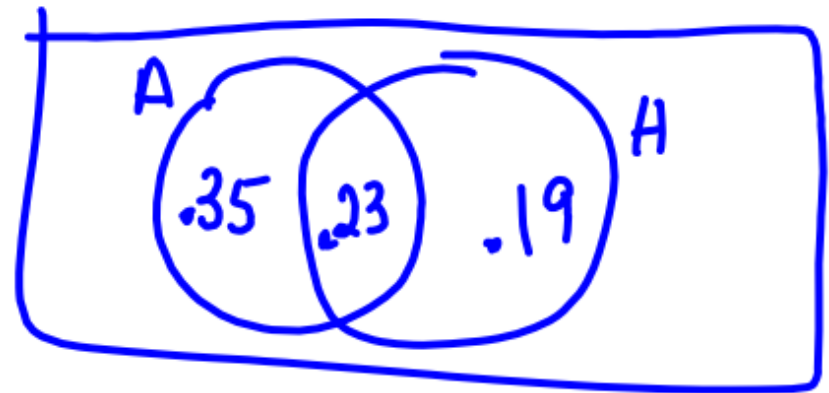
26. Suppose that 58% of all customers of a large insurance agency have automobile policies with the agency, 42% have homeowner's policies, and 23% have both. What is the probability that the customer has at least one of the policies?

$$P(A) = .58 \quad P(H) = .42 \quad P(A \cap H) = .23$$

$$P(A \cup H) = P(A) + P(H) - P(A \cap H)$$

↑
= .58 + .42 - .23 =

Auto or home or both



Question 7

Suppose you have a distribution, X , with mean = 29 and standard deviation = 6. Define a new random variable $Y = 4X - 5$. Find the mean and standard deviation of Y .

$$E[X] = \mu_x = 29$$

$$S_x = 6 \quad \text{VAR}[X] = 36$$

$$E[Y] = E[4X - 5] = 4E[X] - 5$$

$$\text{VAR}[Y] = 4^2 \text{VAR}[X] = 16 \cdot 36$$
$$4(29) - 5 =$$

$$S_y = 4 \cdot S_x = 4 \cdot 6 = 24$$

$$\text{VAR}[aX + b] = a^2 \text{VAR}[X]$$

$$S_{(aX+b)} = a S_x$$

Popper 05

1. The test scores of a class of 20 students have a mean grade of 71.6 and the test scores of another class with 14 students has a mean grade of 78.4. What is the mean of the combined group?
 - a. 74.4
 - b. 75
 - c. 71.6
 - d. 78.4
 - e. none of these

Popper 05

2. If a constant value is added to all data in a sample, the new variance
 - a. will be unchanged
 - b. will be equal to the old variance plus the constant value.
 - c. will be equal to the old variance plus the square of the constant value.
 - d. none of these

3. In how many ways can you select from 7 people, 3 to serve on a committee?
 - a. 35
 - b. 24
 - c. 56
 - d. 5040
 - e. none of these

4. In testing a new drug, researchers found that 6% of all patients using it will have a mild side effect. A random sample of 11 patients using the drug is selected. Find the probability that none will have this mild side effect.

← .06

$n = 11$

$P(X = 0)$

- a. 0.3063
- b. 0.9400
- c. 0.4937
- d. 0.0609
- e. 0.5063

5. Suppose you have a binomial distribution with $n = 20$ and $p = 0.4$. Find $P(8 \leq X \leq 12)$.

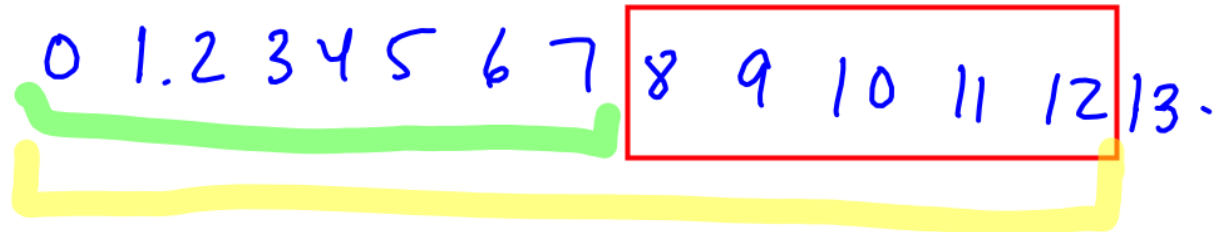
a. 0.3834

b. 0.5955

c. 0.9790

d. 0.5631

e. 0.9400



$$\underline{P(x \leq 12)} - \underline{P(x \leq 7)}$$

$$\text{binomcdf}(20, .4, 12) - \text{binomcdf}(20, .4, 7)$$

6. Which of the following is true?

a. Binomial has a set number of trials

b. Binomial has only success or fail

c. Geometric has only success or fail

d. Geometric does not have a set number of trials (we are looking for first success)

e. All of the above are true

7. Joe has an 50% $p = .5$ probability of passing his statistics quiz 4 each time he takes it. What is the probability he will take no more than 5 tries to pass it?

a. 0.9844

b. 0.0156

c. 0.9688

d. 0.0034

e. none of these

$$P(X \leq 5) = \text{geomet cdf}(.5, 5)$$

p geom