MATH 1342

Test Review 1

24 multiple choice questions

$\text{stnd dev} = \sqrt{\text{variance}}$

$\text{variance} = (\text{stnd dev})^2$

Terms and Vocabulary;
Sample vs. Population
Discrete vs. Continuous
Standard Deviation vs. Variance
Combination vs. Permutation
Mean vs. Median vs. Mode
Reactivity to Outliers

Describe the variable as Categorical or Quantitative. If quantitative, is it discrete or continuous?

a. Someone's political preference

Categorical (non-numeric)

b. How many siblings someone has

Quantitative (numeric), discrete

c. What color eyes someone has

Categorical

d. Someone's weight

Quantitative, continuous

Fifteen people were asked how many cars were registered to their household. The results were: 2, 3, 5, 2, 0, 2, 1, 1, 3, 2, 4, 2, 2, 3, 1 *

a. Give the mean, median, mode

2.2, 2, 2

b. Give the lower and upper quartile

1.5 3

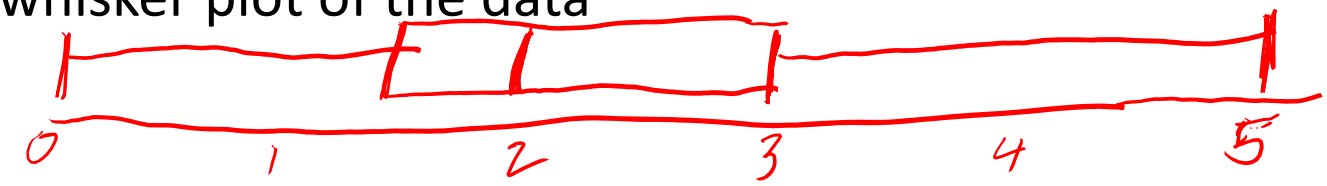
c. Give the range and interquartile range

5 1.5

d. Determine the interval for outliers (No outliers)

Larger than 5.25, or less than −0.75

e. Sketch a box and whisker plot of the data



```
> assign("x",c(2,3,5,2,0,2,1,1,3,2,4,2,2,3,1))
> length(x)
[1] 15
> mean(x)
[1] 2.2
> median(x)
[1] 2
> sort(x)
 [1] 0 1 1 1 2 2 2 2 2 2 3 3 3 4 5
```

Max - Min

```
> 5-0
[1] 5
> IQR=3-1.5
> IQR
[1] 1.5
```

$Q_3 - Q_1$

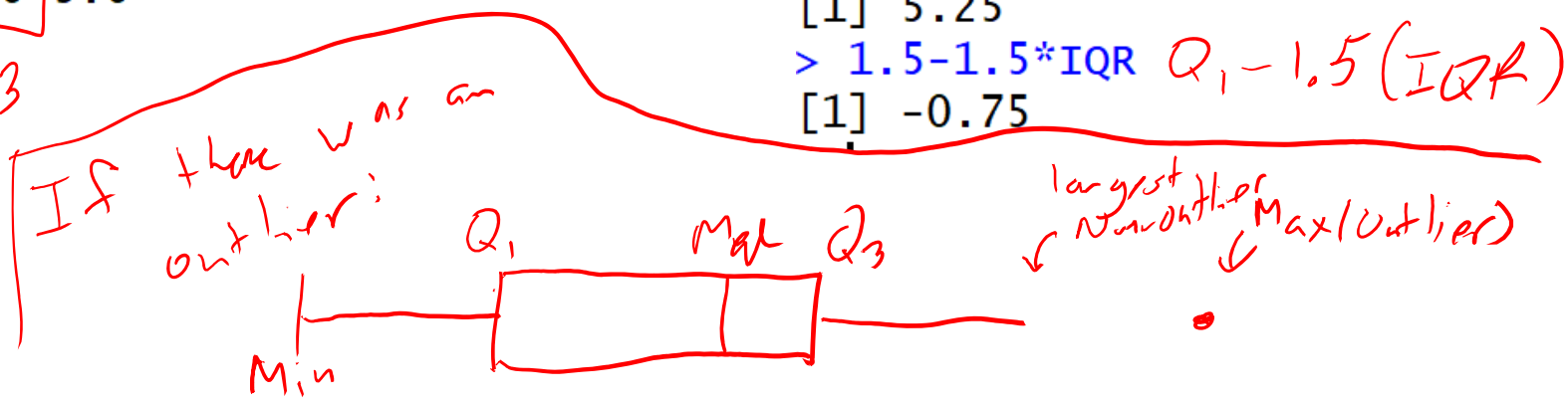
```
> fivenum(x)
[1] 0.0 1.5 2.0 3.0 5.0
```

Q_1 Q_3

```
> 3+1.5*IQR
[1] 5.25
> 1.5-1.5*IQR
[1] -0.75
```

$Q_3 + 1.5(IQR)$

$Q_1 - 1.5(IQR)$



You are dealt a 7 card hand from a standard deck of 52 cards

a. How many total hands are possible? $_{52}C_7$
b. How many hands are possible containing 3 clubs and 4 diamonds? $_{13}C_3 \cdot {}_{13}C_4$
c. What is the probability of selecting a hand with 3 clubs and 4 diamonds? Part b / Part a

a)
```
> choose(52,7)
[1] 133784560
```

b)
```
> choose(13,3)*choose(13,4)
[1] 204490
```

c)
```
> 204490/133784560
[1] 0.001528502
```

How many different ways can the letters of "REGISTER" be arranged?

R : 2
E : 2
G : 1
I : 1
S : 1
T : 1

Total: 8

$$\frac{n!}{r!s!t!u!}$$

$$\frac{8!}{(2!)(2!)(1!)(1!)(1!)(1!)}$$

$(1!)(1!)(1!)(1!) = 1$

$$\frac{8!}{2! \cdot 2!}$$

```
> factorial(8)/(factorial(2)*factorial(2))
[1] 10080
```

For the following:

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

A = {1, 3, 5, 7, 9}

B = {1, 2, 3, 4, 5}

C = {3, 6, 9}

$C^c = \{1, 2, 4, 5, 7, 8, 10\}$

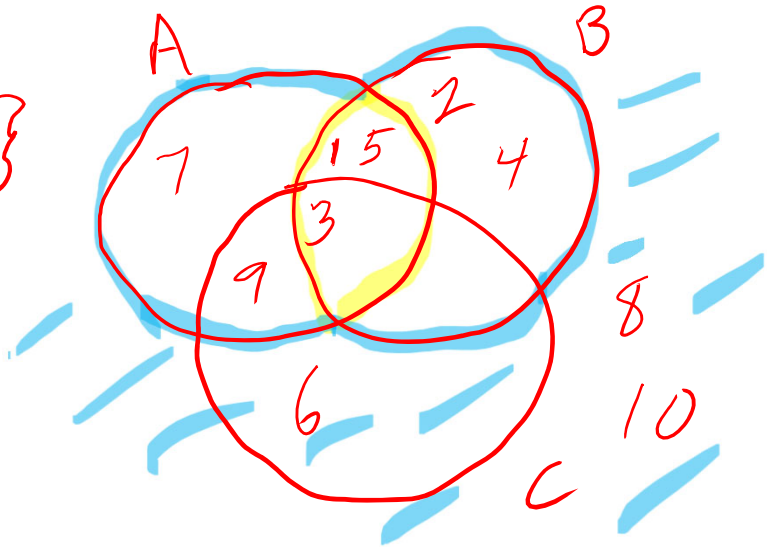
$A \cup B = \{1, 2, 3, 4, 5, 7, 9\}$

a. Find A ∩ B $= \{1, 3, 5\}$ overlap

b. Find C^c U A $= \{1, 2, 3, 4, 5, 7, 8, 9, 10\}$ Not C or A

c. Find $(A \cup B)^c = \{6, 8, 10\}$

d. Draw a Venn Diagram of the information



In a certain town, 50% of people have pets, 80% have children, and 45% of people both.
What percent of people either have pets or children?

→ union

$$P(P \cup C) = P(P) + P(C) - P(P \cap C)$$

$$= .50 + .80 - .45$$

$$= .85$$

$P(A) = 0.35,\ P(B) = 0.56,\ P(A \cup B) = 0.62$ *

a. Find $P(A \cap B)$ = .29

b. Find $P(A|B)$ = $\frac{P(A \cap B)}{P(B)} = \frac{.29}{.56}$ = .5179

c. Find $P(B|A)$ = $\frac{P(A \cap B)}{P(A)} = \frac{.29}{.35}$ = .8286

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

$.62 = .35 + .56 - x$

$.62 = .91 - x$

$-.29 = -x \rightarrow x = .29$

d. Are A and B independent events? No

$P(A) = P(A|B) \rightarrow .35 \neq .5179$

A company sells markers in sets of 1, 2, 5, or 10. * The probability of selling out of each type is given by:

X	1	2	5	10
P(X)	0.4	0.2	??	0.1

a. Find P(X = 5)

```
> 1-(0.4+0.2+0.1)
1] 0.3
```

0.3

```
> assign("x",c(1,2,5,10))
> assign("p",c(0.4,0.2,0.3,0.1))
> sum(x*p)
[1] 3.3
> sum(x^2*p)-sum(x*p)^2
[1] 7.81
> sqrt(7.81)
[1] 2.794638
```

b. Find the mean and standard deviation of markers sold out.

3.3 2.795

c. A manufactures promotion changes the number of markers sold in each package, according to formula Y = 2X – 1. Find the mean and standard deviation for selling out with this promotion.

Mean: $2(3.3)-1 = 5.6$ Stnd dev: $2(2.795) \approx 5.59$

The following table displays the results of a sample of 99 in which the subjects indicated their favorite sport of three listed. The data are organized by favorite sport and age group.

Age	Football	Baseball	Soccer
Over 40	15	8	7
20 – 40	20	11	15
Under 20	8	7	8

What is the probability that someone selection at random will prefer Soccer given that the person is under 20 years old?

$$P(S \mid <20) = \frac{\text{overlap}}{(<20)} = \frac{8}{8+7+8} = .3478$$

The probability of a person having 0, 1, 2, 3, 4, or 5 children is given by (respectively): 0.2, 0.35, 0.2, 0.05, 0.1, and 0.1. *

a. Construct the probability distribution table

X	0	1	2	3	4	5
P	.2	.35	.2	.05	.1	.1

b. Determine P(X > 3)

$P(X=4) + P(X=5) = .1 + .1 = .2$

c. Determine P(1 ≤ X ≤ 3)

$P(X=1) + P(X=2) + P(X=3) = .35 + .2 + .5 = .6$

d. Determine P(X < 4)

$P(X=0) + P(X=1) + P(X=2) + P(X=3) = .2 + .35 + .2 + .05 = .8$

e. What is the expected number of children from this data?

```
> sum(x*p)
[1] 1.8
```

In a study, it was determined that 20% of people will need corrective glasses before the age of 30. To test this theory, a sample of 200 thirty-year-olds are selected.

a. Is this distribution Binomial or Geometric?
b. Calculate the mean and standard deviation of this distribution.
c. Determine the probability that exactly 45 people need glasses.
d. Determine the probability that between 20 and 50 people (inclusive) will need glasses.

$n = 200$
$p = .20$

b)
```
> 200*.20
[1] 40
> 200*.20*(1-.20)
[1] 32
> sqrt(32)
[1] 5.656854
```
mean
standard deviation

c)
```
> dbinom(45,200,0.20)
[1] 0.04614416
```

d)
```
pbinom(50,200,0.20)-pbinom(19,200,0.20)
1] 0.9654582
```
[x=0 to 50] minus [x=0 to 19]

At a carnival, it is 35% likely for someone to "hit the bell" with the hammer game. You want to see how many people in line will swing the hammer before someone hits the bell.

a. Is this distribution Binomial or Geometric?

$p = .35$
n unknown

b. What is the probability that the first person to hit the bell will be the fifth person in line?

$n = 5$

```
> dgeom(5-1,0.35)
1] 0.06247719
```

c. Which person in line can we expect to hit the bell first?

$\mu = \frac{1}{p}$

```
> 1/.35
1] 2.857143
```

d. Determine the probability it will take more than 2 people trying before someone hits the bell.

$x = 3, 4, 5, 6 \ldots$

```
> 1-pgeom(2-1,0.35)
1] 0.4225
```

Popper 07:

Fill out answer choice B for Questions 1 – 5.