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MSDA Math Workshop
Weekly Assignment #3

2.34 Card Game

Draw a red card, you win nothing
Get a spade, win $5
For any club, win $10
Draw an ace of clubs, win an extra $20

a)

Event	X	P(X)	X * P(X)	x - E(X)	(x - E(X))²
Draw a spade	5	13/52 = 0.25	1.25	0.87	0.7569
Draw a club	10	12/52 = 0.23	2.3	5.87	34.4569
Draw an ace of clubs	30	1/52 = 0.019	0.576	25.87	669.2569
everything else	0	1 - (26/52) = .5	0	-4.13	17.0569
			E(X) = 4.13		

X	5	10	30	0
P(X)	0.25	0.23	0.019	0.5

E(X) = 5*0.25 + 10*0.23 + 30*0.019 + 0*0.5 = 4.13
V(X) = (5 - 4.13)²*0.25 + (10 - 4.13)²*0.23 + (30 - 4.3)²*0.019 + (0 - 4.13)²*0.5 = 29.35
SD(X) = SQRT(29.358) = 5.41

Expected winnings for a single game = $4.13
Standard deviation = 5.41

b) I would pay no more than $4.13 per game because you will lose money if you play with anything h

2.40 Baggage fees

$25 for the first bag
$35 for the second bag

54% of passengers cheeck no bags
34% of passengers check 1 bag
12% of passengers check 2 bags

a)

X	P(X)	X * P(X)	x - E(X)	(x - E(X))²	(x - E(X))² * P(X)
0	0.54	0	-15.7	246.49	133.1046
25	0.34	8.5	9.3	86.49	29.4066
60	0.12	7.2	44.3	1962.49	235.4988

E(X) = 15.7 **V(X) = 398.01**
SD(X) = 19.95

X	0	25	60
P(X)	0.54	0.34	0.12

E(X) = 0*.54 + 25*0.34 + 60 * 0.12 = 15.7
V(X) = (0 - 15.7)² * 0.54 + (25 - 15.7)² * 0.34 + (60 - 12.7)² * 0.12 = 398.01
SD(X) = SQRT(398.01) = 19.95

average revenue per passenger = $15.7
standard deviation = 19.95

b) Revenue for a flight of 120 passengers: 120 * $15.7 = **$1884**

With what standard deviation?
V(X) = (0 - 1884)² * 0.54 + (25 - 1884)² * 0.34 + (35 - 1884)² * 0.12
V(X) = 1916706.24 + 1174999.54 + 410256.12 = 3501961
SD(X) = SQRT(3501961) = 1871

2.42 Selling on Ebay

Tracking two items on Ebay
1. a textbook that sells for an avg of $110 with a standard deviation of $4
2. Mario Kart for Wii which sells for $38 with a standard deviation of $5

a)

How much net money should she expect?
Expected value = $110 - $38 = $72 **Marcie will expect to spend $72**

Variance = 4² + 5² = 41
Standard Deviation = 6.40

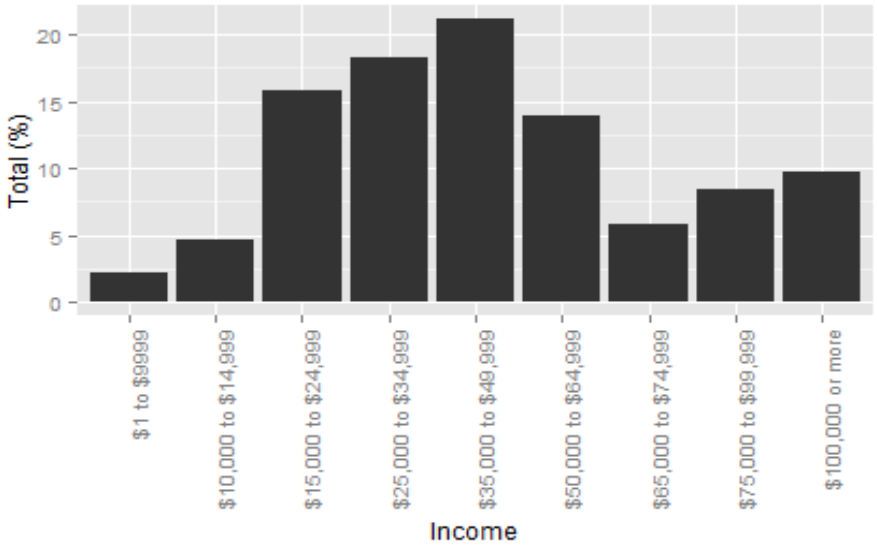
b) How much money should she expect to make selling the text book at a 10% commission?
Expected value = $110 * 0.10 = **$11**

Assuming standard deviation of expected earnings would be 10% of the textbook's std deviation c
=$4 * 0.1 = **.4**

2.46 Income and gender

a) Using R to Plot the data:

```
Income <- c('$1 to $9999',
            '$10,000 to $14,999',
            '$15,000 to $24,999',
            '$25,000 to $34,999',
            '$35,000 to $49,999',
            '$50,000 to $64,999',
            '$65,000 to $74,999',
            '$75,000 to $99,999',
            '$100,000 or more')

Total <- c(2.2, 4.7, 15.8, 18.3, 21.2, 13.9, 5.8, 8.4, 9.7)
Income.Range.Start <- c(1, 10000, 15000, 25000, 35000, 50000, 65000,
75000, 100000)

df <- data.frame(Income, Total, Income.Range.Start)

require (ggplot2)

df$Income <- factor(df$Income , levels=unique(df$Income ))

q <- qplot(df$Income, df$Total, geom="bar", stat="identity",
xlab="Income", ylab="Total (%)")

q + theme(axis.text.x = element_text(angle = 90, hjust = 1))
```



In the graph above, we do not see normal distribution of income. There is skew towards the right

b) Probability that a US resident makes less than $50,000 per year

P(<50k) = 2.2 + 4.7 + 15.8 + 18.3 + 21.2 = 62.2%

Using R:

```
colSums(subset(df, Income.Range.Start < 50000, select = Total))/100
> colSums(subset(df, Income.Range.Start < 50000, select =
Total))/100
Total
0.622
```

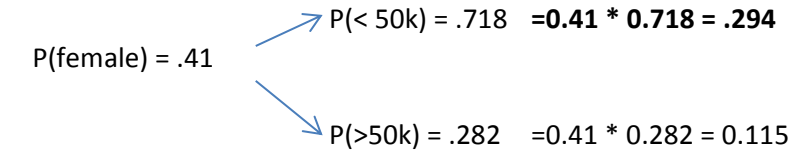
c) P(<50k and female) = P(<50k) * P(female) = .622 * .41 = .255

Assumes that this data is representative in that both men and women are equally included in the

Using R:

```
colSums(subset(df, Income.Range.Start < 50000, select = Total))/100 * 0.41

> colSums(subset(df, Income.Range.Start < 50000, select =
Total))/100 * 0.41
 Total
0.25502
```

d)



I wasn't sure which way to go with this one so I created a tree diagram starting with the probability of being a female then the two branches -- 1) income less than $50,00 and 2) income greater than $50,000. The probability of a being a woman with a salary of less than $50k is .294 which is fairly close to the answer c -- .255

$(x - E(X))^2 * P(X)$
0.189225
7.925087
12.7158811
8.52845

V(X)=29.358

SD(X) = 5.41

higher than this amount

of $4

data, receiving documented salaries.