

Keith Folsom
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 e

a)

Event	X	P(X)	X * P(X)	x - E(X)	(x - E(X)) ²	(x - E(X)) ² * P(X)
Draw a spade	5	13/52 = 0.25	1.25	0.87	0.7569	0.189225
Draw a club	10	12/52 = 0.23	2.3	5.87	34.4569	7.925087
Draw an ace of clubs	30	1/52 = 0.019	0.576	25.87	669.2569	12.7158811
everything else	0	1 - (26/52) = .5	0	-4.13	17.0569	8.52845

$$E(X) = 4.13$$

$$V(X) = 29.358$$

$$SD(X) = 5.41$$

X	5	10	30	0
P(X)	0.3	0.23	0.019	0.5

$$E(X) = 5*0.25 + 10*0.23 + 30*0.019 + 0*0.5 =$$

$$V(X) = (5 - 4.13)^2*0.25 + (10 - 4.13)^2*0.23 + (30 - 4.3)^2*0.019 + (0 - 4.13)^2*0.5 = 29.35$$

$$SD(X) = \text{SQRT}(29.358) = 5.41$$

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 higher

2.40 Baggage fees

\$25 for the first bag

\$35 for the second bag

54% of passengers check 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	-12.7	161.29	87.0966
25	0.34	8.5	12.3	151.29	51.4386
35	0.12	4.2	22.3	497.29	59.6748

$$E(X) = 12.7$$

$$V(X) = 198.21$$

$$SD(X) = 14.07$$

X	0	25	35
P(X)	0.5	0.34	0.12

$$E(X) = 0 \cdot 0.54 + 25 \cdot 0.34 + 35 \cdot 0.12 = 12.7$$

$$V(X) = (0 - 12.7)^2 \cdot 0.54 + (25 - 12.7)^2 \cdot 0.34 +$$

$$SD(X) = \sqrt{198.21} = 14.07$$

average revenue per passenger = \$12.7

standard deviation = 14.07

b) Revenue for a flight of 120 passengers: $120 \cdot \$12.7 = \mathbf{\$1524}$

With what standard deviation?

$$V(X) = (0 - 1524)^2 \cdot 0.54 + (25 - 1524)^2 \cdot 0.34$$

$$V(X) = 1254191 + 763980 + 266054 = 2284225$$

$$SD(X) = \sqrt{2284225} = 1511$$

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 = **Marcie will expect to spend \$72**

$$\text{Variance} = 4^2 + 5^2 = 41$$

$$\text{Standard Deviation} = 6.40$$

b) How much money should she expect to make selling the text book at a 10% commission?

Expected value = \$110 * 0.10 :

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

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')
```

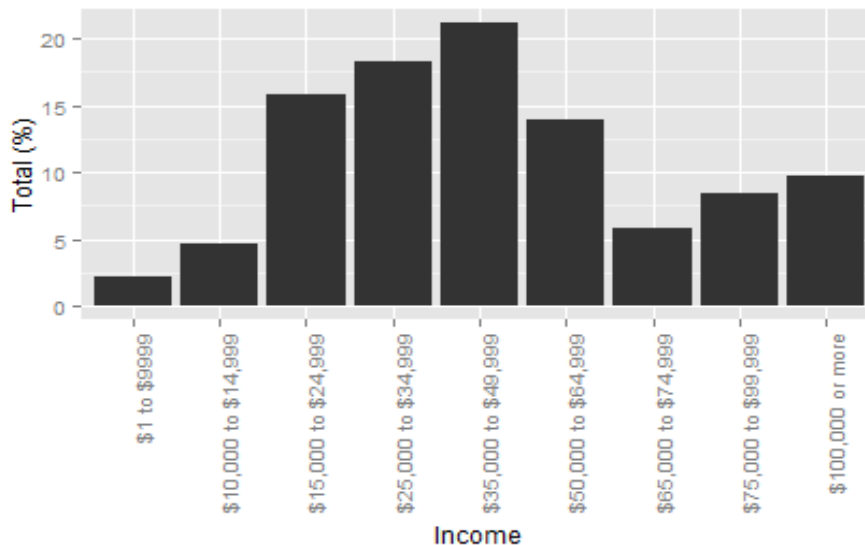
```
Total <- c(2.2, 4.7, 15.8, 18.3, 21.2, 13.9, 5.8, 8.4, 9.7)  
Income.Range.Start <- c(1, 10000, 15000, 25000, 35000,  
                        50000, 65000, 75000, 100000)
```

```
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 (%)")
```



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 = 1
> colSums(subset(df, Income.Range.Start <
50000, select = Total))/100
Total
0.622
```

c) $P(<50k \text{ and female}) = P(<50k) * P(\text{female}) = .622 * .41 = .255$

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

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)

$P(\text{female}) = .41$

$P(< 50k | \text{female}) = 0.41 * 0.718 = .294$

$P(> 50k | \text{female}) = 0.41 * 0.282 = 0.115$

her than this amount

\$4

ita, receiving documented salaries.