Mental Accounting in College: Students and 'Free Money'

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Spring Semester Dates Campus Open: 1/20/19, Start: 1/22/19, End: 5/8/19, Campus Closed: 5/20/19

Fall Semester Dates Campus Open: 8/31/19 Start: 9/3/19, End: 12/11/19, Campus Closed: 12/21/19

```
flex_data <- read_csv("flex_data.csv")
flex_data <- flex_data %>% mutate(Time = mdy_hm(Time)) %>% mutate(Week = epiweek(Time)) %>% rename(Amoun
flex_data <- flex_data %>% filter(Time >= '2019-01-20' & Time <= '2019-12-19') %>%  filter(AmountSpent

#Graph adjustments
theme_update(text = element_text(size=20))
theme_update(plot.title = element_text(hjust = 0.5))

#Transactions by week
springtrans <- flex_data %>% filter(Time <= '2019-5-19') %>% mutate(Week = Week-3) %>% filter(Week!=1 &
falltrans <- flex_data %>% filter(Time >= '2019-9-1') %>% mutate (Week = Week-35) %>% filter(Week!=1 & W

springtransactions <- springtrans %>% group_by(Week) %>% summarize(Transactions = n()) %>% rbind(c(1,0)
falltransactions <- falltrans %>% group_by(Week) %>% summarize(Transactions = n()) %>% rbind(c(1, 0), c

ggplot(springtransactions) + geom_bar(aes(x=Week, y=Transactions), stat='identity', fill = "navy", colo
```
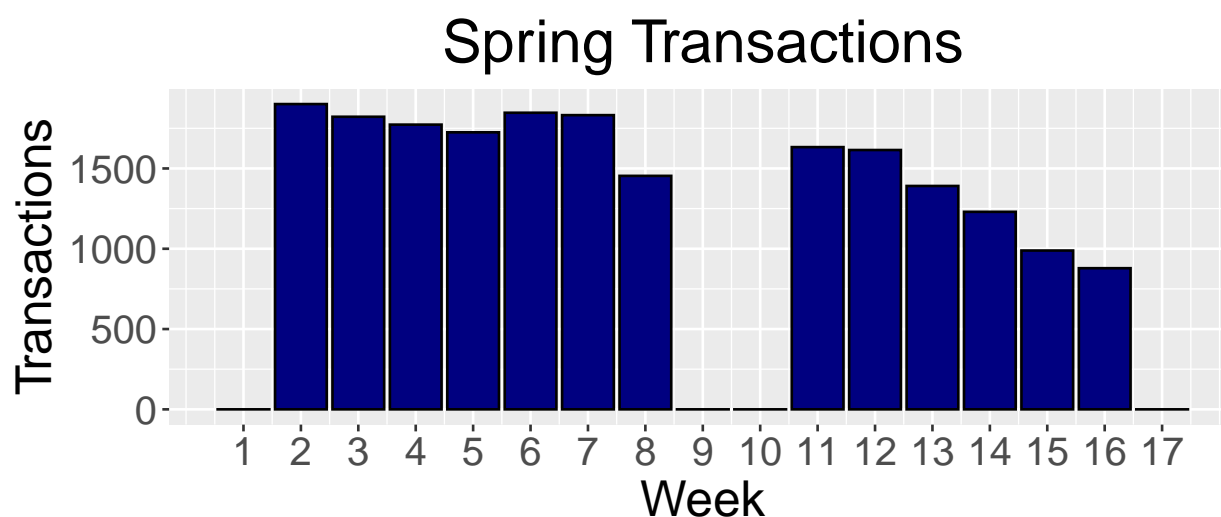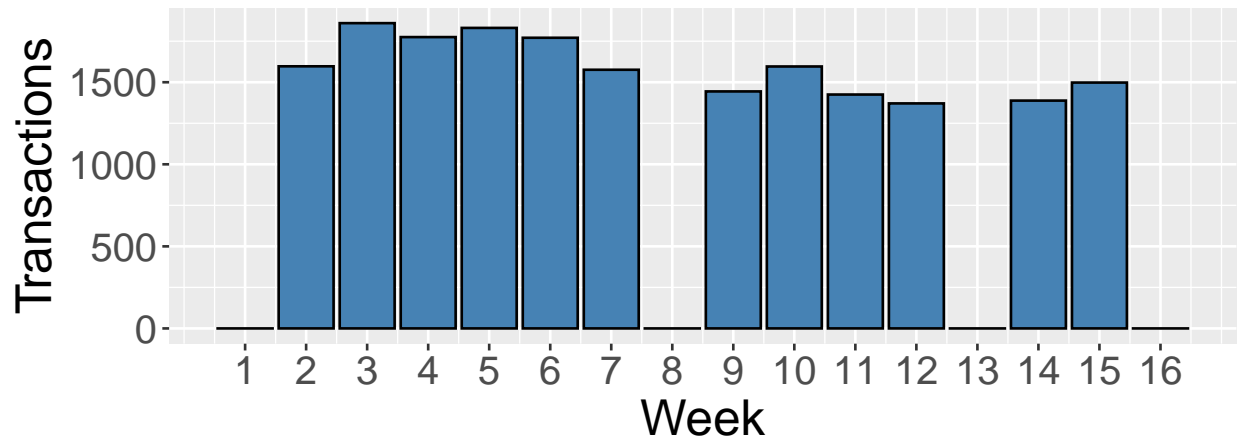


```
ggplot(falltransactions) + geom_bar(aes(x=Week, y=Transactions), stat='identity', fill = "steelblue", co
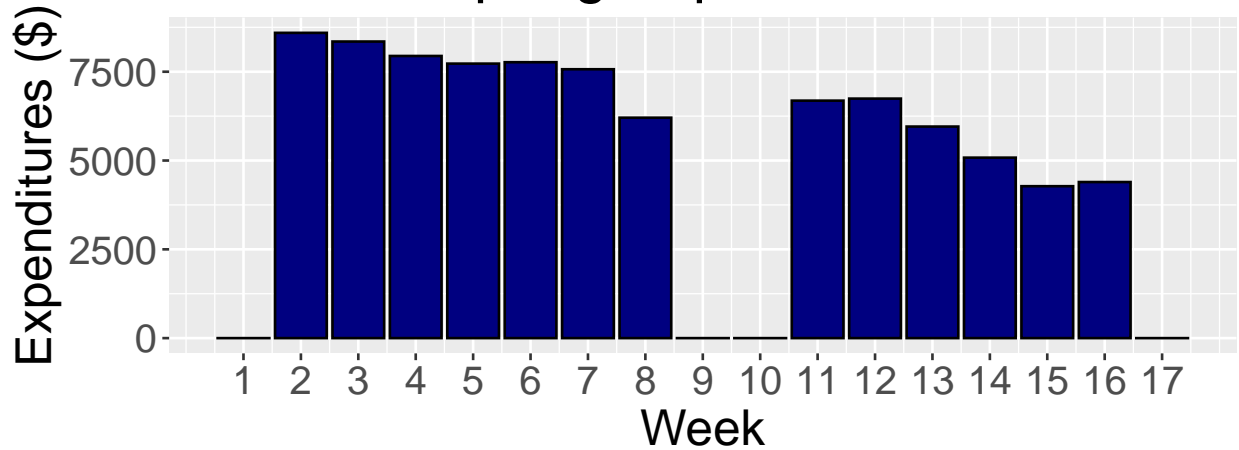```

# Fall Transactions
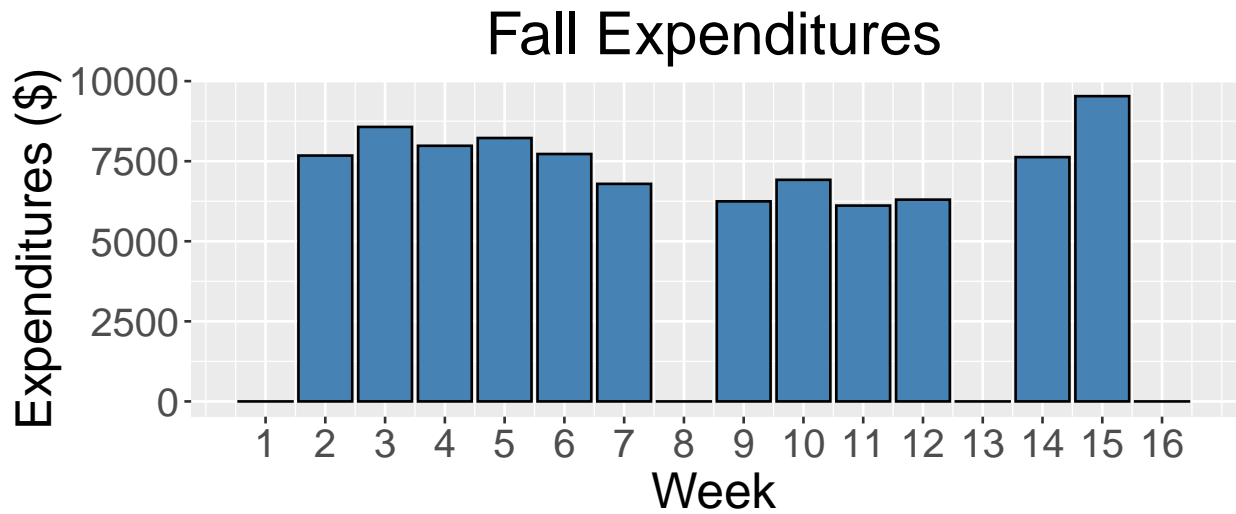


```r
#Purchases by week
springpurchases <- springtrans %>% group_by(Week) %>% summarize(TotalPurch = sum(AmountSpent)) %>% rbind
fallpurchases <- falltrans %>% group_by(Week) %>% summarize(TotalPurch = sum(AmountSpent)) %>% rbind(c(

ggplot(springpurchases) + geom_bar(aes(x=Week, y=TotalPurch), stat='identity', fill = "navy", color = "
```
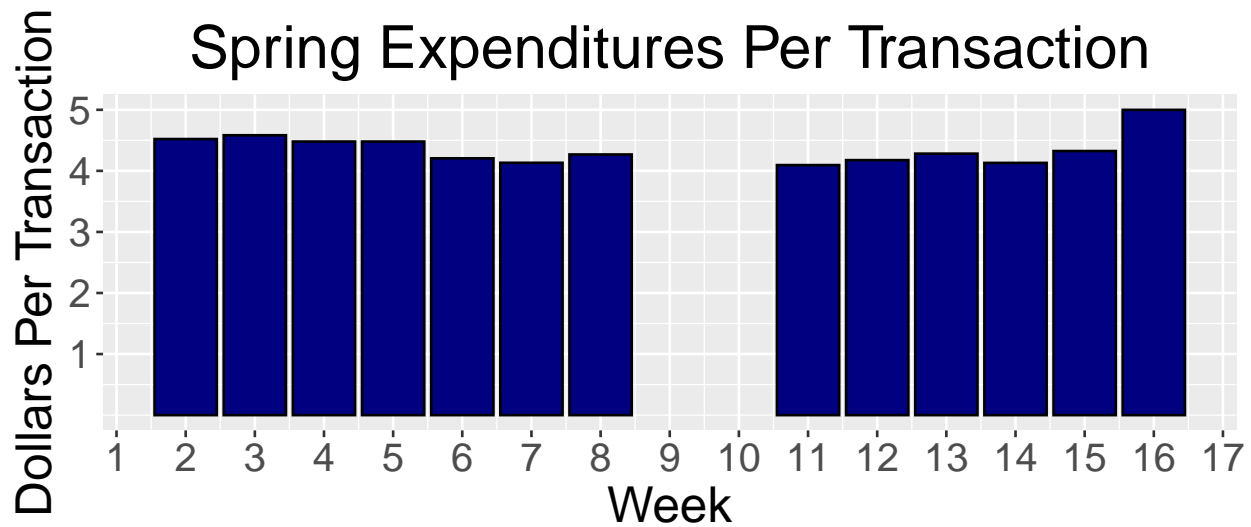
Spring Expenditures


```r
ggplot(fallpurchases) + geom_bar(aes(x=Week, y=TotalPurch), stat='identity', fill = "steelblue", color =
```

Fall Expenditures


```
#Amount Spent Per Transaction
springppt <- springtrans %>% group_by(Week) %>% summarize(TotalTrans = n(), TotalPurch = sum(AmountSpent
fallppt <- falltrans %>% group_by(Week) %>% summarize(TotalTrans = n(), TotalPurch = sum(AmountSpent)) %

ggplot(springppt) + geom_bar(aes(x=Week, y=PPT), stat='identity', fill = "navy", color = "black") + ggt
```

Spring Expenditures Per Transaction


```
ggplot(fallppt) + geom_bar(aes(x=Week, y=PPT), stat='identity', fill = "steelblue", color = "black") + g
```

Fall Expenditures Per Transaction

```r
#Creation of consistent null dataframes

sprnullconsistent <- data.frame("Week"=1:17, "Transactions"= c(0,sum(springppt$TotalTrans)/13,sum(spring

#sprnullconsistentprob <- data.frame("Week"=1:17, "Probability"=c(0,1/13,1/13,1/13,1/13,1/13,1/13,

fallnullconsistent <- data.frame("Week"=1:16, "Transactions"= c(0,sum(fallppt$TotalTrans)/12,sum(fallppt

#fallnullconsistentprob <- data.frame("Week"=1:16, "Probability"=c(0,1/12,1/12,1/12,1/12,1/12,1/12,0,1/

ggplot(sprnullconsistent) + geom_bar(aes(x=Week, y=Transactions), stat='identity', fill = "navy", color
```


Consistent Null: Spring Transactions

```r
ggplot(sprnullconsistent) + geom_bar(aes(x=Week, y=Purchases), stat='identity', fill = "navy", color =
```
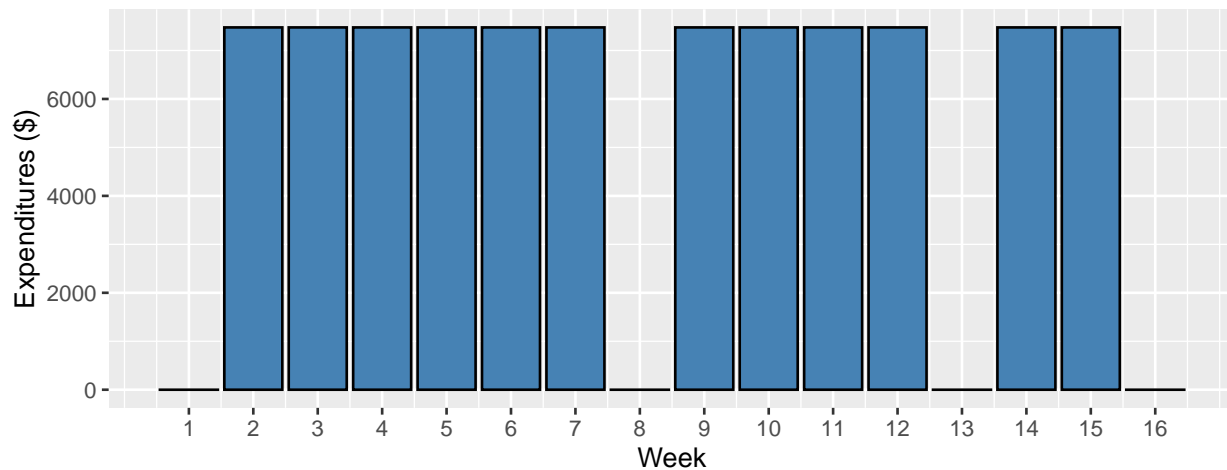
Consistent Null: Spring Expenditures


```
ggplot(fallnullconsistent) + geom_bar(aes(x=Week, y=Transactions), stat='identity', fill = "steelblue",
```

Consistent Null: Fall Transactions
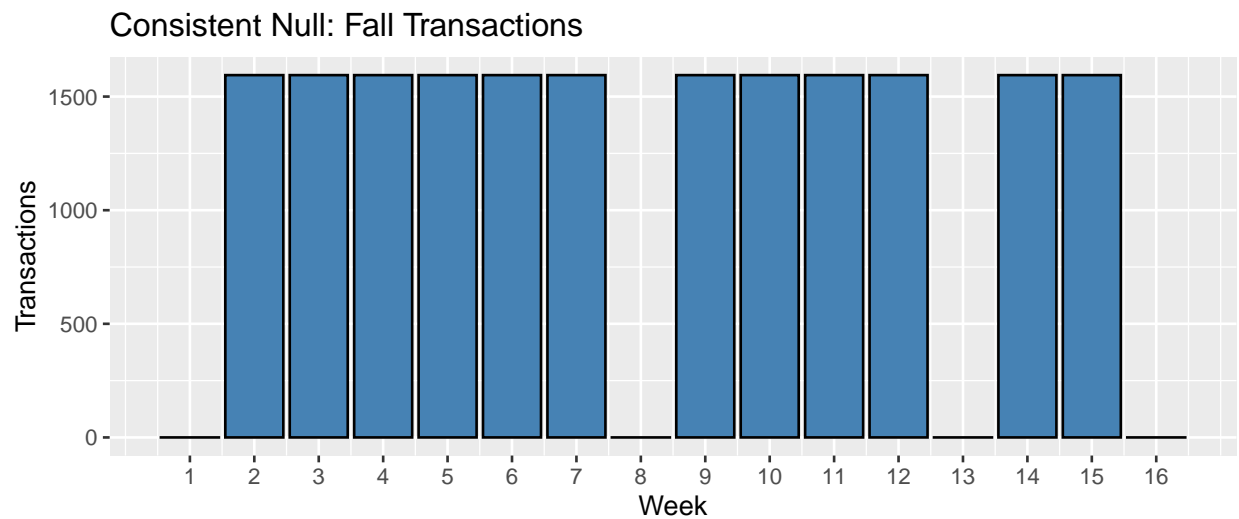

```
ggplot(fallnullconsistent) + geom_bar(aes(x=Week, y=Purchases), stat='identity', fill = "steelblue", co
```

Consistent Null: Fall Expenditures


```
#285/518=55.02% of students believe they spend consistently (1/3 beginning, 1/3 middle, 1/3 end)
#86/518=16.60% of students believe they spend most in beginning (1/2 beginning, 1/3 middle, 1/6 end)
#147/518=28.38% of students believe they spend most at end (1/6 beginning, 1/3 middle, 1/2 end)

#Tested - Sums of spring/fall weighted expectation nulls add up to sum of purchases/transactions from s
#Note - each period represents total spending expected during that period, then divided by number of we

p1springtrans <- (.5502*sum(springppt$TotalTrans)*(1/3) + .1660*sum(springppt$TotalTrans)*(1/2) + .2838
p2springtrans <- (.5502*sum(springppt$TotalTrans)*(1/3) + .1660*sum(springppt$TotalTrans)*(1/3) + .2838
p3springtrans <- (.5502*sum(springppt$TotalTrans)*(1/3) + .1660*sum(springppt$TotalTrans)*(1/6) + .2838

p1springpurch <- (.5502*sum(springppt$TotalPurch)*(1/3) + .1660*sum(springppt$TotalPurch)*(1/2) + .2838
p2springpurch <- (.5502*sum(springppt$TotalPurch)*(1/3) + .1660*sum(springppt$TotalPurch)*(1/3) + .2838
p3springpurch <- (.5502*sum(springppt$TotalPurch)*(1/3) + .1660*sum(springppt$TotalPurch)*(1/6) + .2838

p1springprob <- (.5502*(1/3) + .1660*(1/2) + .2838*(1/6))*.913
p2springprob <- (.5502*(1/3) + .1660*(1/3) + .2838*(1/3))*1.174
p3springprob <- (.5502*(1/3) + .1660*(1/6) + .2838*(1/2))*.913

sprnullweighted <- data.frame("Week"=1:17, "Transactions"= c(0,p1springtrans/4,p1springtrans/4,p1spring

#sprnullweightedprob <- data.frame("Week"=1:17, "Probability"= c(0,p1springprob/4,p1springprob/4,p1spri

p1falltrans <- .5502*sum(fallppt$TotalTrans)*(1/3) + .1660*sum(fallppt$TotalTrans)*(1/2) + .2838*sum(fal
p2falltrans <- .5502*sum(fallppt$TotalTrans)*(1/3) + .1660*sum(fallppt$TotalTrans)*(1/3) + .2838*sum(fal
p3falltrans <- .5502*sum(fallppt$TotalTrans)*(1/3) + .1660*sum(fallppt$TotalTrans)*(1/6) + .2838*sum(fal

p1fallpurch <- .5502*sum(fallppt$TotalPurch)*(1/3) + .1660*sum(fallppt$TotalPurch)*(1/2) + .2838*sum(fal
p2fallpurch <- .5502*sum(fallppt$TotalPurch)*(1/3) + .1660*sum(fallppt$TotalPurch)*(1/3) + .2838*sum(fal
p3fallpurch <- .5502*sum(fallppt$TotalPurch)*(1/3) + .1660*sum(fallppt$TotalPurch)*(1/6) + .2838*sum(fal

p1fallprob <- .5502*(1/3) + .1660*(1/2) + .2838*(1/6)
p2fallprob <- .5502*(1/3) + .1660*(1/3) + .2838*(1/3)
p3fallprob <- .5502*(1/3) + .1660*(1/6) + .2838*(1/2)

fallnullweighted <- data.frame("Week"=1:16, "Transactions"= c(0,p1falltrans/4,p1falltrans/4,p1falltrans,
```

```r
#fallnullweightedprob <- data.frame("Week"=1:16, "Probability"= c(0,p1fallprob/4,p1fallprob/4,p1fallpro
ggplot(sprnullweighted) + geom_bar(aes(x=Week, y=Transactions), stat='identity', fill = "navy", color =
```

Weighted Null: Spring Transactions
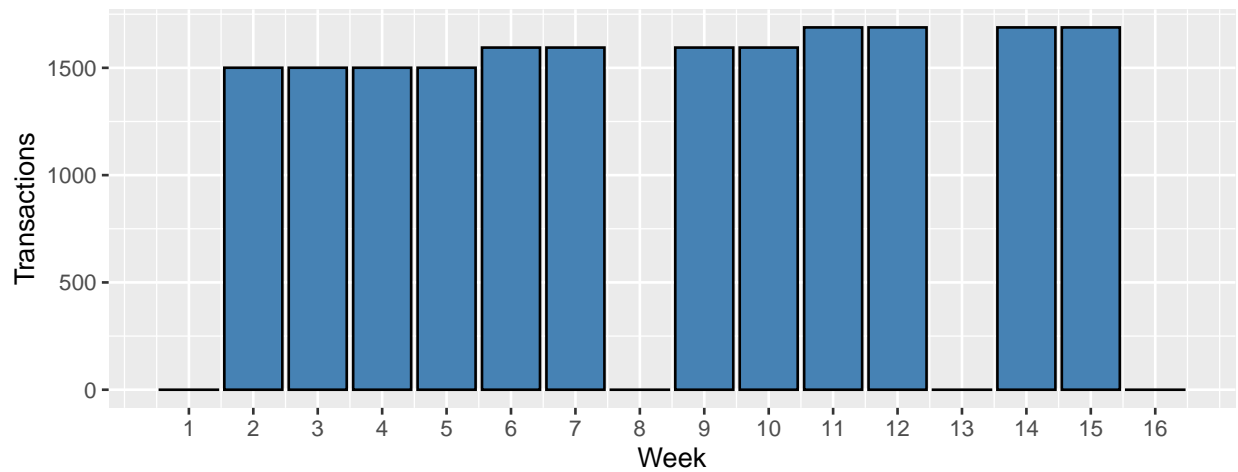


```r
ggplot(sprnullweighted) + geom_bar(aes(x=Week, y=Purchases), stat='identity', fill = "navy", color = "b
```
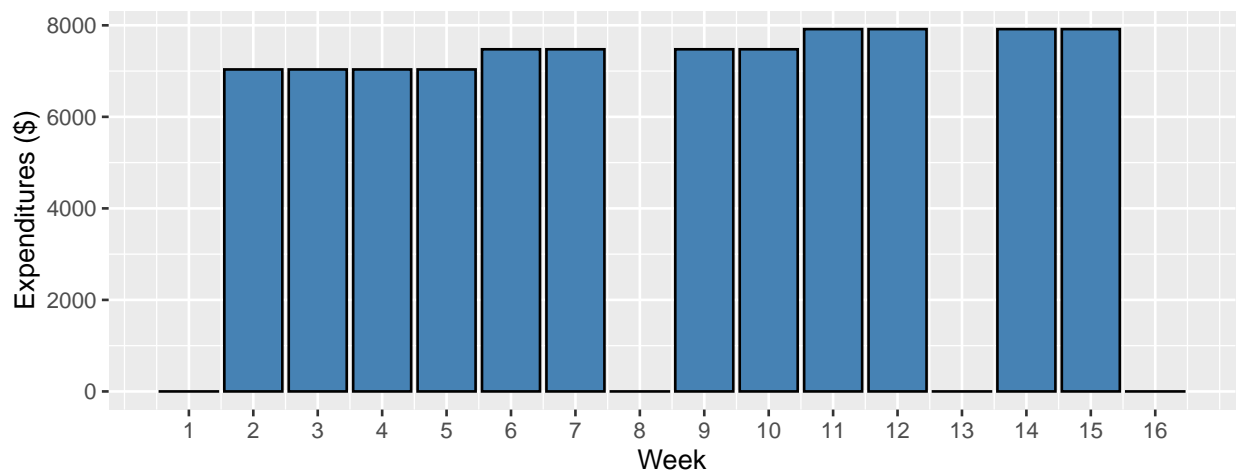
Weighted Null: Spring Expenditures


```r
ggplot(fallnullweighted) + geom_bar(aes(x=Week, y=Transactions), stat='identity', fill = "steelblue", co
```
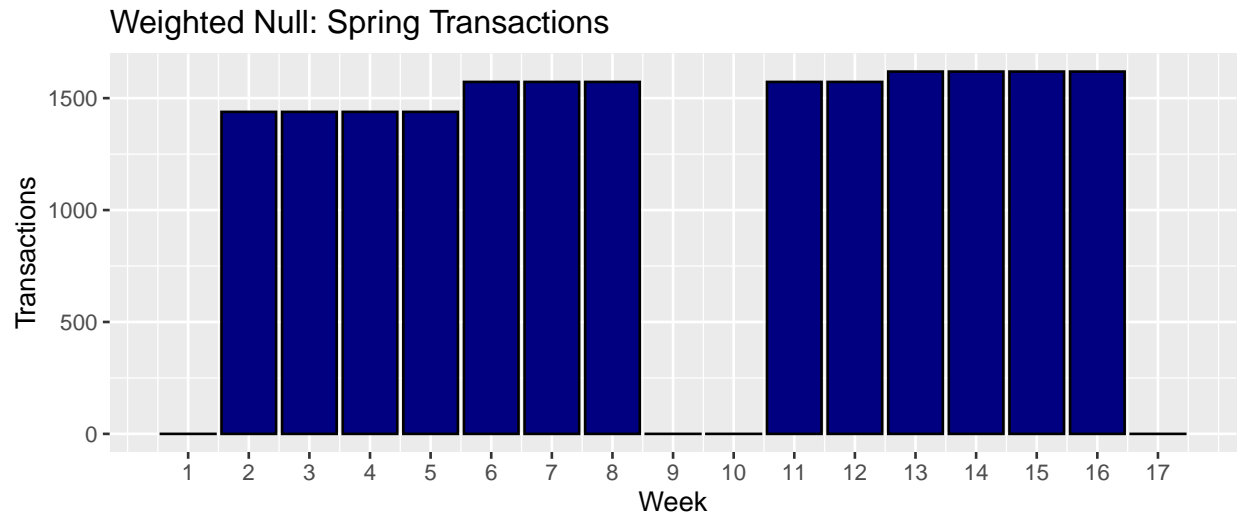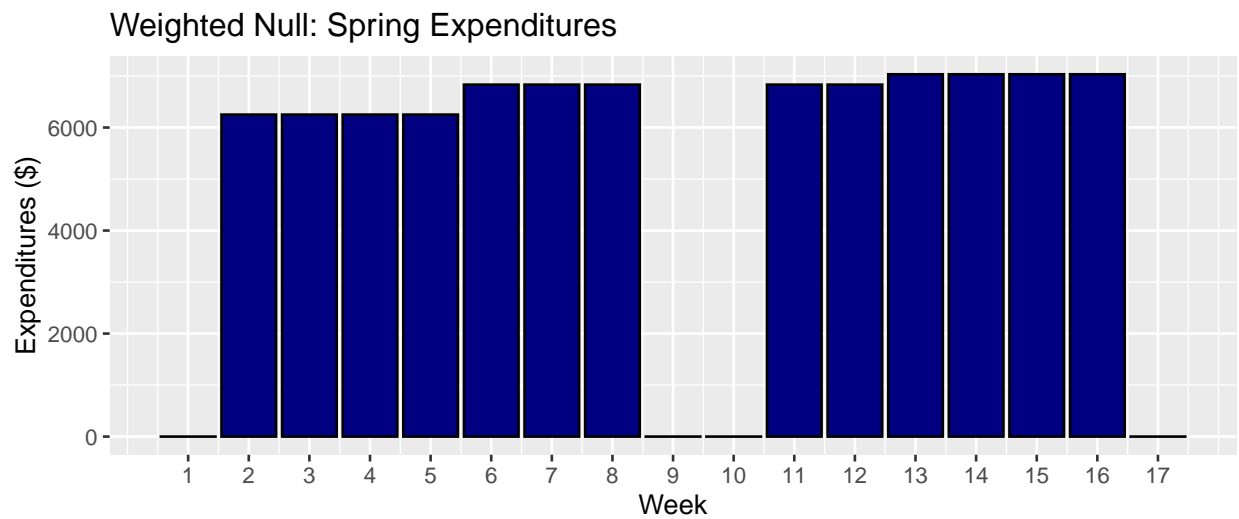
Weighted Null: Fall Transactions


```
ggplot(fallnullweighted) + geom_bar(aes(x=Week, y=Purchases), stat='identity', fill = "steelblue", colo
```

Weighted Null: Fall Expenditures

Chi Squared Models

```
#Two Nulls Against One Another
chisq.test(sprnullweighted$Transactions, sprnullconsistent$Transactions, simulate.p.value = FALSE)
```

```
##
##  Pearson's Chi-squared test
##
## data:  sprnullweighted$Transactions and sprnullconsistent$Transactions
## X-squared = 17, df = 3, p-value = 0.0007067
```

```
chisq.test(sprnullweighted$Purchases, sprnullconsistent$Purchases, simulate.p.value = FALSE)
```

```
## 
##  Pearson's Chi-squared test
## 
## data:  sprnullweighted$Purchases and sprnullconsistent$Purchases
## X-squared = 17, df = 3, p-value = 0.0007067
```

```
chisq.test(fallnullweighted$Transactions, fallnullconsistent$Transactions, simulate.p.value = FALSE)
```

```
## 
##  Pearson's Chi-squared test
## 
## data:  fallnullweighted$Transactions and fallnullconsistent$Transactions
## X-squared = 16, df = 3, p-value = 0.001134
```

```
chisq.test(fallnullweighted$Purchases, fallnullconsistent$Purchases, simulate.p.value = FALSE)
```

```
## 
##  Pearson's Chi-squared test
## 
## data:  fallnullweighted$Purchases and fallnullconsistent$Purchases
## X-squared = 16, df = 3, p-value = 0.001134
```

```
#Spring Transactions Chi Squared
chisq.test(springtransactions$Transactions, sprnullconsistent$Transactions, simulate.p.value = FALSE)
```

```
## 
##  Pearson's Chi-squared test
## 
## data:  springtransactions$Transactions and sprnullconsistent$Transactions
## X-squared = 17, df = 13, p-value = 0.1993
```

```
chisq.test(springtransactions$Transactions, sprnullweighted$Transactions, simulate.p.value = FALSE)
```

```
## 
##  Pearson's Chi-squared test
## 
## data:  springtransactions$Transactions and sprnullweighted$Transactions
## X-squared = 51, df = 39, p-value = 0.09445
```

```
springtransactions$Transactions
```

```
##  [1]    0 1901 1822 1773 1725 1847 1832 1454    0    0 1633 1615 1391 1230
## [15]  989  879    0
```

```
sprnullconsistent$Transactions
```

```
##  [1]    0.000 1545.462 1545.462 1545.462 1545.462 1545.462 1545.462
##  [8] 1545.462    0.000    0.000 1545.462 1545.462 1545.462 1545.462
## [15] 1545.462 1545.462    0.000
```

```
sprnullweighted$Transactions
```

```
## [1]      0.000 1438.556 1438.556 1438.556 1438.556 1572.456 1572.456
## [8] 1572.456    0.000    0.000 1572.456 1572.456 1618.624 1618.624
## [15] 1618.624 1618.624    0.000
```

```
#Spring Purchases Chi Squared
chisq.test(springpurchases$TotalPurch, sprnullconsistent$Purchases, simulate.p.value = FALSE)
```

```
##
##   Pearson's Chi-squared test
##
## data:  springpurchases$TotalPurch and sprnullconsistent$Purchases
## X-squared = 17, df = 13, p-value = 0.1993
```

```
chisq.test(springpurchases$TotalPurch, sprnullweighted$Purchases, simulate.p.value = FALSE)
```

```
##
##   Pearson's Chi-squared test
##
## data:  springpurchases$TotalPurch and sprnullweighted$Purchases
## X-squared = 51, df = 39, p-value = 0.09445
```

```
springpurchases$TotalPurch
```

```
## [1]     0.00 8595.10 8350.54 7943.43 7728.32 7767.83 7570.22 6206.38
## [9]     0.00    0.00 6686.24 6743.47 5956.14 5080.85 4276.92 4394.50
## [17]    0.00
```

```
sprnullconsistent$Purchases
```

```
## [1]     0.00 6715.38 6715.38 6715.38 6715.38 6715.38 6715.38 6715.38
## [9]     0.00    0.00 6715.38 6715.38 6715.38 6715.38 6715.38 6715.38
## [17]    0.00
```

```
sprnullweighted$Purchases
```

```
## [1]      0.000 6250.852 6250.852 6250.852 6250.852 6832.675 6832.675
## [8] 6832.675    0.000    0.000 6832.675 6832.675 7033.288 7033.288
## [15] 7033.288 7033.288    0.000
```

```
#Fall Transactions Chi Squared
chisq.test(falltransactions$Transactions, fallnullconsistent$Transactions, simulate.p.value = FALSE)
```

```
##
##   Pearson's Chi-squared test
##
## data:  falltransactions$Transactions and fallnullconsistent$Transactions
## X-squared = 16, df = 12, p-value = 0.1912
```

```r
chisq.test(falltransactions$Transactions, fallnullweighted$Transactions, simulate.p.value = FALSE)
```

```
##
##  Pearson's Chi-squared test
##
## data:  falltransactions$Transactions and fallnullweighted$Transactions
## X-squared = 48, df = 36, p-value = 0.08713
```

```r
#Fall Purchases Chi Squared
chisq.test(fallpurchases$TotalPurch, fallnullconsistent$Purchases, simulate.p.value = FALSE)
```

```
##
##  Pearson's Chi-squared test
##
## data:  fallpurchases$TotalPurch and fallnullconsistent$Purchases
## X-squared = 16, df = 12, p-value = 0.1912
```

```r
chisq.test(fallpurchases$TotalPurch, fallnullweighted$Purchases, simulate.p.value = FALSE)
```

```
##
##  Pearson's Chi-squared test
##
## data:  fallpurchases$TotalPurch and fallnullweighted$Purchases
## X-squared = 48, df = 36, p-value = 0.08713
```