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Effective Emails

Introduction

This study tries to answer whether certain changes to email formats can significantly affect email engagement to solicitous requests. To answer this, we ran a completely randomized experiment in which recorded the effect of different email characteristics on response time to solicitous emails to UC Berkeley students. The email characteristics we tested are the following: time, research disclosure, and monetary incentive.

> *SUBJECT: [$___ Survey] - What is your favorite building on campus?*
>
> *Hi,*
>
> *Our group is trying to find out the most popular building on campus. Reply to this email with your favorite building at Berkeley and why. Every person that responds will be entered into a $___ raffle. If you win, you can expect an email back by May 10th. ~~The data that we collect will be used anonymously in our statistics research~~. Thanks!*
>
> *Tyler*

We used our universal email template above, only changing 3 variables based on the treatment assigned: the time of email sending, disclosure of our research (or omittance), and the dollar amount of the raffle offered. From the 120 units studied in the experiment, we found that no single treatment could be said to have a significant effect on email engagement, although certain combinations of treatments have interactions which certainly can effect on the engagement of solicitous emails.

Methodology

Conditions and Responses

The treatments we used in the experiment were constituted by different changes we made to our solicitous email. The factors used include the time the email is sent out (morning vs. evening), disclosure within the email that responses are being used for research (disclosure vs. non-disclosure), and amount of monetary incentive to respond ($10 vs. $100). The response we were most interested in was the subject's response time to an email. Furthermore, in anticipation of nonresponse, we tracked response rates for each treatment level. We were interested in response time to the email because we believe this to be an accurate measure of engagement to the email. We will take a lower time to respond to suggest higher engagement and a longer time to respond to suggest lower engagement.

Design Reasoning

We chose a CR design because it is the most straightforward design to test the three treatment factors we were interested in. Furthermore, a blocking design would not have made sense as there was no obvious blocking factor in our randomly sampled population of Berkeley students. For similar reasons and the fact that we have no unwieldy whole plot factor, a split plot

design would not have made sense either. With the CR design, we allow for easy analysis of possible interactions between treatments.

Although we would have liked to poll the entire student population, we used a sample size of 120 subjects in virtue of our limited resources. Furthermore, because we had to tabulate minute response times by hand, it would have been incredibly difficult and time consuming to have thousands of students in our sample.

We chose the time levels (6am, 2pm, 10pm) as they are easily distinguishable eight hour intervals within a normal person's day: 6am equals morning, 2pm equals afternoon, and 10pm equals evening. We think it is reasonable to expect a different response between these factor levels because we would expect that students would check their emails at different times of the day.

We chose the research disclosure condition because we wondered whether working within an "official" capacity would yield faster and more numerous responses than otherwise. We might expect that a research disclosure would make the solicitation seem less like a spam email and therefore yield better results. On the other hand, non-disclosure could seem more personable and therefore stand out from the barrage of emails students receive every day.

We chose the monetary incentive levels ($10 vs. $100) as this is one of the most widely used email incentives used by college administrators. This is perhaps the most obvious treatment that marketers attempt. Although we initially planned to have the levels be $100 versus $0, it was unclear as to how to rewrite the email template such that this change would make sense. Therefore, we changed the treatment levels to high vs. low.

Shortcomings of the Design

We were quite happy with the validity of our response as the email seemed to only return a response when the subject felt that it was worth it to do so. One problem that is difficult to account for is what happens when a subject refuses to open the email in the first place. In this case, they will have only been exposed to the monetary incentive condition which was placed both in the subject line and the body of the email. Another slight problem is the implication that a subject that wakes up in the morning to view and respond to an email sent to them at 10pm would be less engaged than another subject which had been sent an email at 6am. To combat this, we have taken into account overall response rates rather than simply response times in the results of our analysis.

Our experiment is highly replicable in any particular population of interest. The email template can be easily reused with only changes to dates and the solicitation. The one wrinkle that is difficult to understand is the effect that living within the pandemic has on response times and email response rates. It must be noted that living in a pandemic means that students will likely be on their devices all the time, thereby artificially lowering the response times. Because of this, results may vary when the world has left the pandemic behind.

There is also a clear issue in power in our experiment. Due to our low sample size, we obtained a power estimated at about 19%. In the future, if a researcher wished to replicate this experiment, hopefully more financial and time resources could be devoted to parsing thousands of subjects and their responses. This practical reason was our biggest shortcoming by far.

Protocol

Generally speaking, the procedure was conducted as follows. We first obtained a list of email addresses of UC Berkeley students. We numbered the list alphabetically from 1 to 120 and

used a random number generator to draw 10 numbers without replacement, 12 times from the sample. Each of these lots were then assigned a condition, grouping the particular type of email they would receive. Using Tyler's Berkeley email address, email batches were prepared and scheduled to be sent out on a Monday. Email groups were always sent as bcc. To prepare the email batches, we created a universal email template with blank fields to change in accordance to the treatment assigned. When subjects emailed back responses, the timestamp on the received email was used to record response time in minutes. If the subject did not respond within 5 days from the time of sending the email, we recorded the response time as 7200 minutes. More detail on our procedure can be found in our protocol report.

Time	Disclosure	Money	Response Time	Binary Respond
6:00 AM	Disclosed	$10	420	1
6:00 AM	Disclosed	$10	597	1
6:00 AM	Disclosed	$10	882	1
6:00 AM	Disclosed	$10	1103	1
6:00 AM	Disclosed	$10	1388	1
6:00 AM	Disclosed	$10	2021	1
6:00 AM	Disclosed	$10	2077	1
6:00 AM	Disclosed	$10	1567	1
6:00 AM	Disclosed	$10	7200	0
6:00 AM	Disclosed	$10	7200	0

Results

By the end of the experiment we got a total of 35 responses, with at least 1 response from each of the 12 different combinations of factors. From the 120 emails sent during the experiment period, we got a total of 35 responses, which is 29.17% response rate. The rate of responses is broken down below:

Time	Response Rate	Disclosure	Response Rate	Money	Response Rate
6am	35%	Disclosed	31.67%	$10	26.67%
2pm	25%	Not Disclosed	26.67%	$100	31.67%
10pm	27.5%				

From the table above we can see that emails sent in the morning received more responses than emails that were sent later in the day. We can also see that emails with disclosure received

more responses than the emails without disclosures. Similarly, emails with the $100 tag received more responses than emails with the $10 tag as one would expect.

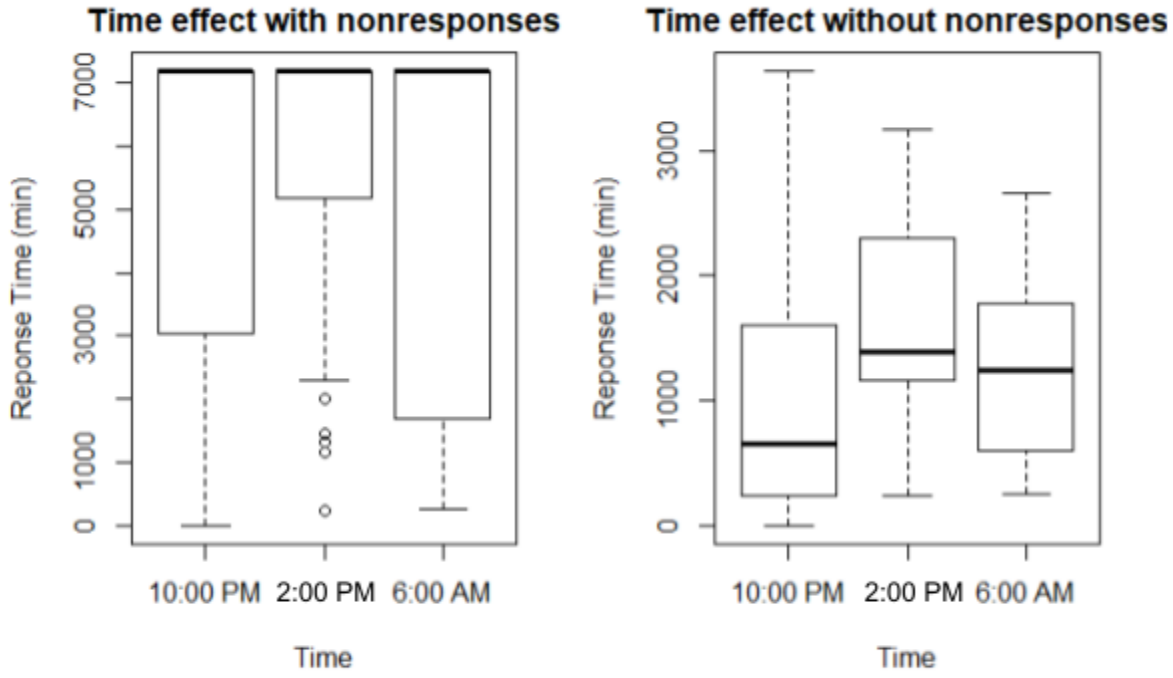

Figure 1: Primary Effect of the Time Factor

Figure 1 tells us two things. First is that with the nonresponses, it is difficult to determine the differences between three treatment levels within the time factors. Looking at the plot on the right (one without the none responses) We can see that all three distributions have a very similar distribution in terms of the spread. The most important thing from this plot is that the emails sent at 10 PM have a significantly faster response time compared to 2 PM and 6 PM when looking at median values. The means are given below. The emails sent at 10 PM have an average response time that is 4 hours faster than the emails sent at 6 PM and 10 hours to the w PM emails.

Time	Response.Time
10:00 PM	1048.364
2:00 PM	1670.300
6:00 AM	1275.071

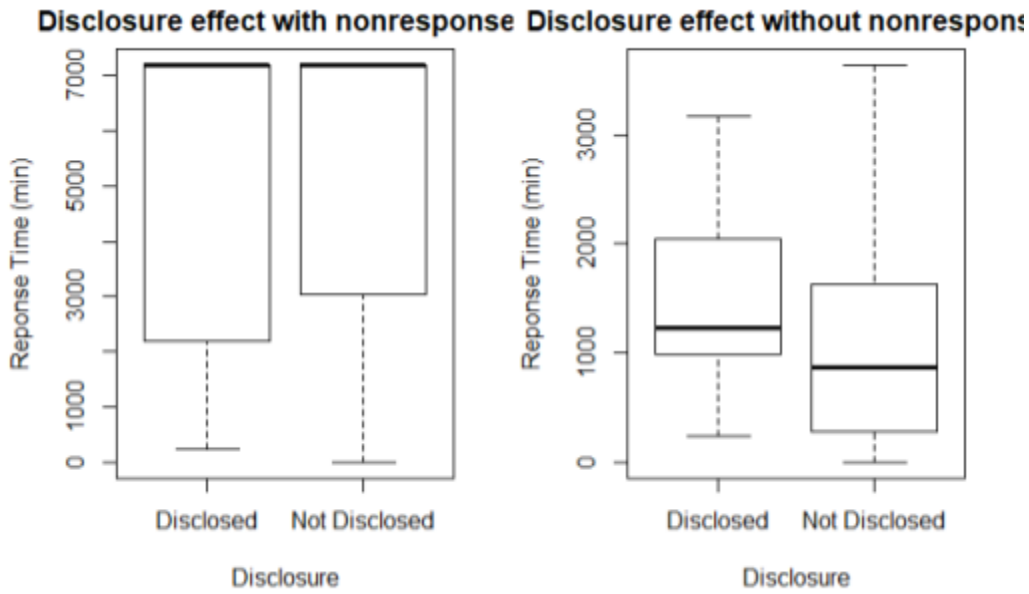

Figure 2: Primary Effect of the Disclosure Factor

Figure 2 shows similar results when looking at the graph with non responses, but it also shows that there are not much differences in the median response time between disclosed and not disclosed emails. However, we can see from the data that the disclosed emails have a distribution that is skewed to the right, which makes the mean a lot higher than the not disclosed emails as seen from the mean table below.

Disclosure	Response.Time
Disclosed	1500.579
Not Disclosed	1098.438

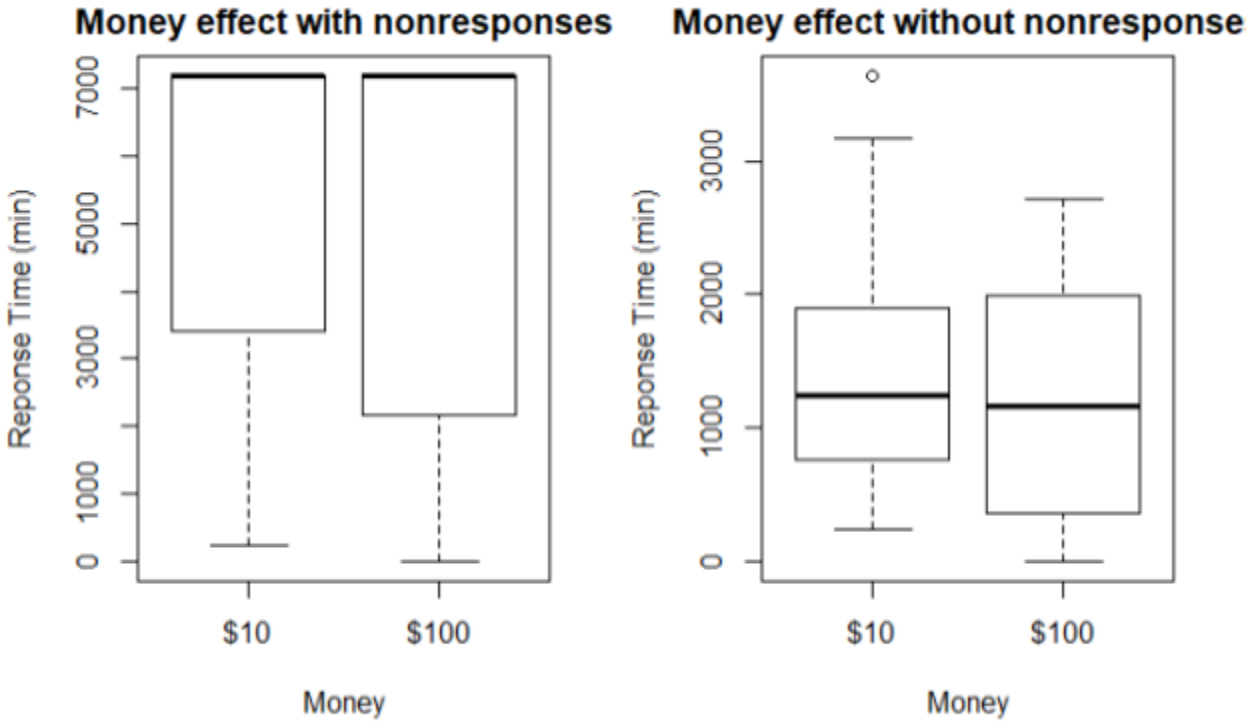

Figure 3: Primary Effect of the Money Factor

Figure 3 is a plot of the money factor, and it shows that $10 and $100 did not make a huge difference in our experiment. There is only a slight increase in time in the $10 plot that did not convince us that it has any effect compared to the $100. However, the means, as shown below, show that the $10 factor level increases the response time by about 4 hours. This result is what we were expecting: overall $100 made responses slightly faster.

Money	Response.Time
$10	1449.000
$100	1205.368

Checking for Interactions:

We want to see the interactions between our three treatment variables. Since there are a lot of non-response in our data, we will only look at the data points that were replied back to us within the experimental timeframe.

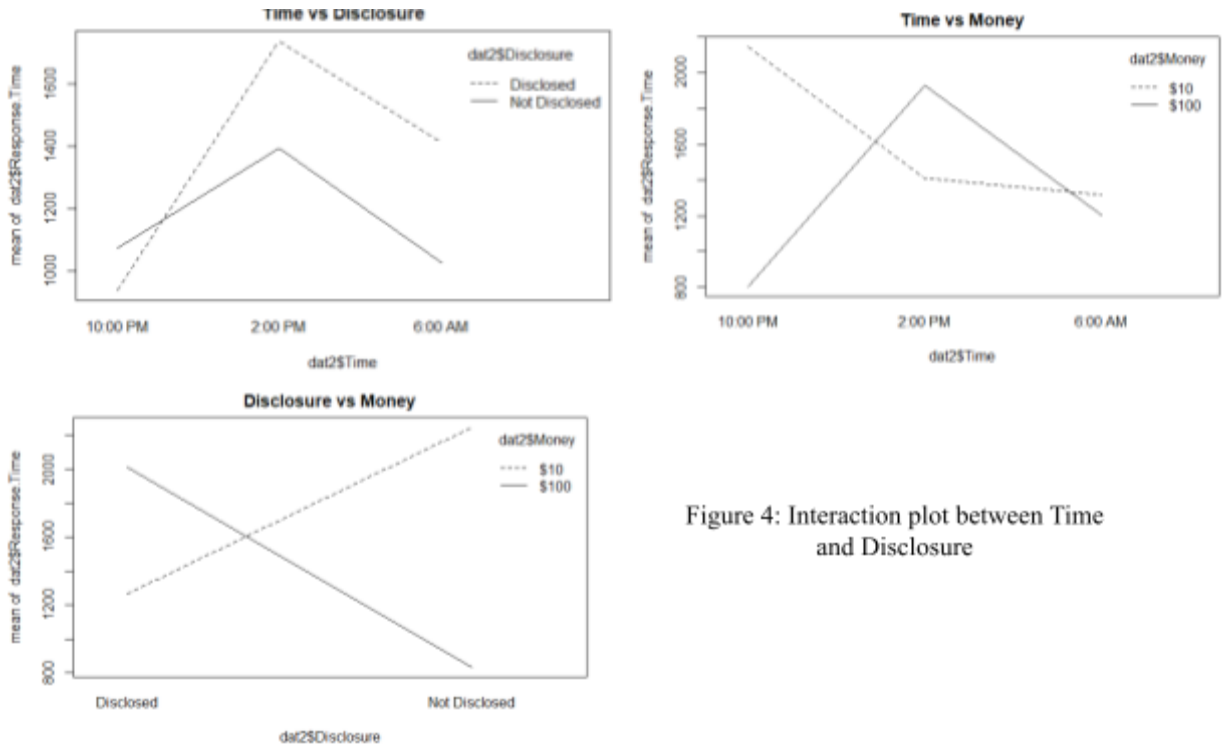

Figure 4: Interaction plot between Time and Disclosure

Figure 4 shows the interaction plots of the binary combinations of Time, Disclosure, and Money with the non-responses removed. We can see in the "Time vs Disclosure" plot that the two lines followed similar patterns with only a slight indication of interactions existing which can be due to errors. In the "Time vs Money" and the "Disclosure vs Money" plot, there are clear indications of interactions existing between the corresponding variables.

Checking Assumptions:

There are no run orders in this experiment other than the explicit Time factor that differentiate the time of which the emails are sent. The independence assumptions are given by our experimental design which assumes no two individuals on our mailing list have any sort of contacts that can alter their responses to this experiment. Therefore, the only two assumptions we need to check are the constant variance assumption and the normality assumption.

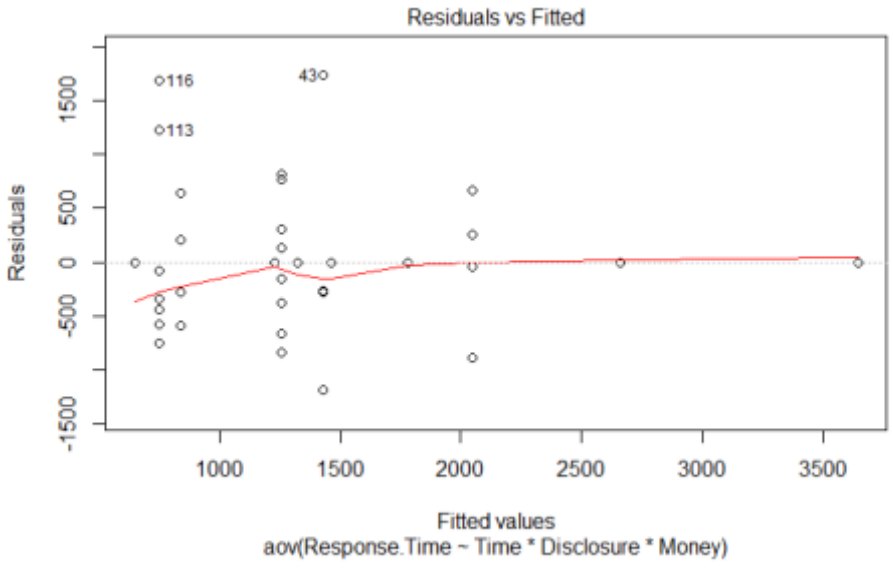

Figure 5: Residuals vs Fitted plot

Figure 5 is a Residuals vs Fitted plot for the anova model with all the non-responses removed. There are no interesting patterns that may

violate the constant variance assumption. However, there are some outliers with large residuals, but we are not convinced there is really a non-constant variance since other than the outliers, the residuals are similarly distributed across the fitted values.

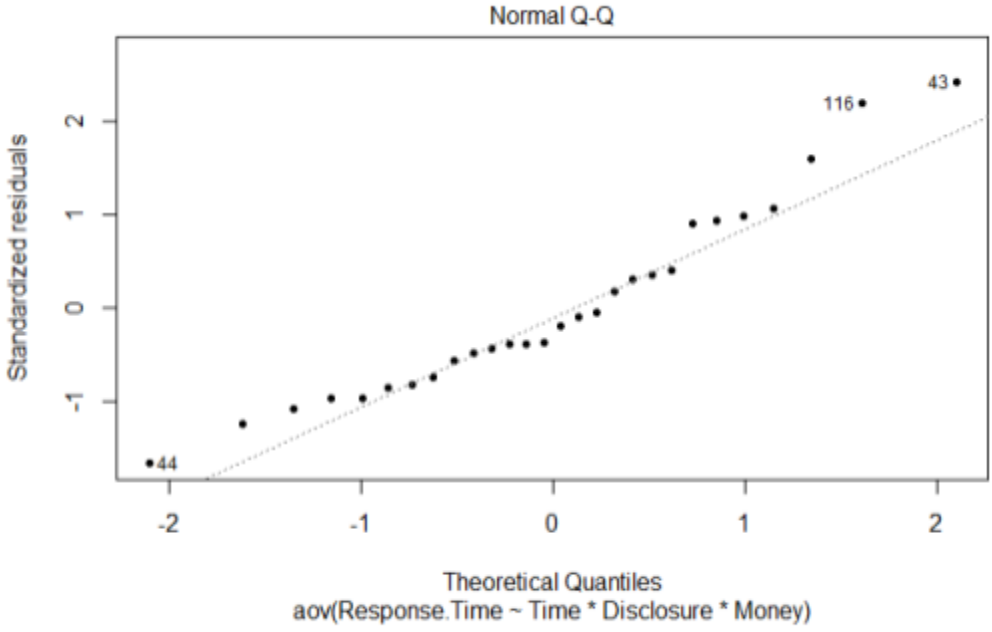

Figure 6: QQ Plot

Looking at the QQ plot from figure 6 against the normal distribution, we can see that the normality assumption is perfectly reasonable.

Anova Results:

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Time	2	2066639.11	1033319.56	1.52	0.2390
Disclosure	1	385155.12	385155.12	0.57	0.4587
Money	1	52144.76	52144.76	0.08	0.7840
Time:Disclosure	2	305946.07	152973.04	0.23	0.7998
Time:Money	2	4525826.93	2262913.46	3.34	0.0534
Disclosure:Money	1	4604754.91	4604754.91	6.79	0.0158
Time:Disclosure:Money	2	1670163.30	835081.65	1.23	0.3103
Residuals	23	15593986.50	677999.41		

Table 1: ANOVA Table based on Response Time (without non responses)

Performing an anova analysis on the data with the non responses removed we see that with a significance level of .05, there is significant interaction between disclosure and money amount. This is possibly due to the fact that disclosure gives certain credibility. However there is

not a significant three-way interaction as well as the time and disclosure interaction (.31 > .05, .80 > .05 respectively). It is also worth noting that the interaction between time and money is not significant but the p value is relatively close (.053 > .05).

In addition, the p values for each individual factor is significantly greater than the significance level of 0.05. This means that for the time, disclosure, and money factors the difference between the respective levels are not significant. These results are expected from the informal analysis as the interaction plots have shown. As well the individual box plots showed that the distribution of the money factor was fairly similar which matches up with it's high p value of .79.

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Time	2	0.22	0.11	0.70	0.4985
Disclosure	1	0.08	0.08	0.49	0.4876
Money	1	0.08	0.08	0.49	0.4876
Time:Disclosure	2	2.45	1.22	7.92	0.0006
Time:Money	2	1.55	0.77	5.01	0.0083
Disclosure:Money	1	2.41	2.41	15.57	0.0001
Time:Disclosure:Money	2	1.32	0.66	4.26	0.0166
Residuals	108	16.70	0.15		

Table 2: ANOVA Table based on Binary Results (with Non Responses)

Because the non responses are quite significant as a majority of responses were non responses , we also examined how the three factors interacted with each other based on whether or not the participants actually responded (1 being response and 0 being no response). Again we see that all the two way interaction and the three way interaction are significant as the p values are less than a significance level of .05. As well, for each individual factor the effects of each level is 0 as the p values are all greater than .05.

Contrasts:

Beyond the pairwise contrasts we wanted to examine the contrasts between the time element of afternoon and evening emails vs morning emails as some may delay answering mid and late day emails to the next day. A specified w vector of (1, -½,-½) that corresponds to the morning, afternoon, and evening. We get a t-stat of -0.2964498, which with a df of 23 as shown in Table 1. This corresponds to a p-value of .6152265 which is > .05, which means we fail to reject the null hypothesis that the treatment mean difference specified by the contrast is zero. Given this we see that although the differences between the times are shown to be not significantly different, sending out emails during the morning results in slightly faster response times in comparison to the PM times.

With regards to pairwise contrasts, running a tukey test, we find that no pairwise comparison results in any significant p values, as all of them are > .05 (Table 3, Appendix). Some notable pairwise contrasts that could be explored further would be the difference between

non disclosure and money levels, as a p value of roughly .2. Changing this specific null hypothesis to test a different contrast that could help us understand how disclosure and money interacts with one another.

Conclusions:

From this experiment we failed to find evidence that the time of email, incentive, and disclosure had a significant effect on response times or response rates to solicitous emails. Furthermore, we found no evidence that emails sent in the AM have better engagement than those sent in the PM. Interestingly, we found some evidence that these factors have interactions that positively affect email engagement. Particularly, it seems that Disclosure and Monetary Incentive has a real effect on response times, while every combination of interactions seemed to have an effect on response rates. This seems to suggest that although a particular treatment itself will not significantly affect email engagements, combinations of these treatments *will* positively affect engagement, particularly evident in the response rates. Intuitively, this makes sense as that barrier to cross in getting a person to reply to a solicitation is quite high for a single technical change to have an effect. However, with a combination of small positive changes, that barrier is more likely to be crossed. We might *tentatively* recommend that a prospective solicitor use the combination of 10PM emails, nondisclosure, and 100$ incentive to increase email engagement.

The reader should note that while we were able to conclude *some* substantial results, this study should be redone with a far larger sample size. Because of our low power (approximately 19%), it may be difficult to take our interaction conclusions with strong confidence. In any study with an expected high nonresponse rate, we will need to account for this noise with larger and larger samples.

We might wonder further what else can be done to increase email engagement cheaply and easily for the students at UC Berkeley, if anything. We might question whether solicitation fatigue has occurred at UC Berkeley and how to measure that, if so. Perhaps this is needed for a study on email engagement for college students as a whole.

Overall, this experiment provided an insight as to what makes people have higher response rates and lower response times to an email within the student population on campus at UC Berkeley. The need to understand these factors is however, not limited solely to the confines of this university but rather much needed in other settings by both businesses and politicians who aim to shape their practices on a high response rate email surveys. Thus, the importance of experiments like this highlight the need for response rate analysis in order to ensure well-crafted statistical surveys receive representative responses to be as accurate as possible.

Appendix

```
# Loading the data

dat <- read.csv("exp_data.csv")

# Checking the data

dat %>% group_by(Time, Binary.Respond) %>% tally()

dat %>% group_by(Disclosure, Binary.Respond) %>% tally()

dat %>% group_by(Money, Binary.Respond) %>% tally()

# Removing non-responses

dat2 <- dat[dat$Binary.Respond == 1, ]

# Primary effect plots

par(mfrow = c(1, 2))
plot(dat$Time, dat$Response.Time, main = "Time effect with nonresponses", xlab = "Time",
ylab = "Reponse Time (min)")
plot(dat2$Time, dat2$Response.Time, main = "Time effect without nonresponses", xlab =
"Time", ylab = "Reponse Time (min)")

par(mfrow = c(1, 2))
plot(dat$Disclosure, dat$Response.Time, main = "Disclosure effect with nonresponses", xlab =
"Disclosure", ylab = "Reponse Time (min)")
plot(dat2$Disclosure, dat2$Response.Time, main = "Disclosure effect without nonresponses",
xlab = "Disclosure", ylab = "Reponse Time (min)")

par(mfrow = c(1, 2))
plot(dat$Money, dat$Response.Time, main = "Money effect with nonresponses", xlab =
"Money", ylab = "Reponse Time (min)")
plot(dat2$Money, dat2$Response.Time, main = "Money effect without nonresponses", xlab =
"Money", ylab = "Reponse Time (min)")

# Mean Calculations
```

```
aggregate(Response.Time ~ Time, data = dat2, mean)
aggregate(Response.Time ~ Disclosure, data = dat2, mean)
aggregate(Response.Time ~ Money, data = dat2, mean)


# Interaction plots

interaction.plot(dat2$Time, dat2$Disclosure, dat2$Response.Time, main = "Time vs
Disclosure")
interaction.plot(dat2$Time, dat2$Money, dat2$Response.Time, main = "Time vs Money")
interaction.plot(dat2$Disclosure, dat2$Money, dat2$Response.Time, main = "Disclosure vs
Money")

# Fitting the model
dat.model <- aov(Response.Time ~ Time * Disclosure * Money, data = dat2)

# Fitted vs Residuals
plot(dat.model, which = 1)

#QQPLOT
plot(dat.model, which = 2, pch = 20)


## ANOVA and Contrast Code
# obtain data and separate filtered set excluding non responses
data <- read.csv('exp data.csv', header = TRUE)
data1 <- data[data$Binary.Respond==1,]

# set contrast options
options(contrasts=c("contr.sum","contr.poly"))

# anova for binary results
res.aov <- anova(lm(Response.Time ~ Time*Disclosure*Money, data=data1))
res1.aov <- anova(lm(Binary.Respond ~ Time*Disclosure*Money, data=data))

# obtain LaTeX output
xtable(res.aov)
xtable(res1.aov)

# same as res.aov, but using aov command for same results but different way it its displayed
```

```
res2.aov <- aov(Response.Time ~ Time*Disclosure*Money, data=data1)

# calculate the mean difference based on contrast
diff_mean <- mean(data1$Response.Time[data1$Time=="6:00 AM"]) -
.5*mean(data1$Response.Time[data1$Time=="2:00 PM"]) -
.5*mean(data1$Response.Time[data1$Time=="10:00 PM"])

n <- unlist(table(data1$Time))

#obtain contrast vector
contrast <- (c(-0.5, -0.5, 1)/n)[as.numeric(data1$Time)]

# calculate standard error
se_contrast <- as.numeric(se.contrast(res2.aov, matrix(contrast, ncol = 1)))


# create t-statistic
t_stat <- diff_mean / se_contrast

# obtain p value
1-pt(t_stat, 23, lower.tail = TRUE)

# obtain tukey test results
res2.tukey<- TukeyHSD(res2.aov, ordered = FALSE, conf.level = 0.95)
print(xtable(tidy(res2.tukey)), scalebox = '.25')
```

	term	contrast	null.value	estimate	conf.low	conf.high	adj.p.value
1	Time	2:00 PM-10:00 PM	0.00	621.94	-279.05	1522.93	0.22
2	Time	6:00 AM-10:00 PM	0.00	226.71	-604.13	1057.55	0.78
3	Time	6:00 AM-2:00 PM	0.00	-395.23	-1249.01	458.56	0.49
4	Disclosure	Not Disclosed-Disclosed	0.00	-181.47	-759.44	396.49	0.52
5	Money	$100-$10	0.00	-64.88	-642.85	513.08	0.82
6	Time:Disclosure	2:00 PM:Disclosed-10:00 PM:Disclosed	0.00	804.66	-1215.27	2824.60	0.81
7	Time:Disclosure	6:00 AM:Disclosed-10:00 PM:Disclosed	0.00	461.82	-1535.54	2459.19	0.98
8	Time:Disclosure	10:00 PM:Not Disclosed-10:00 PM:Disclosed	0.00	128.76	-1868.60	2126.12	1.00
9	Time:Disclosure	2:00 PM:Not Disclosed-10:00 PM:Disclosed	0.00	417.77	-2137.26	2972.81	1.00
10	Time:Disclosure	6:00 AM:Not Disclosed-10:00 PM:Disclosed	0.00	98.48	-2039.22	2236.17	1.00
11	Time:Disclosure	6:00 AM:Disclosed-2:00 PM:Disclosed	0.00	-342.84	-1584.36	898.69	0.95
12	Time:Disclosure	10:00 PM:Not Disclosed-2:00 PM:Disclosed	0.00	-675.90	-1917.43	565.62	0.55
13	Time:Disclosure	2:00 PM:Not Disclosed-2:00 PM:Disclosed	0.00	-386.89	-2406.82	1633.04	0.99
14	Time:Disclosure	6:00 AM:Not Disclosed-2:00 PM:Disclosed	0.00	-706.19	-2162.78	750.41	0.66
15	Time:Disclosure	10:00 PM:Not Disclosed-6:00 AM:Disclosed	0.00	-333.06	-1537.52	871.39	0.95
16	Time:Disclosure	2:00 PM:Not Disclosed-6:00 AM:Disclosed	0.00	-44.05	-2041.41	1953.31	1.00
17	Time:Disclosure	6:00 AM:Not Disclosed-6:00 AM:Disclosed	0.00	-363.35	-1788.48	1061.78	0.97
18	Time:Disclosure	2:00 PM:Not Disclosed-10:00 PM:Not Disclosed	0.00	289.01	-1708.35	2286.38	1.00
19	Time:Disclosure	6:00 AM:Not Disclosed-10:00 PM:Not Disclosed	0.00	-30.28	-1455.42	1394.85	1.00
20	Time:Disclosure	6:00 AM:Not Disclosed-2:00 PM:Not Disclosed	0.00	-319.30	-2457.60	1818.40	1.00
21	Time:Money	2:00 PM:$10-10:00 PM:$10	0.00	-778.08	-2915.77	1359.62	0.86
22	Time:Money	6:00 AM:$10-10:00 PM:$10	0.00	-964.62	-2961.98	1032.74	0.67
23	Time:Money	10:00 PM:$100-10:00 PM:$10	0.00	-1396.82	-3394.18	600.55	0.29
24	Time:Money	2:00 PM:$100-10:00 PM:$10	0.00	-263.75	-2401.45	1873.95	1.00
25	Time:Money	6:00 AM:$100-10:00 PM:$10	0.00	-828.88	-2966.58	1308.82	0.83
26	Time:Money	6:00 AM:$10-2:00 PM:$10	0.00	-186.54	-1631.67	1258.59	1.00
27	Time:Money	10:00 PM:$100-2:00 PM:$10	0.00	-618.74	-2043.87	806.39	0.76
28	Time:Money	2:00 PM:$100-2:00 PM:$10	0.00	514.33	-1101.62	2130.27	0.92
29	Time:Money	6:00 AM:$100-2:00 PM:$10	0.00	-50.80	-1666.75	1565.14	1.00
30	Time:Money	10:00 PM:$100-6:00 AM:$10	0.00	-432.20	-1636.65	772.26	0.87
31	Time:Money	2:00 PM:$100-6:00 AM:$10	0.00	700.87	-724.26	2126.00	0.65
32	Time:Money	6:00 AM:$100-6:00 AM:$10	0.00	135.74	-1289.39	1560.87	1.00
33	Time:Money	2:00 PM:$100-10:00 PM:$100	0.00	1133.07	-292.06	2558.20	0.18
34	Time:Money	6:00 AM:$100-10:00 PM:$100	0.00	567.94	-857.19	1993.07	0.81
35	Time:Money	6:00 AM:$100-2:00 PM:$100	0.00	-565.13	-2181.08	1050.82	0.88
36	Disclosure:Money	Not Disclosed:$10-Disclosed:$10	0.00	771.44	-688.04	2230.93	0.48
37	Disclosure:Money	Disclosed:$100-Disclosed:$10	0.00	471.35	-658.26	1595.96	0.66
38	Disclosure:Money	Not Disclosed:$100-Disclosed:$10	0.00	-218.18	-1111.93	675.57	0.91
39	Disclosure:Money	Disclosed:$100-Not Disclosed:$10	0.00	-300.09	-1911.32	1311.13	0.95
40	Disclosure:Money	Not Disclosed:$100-Not Disclosed:$10	0.00	-989.63	-2449.31	469.86	0.27
41	Disclosure:Money	Not Disclosed:$100-Disclosed:$100	0.00	-689.53	-1814.14	435.08	0.35
42	Time:Disclosure:Money	2:00 PM:Disclosed:$10-10:00 PM:Disclosed:$10	0.00	783.00	-2550.38	4116.38	1.00
43	Time:Disclosure:Money	6:00 AM:Disclosed:$10-10:00 PM:Disclosed:$10	0.00	607.87	-2554.44	3770.19	1.00
44	Time:Disclosure:Money	10:00 PM:Not Disclosed:$10-10:00 PM:Disclosed:$10	0.00	2996.00	-1220.43	7212.43	0.35
45	Time:Disclosure:Money	2:00 PM:Not Disclosed:$10-10:00 PM:Disclosed:$10	0.00	677.00	-3539.43	4893.43	1.00
46	Time:Disclosure:Money	6:00 AM:Not Disclosed:$10-10:00 PM:Disclosed:$10	0.00	1132.00	-3084.43	5348.43	1.00
47	Time:Disclosure:Money	10:00 PM:Disclosed:$100-10:00 PM:Disclosed:$10	0.00	580.00	-3636.43	4796.43	1.00
48	Time:Disclosure:Money	2:00 PM:Disclosed:$100-10:00 PM:Disclosed:$10	0.00	1398.00	-1935.38	4731.38	0.92
49	Time:Disclosure:Money	6:00 AM:Disclosed:$100-10:00 PM:Disclosed:$10	0.00	2013.00	-2203.43	6229.43	0.84
50	Time:Disclosure:Money	10:00 PM:Not Disclosed:$100-10:00 PM:Disclosed:$10	0.00	102.12	-3060.19	3264.44	1.00
51	Time:Disclosure:Money	2:00 PM:Not Disclosed:$100-10:00 PM:Disclosed:$10	0.00	812.00	-3404.43	5028.43	1.00
52	Time:Disclosure:Money	6:00 AM:Not Disclosed:$100-10:00 PM:Disclosed:$10	0.00	189.25	-3144.13	3522.63	1.00
53	Time:Disclosure:Money	6:00 AM:Disclosed:$10-2:00 PM:Disclosed:$10	0.00	-175.12	-2000.89	1650.64	1.00
54	Time:Disclosure:Money	10:00 PM:Not Disclosed:$10-2:00 PM:Disclosed:$10	0.00	2213.00	-1120.38	5546.38	0.44
55	Time:Disclosure:Money	2:00 PM:Not Disclosed:$10-2:00 PM:Disclosed:$10	0.00	-106.00	-3439.38	3227.38	1.00
56	Time:Disclosure:Money	6:00 AM:Not Disclosed:$10-2:00 PM:Disclosed:$10	0.00	349.00	-2984.38	3682.38	1.00
57	Time:Disclosure:Money	10:00 PM:Disclosed:$100-2:00 PM:Disclosed:$10	0.00	-203.00	-3536.38	3130.38	1.00
58	Time:Disclosure:Money	2:00 PM:Disclosed:$100-2:00 PM:Disclosed:$10	0.00	615.00	-3498.21	2728.21	0.99
59	Time:Disclosure:Money	6:00 AM:Disclosed:$100-2:00 PM:Disclosed:$10	0.00	1230.00	-2305.38	4565.38	0.96
60	Time:Disclosure:Money	10:00 PM:Not Disclosed:$100-2:00 PM:Disclosed:$10	0.00	-680.87	-2506.64	1144.89	0.96
61	Time:Disclosure:Money	2:00 PM:Not Disclosed:$100-2:00 PM:Disclosed:$10	0.00	29.00	-3304.38	3362.38	1.00
62	Time:Disclosure:Money	6:00 AM:Not Disclosed:$100-2:00 PM:Disclosed:$10	0.00	-593.75	-2701.96	1514.46	1.00
63	Time:Disclosure:Money	10:00 PM:Not Disclosed:$10-6:00 AM:Disclosed:$10	0.00	2388.13	-774.19	5550.44	0.27
64	Time:Disclosure:Money	2:00 PM:Not Disclosed:$10-6:00 AM:Disclosed:$10	0.00	69.12	-3093.19	3231.44	1.00
65	Time:Disclosure:Money	6:00 AM:Not Disclosed:$10-6:00 AM:Disclosed:$10	0.00	524.13	-2638.19	3686.44	1.00
66	Time:Disclosure:Money	10:00 PM:Disclosed:$100-6:00 AM:Disclosed:$10	0.00	-27.88	-3190.19	3134.44	1.00
67	Time:Disclosure:Money	2:00 PM:Disclosed:$100-6:00 AM:Disclosed:$10	0.00	790.12	-1035.64	2615.89	0.90
68	Time:Disclosure:Money	6:00 AM:Disclosed:$100-6:00 AM:Disclosed:$10	0.00	1405.13	-1757.19	4567.44	0.89
69	Time:Disclosure:Money	10:00 PM:Not Disclosed:$100-6:00 AM:Disclosed:$10	0.00	-505.75	-1996.48	984.98	0.98
70	Time:Disclosure:Money	2:00 PM:Not Disclosed:$100-6:00 AM:Disclosed:$10	0.00	204.12	-2958.19	3366.44	1.00
71	Time:Disclosure:Money	6:00 AM:Not Disclosed:$100-6:00 AM:Disclosed:$10	0.00	-418.62	-2244.39	1407.14	1.00
72	Time:Disclosure:Money	2:00 PM:Not Disclosed:$10-10:00 PM:Not Disclosed:$10	0.00	-2319.00	-6535.43	1897.43	0.69
73	Time:Disclosure:Money	6:00 AM:Not Disclosed:$10-10:00 PM:Not Disclosed:$10	0.00	-1864.00	-6080.43	2352.43	0.89
74	Time:Disclosure:Money	10:00 PM:Disclosed:$100-10:00 PM:Not Disclosed:$10	0.00	-2416.00	-6632.43	1800.43	0.64
75	Time:Disclosure:Money	2:00 PM:Disclosed:$100-10:00 PM:Not Disclosed:$10	0.00	-1598.00	-4931.38	1735.38	0.83
76	Time:Disclosure:Money	6:00 AM:Disclosed:$100-10:00 PM:Not Disclosed:$10	0.00	-983.00	-5199.43	3233.43	1.00
77	Time:Disclosure:Money	10:00 PM:Not Disclosed:$100-10:00 PM:Not Disclosed:$10	0.00	-2893.88	-6056.19	268.44	0.09
78	Time:Disclosure:Money	2:00 PM:Not Disclosed:$100-10:00 PM:Not Disclosed:$10	0.00	-2184.00	-6400.43	2032.43	0.76
79	Time:Disclosure:Money	6:00 AM:Not Disclosed:$100-10:00 PM:Not Disclosed:$10	0.00	-2806.75	-6140.13	526.63	0.16
80	Time:Disclosure:Money	6:00 AM:Not Disclosed:$10-2:00 PM:Not Disclosed:$10	0.00	455.00	-3761.43	4671.43	1.00
81	Time:Disclosure:Money	10:00 PM:Disclosed:$100-2:00 PM:Not Disclosed:$10	0.00	-97.00	-4313.43	4119.43	1.00
82	Time:Disclosure:Money	2:00 PM:Disclosed:$100-2:00 PM:Not Disclosed:$10	0.00	721.00	-2612.38	4054.38	1.00
83	Time:Disclosure:Money	6:00 AM:Disclosed:$100-2:00 PM:Not Disclosed:$10	0.00	1336.00	-2880.43	5552.43	0.99
84	Time:Disclosure:Money	10:00 PM:Not Disclosed:$100-2:00 PM:Not Disclosed:$10	0.00	-574.87	-3737.19	2587.44	1.00
85	Time:Disclosure:Money	2:00 PM:Not Disclosed:$100-2:00 PM:Not Disclosed:$10	0.00	135.00	-4081.43	4351.43	1.00
86	Time:Disclosure:Money	6:00 AM:Not Disclosed:$100-2:00 PM:Not Disclosed:$10	0.00	-487.75	-3821.13	2845.63	1.00
87	Time:Disclosure:Money	10:00 PM:Disclosed:$100-6:00 AM:Not Disclosed:$10	0.00	-552.00	-4788.43	3684.43	1.00
88	Time:Disclosure:Money	2:00 PM:Disclosed:$100-6:00 AM:Not Disclosed:$10	0.00	266.00	-3067.38	3599.38	1.00
89	Time:Disclosure:Money	6:00 AM:Disclosed:$100-6:00 AM:Not Disclosed:$10	0.00	881.00	-3335.43	5097.43	1.00
90	Time:Disclosure:Money	10:00 PM:Not Disclosed:$100-6:00 AM:Not Disclosed:$10	0.00	-1029.88	-4192.19	2132.44	0.99
91	Time:Disclosure:Money	2:00 PM:Not Disclosed:$100-6:00 AM:Not Disclosed:$10	0.00	-320.00	-4536.43	3896.43	1.00
92	Time:Disclosure:Money	6:00 AM:Not Disclosed:$100-6:00 AM:Not Disclosed:$10	0.00	-942.75	-4276.13	2390.63	1.00
93	Time:Disclosure:Money	2:00 PM:Disclosed:$100-10:00 PM:Disclosed:$100	0.00	818.00	-2515.38	4151.38	1.00
94	Time:Disclosure:Money	6:00 AM:Disclosed:$100-10:00 PM:Disclosed:$100	0.00	1433.00	-2783.43	5649.43	0.98
95	Time:Disclosure:Money	10:00 PM:Not Disclosed:$100-10:00 PM:Disclosed:$100	0.00	-477.87	-3640.19	2684.44	1.00
96	Time:Disclosure:Money	2:00 PM:Not Disclosed:$100-10:00 PM:Disclosed:$100	0.00	232.00	-3984.43	4448.43	1.00
97	Time:Disclosure:Money	6:00 AM:Not Disclosed:$100-10:00 PM:Disclosed:$100	0.00	-390.75	-3724.13	2942.63	1.00
98	Time:Disclosure:Money	6:00 AM:Disclosed:$100-2:00 PM:Disclosed:$100	0.00	615.00	-2718.38	3948.38	1.00
99	Time:Disclosure:Money	10:00 PM:Not Disclosed:$100-2:00 PM:Disclosed:$100	0.00	-1295.88	-3121.64	529.89	0.35
100	Time:Disclosure:Money	2:00 PM:Not Disclosed:$100-2:00 PM:Disclosed:$100	0.00	-586.00	-3919.38	2747.38	1.00
101	Time:Disclosure:Money	6:00 AM:Not Disclosed:$100-2:00 PM:Disclosed:$100	0.00	-1208.75	-3316.96	899.46	0.64
102	Time:Disclosure:Money	10:00 PM:Not Disclosed:$100-6:00 AM:Disclosed:$100	0.00	-1910.88	-5073.19	1251.44	0.57
103	Time:Disclosure:Money	2:00 PM:Not Disclosed:$100-6:00 AM:Disclosed:$100	0.00	-1201.00	-5417.43	3015.43	0.99
104	Time:Disclosure:Money	6:00 AM:Not Disclosed:$100-6:00 AM:Disclosed:$100	0.00	-1823.75	-5157.13	1509.63	0.70
105	Time:Disclosure:Money	2:00 PM:Not Disclosed:$100-10:00 PM:Not Disclosed:$100	0.00	709.87	-2452.44	3872.19	1.00
106	Time:Disclosure:Money	6:00 AM:Not Disclosed:$100-10:00 PM:Not Disclosed:$100	0.00	87.13	-3738.64	1912.89	1.00
107	Time:Disclosure:Money	6:00 AM:Not Disclosed:$100-2:00 PM:Not Disclosed:$100	0.00	-622.75	-3956.13	2710.63	1.00

Table 3: Tukey Test Results: All pairwise comparisons.

Selected Responses

Hi Tyler,

My favorite building on campus is VLSB because it has so many cool exhibits and museums inside.

Thanks,
Sam

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Wurster Hall
a hidden gem, its needlessly confusing and full of artsy treasures, plus it has its own yard, courtyard, and a library with strange chairs
when the elevator died they created a shrine
Oh! and the views from the enclosed balconies are amazing

•••

Evans! It's a humble building. People might say it's ugly but I don't think the glade would be the same without it.

•••

Full Dataset

Time	Disclosure	Money	Response Time	Binary Respond
6:00 AM	Disclosed	$10	420	1
6:00 AM	Disclosed	$10	597	1
6:00 AM	Disclosed	$10	882	1
6:00 AM	Disclosed	$10	1103	1
6:00 AM	Disclosed	$10	1388	1
6:00 AM	Disclosed	$10	2021	1
6:00 AM	Disclosed	$10	2077	1
6:00 AM	Disclosed	$10	1567	1
6:00 AM	Disclosed	$10	7200	0
6:00 AM	Disclosed	$10	7200	0
6:00 AM	Disclosed	$100	2662	1
6:00 AM	Disclosed	$100	7200	0

6:00 AM	Disclosed	$100	7200	0
6:00 AM	Disclosed	$100	7200	0
6:00 AM	Disclosed	$100	7200	0
6:00 AM	Disclosed	$100	7200	0
6:00 AM	Disclosed	$100	7200	0
6:00 AM	Disclosed	$100	7200	0
6:00 AM	Disclosed	$100	7200	0
6:00 AM	Disclosed	$100	7200	0
6:00 AM	Not Disclosed	$10	1781	1
6:00 AM	Not Disclosed	$10	7200	0
6:00 AM	Not Disclosed	$10	7200	0
6:00 AM	Not Disclosed	$10	7200	0
6:00 AM	Not Disclosed	$10	7200	0
6:00 AM	Not Disclosed	$10	7200	0
6:00 AM	Not Disclosed	$10	7200	0
6:00 AM	Not Disclosed	$10	7200	0
6:00 AM	Not Disclosed	$10	7200	0
6:00 AM	Not Disclosed	$10	7200	0
6:00 AM	Not Disclosed	$100	251	1
6:00 AM	Not Disclosed	$100	1051	1
6:00 AM	Not Disclosed	$100	1487	1
6:00 AM	Not Disclosed	$100	564	1
6:00 AM	Not Disclosed	$100	7200	0
6:00 AM	Not Disclosed	$100	7200	0
6:00 AM	Not Disclosed	$100	7200	0
6:00 AM	Not Disclosed	$100	7200	0
6:00 AM	Not Disclosed	$100	7200	0
6:00 AM	Not Disclosed	$100	7200	0
2:00 PM	Disclosed	$10	1164	1
2:00 PM	Disclosed	$10	1154	1
2:00 PM	Disclosed	$10	3167	1
2:00 PM	Disclosed	$10	243	1
2:00 PM	Disclosed	$10	7200	0
2:00 PM	Disclosed	$10	7200	0
2:00 PM	Disclosed	$10	7200	0

2:00 PM	Disclosed	$10	7200	0
2:00 PM	Disclosed	$10	7200	0
2:00 PM	Disclosed	$10	7200	0
2:00 PM	Disclosed	$100	1160	1
2:00 PM	Disclosed	$100	2008	1
2:00 PM	Disclosed	$100	2302	1
2:00 PM	Disclosed	$100	2718	1
2:00 PM	Disclosed	$100	7200	0
2:00 PM	Disclosed	$100	7200	0
2:00 PM	Disclosed	$100	7200	0
2:00 PM	Disclosed	$100	7200	0
2:00 PM	Disclosed	$100	7200	0
2:00 PM	Disclosed	$100	7200	0
2:00 PM	Not Disclosed	$10	1326	1
2:00 PM	Not Disclosed	$10	7200	0
2:00 PM	Not Disclosed	$10	7200	0
2:00 PM	Not Disclosed	$10	7200	0
2:00 PM	Not Disclosed	$10	7200	0
2:00 PM	Not Disclosed	$10	7200	0
2:00 PM	Not Disclosed	$10	7200	0
2:00 PM	Not Disclosed	$10	7200	0
2:00 PM	Not Disclosed	$10	7200	0
2:00 PM	Not Disclosed	$10	7200	0
2:00 PM	Not Disclosed	$100	1461	1
2:00 PM	Not Disclosed	$100	7200	0
2:00 PM	Not Disclosed	$100	7200	0
2:00 PM	Not Disclosed	$100	7200	0
2:00 PM	Not Disclosed	$100	7200	0
2:00 PM	Not Disclosed	$100	7200	0
2:00 PM	Not Disclosed	$100	7200	0
2:00 PM	Not Disclosed	$100	7200	0
2:00 PM	Not Disclosed	$100	7200	0
2:00 PM	Not Disclosed	$100	7200	0
10:00 PM	Disclosed	$10	649	1
10:00 PM	Disclosed	$10	7200	0

10:00 PM	Disclosed	$10	7200	0
10:00 PM	Disclosed	$10	7200	0
10:00 PM	Disclosed	$10	7200	0
10:00 PM	Disclosed	$10	7200	0
10:00 PM	Disclosed	$10	7200	0
10:00 PM	Disclosed	$10	7200	0
10:00 PM	Disclosed	$10	7200	0
10:00 PM	Disclosed	$10	7200	0
10:00 PM	Disclosed	$100	1229	1
10:00 PM	Disclosed	$100	7200	0
10:00 PM	Disclosed	$100	7200	0
10:00 PM	Disclosed	$100	7200	0
10:00 PM	Disclosed	$100	7200	0
10:00 PM	Disclosed	$100	7200	0
10:00 PM	Disclosed	$100	7200	0
10:00 PM	Disclosed	$100	7200	0
10:00 PM	Disclosed	$100	7200	0
10:00 PM	Disclosed	$100	7200	0
10:00 PM	Not Disclosed	$10	3645	1
10:00 PM	Not Disclosed	$10	7200	0
10:00 PM	Not Disclosed	$10	7200	0
10:00 PM	Not Disclosed	$10	7200	0
10:00 PM	Not Disclosed	$10	7200	0
10:00 PM	Not Disclosed	$10	7200	0
10:00 PM	Not Disclosed	$10	7200	0
10:00 PM	Not Disclosed	$10	7200	0
10:00 PM	Not Disclosed	$10	7200	0
10:00 PM	Not Disclosed	$100	4	1
10:00 PM	Not Disclosed	$100	1	1
10:00 PM	Not Disclosed	$100	1984	1
10:00 PM	Not Disclosed	$100	412	1
10:00 PM	Not Disclosed	$100	673	1
10:00 PM	Not Disclosed	$100	2447	1
10:00 PM	Not Disclosed	$100	311	1

10:00 PM	**Not Disclosed**	**$100**	**177**	**1**
10:00 PM	**Not Disclosed**	**$100**	**7200**	**0**
10:00 PM	**Not Disclosed**	**$100**	**7200**	**0**