1 Mean depth of the ocean

```
head(depths)
```

```
##           X        lon       lat  alt water South
## 41995 41995  -87.21236 59.290367  190     1     0
## 11151 11151 -122.33034  5.554558 4167     1     0
## 43640 43640 -148.54790 36.237464 5447     1     0
## 8615   8615  -24.92364 21.625967 5063     1     0
## 8126   8126  177.18458 13.880370 5634     1     0
## 16548 16548   48.88215  3.229250 3691     1     0
```

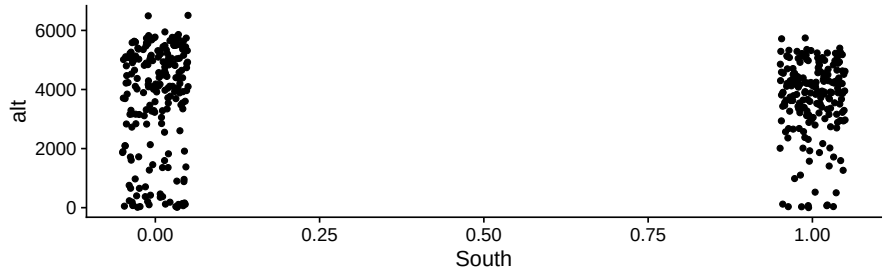
```
dim(depths)
```

```
## [1] 400   6
```

```
fit <- lm(alt ~ 1, data = depths)
summary(fit)
```

```
##
## Call:
## lm(formula = alt ~ 1, data = depths)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3681.5  -584.8   405.5  1197.2  2827.5
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  3683.52      78.71    46.8   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1574 on 399 degrees of freedom
```

2 Mean depth of the ocean in northern and southern hemisphere




```
fit <- lm(alt ~ South, data = depths)
summary(fit)
```

```
##
## Call:
## lm(formula = alt ~ South, data = depths)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3722.0  -608.5   401.5  1200.4  2867.9
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  3643.08     111.42  32.698   <2e-16 ***
## South          80.88     157.56   0.513    0.608
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1576 on 398 degrees of freedom
## Multiple R-squared:  0.0006617,Adjusted R-squared:  -0.001849
## F-statistic: 0.2635 on 1 and 398 DF,  p-value: 0.608
```

```
t.test(alt ~ South, data = depths, var.equal = TRUE)
```

```
##
##  Two Sample t-test
##
## data:  alt by South
## t = -0.51334, df = 398, p-value = 0.608
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -390.6487  228.8787
## sample estimates:
## mean in group 0 mean in group 1
##        3643.080        3723.965
```

3 Ratio depth of the ocean in northern and southern hemisphere

```
# note: we are now using glm
fit <- glm(alt ~ South, data = depths, family = gaussian(link=log))
summary(fit)
```

```
##
## Call:
## glm(formula = alt ~ South, family = gaussian(link = log), data = depths)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -3722.0   -608.5    401.5   1200.4   2867.9
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  8.20058    0.03058 268.144   <2e-16 ***
## South        0.02196    0.04278   0.513    0.608
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 2482673)
##
##     Null deviance: 988758010  on 399  degrees of freedom
## Residual deviance: 988103771  on 398  degrees of freedom
## AIC: 7029.1
##
## Number of Fisher Scoring iterations: 5
```

4 Student drinking

```
fit <- lm(drinks ~ gender, data = drinks)
summary(fit)
```

```
##
## Call:
## lm(formula = drinks ~ gender, data = drinks)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -5.5185 -1.7947 -0.2947  1.4815  9.4815
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   4.2947     0.2837  15.138  < 2e-16 ***
## gender        2.2238     0.4182   5.318  3.2e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.765 on 174 degrees of freedom
## Multiple R-squared:  0.1398,Adjusted R-squared:  0.1348
## F-statistic: 28.28 on 1 and 174 DF,  p-value: 3.197e-07
```

```
fit <- glm(drinks ~ gender, data = drinks, family = gaussian(link=log))
summary(fit)
```

```
##
## Call:
## glm(formula = drinks ~ gender, family = gaussian(link = log),
##     data = drinks)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -5.5185  -1.7947  -0.2947   1.4815   9.4815
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.45739    0.06606  22.062  < 2e-16 ***
## gender       0.41726    0.08115   5.142 7.27e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 7.646385)
##
##     Null deviance: 1546.7  on 175  degrees of freedom
## Residual deviance: 1330.5  on 174  degrees of freedom
## AIC: 861.48
##
## Number of Fisher Scoring iterations: 5
```