H1 Q5

2023-01-29

```
library(tidyverse)
```

```
## ── Attaching packages ─────────────────────────────────────── tidyverse 1.3.2 ──
## ✓ ggplot2 3.3.6      ✓ purrr   0.3.4
## ✓ tibble  3.1.8      ✓ dplyr   1.0.10
## ✓ tidyr   1.2.1      ✓ stringr 1.4.1
## ✓ readr   2.1.2      ✓ forcats 0.5.2
## ── Conflicts ────────────────────────────────────────── tidyverse_conflicts() ──
## ✕ dplyr::filter() masks stats::filter()
## ✕ dplyr::lag()    masks stats::lag()
```

Part A

```
mmdark.dat = read.table("mmdark2023.txt",header=TRUE)
```

```
mmdarksum = mmdark.dat %>% mutate(notblue = rowSums(mmdark.dat)-blue) %>% select(blue,notblue)

apply(mmdarksum,2,sum)
```

```
##    blue notblue
##     169     461
```

There were 169 blue and 461 non-blue M&Ms.

Part D

```
mmdark.dat17 = read.table("mmdark2017.txt",header=TRUE)
```

```
mmdarksum17 = mmdark.dat17 %>% mutate(notblue = rowSums(mmdark.dat17)-blue) %>% select(blue,notb
lue)

apply(mmdarksum17,2,sum)
```

```
##    blue notblue
##     148     518
```

Part F

ii)

```
qbeta(0.025,318,980)
```

```
## [1] 0.2219823
```

```
qbeta(0.975,318,980)
```

```
## [1] 0.2687466
```

#Part G

```
# placenta.R - show likelihood, prior, posterior from placenta previa example
# (Gelman et al p. 43-45).
plot.beta <- function(alpha, bbeta, y, n) {


# arguments: alpha and bbeta are hyperparameters for beta prior,
# and y and n are observed successes and observed total from data
theta <- seq(0,.60,.001) ### values for x-axis

# dbeta(x,shape1,shape2,ncp=0,log=F), where x=vector of quantiles,
# shape1=alpha, shape2=bbeta, ncp=noncentrality param, and if log=T it
# gives probabilities as log(p)

ttitle <- paste0("Prior: alpha=",alpha,", beta=",bbeta)

plot(theta,dbeta(theta,y+alpha,n-y+bbeta),type="n",bty="l",
xlab="theta",ylab="", cex.lab=1.4, main=ttitle)
# Likelihood
lines(theta,dbeta(theta,y,n-y), lwd=2,col="red",lty=1)
# Prior
lines(theta,dbeta(theta,alpha,bbeta), lwd=2,col="blue",lty=3)
# Posterior
lines(theta,dbeta(theta,(y+alpha),(n-y+bbeta)),lwd=4,col="purple",lty=2)
legend("topright",c("Prior","Likelihood","Posterior"),lty=c(3, 1, 2),
col=c("blue","red","purple"),lwd=c(2,2,2),cex=1)
}


pdf("placenta.pdf")

plot.beta(6,28,169,630)
plot.beta(149,519,169,630)

mtext("Data: y=169,n=630",side=3,outer=T,cex=1.6,line=0)
dev.off()
```

```
## png
##   2
```

The prior is flatter, so the posterior is very influenced by the likelihood (data).

The prior and likelihood are equally informatives since they are both sharp, so the posterior falls in between.