```r
# a. Find the probability that X is equal to 17
dbinom(17, 31, 0.447)
# 0.0753 is the probability that x is equal to 17

# b. Find the probability that X is at most 13
pbinom(13, 31, 0.447)
# 0.4514 is the probability that x is at most 13

# c. Find the probability that X is bigger than 11.
pbinom(11, 31, 0.447, lower.tail = F)
# 0.8020 is the probability that x is bigger than 11

# d. Find the probability that X is at least 15.
pbinom(14, 31, 0.447, lower.tail = F)
# 0.4060 is the probability that x is at least 15

# e. Find the probability that X is between 16 and 19, inclusive
sum(dbinom(16:19, 31, 0.447))
diff(pbinom(c(19,15), 31, 0.447, lower.tail = FALSE))
# 0.2545 is the probability between 16 and 19 , inclusive
```

```
> dbinom(17, 31, 0.447)
[1] 0.07532248
> # a. Find the probability that X is equal to 17
> dbinom(17, 31, 0.447)
[1] 0.07532248
> # b. Find the probability that X is at most 13
> pbinom(13, 31, 0.447)
[1] 0.451357
> # c. Find the probability that X is bigger than 11.
> pbinom(11, 31, 0.447, lower.tail = F)
[1] 0.8020339
> # d. Find the probability that X is at least 15.
> pbinom(14, 31, 0.447, lower.tail = F)
[1] 0.406024
> # e. Find the probability that X is between 16 and 19, inclusive
> sum(dbinom(16:19, 31, 0.447))
[1] 0.2544758
> diff(pbinom(c(19,15), 31, 0.447, lower.tail = FALSE))
[1] 0.2544758
>
```