p8130_hw1_yl5508

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2023/9/23

Problem 1

(a) ordinal.
(b) binary.
(c) nominal.
(d) continuous.
(e) discrete.

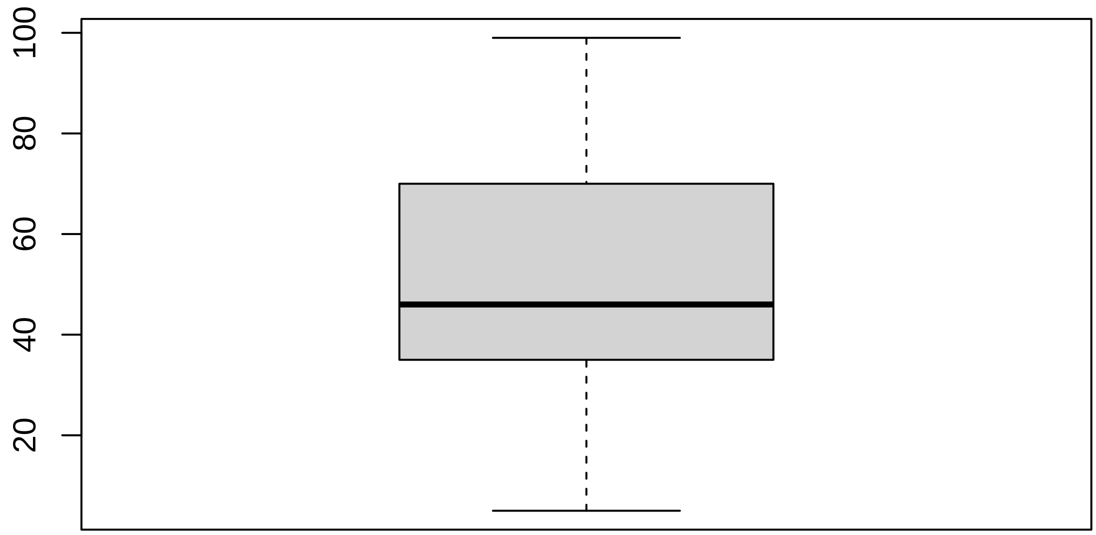
Problem 2

Problem 2.1

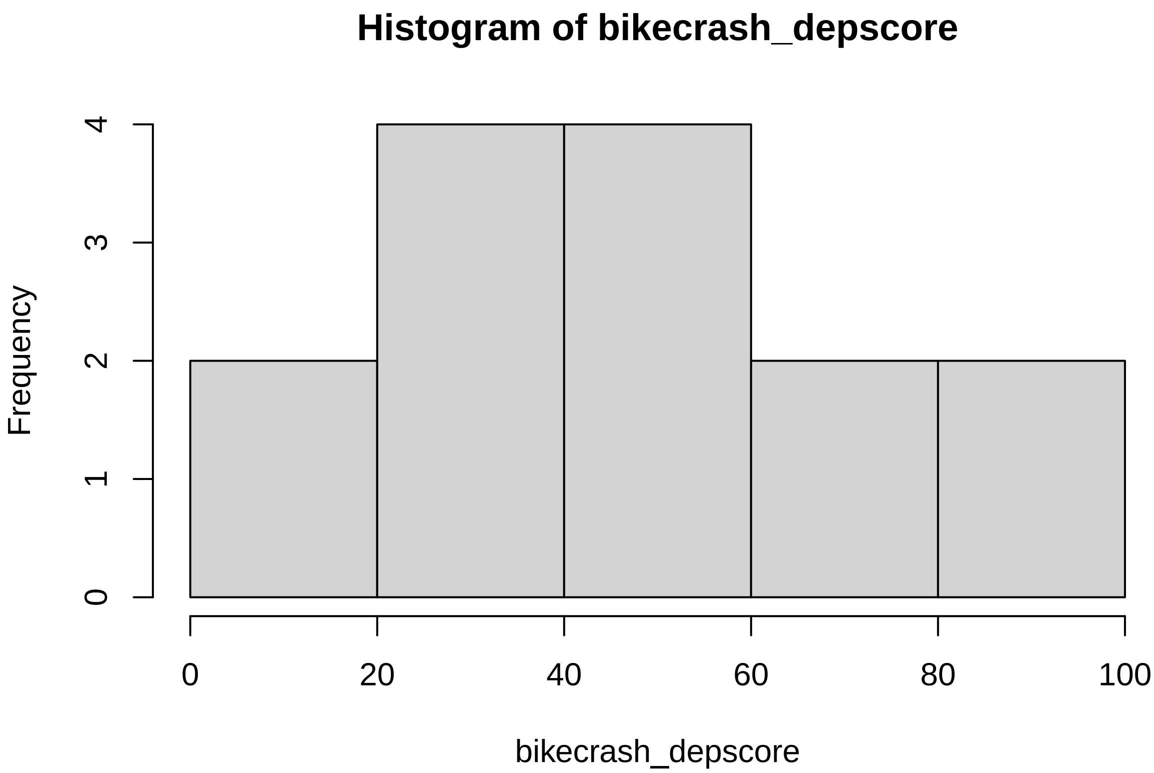
```
bikecrash_depscore = c(45, 39, 25, 47, 49, 5, 70, 99, 74, 37, 99, 35, 8, 59)
mean(bikecrash_depscore)
median(bikecrash_depscore)
range(bikecrash_depscore)
sd(bikecrash_depscore)
#Like var, sd uses denominator n-1.
```

(a) Descriptive summaries: (mean) 49.36, (median) 46, (range) 5, 99, (sd) 28.85.

```
boxplot(bikecrash_depscore)
```




```r
hist(bikecrash_depscore)
```

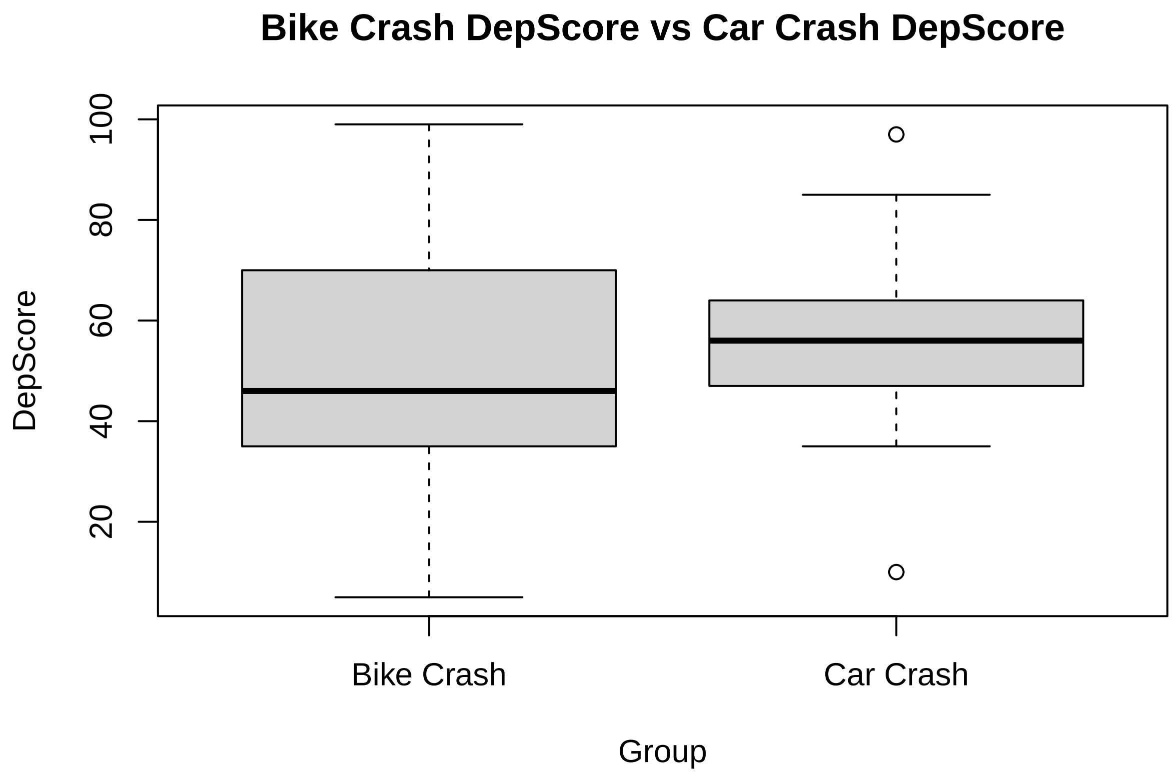


(b) Some key elements of the boxplot of bike crash:
(1) maximum: 99.
(2) minimum: 5.
(3) 1st quartile is around 35.
(4) 3rd quartile is around 70.
(5) median is around 40.
(6) no outlier.
We can see characteristics of underlying distribution: right-skewed, unimodal distribution.

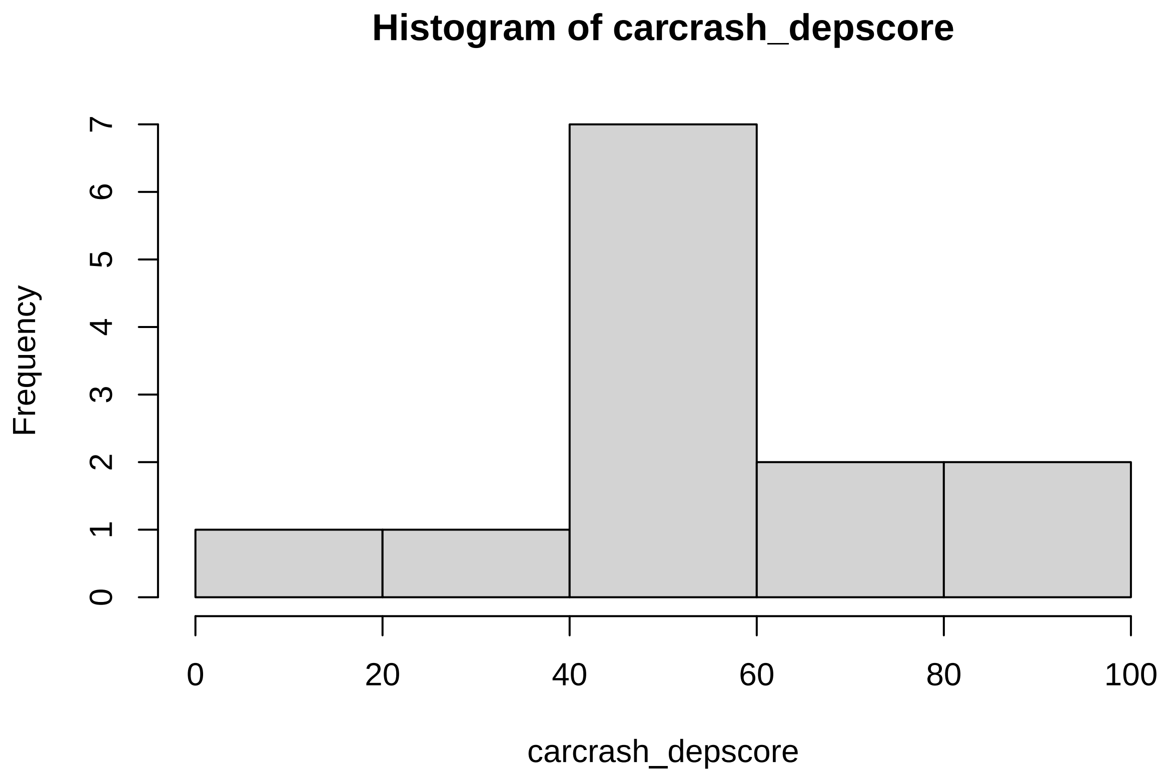
Problem 2.2

(a) side-by-side boxplot (bikecrash vs carcrash)

```
carcrash_depscore = c(67, 50, 85, 43, 64, 35, 47, 97, 58, 58, 10, 56, 50)
boxplot(bikecrash_depscore, carcrash_depscore,
        xlab = "Group", ylab = "DepScore",
        names = c("Bike Crash", "Car Crash"),
        main = "Bike Crash DepScore vs Car Crash DepScore")
```




```
hist(carcrash_depscore)
```



(b) Some key elements of the boxplot of car crash:
(1) maximum: 97.
(2) minimum: 10.
(3) 1st quartile is around 45.
(4) 3rd quartile is around 65.
(5) median is around 55.
(6) there's one outlier.
For car crash DepScore, the characteristic of its distribution is right-skewed and Unimodal.

(c) Group Bike Crash probably have a lower typical depression score. Cause both the median(46) and mean(49.36) of the bike crash depression score are lower than those of car crash (median(56) and mean(55.38)).

Problem 3

(a) $p(A) = 6/12 = 1/2$.
(b) $p(B) = 1/12$.
(c) $\because B \subset A \therefore p(B \cup A) = p(A) = 1/2$.
(d) $\because p(A \cup B) = p(A) + p(B) - p(A \cap B) \therefore p(A \cap B) = p(A) + p(B) - p(A \cup B) = 1/2 + 1/12 - 1/2 = 1/12$
$\because p(A \cap B) \neq p(A) \times p(B) \therefore$ event A and B are not independent$.

Problem 4

$event\ A:\ 75+\ y's\ woman\ has\ a\ positive\ scan\ finding$
$event\ B:\ 75+\ y's\ woman\ has\ dementia$

$p(B) = 0.05$ $p(A|B) = p(A \cap B)/p(B) = 0.8$ $p(A|B^{\complement}) = p(A \cap B^{\complement})/p(B^{\complement}) = 0.1$

$p(B^{\complement}) = 1 - p(B) = 0.95$ According to *Bayes' Rule*,
$p(B|A) = \frac{p(A|B) \times p(B)}{p(A|B) \times p(B) + p(A|B^{\complement}) \times p(B^{\complement})} = \frac{0.8 \times 0.05}{0.8 \times 0.05 + 0.1 \times 0.95} \approx 0.296$
So, the probability that the woman who has a positive scan finding may have dementia is 29.6%.