Problem Set 3 Key

1 Problem 1

The table below shows the frequency table of the number of referrals offered for expectant mothers who experience socioeconomic barriers for needed healthcare.

Number of Referrals	Frequency
0	90
1	132
2	76
3	10

• What is the probability that a randomly selected participant received at least one referral? [2 pts.]

Note

We need to calculate the relative frequencies for each category first to calculate the specific probabilities.

library(tidyverse)

```
----- tidyverse 2.0.0 --
-- Attaching core tidyverse packages --
v dplyr
           1.1.4
                     v readr
                                 2.1.5
v forcats
           1.0.0
                     v stringr
                                 1.5.1
v ggplot2
           3.5.2
                     v tibble
                                 3.3.0
v lubridate 1.9.4
                     v tidyr
                                 1.3.1
v purrr
           1.1.0
-- Conflicts -----
                                   x dplyr::filter() masks stats::filter()
x dplyr::lag()
                 masks stats::lag()
i Use the conflicted package (<a href="http://conflicted.r-lib.org/">http://conflicted.r-lib.org/</a>) to force all conflicts to become
```

```
Referrals Frequency RelFrequency
1 0 90 0.29220779
2 1 132 0.42857143
3 2 76 0.24675325
4 3 10 0.03246753
```

OR

Referrals Frequency Rel.Frequency 0 90 0.29220779 1 2 1 132 0.42857143 3 2 76 0.24675325 4 10 0.03246753

$$P(X \ge 1) = P(X = 1) + P(X = 2) + P(X = 3)$$

or

$$P(X \ge 1) = 1 - P(X = 0)$$

Hence the probability $P(X \le 1)$ is:

```
1-90/sum(c(90,132,76,10))
```

[1] 0.7077922

OR

1-0.2922

[1] 0.7078

• What is the expected value of the number of referrals in the sample? [1pt.]

Note

The expected number of referrals is the sum of the product of the outcome and their corresponding probabilities.

$$E(X) = 1 * (90/308) + 2 * (132/308) + 3 * (76/308) + 4 * (10/308)$$

```
0*(90/308) + 1*(132/308) + 2*(76/308) + 3*(10/308)
```

[1] 1.019481

OR

sum(df\$Referrals*df\$Rel.Frequency)

[1] 1.019481