INTRODUCTION TO STATISTICS

PROBLEM SET 5

S520

1. Suppose that X is a continuous random variable with probability function.

$$f(x) = \left\{ \begin{array}{ccc} 0 & & x < 0 \\ x & & x \in (0,1) \\ (3-x)/4 & & x \in (1,3) \\ 0 & & x > 3 \end{array} \right\}.$$

(a) Compute q2(X), the population median.

Q1.	given , × is a contineus roudern variable with
	probability function
	0 2 0
	x x ∈ (0,1)
	$f(x) = \begin{cases} x & \alpha \in (\theta_1) \\ (3-x)/4 & \alpha \in (1:3) \\ 0 & \alpha > 3 \end{cases}$
	(o x>3
	a see that any area of the second are
(a)	92(X), population molion.
(,	nudian - value of x such that copof x = 0.5.
	[: median is the soth percentile]
	FOL N = 0
	F(M) = 1 0.dn = 0
	o
	For 0<151
	$f(x) = \frac{1}{2} t dt$ $0 \Rightarrow \frac{1}{2} x^{2}$
	o' → 1 x2
	2
	for 1<2<3
	$F(N) = \int t dt + \int \frac{(3-t)}{4} dt = \frac{1}{2} + \left[\frac{3(x-1)}{4} \right] - \left[\frac{1}{4} (x-1) \right]$

For
$$x > 3$$

$$F(N) = 1 \quad [: Morrismum possible value]$$

$$q_{2}(x) \rightarrow ?$$

$$F(q_{2}) = 0.5$$

$$solving for q_{2}$$

$$for 0 < q_{1} \leq 1$$

$$\frac{1}{2} (q_{2})^{2} = 0.5$$

$$q_{2} = 1$$

$$q_{2} = 1$$
we know that q_{2} must be in $(0,1)$ interval
$$q_{2} = 1$$

(b) Which is greater, q2(X) or EX? Explain your reasoning.

b)
$$q_{2}(x) = (x)$$
, which is greate?

We know $q_{2}(x) = 1$
 $E(x) = ?$
 $E(x) = ?$
 $E(x) = 4$
 $x = (x) dx + 3$
 x

(c) Compute P(0.5<X<1.5).

(1)	compute P(0.5 < X < 1.5)
()	
	b(x=1.2)= = b(x=1.2)-b(x=0.2)
	P(X41.5)= (Ha)dx
	1.5
	$\Rightarrow \int f(x) dx + \int f(x) dx + \int f(x) dx$
	1.5
	$\Rightarrow 0 + \int \chi d\chi + \int \frac{3}{4} d\chi - \int \frac{\chi}{4} d\chi$
	$\Rightarrow \left[\frac{\chi^2}{2}\right]_0^1 + \frac{3}{4}\left[\chi\right]_1^{1/5} - \frac{1}{4}\left[\frac{\chi^2}{2}\right]_1^{1/5}$
	$\Rightarrow \frac{1}{2} + \frac{3}{4} \left(1.5 - 1 \right) - \frac{1}{4} \times \frac{1}{2} \left[\left(1.5 \right)^{2} \left(1 \right)^{2} \right]$
	€ 0.5 + 0.375 - 0.156 = 0.719
	P(x51.5) = 0.719.
	$P(\times \leq 0.5) = \int_{0.5}^{0.5} f(x) dx$
	-00
_	$\Rightarrow \int f(x) dx + \int f(x) dx$
	$0 + \int n dx = \left[\frac{\chi^2}{2}\right]^{0.5} = 0.127$

$$P(\times \leq 0.5) = 0.125/$$

$$P(0.5 \leq \times \leq 1.5) = 0.719 - 0.125$$

$$= 0.594/$$

(d) Compute iqr(X), the population interquartile range.

(d)	$(q \mathcal{H} \times)$, population interguartile range.				
	the Integrative range is between the 75th (93) and 25th (91) $F(03) = 0.75; F(01) = 0.25$ from the CDF, we brow $-93^{2} + 603^{-1}$ $= 0.75$ $\Rightarrow 03^{2} - 603 + 7 = 0$				
	quadratic formula: -61 \ 36- (4x1x7)				
	$\Rightarrow \frac{61 \sqrt{8}}{2} \Rightarrow \frac{6}{3} = \frac{6+2.82}{2}, \frac{6-2.82}{2}$				
	2 3 2 2				
	a3 = 4.41; 1.59				
	with the basser boundaries, we know Q3 = 1.59/				
	$F(Q_i) = 0.25$				
	$\frac{\mathfrak{d}_{1}^{2}}{2} = 0.25 \Rightarrow \mathfrak{d}_{1} = 0.7 $				
	interquartile range = $P_3 - Q_1 \Rightarrow 1.59 - 0.7$				
	= 0.878/				

- 2. The heights of adult women follow an approximately normal distribution with mean 63.8 inches and SD 2.9 inches.
 - (a) What percentage of adult women are taller than 65.5 inches?

```
> mean_height <- 63.8
> sd_height <- 2.9
>
> # Height you want to find the probability for
> height <- 65.5
>
> # Calculate the Z-score
> z_score <- (height - mean_height) / sd_height
> z_score
[1] 0.5862069
```

Q2·	hights of adult women:
	rumal distribution will
	Standard diviation = 2-9 inches
(a)	percentage of adult women taller than 65.5 inclus?
	P(X > 65.5) = P(Z > 65.5 - 63.8)
	⇒ 1- P(2< 0.586)
	⇒ 1-0.72106
	⇒ 0.2789 which is 27.89%.
	percentage of woman tallor thom 65.5 moles = 27.89

(b) What is the interquartile range of adult women's heights?

```
> z_score <- qnorm(0.25)
> z_score
[1] -0.6744898
> z_score <- qnorm(0.75)
> z_score
[1] 0.6744898
```

(6)	interqualitie range of adult wanter's height. $P(x < P_i) = 0.25$
	$P(x < \emptyset_i) = 0.25$
	Q1-63·8
. 8	2.9 = -0.675
	P1 = 61.8425
	P(× < 03) = 0.75
	Q3-63.8
	2.9 = 0.675
	Q3 = 65.7575
	ar= 03-9, = 65.7575-61.8425 = 3.915

(c) Complete the following, rounding to the nearest 0.1 of an inch: "The shortest 2.5% of women are shorter than —, while the tallest 2.5% of women are taller than —."

```
> z_score
[1] -1.959964
> z_score <- qnorm(0.975)
> z_score
[1] 1.959964
```

<u> </u>	variet 0.1 of an inch. The shortest 2.5% of women are shorter thom _ whi
t	he tallest 2.5% of women are taller thom
	P(X < c) = 0.025
	$\frac{c - 63.8}{2.9} = -1.96$
	C= 58.116
	: diastert 2.5% of women are shorter than 58.116
	P(x cc) = 0.975
	C- 63·8
	2-9 = 1.96
	c= 69.484
7211	tallest 2.5% of women are taller thom 69.484

- 3. (From the Fall 2014 takehome.) Let X be a standard normal random variable. Let $Y = X_2$.
 - (a) FindP(Y > 1).

```
> # Number of random samples to generate
> num_samples <- 100000
>
> # Generate random samples from a standard normal distribution
> x <- rnorm(num_samples)
>
> # Calculate Y = X^2
> y <- x^2
> # Calculate the proportion of samples where Y > 1
> probability <- sum(y > 1) / num_samples
> cat("P(Y > 1) =", probability, "\n")
P(Y > 1) = 0.31865
```

(b) Find the 0.9-quantile of Y.

```
03 0.90 quantile of Y is y such that
P(Y < Y) = 0.90
P(X^{2} < Y) = 0.90
P(-Jy < x < Jy) = 0.90
2P(0 < x < Jy) = 0.90
P(0 < x < Jy) = 0.90
P(x < Jy) = 0.90
P(x < Jy) = 0.45
P(x < Jy) = 0.45
P(x < Jy) = 0.95
P(x < Jy) = 0.95
```

```
> y=(qnorm(0.95))^2
> y
[1] 2.705543
```

- 4. Let X be a continuous random variable with PDF $0.30 \le x < 1 \text{ f(x)} = 0.71 \le x < 2.$ 0 otherwise
 - (a) Find is the constant value a that minimizes E|X-a|.

	· × - continous roundom variable with PDF
9(4)	× - continous runas
	$f(x) = \begin{cases} 0.7 & 1 \le x < 2 \\ 0 & \text{otherwise} \end{cases}$
	13.5 (6.1)
	constant value a that minimises E[x-a].
(a)	the constant value a that minimizes $E[X-a]$ is
	11 land (alue A) that prover is
	the redion. Hence we find y for F(y) = 0.5
	F(y) is the COF
	For - & 5 y < 0
	F(y) =0
	FOR OSY <1
	F(y) = f(n)da + ftmda
	f(n)da + f(n)da
J	→ 0 + 0 o du
	3 0 1 0 3 du
	F(05y21) = 0.34.1
	FOR 159<2
	$F(y) = \int f(x) dx + \int f(x) dx + \int f(x) dx$
*	-00 +(x)xx + +(x)xx
-	D 10 10 10 1 1 1 7 9
	⇒ 0+[0.3y] + [0.1] y
	1(0) 10 (00)
	D 0.3 + 0.14 - 0.7

F(1 \leq y \req 2) = 0.7y - 0.4

For
$$y \ge 2$$
, $F(y) = \int_{-\infty}^{\infty} f(x) dx + \int_{-\infty}^{\infty} f(x) d$

(b) Find the constant value b that minimizes $E[(X - b)_2]$.

(6)	constant value of b that minimizes E[(X-b)2].				
	The constant value shat minimizes is called the				
	Enperted value E(X).				
	$E(x) = \int u f(x) du$				
	2 00				
	$E(x) = \int_{0}^{\infty} x f(x) dx + \int_{0}^{\infty} x f(x) dx + \int_{0}^{\infty} x f(x) dx$				
	-w b				
	$\Rightarrow 0 + 0.3 \left[\frac{\chi^{2}}{2} \right]^{2} + 0$				
	$\begin{bmatrix} 2 \end{bmatrix}_0 \begin{bmatrix} 2 \end{bmatrix}_1$				
	≥ 0 + 0.15 + 1.05				
	= [.2				
	E(x) = (.2				
	constant value b' that ninimizes E/(x-b/= / 13 1,24				

- 5. The file IUSalaries2023.csv contains the salaries of IU Bloomington academic faculty for the 2023–24 academic year (this is publicly available information.) Read this data into R, e.g. by using the function read.csv().
 - Dr. Luen's salary is \$81,902. What is the percentile rank of his salary among IUB academic faculty? Remember to include your code.

```
> getwd()
[1] "/Users/monishapatro/Documents/Intro to Stats/STAT R520/STAT560"
                > IUSalaries <- read.csv("IUSalaries2023.csv", header = TRUE, sep =",")
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IUSM - BLOOMINGTON AC1
DEPARTMENT OF INFORMATICS AC1
CGB SEQUENCING FACILITY AC1
EMPIDIOLOGY AND BLOSTATISTICS AC1
PHILOSOPHY AC1
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THE O'NEILL SCHOOL - BL SPEA AC1
OLE EASTERN LANGUAGE AND CULTURE AC1
APPLIED HEALTH SCIENCE AC1
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16 BL NELC MIDDLE EASTERN LANGUAGES AND CULTURE
17 BL MATH
18 BL CEDP COUNSELING & EDUCATIONAL PSY
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19 BL LAWL LAW LEBRARY
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PSYCHOLOGICAL & BRAIN SCIENCES ACI
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5
   EPIDEMIOLOGY AND BIOSTATISTICS 73250
                                          1
                                                12
                      PHILOSOPHY
                                  97947
                                          1
                                                10
       DEPARTMENT OF INFORMATICS 361846
7
                                                12
                                          1
   ESKENAZI SCHOOL OF ART ARCH + 160000
                                          1
                                                10
           SCHOOL OF SOCIAL WORK 59740
                                                12
```

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SCHOOL OF SOCIAL MONE SSEED T
10
          JACOBS SCHOOL OF MUSIC 78000 1
                                               10
11
                        ENGLISH 119036
                                               10
                      PHILOSOPHY 79898
13 PSYCHOLOGICAL & BRAIN SCIENCES 37370
                                         1
                                               12
          CINEMA & MEDIA STUDIES 94822
                                               10
14
                                         1
15
    THE O'NEILL SCHOOL - BL SPEA 113345
                                               10
16 MIDDLE EASTERN LANGUAGES AND C 144466
                                         1
                                               10
17
                     MATHEMATICS 53000
                                               10
18
                       EDUCATION 77462
19
          APPLIED HEALTH SCIENCE 155864
20
          APPLIED HEALTH SCIENCE 97679
                                               10
                     LAW LIBRARY 89554
21
                                         1
                                               12
22
                         BIOLOGY 37370
                                         1
                                               12
23
       DEPARTMENT OF INFORMATICS 143089
                                         1
                                               10
24
       KELLEY SCHOOL OF BUSINESS 115000
                                               10
     EAST ASIAN LANGS & CULTURES 83005
26 EPIDEMIOLOGY AND BIOSTATISTICS 139463
                                               10
27
       KELLEY SCHOOL OF BUSINESS 95000
                                               10
                                         1
28
                       EDUCATION 135523
                                               10
     EAST ASIAN LANGS & CULTURES 64322
29
                                         1
                                               10
30 ESKENAZI SCHOOL OF ART ARCH + 89446
                                               10
31 MIDDLE EASTERN LANGUAGES AND C 95627
          JACOBS SCHOOL OF MUSIC 76688
                                               10
33 MIDDLE EASTERN LANGUAGES AND C 53774
                                               10
34 PSYCHOLOGICAL & BRAIN SCIENCES 184226
                                         1
                                               10
                    ANTHROPOLOGY 81563
                                               10
36 ENVIRONMENTAL AND OCCUPATIONAL 65000
                                         1
                                               12
37
                       SOCIOLOGY 141775
38
       KELLEY SCHOOL OF BUSINESS 62500
39
    THE O'NEILL SCHOOL - BL SPEA 70860
                                               10
40
                       ECONOMICS 176875
                                         1
                                               10
41
                       LIBRARIES 67000
                                               12
42 EPIDEMIOLOGY AND BIOSTATISTICS 65207
                                         1
                                               12
43
  THE O'NEILL SCHOOL - BL SPEA 79374
                                               10
44
                       SOCIOLOGY 108039
                                               10
45
                        HISTORY 151719
46
          JACOBS SCHOOL OF MUSIC 172525
                                               12
                 GENDER STUDIES 81910
47
                                         1
                                               10
48 SCHOOL OF PUBLIC HEALTH - BLOO 486236
                                         1
                                               12
49
      HEALTH AND WELLNESS DESIGN 82193
                                         1
                                               10
            MAURER SCHOOL OF LAW 156187
                                               10
51 MIDDLE EASTERN LANGUAGES AND C 62225
52 MIDDLE EASTERN LANGUAGES AND C 95213
                                               10
                    ANTHROPOLOGY 97570
53
                                         1
                                               10
```

```
EDUCATION 65000 1
                                                10
55 PSYCHOLOGICAL & BRAIN SCIENCES 56800
                                                12
56 AFRICAN AMER & AFRICAN DIASPOR 78000
                                                10
57
      SPEECH & HEARING SCIENCES 92236
                                                12
    THE O'NEILL SCHOOL - BL SPEA 188897
58
                                                10
                         BIOLOGY 60000
                                                10
60
                    MEDIA SCHOOL 79402 1
                                                10
61
                         ENGLISH 91451
                                                10
                       EDUCATION 160126
62
                                                12
       KELLEY SCHOOL OF BUSINESS 68000
       SPEECH & HEARING SCIENCES 122649
                                                10
64
65 IND INST ON DISABILITY/COMMNTY 77250
                                                12
66 SCHOOL OF PUBLIC HEALTH - BLOO 67809
                                                12
                         ENGLISH 77214
                                                10
                AMERICAN STUDIES 94294
68
                                                10
       SPEECH & HEARING SCIENCES 127272
69
                                                10
70
       KELLEY SCHOOL OF BUSINESS 241000
                                                10
71 PSYCHOLOGICAL & BRAIN SCIENCES 60000
                                                12
72 IND INST ON DISABILITY/COMMNTY 76282
                                                12
       KELLEY SCHOOL OF BUSINESS 173040
                                                10
73
     ORGN OF AMERICAN HISTORIANS 74656
                                                12
75
                COMPUTER SCIENCE 115000 1
                                                10
STATISTICS 65000 1 10
[ reached 'max' / getOption("max.print") -- omitted 2958 rows ]
76
```

```
> # Initialize the "salary" variable with Dr. Luen's salary
> salary <- 81902
> # Read the data from the CSV file
 salary_data <- read.csv("IUSalaries2023.csv")</pre>
 salary_data
                                                                                                  Class Pos.Nbr Dept.ID
   COA Org
                                    Funding.Org.Name Plan Grade Post
    BL MSCI
1
                                  IUSM - BLOOMINGTON AC1
                                                             FVX
                                                                 FV8
                                                                                                          53730 IN-MSCI
    BL INFI
                           DEPARTMENT OF INFORMATICS
                                                             RSP
                                                                  RSP
                                                                                                          48823 BL-INFI
2
                                                       AC1
3
    BL CGB
                             CGB SEQUENCING FACILITY
                                                             RSS
                                                                  RSS
                                                                                                          28414 BL-CGBI
                                                       AC1
                                                                                                            745 BL-MATH
4
    BL MATH
                                         MATHEMATICS AC1
                                                             FVX
5
                      EPIDEMIOLOGY AND BIOSTATISTICS
    BL EBIO
                                                     AC1
                                                             RSS
                                                                  RSS
                                                                                                           9991 BL-EBIO
6
    BL PL
                                          PHILOSOPHY AC1
                                                             FTX
                                                                  AAM
                                                                                                          13396 BL-PL
7
    BL INFI
                           DEPARTMENT OF INFORMATICS AC1
                                                             FTX
                                                                  FT1
                                                                                         PR - Professor
                                                                                                          53583 BL-INFI
8
    BL SOAD
                ESKENAZI SCHOOL OF ART ARCH + DESIGN
                                                             FTX
                                                                                         PR - Professor
                                                                                                          54488 BL-SOAD
                                                       AC1
                                                                  FT1
9
    BL SOCW
                               SCHOOL OF SOCIAL WORK
                                                             FVX
                                                                  FV5
                                                                                         TL - Lecturer
                                                                                                          12276 IN-SOCW
                                                      AC1
10
    BL MUTH
                                         MUSIC THEORY
                                                       AC1
                                                                  FT2
                                                                              PC - Associate Professor
                                                                                                           5962 BL-MUS
                                                             FTX
11
    BL ENG
                                              ENGLISH AC1
                                                                  AAL
                                                                                                           5048 BL-ENG
12
    BL
        PL
                                          PHILOSOPHY PHILOSOPHY
                                                       AC1
                                                             FTX
                                                                  FT3
                                                                              PT - Assistant Professor
                                                                                                           5453
                                                                                                                 BL-PL
13
    BL PSY
                      PSYCHOLOGICAL & BRAIN SCIENCES
                                                             FVX
                                                                  FV8
                                                                                                          29072 BL-PSY
                                                       AC1
14
    RI CTMS
                              CINEMA & MEDIA STUDIES
                                                       AC1
                                                             FTX
                                                                  FT2
                                                                              PC - Associate Professor
                                                                                                          42519 RI -CTMS
                        THE O'NEILL SCHOOL - BL SPEA
                                                                                         PR - Professor
                                                                                                           8171 BL-SPEA
15
    BL SPEA
                                                                  FC1
                MIDDLE EASTERN LANGUAGES AND CULTURE
                                                             FTX
                                                                                         PR - Professor
16
   BL NELC
                                                      AC1
                                                                  FT1
                                                                                                          28698 BL-NELC
17
    BL MATH
                                         MATHEMATICS
                                                       AC1
                                                             FLX
                                                                  FL5
                                                                                          TL - Lecturer
                                                                                                          26799 BL-MATH
18
    BL CEDP
                        COUNSELING & EDUCATIONAL PSY
                                                       AC1
                                                             FTX
                                                                  FT3
                                                                              PT - Assistant Professor
                                                                                                           5689 BL-EDUC
                                                                              PC - Associate Professor
                                                                                                           4690 BL-APHS
19
    BL APHS
                              APPLIED HEALTH SCIENCE
                                                             FTX
                                                                  FT2
                                                       AC1
    BL APHS
                              APPLIED HEALTH SCIENCE
                                                                              PT - Assistant Professor
                                                                                                           4698 BL-APHS
20
                                                                  FT3
21
    BL LAWL
                                         LAW LIBRARY AC1
                                                             ITX
                                                                  1 T2
                                                                                                          18019 BL-LAWL
                                                                              LC - Associate Librarian
22
    BL BI
                                              BIOLOGY
                                                       AC1
                                                             RSS
                                                                  RSS
                                                                                                            878 BL-BI
23
    BL INFI
                           DEPARTMENT OF INFORMATICS
                                                       AC1
                                                             FTX
                                                                  FT1
                                                                                         PR - Professor
                                                                                                          26761 BL-INFI
                   DEPT OF ECONOMICS & PUBLIC POLICY
                                                             FVX
                                                                  FV3
                                                                              PT - Assistant Professor
                                                                                                          54605 BL-BUS
24
    BL BEPP
                                                       AC1
25
    BL EALC
                         EAST ASIAN LANGS & CULTURES
                                                                  FT3
                                                                              PT - Assistant Professor
                                                                                                           8149 BL-EALC
26
    BL GRCH
                                      GRAND CHALLENGE
                                                      AC1
                                                             FTX
                                                                  FT2
                                                                              PC - Associate Professor
                                                                                                           5539 BL-EBIO
27
    BL OADT BUSINESS OPERATIONS & DECISION TECHNOLOG
                                                       AC1
                                                             FLX
                                                                  FLS
                                                                                  TS - Senior Lecturer
                                                                                                          11059 BL-BUS
28
    BL CRIN
                            CURRICULUM & INSTRUCTION
                                                       AC1
                                                             FTX
                                                                  FT1
                                                                                        PR - Professor
                                                                                                             35 BL-EDUC
    BL EALC
                         EAST ASIAN LANGS & CULTURES AC1
                                                                                                          34539 BL-EALC
29
                                                             FLX
                                                                  FLS
                                                                                  TS - Senior Lecturer
30
    BL SOAD
                ESKENAZI SCHOOL OF ART ARCH + DESIGN
                                                                  AAM
                                                                                                           5359 BL-SOAD
                MIDDLE EASTERN LANGUAGES AND CULTURE
                                                             FTX
                                                                  FT1
                                                                                         PR - Professor
31
    BL NELC
                                                       AC1
                                                                                                           5379 BL-NELC
32
    BL MUCA
                                      CHORAL ENSEMBLE
                                                       AC1
                                                             FTX
                                                                  FT2
                                                                              PC - Associate Professor
                                                                                                           6008 BL-MUS
33
    BL NELC
                MIDDLE EASTERN LANGUAGES AND CULTURE
                                                       AC1
                                                             FLX
                                                                  FL5
                                                                                         TL - Lecturer
                                                                                                          27235 BL-NELC
34
    BL PSY
                      PSYCHOLOGICAL & BRAIN SCIENCES
                                                             FTX
                                                                  FT1
                                                                                         PR - Professor
                                                                                                          28294 BL-PSY
                                                       AC1
35
    BL ANTH
                                         ANTHROPOLOGY AC1
                                                             FTX
                                                                  FT3
                                                                              PT - Assistant Professor
                                                                                                          36612 BL-ANTH
36
   BL ENVR
               ENVIRONMENTAL AND OCCUPATIONAL HEALTH AC1
                                                             RSS
                                                                  RSS
                                                                                                          36182 BL-ENVR
37
    BL SOC
                                           SOCIOLOGY
                                                       AC1
                                                             FTX
                                                                  FT1
                                                                                         PR - Professor
                                                                                                           5581 BL-SOC
   BL CPCS
                      COMM, PROF, AND COMPUTER SKILL
38
                                                       AC1
                                                             FLX
                                                                  FL5
                                                                                          TL - Lecturer
                                                                                                          54762 BL-BUS
```

40	BL ECON	ECONOMICS	AC1	FTX	FT1	PR - Professor	8516 BL-ECON
41	BL LREF	SCHOLARS COMMONS	AC1	LTX	LT2	LC - Associate Librarian	16678 BL-LIBR
42	BL BCC	BIOSTATISTICS CONSULTING CENTER	AC1	RSS	RSS		31442 BL-EBIO
43	BL SPEA	THE O'NEILL SCHOOL - BL SPEA	AC1	FVX		TL - Lecturer	5609 BL-SPEA
44	BL SOC	SOCIOLOGY	AC1	FTX	AAM		27527 BL-SOC
45	BL HIST	HISTORY	AC1	FTX	FT1	PR - Professor	5170 BL-HIST
46	BL MUAD	ADMINISTRATION - JACOBS	AC1	AAJ	AAJ		44575 BL-MUS
47	BL GNDR	GENDER STUDIES	AC1	FTX	FT3	PT - Assistant Professor	51109 BL-GNDR
48	BL SPHB	SCHOOL OF PUBLIC HEALTH - BLOOMINGTON	AC1	AAI	AAI		3654 BL-SPHB
49	BL HEWD	HEALTH AND WELLNESS DESIGN	AC1	FCX	FC3	PT - Assistant Professor	34031 BL-HEWD
50	BL LAWS	MAURER SCHOOL OF LAW	AC1	FTX	FT2	PC - Associate Professor	5848 BL-LAWS
51	BL NELC	MIDDLE EASTERN LANGUAGES AND CULTURE	AC1	FLX	FLS	TS - Senior Lecturer	42190 BL-NELC
52	BL NELC	MIDDLE EASTERN LANGUAGES AND CULTURE	AC1	FTX	FT2	PC - Associate Professor	5378 BL-NELC
53	BL ANTH	ANTHROPOLOGY	AC1	FTX	AAM		29834 BL-ANTH
54	BL CRIN	CURRICULUM & INSTRUCTION	AC1	FCX	FC3	PT - Assistant Professor	7493 BL-EDUC
55	BL PSY	PSYCHOLOGICAL & BRAIN SCIENCES	AC1	FVX	FV6		36198 BL-PSY
56	BL AFRI	AFRICAN STUDIES PROGRAM	AC1	FTX	FT3	PT - Assistant Professor	31489 BL-AFRO
57	BL SPHS	SPEECH & HEARING SCIENCES	AC1	FCX	FC2	PC - Associate Professor	29214 BL-SPHS
58	BL SPEA	THE O'NEILL SCHOOL - BL SPEA	AC1	FTX	FT1	PR - Professor	5626 BL-SPEA
59	BL BI	BIOLOGY	AC1	FLX	FL5	TL - Lecturer	9848 BL-BI
60	BL MSCH	MEDIA SCHOOL	AC1	FTX	FT2	PC - Associate Professor	42489 BL-MSCH
61	BL ENG	ENGLISH	AC1	FTX	FT2	PC - Associate Professor	5093 BL-ENG
62	BL TEED	TEACHER EDUCATION	AC1	AAJ	AAJ		5033 BL-EDUC
63	BL CPCS	COMM, PROF, AND COMPUTER SKILL	AC1	FLX	FL5	TL - Lecturer	54910 BL-BUS
64	BL SPHS	SPEECH & HEARING SCIENCES	AC1	FTX	FT1	PR - Professor	5657 BL-SPHS
65	BL IIDC	IND INST ON DISABILITY/COMMNTY	AC1	RSX	RS3 R	RT - Assistant Scientist;Scholar	53220 BL-IIDC
66	BL SPHB	SCHOOL OF PUBLIC HEALTH - BLOOMINGTON	AC1	UAS	AAM		11207 BL-SPHB
67	BL ENG	ENGLISH	AC1	FTX	FT2	PC - Associate Professor	5052 BL-ENG
68	BL AMST	AMERICAN STUDIES	AC1	FTX	FT2	PC - Associate Professor	37206 BL-AMST
69	BL SPHS	SPEECH & HEARING SCIENCES	AC1	FTX	FT1	PR - Professor	5656 BL-SPHS
70	BL ACTG	ACCOUNTING DEPARTMENT	AC1	FTX	FT3	PT - Assistant Professor	54176 BL-BUS
71	BL PSY	PSYCHOLOGICAL & BRAIN SCIENCES	AC1	FVX	FV6		22783 BL-PSY
72	BL IIDC	IND INST ON DISABILITY/COMMNTY	AC1	RSX	RS3 R	RT - Assistant Scientist;Scholar	52696 BL-IIDC
73	BL ACTG	ACCOUNTING DEPARTMENT	AC1	FCX	FC3	PT - Assistant Professor	52771 BL-BUS
74	BL OAMH	ORGN OF AMERICAN HISTORIANS	AC1	UAS	UAS		30644 BL-0AMH
75	BL INAD	SICE ADMINISTRATION	AC1	FTX	FT3	PT - Assistant Professor	4974 BL-CSCI
76	BL STAT	STATISTICS	AC1	FVX	FV1	PR - Professor	45084 BL-STAT
		Position.Dept.Name Salary FTE Months					
1		IUSM - BLOOMINGTON 54835 1 12					
2	DEPAR	RTMENT OF INFORMATICS 41200 1 12					
3	GENOMIC	CS AND BIOINFORMATICS 58834 1 12					
4		MATHEMATICS 47500 1 10					
5	EPIDEMIOLO	DGY AND BIOSTATISTICS 73250 1 12					
6		PHILOSOPHY 97947 1 10					

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THE O METER SCHOOL
44
                       SOCIOLOGY 108039
                                                10
45
                         HISTORY 151719
                                                10
           JACOBS SCHOOL OF MUSIC 172525
46
                                                12
                                          1
47
                  GENDER STUDIES 81910
                                                10
48 SCHOOL OF PUBLIC HEALTH - BLOO 486236
                                                12
49
      HEALTH AND WELLNESS DESIGN 82193
                                                10
50
            MAURER SCHOOL OF LAW 156187
                                                10
51 MIDDLE EASTERN LANGUAGES AND C 62225
                                                10
52 MIDDLE EASTERN LANGUAGES AND C
                                  95213
                                                10
53
                    ANTHROPOLOGY 97570
                                                10
54
                       EDUCATION 65000
                                                10
55 PSYCHOLOGICAL & BRAIN SCIENCES
                                  56800
                                                12
56 AFRICAN AMER & AFRICAN DIASPOR 78000
                                                10
57
        SPEECH & HEARING SCIENCES 92236
                                                12
58
    THE O'NEILL SCHOOL - BL SPEA 188897
                                                10
                                          1
59
                         BIOLOGY 60000 1
                                                10
60
                    MEDIA SCHOOL 79402 1
                                                10
61
                         ENGLISH 91451 1
                                                10
62
                       EDUCATION 160126 1
                                                12
63
        KELLEY SCHOOL OF BUSINESS 68000
                                                10
64
        SPEECH & HEARING SCIENCES 122649
                                                10
65 IND INST ON DISABILITY/COMMNTY 77250
                                                12
66 SCHOOL OF PUBLIC HEALTH - BLOO 67809
                                                12
67
                         ENGLISH 77214
                                                10
68
                AMERICAN STUDIES 94294
                                                10
69
        SPEECH & HEARING SCIENCES 127272
                                                10
                                          1
70
        KELLEY SCHOOL OF BUSINESS 241000
                                                10
71 PSYCHOLOGICAL & BRAIN SCIENCES 60000 1
                                                12
72 IND INST ON DISABILITY/COMMNTY 76282
                                                12
73
        KELLEY SCHOOL OF BUSINESS 173040 1
                                                10
74
      ORGN OF AMERICAN HISTORIANS 74656
                                                12
75
                COMPUTER SCIENCE 115000
                                                10
                                        1
                      STATISTICS 65000
                                         1
                                                10
[ reached 'max' / getOption("max.print") -- omitted 2958 rows ]
> # Calculate the percentile rank
> percentile_rank <- sum(salary_data$Salary <= salary) / length(salary_data$Salary) * 100</pre>
> percentile_rank
[1] 38.0356
> # Print the percentile rank
> cat("The percentile rank of Dr. Luen's salary is:", percentile_rank, "%")
The percentile rank of Dr. Luen's salary is: 38.0356 %
```

6. Fill in the file fly-wings.Rmd, replacing the ?????s with appropriate content. Knit the file to HTML or PDF, and upload this knitted file as part of your submission.

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