Prob a1 - R codes of Pie chart problems, Histogram, Ogive and Polygon Histogram and commutative

Probability and statitics (National University of Computer and Emerging Sciences)

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Section: A

Course Name: Probability and Statistics

Course Code: MT-206

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Problem #1.

According to the Union of Concerned Scientists (www.ucsusa.org), as of November 2012, there were 502 low Earth orbit (LEO) and 432 geosynchronous orbit (GEO) satellites in space. Each satellite is owned by an entity in either the government, military, commercial, or civil sector. A breakdown of the number of satellites in orbit for each sector is displayed in the accompanying table. Use this information to construct pair of graphs (i. Rectangles, Pie Chart) that compare the ownership sectors of LEO and GEO satellites in orbit. What observations do you have about the data?

Ownership Sectors	LEO Satellites	GEO Satellites
Government	229	59
Military	109	91
Commercial	118	281
Civil	46	1

Solution:

Part 1) Barplot of Ownership Sectors

```
Sectors =c ("Government", "Military", "Commercial", "Civil")

Colors = c ("Green", "Red")

Leo = c (229,109,118,46)

Geo = c (59,91,281,46)

elements = rbind (Leo, Geo)

barplot(elements, names.arg = Sectors, main="Barplot of Ownership Sectors", col=Colors)

legend("topright",c("Leo","Geo"),fill=Colors)
```

Part 2) Pie Chart of LEO Satellites

```
Colors = c("red","green","blue","yellow")

pie(Leo, Sectors, main="Pie Chart of LEO satellite", col = Colors)
```

Part 3) Pie Chart of GEO Satellites

```
Colors = c("green","blue","red","yellow")

pie(Leo, Sectors, main="Pie Chart of GEO satellite", col = Colors)
```

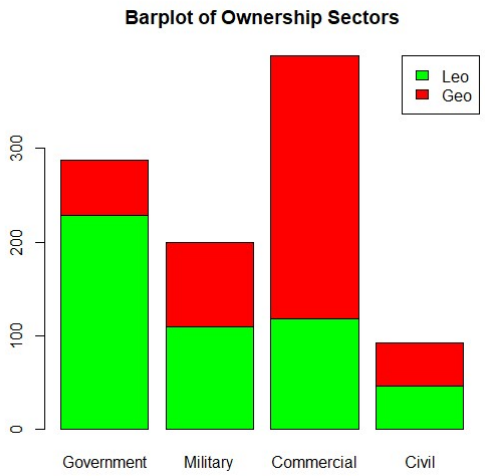


Fig. 01

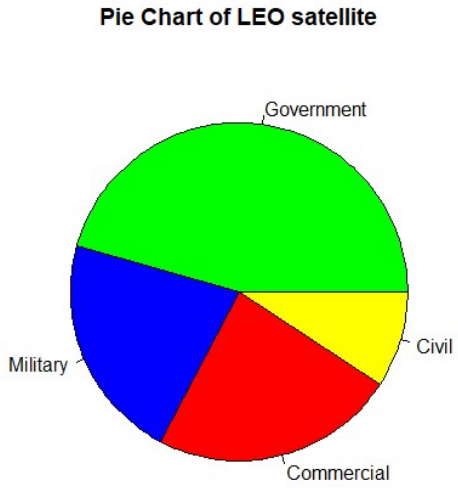


Fig. 02

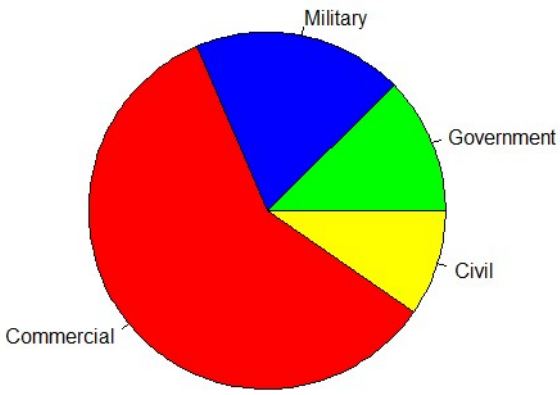


Fig. 03

Problem #2.

Do social robots walk or roll? According to the United Nations, social robots now outnumber industrial robots worldwide. A social (or service) robot is designed to entertain, educate, and care for human users. In a paper published by the International Conference on Social Robotics (Vol. 6414, 2010), design engineers investigated the trend in the design of social robots. Using a random sample of 106 social robots obtained through a web search, the engineers found that 63 were built with legs only, 20 with wheels only, 8 with both legs and wheels, and 15 with neither legs nor wheels.

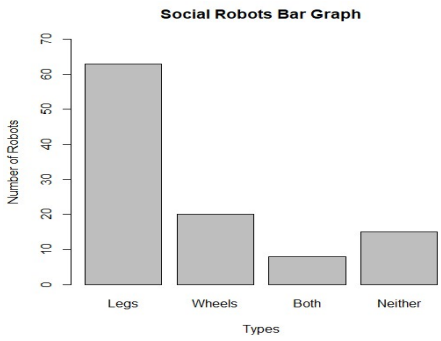
a. What type of graph is used to describe the data?
b. Identify the variable measured for each of the 106 robot designs.
c. Use graph to identify the social robot design that is currently used the most.
d. Compute class relative frequencies for the different categories shown in the graph.

Solution:

a. What type of graph is used to describe the data?
Answer: Bar Graph.

b. Identify the variable measured for each of the 106 robot designs.
Answer: Legs only, Wheels only, Both Legs and Wheels, Neither Legs nor Wheels.

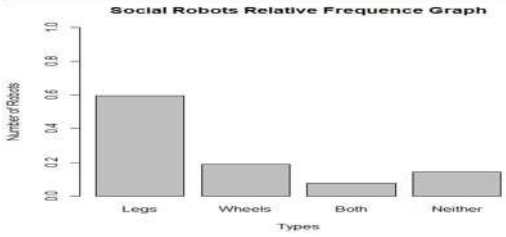
c. Use graph to identify the social robot design that is currently used the most.
Answer:



d. Compute class relative frequencies for the different categories shown in the graph.

Answer:

Robot Design	No. of Robots	Class Relative Frequency
Legs	**63**	63/106 = 0.59
Wheels	**20**	20/106 = 0.18
Both	**8**	8/106 = 0.07
None	**15**	15/106 = 0.14



Problem #3.

Use R Code to construct a pie chart to organize the data given in problem 2. What can you conclude?

Solution:

```
names = c ("Legs only", "Wheels only", "Both", "Neither")

values = c (63,20,8,15)

colors = c ("brown", "grey", "red", "blue")

pie (values, main="Pie Chart of the social robots", labels=names, col=colors)
```

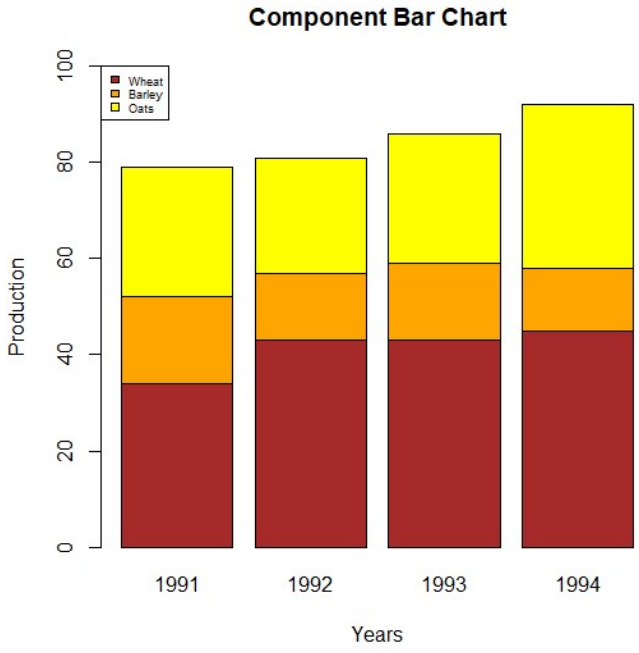
Problem #4.

(i) Take a suitable data set to construct the component bar diagram through R-lang.

Solution:

Years	Wheat	Barley	Oats	Total
1991	34	18	27	79
1992	43	14	24	81
1993	43	16	27	86
1994	45	13	34	92

```
Years=c("1991","1992","1993","1994")
color=c("brown","orange","yellow")
Wheat = c(34, 43, 43, 45)
Barley = c(18, 14, 16, 13)
Oats = c(27, 24, 27, 34)
data=rbind(Wheat, Barley, Oats)
barplot(data,main="Component Bar Chart",names.arg=Years,col=color,xlab = "Years",ylab =
"Production",ylim = c(0,100))
legend("topleft",c("Wheat", "Barley", "Oats"),fill = color,cex = 0.55)
```



Data collection reference : *https://www.emathzone.com/tutorials/basic-statistics/component-bar-chart.html*

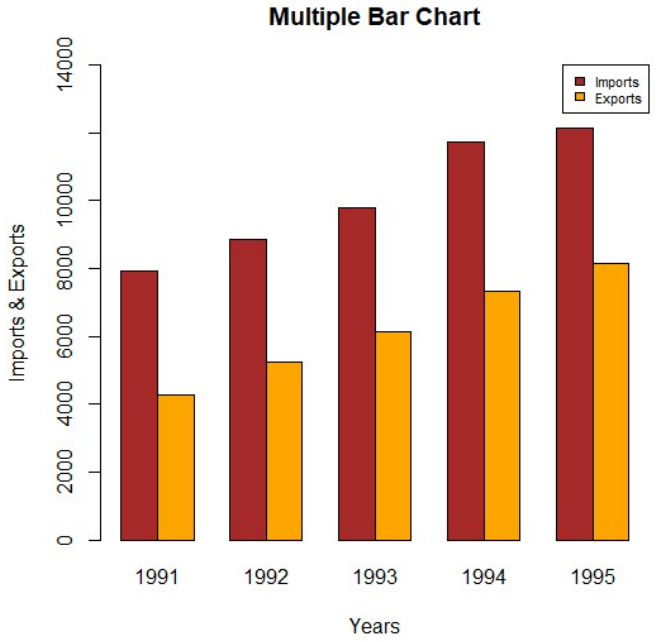
(ii) Use another data set to display the multiple bar diagram through R-lang.

Solution:

The following data represents the imports and exports of Canada (values in $) for the years 1991 to 1995.

Years	Imports	Exports
1991	7930	4260
1992	8850	5225
1993	9780	6150
1994	11720	7340
1995	12150	8145

```
Years = c ("1991","1992","1993","1994","1995")

Colors = c ("brown","orange")

Imports = c (7930, 8850, 9780, 11720, 12150)

Exports = c (4260, 5225, 6150, 7340, 8145)

data = rbind(Imports,Exports)

barplot(data,main="Multiple Bar Chart",names.arg=Years,col=Colors,beside=TRUE,ylab = "Imports & Exports",xlab = "Years",ylim = c(0,14000))

legend("topright",c("Imports", "Exports"),fill = color,cex = 0.65)
```



Data collection reference : *https://www.emathzone.com/tutorials/basic-statistics/multiple-bar-chart.html*

Problem #5.

Collect the data (40-50 values) on a targeted variable which must be continuous:

52	**7**	**63**	**68**	**29**	**73**	**29**	**76**
29	**57**	**46**	**7**	**33**	**32**	**9**	**56**
71	**68**	**42**	**90**	**21**	**86**	**39**	**28**
45	**12**	**78**	**62**	**94**	**82**	**86**	**33**
92	**69**	**22**	**39**	**85**	**59**	**68**	**94**

(i) Construct the frequency distribution.

Solution:

Min value: 7

Max value: 94

Frequency Distribution	**Frequency**
[5-15)	4
[15-25)	2
[25-35)	7
[35-45)	3
[45-55)	3
[55-65)	5
[65-75)	6
[75-85)	3
[85-95)	7

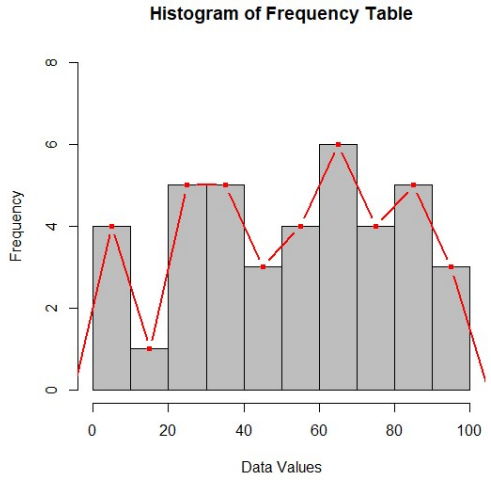
Total (n) = 40

(ii) List the mid-points for your frequency distribution, as well as the relative and cumulative frequencies.

Frequency Distribution	**Frequency**	**Midpoints**	**Relative Frequency**	**Cumulative Frequency**
[5-15)	4	10	0.1	4
[15-25)	2	20	0.05	6
[25-35)	7	30	0.175	13
[35-45)	3	40	0.075	16
[45-55)	3	50	0.075	19
[55-65)	5	60	0.125	24
[65-75)	6	70	0.15	30
[75-85)	3	80	0.075	33
[85-95)	7	90	0.175	40

(iii)Draw a histogram depicting the data from the frequency table in # (ii) above and superimpose a frequency polygon on top of a histogram

```
data = c(52,7,63,68,29,73,29,76,29,57,46,7,33,32,9,56,71,68,42,
90,21,86,39,28,45,12,78,62,94,82,86,33,92,69,2,39,85,59,68,94)
h = hist(data,main="Histogram of Frequency Table",xlab="Data Values",
ylab="Frequency",xlim = c(0,100),ylim =c(0,8),col = "grey",border = "black")
mp = c(min(h$mids)-(h$mids[2]-h$mids[1]),h$mids,max(h$mids)+(h$mids[2]-h$mids[1]))
freq = c(0,h$counts,0)
lines(mp, freq, type = "b", pch = 20, col = "red", lwd = 2)
```



(iv) Show the histogram and density curve in one graph.

(v) Show the histogram, density curve and frequency polygon in one graph.

(vi) Also construct an Ogive for the data considered before through R.

data = c(52,7,63,68,29,73,29,76,29,57,46,7,33,32,9,56,71,68,42,90,21,86,39,28,45,12,78,62,94,82,86,33,92,69,2,39,85,59,68,94)

h = hist(data,main="Histogram of Frequency Table",xlab="Data Values",ylab="Frequency",xlim = c(0,100),ylim =c(0,8),col = "grey",border = "black")

mp = c(min(h$mids)-(h$mids[2]-h$mids[1]),h$mids,max(h$mids)+(h$mids[2]-h$mids[1]))

f = c(4,2,7,3,3,5,6,3,7)

freq = c(0,h$counts,0)

lines(mp, freq, type = "b", pch = 20, col = "red", lwd = 2)