

Assignment_4

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```
install.packages("dplyr")

## Installing package into '/cloud/lib/x86_64-pc-linux-gnu-library/4.2'
## (as 'lib' is unspecified)

library("dplyr")

##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##   filter, lag

## The following objects are masked from 'package:base':
##
##   intersect, setdiff, setequal, union

threatened_species <- read.csv("/cloud/project/threatened_species.csv")

#1. Remove the estimated number of described species from the analysis

threatened_species1=select(threatened_species,-"Estimated.No..of.Described.Species1")
head(threatened_species1 )

##   Particulars Major.groups
## 1   Mammals   Vertebrates
## 2    Birds   Vertebrates
## 3  Reptiles   Vertebrates
## 4 Amphibians   Vertebrates
## 5    Fishes   Vertebrates
## 6   Insects Invertebrates
## No..of.Species.Evaluated.by.2016..IUCN.Red.List.Version.2016.3.
## 1                                     5567
## 2                                    11121
## 3                                     5338
## 4                                     6534
## 5                                    16134
## 6                                     6587
## No..of.Threatened.Species.in.2012 No..of.Threatened.Species.2013
## 1                                1139                                1143
## 2                                1313                                1308
## 3                                 807                                 879
## 4                                1933                                1950
## 5                                2058                                2110
## 6                                 829                                 896
```

```
## No..of.Threatened.Species.2014 No..of.Threatened.Species.2015
## 1 1199 1197
## 2 1373 1375
## 3 927 944
## 4 1957 1994
## 5 2222 2271
## 6 993 1046
## No..of.Threatened.Species.2016 No..of.Threatened.Species.2017
## 1 1194 1204
## 2 1460 1469
## 3 1079 1215
## 4 2068 2100
## 5 2359 2386
## 6 1268 1414
## No..of.Threatened.Species.2018
## 1 1219
## 2 1492
## 3 1307
## 4 2092
## 5 2332
## 6 1537
```

#2. filter out rows with missing observations (NA values)

```
threatened_species1 %>%
  na.omit()
```

```
## Particulars Major.groups
## 1 Mammals Vertebrates
## 2 Birds Vertebrates
## 3 Reptiles Vertebrates
## 4 Amphibians Vertebrates
## 5 Fishes Vertebrates
## 6 Insects Invertebrates
## 7 Molluscs Invertebrates
## 8 Crustaceans Invertebrates
## 9 Corals Invertebrates
## 10 Arachnids Invertebrates
## 11 Velvet Worms Invertebrates
## 13 Other Invertebrates
## 14 Mosses Plants
## 15 Ferns and Allies Plants
## 16 Gymnosperms Plants
## 17 Flowering Plants Plants
## 18 Green Algae Plants
## 19 Red Algae Plants
## 20 Lichens Fungi and Protists
## 21 Mushrooms Fungi and Protists
## 22 Brown Algae10 Fungi and Protists
## No..of.Species.Evaluated.by.2016..IUCN.Red.List.Version.2016.3.
## 1 5567
## 2 11121
## 3 5338
## 4 6534
## 5 16134
```

## 6		6587
## 7		7276
## 8		3177
## 9		862
## 10		212
## 11		11
## 13		480
## 14		102
## 15		417
## 16		1011
## 17		20652
## 18		13
## 19		58
## 20		8
## 21		25
## 22		15
##	No..of.Threatened.Species.in.2012	No..of.Threatened.Species.2013
## 1	1139	1143
## 2	1313	1308
## 3	807	879
## 4	1933	1950
## 5	2058	2110
## 6	829	896
## 7	1857	1898
## 8	596	723
## 9	236	235
## 10	20	21
## 11	9	9
## 13	23	40
## 14	76	76
## 15	167	187
## 16	374	399
## 17	8764	9394
## 18	0	0
## 19	9	9
## 20	2	7
## 21	1	22
## 22	6	6
##	No..of.Threatened.Species.2014	No..of.Threatened.Species.2015
## 1	1199	1197
## 2	1373	1375
## 3	927	944
## 4	1957	1994
## 5	2222	2271
## 6	993	1046
## 7	1950	1950
## 8	725	728
## 9	235	237
## 10	163	164
## 11	9	9
## 13	65	67
## 14	76	76
## 15	194	197
## 16	400	400

```
## 17          9905          10551
## 18           0           0
## 19           9           9
## 20           4           7
## 21           1          22
## 22           6           6
##   No..of.Threatened.Species.2016 No..of.Threatened.Species.2017
## 1          1194          1204
## 2          1460          1469
## 3          1079          1215
## 4          2068          2100
## 5          2359          2386
## 6          1268          1414
## 7          1984          2187
## 8           732           732
## 9           237           237
## 10          166           170
## 11           9            9
## 13           73          143
## 14           76           76
## 15          217          246
## 16          400          401
## 17         10941         11773
## 18           0            0
## 19           9            9
## 20           7           10
## 21          21           33
## 22           6            6
##   No..of.Threatened.Species.2018
## 1          1219
## 2          1492
## 3          1307
## 4          2092
## 5          2332
## 6          1537
## 7          2195
## 8           733
## 9           237
## 10          182
## 11           9
## 13          146
## 14           76
## 15          249
## 16          401
## 17         12564
## 18           0
## 19           9
## 20          20
## 21          33
## 22           6
```

```
head(threatened_species1 )
```

```
##   Particulars Major.groups
## 1     Mammals  Vertebrates
```

```

## 2      Birds      Vertebrates
## 3      Reptiles   Vertebrates
## 4      Amphibians Vertebrates
## 5      Fishes     Vertebrates
## 6      Insects   Invertebrates
##  No..of.Species.Evaluated.by.2016..IUCN.Red.List.Version.2016.3.
## 1                                           5567
## 2                                           11121
## 3                                           5338
## 4                                           6534
## 5                                           16134
## 6                                           6587
##  No..of.Threatened.Species.in.2012 No..of.Threatened.Species.2013
## 1                                           1139      1143
## 2                                           1313      1308
## 3                                           807       879
## 4                                           1933      1950
## 5                                           2058      2110
## 6                                           829       896
##  No..of.Threatened.Species.2014 No..of.Threatened.Species.2015
## 1                                           1199      1197
## 2                                           1373      1375
## 3                                           927       944
## 4                                           1957      1994
## 5                                           2222      2271
## 6                                           993       1046
##  No..of.Threatened.Species.2016 No..of.Threatened.Species.2017
## 1                                           1194      1204
## 2                                           1460      1469
## 3                                           1079      1215
## 4                                           2068      2100
## 5                                           2359      2386
## 6                                           1268      1414
##  No..of.Threatened.Species.2018
## 1                                           1219
## 2                                           1492
## 3                                           1307
## 4                                           2092
## 5                                           2332
## 6                                           1537

```

#3. rename variable names to meaningful names

```

threatened_species1 = select(threatened_species1,"Animals"="Particulars","Groups"="Major.groups","No. o
threatened_species1

```

```

##          Animals          Groups No. of Species Evaluated by 2016
## 1          Mammals      Vertebrates          5567
## 2           Birds      Vertebrates      11121
## 3        Reptiles      Vertebrates          5338
## 4      Amphibians      Vertebrates          6534
## 5          Fishes      Vertebrates      16134
## 6        Insects      Invertebrates          6587
## 7        Molluscs      Invertebrates          7276

```

## 8	Crustaceans	Invertebrates	3177
## 9	Corals	Invertebrates	862
## 10	Arachnids	Invertebrates	212
## 11	Velvet Worms	Invertebrates	11
## 12	Horseshoe Crabs	Invertebrates	4
## 13	Other	Invertebrates	480
## 14	Mosses	Plants	102
## 15	Ferns and Allies	Plants	417
## 16	Gymnosperms	Plants	1011
## 17	Flowering Plants	Plants	20652
## 18	Green Algae	Plants	13
## 19	Red Algae	Plants	58
## 20	Lichens Fungi and Protists		8
## 21	Mushrooms Fungi and Protists		25
## 22	Brown Algae10 Fungi and Protists		15
##	No..of.Threatened.Species.in.2012		No..of.Threatened.Species.2013
## 1		1139	1143
## 2		1313	1308
## 3		807	879
## 4		1933	1950
## 5		2058	2110
## 6		829	896
## 7		1857	1898
## 8		596	723
## 9		236	235
## 10		20	21
## 11		9	9
## 12		0	0
## 13		23	40
## 14		76	76
## 15		167	187
## 16		374	399
## 17		8764	9394
## 18		0	0
## 19		9	9
## 20		2	7
## 21		1	22
## 22		6	6
##	No..of.Threatened.Species.2014		No..of.Threatened.Species.2015
## 1		1199	1197
## 2		1373	1375
## 3		927	944
## 4		1957	1994
## 5		2222	2271
## 6		993	1046
## 7		1950	1950
## 8		725	728
## 9		235	237
## 10		163	164
## 11		9	9
## 12		NA	NA
## 13		65	67
## 14		76	76
## 15		194	197

## 16	400	400
## 17	9905	10551
## 18	0	0
## 19	9	9
## 20	4	7
## 21	1	22
## 22	6	6
##	No..of.Threatened.Species.2016	No..of.Threatened.Species.2017
## 1	1194	1204
## 2	1460	1469
## 3	1079	1215
## 4	2068	2100
## 5	2359	2386
## 6	1268	1414
## 7	1984	2187
## 8	732	732
## 9	237	237
## 10	166	170
## 11	9	9
## 12	NA	1
## 13	73	143
## 14	76	76
## 15	217	246
## 16	400	401
## 17	10941	11773
## 18	0	0
## 19	9	9
## 20	7	10
## 21	21	33
## 22	6	6
##	No..of.Threatened.Species.2018	
## 1	1219	
## 2	1492	
## 3	1307	
## 4	2092	
## 5	2332	
## 6	1537	
## 7	2195	
## 8	733	
## 9	237	
## 10	182	
## 11	9	
## 12	1	
## 13	146	
## 14	76	
## 15	249	
## 16	401	
## 17	12564	
## 18	0	
## 19	9	
## 20	20	
## 21	33	
## 22	6	

#4. sort the data frame in the ascending order of threatened species in 2018

```
threatened_species1 %>%
  arrange(No..of.Threatened.Species.2018)
```

##	Animals	Groups	No. of Species Evaluated by 2016
## 1	Green Algae	Plants	13
## 2	Horseshoe Crabs	Invertebrates	4
## 3	Brown Algae	Fungi and Protists	15
## 4	Velvet Worms	Invertebrates	11
## 5	Red Algae	Plants	58
## 6	Lichens	Fungi and Protists	8
## 7	Mushrooms	Fungi and Protists	25
## 8	Mosses	Plants	102
## 9	Other	Invertebrates	480
## 10	Arachnids	Invertebrates	212
## 11	Corals	Invertebrates	862
## 12	Ferns and Allies	Plants	417
## 13	Gymnosperms	Plants	1011
## 14	Crustaceans	Invertebrates	3177
## 15	Mammals	Vertebrates	5567
## 16	Reptiles	Vertebrates	5338
## 17	Birds	Vertebrates	11121
## 18	Insects	Invertebrates	6587
## 19	Amphibians	Vertebrates	6534
## 20	Molluscs	Invertebrates	7276
## 21	Fishes	Vertebrates	16134
## 22	Flowering Plants	Plants	20652
##	No..of.Threatened.Species.in.2012	No..of.Threatened.Species.2013	
## 1	0	0	
## 2	0	0	
## 3	6	6	
## 4	9	9	
## 5	9	9	
## 6	2	7	
## 7	1	22	
## 8	76	76	
## 9	23	40	
## 10	20	21	
## 11	236	235	
## 12	167	187	
## 13	374	399	
## 14	596	723	
## 15	1139	1143	
## 16	807	879	
## 17	1313	1308	
## 18	829	896	
## 19	1933	1950	
## 20	1857	1898	
## 21	2058	2110	
## 22	8764	9394	
##	No..of.Threatened.Species.2014	No..of.Threatened.Species.2015	
## 1	0	0	
## 2	NA	NA	
## 3	6	6	

## 4	9	9
## 5	9	9
## 6	4	7
## 7	1	22
## 8	76	76
## 9	65	67
## 10	163	164
## 11	235	237
## 12	194	197
## 13	400	400
## 14	725	728
## 15	1199	1197
## 16	927	944
## 17	1373	1375
## 18	993	1046
## 19	1957	1994
## 20	1950	1950
## 21	2222	2271
## 22	9905	10551
##	No..of..Threatened.Species..2016	No..of..Threatened.Species..2017
## 1	0	0
## 2	NA	1
## 3	6	6
## 4	9	9
## 5	9	9
## 6	7	10
## 7	21	33
## 8	76	76
## 9	73	143
## 10	166	170
## 11	237	237
## 12	217	246
## 13	400	401
## 14	732	732
## 15	1194	1204
## 16	1079	1215
## 17	1460	1469
## 18	1268	1414
## 19	2068	2100
## 20	1984	2187
## 21	2359	2386
## 22	10941	11773
##	No..of..Threatened.Species..2018	
## 1	0	
## 2	1	
## 3	6	
## 4	9	
## 5	9	
## 6	20	
## 7	33	
## 8	76	
## 9	146	
## 10	182	
## 11	237	

```
## 12          249
## 13          401
## 14          733
## 15         1219
## 16         1307
## 17         1492
## 18         1537
## 19         2092
## 20         2195
## 21         2332
## 22        12564
```

#5 sort the data frame in the ascending order of threatened species in 2018

```
threatened_species1 %>%
  bind_rows(summarise(.,
    across(where(is.numeric), sum),
    across(where(is.character), ~"Total"))))
```

##	Animals	Groups	No. of Species Evaluated by 2016
## 1	Mammals	Vertebrates	5567
## 2	Birds	Vertebrates	11121
## 3	Reptiles	Vertebrates	5338
## 4	Amphibians	Vertebrates	6534
## 5	Fishes	Vertebrates	16134
## 6	Insects	Invertebrates	6587
## 7	Molluscs	Invertebrates	7276
## 8	Crustaceans	Invertebrates	3177
## 9	Corals	Invertebrates	862
## 10	Arachnids	Invertebrates	212
## 11	Velvet Worms	Invertebrates	11
## 12	Horseshoe Crabs	Invertebrates	4
## 13	Other	Invertebrates	480
## 14	Mosses	Plants	102
## 15	Ferns and Allies	Plants	417
## 16	Gymnosperms	Plants	1011
## 17	Flowering Plants	Plants	20652
## 18	Green Algae	Plants	13
## 19	Red Algae	Plants	58
## 20	Lichens Fungi and Protists		8
## 21	Mushrooms Fungi and Protists		25
## 22	Brown Algae10 Fungi and Protists		15
## 23	Total	Total	85604

##	No..of.Threatened.Species.in.2012	No..of.Threatened.Species.2013
## 1	1139	1143
## 2	1313	1308
## 3	807	879
## 4	1933	1950
## 5	2058	2110
## 6	829	896
## 7	1857	1898
## 8	596	723
## 9	236	235
## 10	20	21
## 11	9	9

## 12	0	0
## 13	23	40
## 14	76	76
## 15	167	187
## 16	374	399
## 17	8764	9394
## 18	0	0
## 19	9	9
## 20	2	7
## 21	1	22
## 22	6	6
## 23	20219	21312
##	No..of.Threatened.Species.2014	No..of.Threatened.Species.2015
## 1	1199	1197
## 2	1373	1375
## 3	927	944
## 4	1957	1994
## 5	2222	2271
## 6	993	1046
## 7	1950	1950
## 8	725	728
## 9	235	237
## 10	163	164
## 11	9	9
## 12	NA	NA
## 13	65	67
## 14	76	76
## 15	194	197
## 16	400	400
## 17	9905	10551
## 18	0	0
## 19	9	9
## 20	4	7
## 21	1	22
## 22	6	6
## 23	NA	NA
##	No..of.Threatened.Species.2016	No..of.Threatened.Species.2017
## 1	1194	1204
## 2	1460	1469
## 3	1079	1215
## 4	2068	2100
## 5	2359	2386
## 6	1268	1414
## 7	1984	2187
## 8	732	732
## 9	237	237
## 10	166	170
## 11	9	9
## 12	NA	1
## 13	73	143
## 14	76	76
## 15	217	246
## 16	400	401
## 17	10941	11773

```
## 18          0          0
## 19          9          9
## 20          7         10
## 21         21         33
## 22          6          6
## 23         NA        25821
##   No..of.Threatened.Species.2018
## 1          1219
## 2          1492
## 3          1307
## 4          2092
## 5          2332
## 6          1537
## 7          2195
## 8           733
## 9           237
## 10          182
## 11           9
## 12           1
## 13          146
## 14           76
## 15          249
## 16          401
## 17         12564
## 18           0
## 19           9
## 20          20
## 21          33
## 22           6
## 23         26840
```

#6. group the data by major categories and find the total number of threatened species from 2012-18(Hint: group_by() and summarize())

```
threatened_species1 %>%
  group_by(Groups)
```

```
## # A tibble: 22 x 10
## # Groups:   Groups [4]
##   Animals      Groups   No. o~1 No..o~2 No..o~3 No..o~4 No..o~5 No..o~6 No..o~7
##   <chr>        <chr>     <int>  <int>  <int>  <int>  <int>  <int>  <int>
## 1 Mammals      Vertebra~   5567   1139   1143   1199   1197   1194   1204
## 2 Birds        Vertebra~  11121   1313   1308   1373   1375   1460   1469
## 3 Reptiles     Vertebra~   5338    807    879    927    944   1079   1215
## 4 Amphibians   Vertebra~   6534   1933   1950   1957   1994   2068   2100
## 5 Fishes       Vertebra~  16134   2058   2110   2222   2271   2359   2386
## 6 Insects      Inverteb~   6587    829    896    993   1046   1268   1414
## 7 Molluscs     Inverteb~   7276   1857   1898   1950   1950   1984   2187
## 8 Crustaceans  Inverteb~   3177    596    723    725    728    732    732
## 9 Corals       Inverteb~    862    236    235    235    237    237    237
## 10 Arachnids   Inverteb~    212     20     21    163    164    166    170
## # ... with 12 more rows, 1 more variable: No..of.Threatened.Species.2018 <int>,
## #   and abbreviated variable names 1: `No. of Species Evaluated by 2016`,
## #   2: No..of.Threatened.Species.in.2012, 3: No..of.Threatened.Species.2013,
## #   4: No..of.Threatened.Species.2014, 5: No..of.Threatened.Species.2015,
```

```
## # 6: No..of.Threatened.Species.2016, 7: No..of.Threatened.Species.2017
## # i Use `print(n = ...)` to see more rows, and `colnames()` to see all variable names
```

#7. Conclude about the data set.

```
threatened_species1
```

```
##           Animals           Groups No. of Species Evaluated by 2016
## 1           Mammals           Vertebrates           5567
## 2             Birds           Vertebrates           11121
## 3           Reptiles           Vertebrates           5338
## 4       Amphibians           Vertebrates           6534
## 5             Fishes           Vertebrates           16134
## 6           Insects           Invertebrates           6587
## 7           Molluscs           Invertebrates           7276
## 8       Crustaceans           Invertebrates           3177
## 9             Corals           Invertebrates           862
## 10          Arachnids           Invertebrates           212
## 11      Velvet Worms           Invertebrates           11
## 12 Horseshoe Crabs           Invertebrates           4
## 13             Other           Invertebrates           480
## 14           Mosses           Plants           102
## 15 Ferns and Allies           Plants           417
## 16       Gymnosperms           Plants           1011
## 17 Flowering Plants           Plants           20652
## 18       Green Algae           Plants           13
## 19       Red Algae           Plants           58
## 20          Lichens Fungi and Protists           8
## 21      Mushrooms Fungi and Protists           25
## 22      Brown Algae10 Fungi and Protists           15
## No..of.Threatened.Species.in.2012 No..of.Threatened.Species.2013
## 1           1139           1143
## 2           1313           1308
## 3           807           879
## 4           1933           1950
## 5           2058           2110
## 6           829           896
## 7           1857           1898
## 8           596           723
## 9           236           235
## 10          20           21
## 11          9           9
## 12          0           0
## 13          23           40
## 14          76           76
## 15          167           187
## 16          374           399
## 17          8764           9394
## 18          0           0
## 19          9           9
## 20          2           7
## 21          1           22
## 22          6           6
## No..of.Threatened.Species.2014 No..of.Threatened.Species.2015
## 1           1199           1197
```

## 2	1373	1375
## 3	927	944
## 4	1957	1994
## 5	2222	2271
## 6	993	1046
## 7	1950	1950
## 8	725	728
## 9	235	237
## 10	163	164
## 11	9	9
## 12	NA	NA
## 13	65	67
## 14	76	76
## 15	194	197
## 16	400	400
## 17	9905	10551
## 18	0	0
## 19	9	9
## 20	4	7
## 21	1	22
## 22	6	6
##	No..of.Threatened.Species.2016	No..of.Threatened.Species.2017
## 1	1194	1204
## 2	1460	1469
## 3	1079	1215
## 4	2068	2100
## 5	2359	2386
## 6	1268	1414
## 7	1984	2187
## 8	732	732
## 9	237	237
## 10	166	170
## 11	9	9
## 12	NA	1
## 13	73	143
## 14	76	76
## 15	217	246
## 16	400	401
## 17	10941	11773
## 18	0	0
## 19	9	9
## 20	7	10
## 21	21	33
## 22	6	6
##	No..of.Threatened.Species.2018	
## 1	1219	
## 2	1492	
## 3	1307	
## 4	2092	
## 5	2332	
## 6	1537	
## 7	2195	
## 8	733	
## 9	237	

## 10	182
## 11	9
## 12	1
## 13	146
## 14	76
## 15	249
## 16	401
## 17	12564
## 18	0
## 19	9
## 20	20
## 21	33
## 22	6