|  |  |
| --- | --- |
| Activity | Data Type |
| Number of beatings from Wife | Discrete |
| Results of rolling a dice | Discrete |
| Weight of a person | Continuous |
| Weight of Gold | Continuous |
| Distance between two places | Continuous |
| Length of a leaf | Continuous |
| Dog's weight | Continuous |
| Blue Color | Discrete |
| Number of kids | Discrete |
| Number of tickets in Indian railways | Discrete |
| Number of times married | Discrete |
| Gender (Male or Female) | Discrete |

Q1) Identify the Data type for the Following:

Q2) Identify the Data types, which were among the following

Nominal, Ordinal, Interval, Ratio.

|  |  |
| --- | --- |
| Data | Data Type |
| Gender | Nominal |
| High School Class Ranking | Ordinal |
| Celsius Temperature | Interval |
| Weight | Ratio |
| Hair Color | Nominal |
| Socioeconomic Status | Ordinal |
| Fahrenheit Temperature | Interval |
| Height | Ratio |
| Type of living accommodation | Nominal |
| Level of Agreement | Ordinal |
| IQ(Intelligence Scale) | Interval |
| Sales Figures | Ratio |
| Blood Group | Nominal |
| Time Of Day | Ordinal |
| Time on a Clock with Hands | Interval |
| Number of Children | Ratio |
| Religious Preference | Nominal |
| Barometer Pressure | Ordinal |
| SAT Scores | Interval |
| Years of Education | Ratio |

Q3) Three Coins are tossed, find the probability that two heads and one tail are obtained?

1. As three coins are tossed so outcome will be 8

The probability of two heads and one tails is 1st coin is head, 2nd coin is head, 3rd coin is tails.

1st coin is tails, 2nd coin is head, 3rd coin is head.

1st coin is head, 2nd coin is tail, 3rd coin is head

Total outcome is = 8

Desired outcome is = 3

So probability is = 3/8

Q4) Two Dice are rolled, find the probability that sum is

1. Equal to 1
2. Less than or equal to 4
3. Sum is divisible by 2 and 3
4. When 2 dice are thrown we get the out comes n = 36
5. The sum is equal to 1 is 0
6. The sum is less than or equal to 4

The possible outcomes are {(1,1),(1,2), (1,3),(2,1),(3,1),(2,2)} = 6

Required probability = 6/36

= 0.167

1. The sum is divisible by 2 and 3 { (1,5),(2,4),(3,3),(4,2),(5,1),(6,6)} = 6

= 6/36

= 1/6

Q5) A bag contains 2 red, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?

1. Total number of balls = ( 2 + 3 + 2 ) = 7

Let S be the sample space

Then, n (S) = Number of ways of drawing 2 balls out of 7 = 7C2

= ( 7 \* 2 ) / ( 2 \* 1 )

= 21

Let E = event of drawing 2 balls, none of which is blue.

Therefore, n (E) = Number of ways of drawing 2 balls out of ( 2 + 3 ) balls.

= 5C2

= ( 5 \* 4 ) / ( 2 \* 1 )

= 10

Therefore, P ( E ) = n ( E ) / n ( S )

= 10 / 21

Q6) Calculate the Expected number of candies for a randomly selected child

Below are the probabilities of count of candies for children (ignoring the nature of the child-Generalized view)

|  |  |  |
| --- | --- | --- |
| CHILD | Candies count | Probability |
| A | 1 | 0.015 |
| B | 4 | 0.20 |
| C | 3 | 0.65 |
| D | 5 | 0.005 |
| E | 6 | 0.01 |
| F | 2 | 0.120 |

Child A – probability of having 1 candy = 0.015.

Child B – probability of having 4 candies = 0.20

1. Expected number of candies for a randomly selected child

= 1\*0.015 + 4\*0.20 + 3\*0.65 + 5\*0.005 + 6\* 0.01 + 2\*0.12

= 0.015 + 0.8 + 1.95 + 0.025 + 0.06 + 0.24

= 3.090

= 3.09

Q7) Calculate Mean, Median, Mode, Variance, Standard Deviation, Range & comment about the values / draw inferences, for the given dataset

* For Points, Score, Weigh>

Find Mean, Median, Mode, Variance, Standard Deviation, and Range and also Comment about the values/ Draw some inferences.

**Use Q7.csv file**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Points | Score | Weigh |
| Mazda RX4 | 3.9 | 2.62 | 16.46 |
| Mazda RX4 Wag | 3.9 | 2.875 | 17.02 |
| Datsun 710 | 3.85 | 2.32 | 18.61 |
| Hornet 4 Drive | 3.08 | 3.215 | 19.44 |
| Hornet Sport about | 3.15 | 3.44 | 17.02 |
| Valiant | 2.76 | 3.46 | 20.22 |
| Duster 360 | 3.21 | 3.57 | 15.84 |
| Merc 240D | 3.69 | 3.19 | 20 |
| Merc 230 | 3.92 | 3.15 | 22.9 |
| Merc 280 | 3.92 | 3.44 | 18.3 |
| Merc 280C | 3.92 | 3.44 | 18.9 |
| Merc 450SE | 3.07 | 4.07 | 17.4 |
| Merc 450SL | 3.07 | 3.73 | 17.6 |
| Merc 450SLC | 3.07 | 3.78 | 18 |
| Cadillac Fleetwood | 2.93 | 5.25 | 17.98 |
| Lincoln Continental | 3 | 5.424 | 17.82 |
| Chrysler Imperial | 3.23 | 5.345 | 17.42 |
| Fiat 128 | 4.08 | 2.2 | 19.47 |
| Honda Civic | 4.93 | 1.615 | 18.52 |
| Toyota Corolla | 4.22 | 1.835 | 19.9 |
| Toyota Corona | 3.7 | 2.465 | 20.01 |
| Dodge Challenger | 2.76 | 3.52 | 16.87 |
| AMC Javelin | 3.15 | 3.435 | 17.3 |
| Camaro Z28 | 3.73 | 3.84 | 15.41 |
| Pontiac Firebird | 3.08 | 3.845 | 17.05 |
| Fiat X1-9 | 4.08 | 1.935 | 18.9 |
| Porsche 914-2 | 4.43 | 2.14 | 16.7 |
| Lotus Europa | 3.77 | 1.513 | 16.9 |
| Ford Pantera L | 4.22 | 3.17 | 14.5 |
| Ferrari Dino | 3.62 | 2.77 | 15.5 |
| Maserati Bora | 3.54 | 3.57 | 14.6 |
| Volvo 142E | 4.11 | 2.78 | 18.6 |

1. **MEAN :**

Points = 3.596563

Score = 3.21725

Weigh = 17.84875

**MEDIAN :**

Points = 3.695

Score = 3.325

Weigh = 17.71

**MODE :**

Points = 3.07

Score = 3.44

Weigh = 17.02 , 18.90

**VARIANCE** **:**

Points = 0.2858814

Score = 0.957379

Weigh = 3.193166

**STANDARD DEVIATION :**

Points = 0.5346787

Score = 0.9784574

Weigh = 1.786943

**RANGE :**

Points = 2.76, 4.93

Score = 1.513, 5.424

Weigh = 14.5, 22.9

**COMMENT :**

1. **“Points”** and **“Score”** these two columns have mean and median close to each other but for **“Weigh”** it is slightly different.
2. **“Points”** and **“Weigh”** are Bimodal.

Q8) Calculate Expected Value for the problem below

1. The weights (X) of patients at a clinic (in pounds), are

108, 110, 123, 134, 135, 145, 167, 187, 199

Assume one of the patients is chosen at random. What is the Expected Value of the Weight of that patient?

1. Expected value =

There are 9 patients

Probability of selecting each patient = 1/9

Ex : 108, 110, 123, 134, 135, 145, 167, 187, 199

P(x) = 1/9 1/9 1/9 1/9 1/9 1/9 1/9 1/9 1/9

Expected Value = (1/9)(108) + (1/9)(110) + (1/9)(123) + (1/9)(134) + (1/9)(135) + (1/9)(145) + (1/9)(167) + (1/9)(187) + (1/9)(199)

= (1/9) ( 108 + 110 + 123 + 134 + 135 + 145 + 167 + 187 + 199 )

= (1/9) (1308)

= 145.33

Expected value of the weight of that patient = 145.33

**Q9) Calculate Skewness, Kurtosis & draw inferences on the following data**

**Cars speed and distance**

**Use Q9\_a.csv**

|  |  |  |
| --- | --- | --- |
| Index | speed | dist |
| 1 | 4 | 2 |
| 2 | 4 | 10 |
| 3 | 7 | 4 |
| 4 | 7 | 22 |
| 5 | 8 | 16 |
| 6 | 9 | 10 |
| 7 | 10 | 18 |
| 8 | 10 | 26 |
| 9 | 10 | 34 |
| 10 | 11 | 17 |
| 11 | 11 | 28 |
| 12 | 12 | 14 |
| 13 | 12 | 20 |
| 14 | 12 | 24 |
| 15 | 12 | 28 |
| 16 | 13 | 26 |
| 17 | 13 | 34 |
| 18 | 13 | 34 |
| 19 | 13 | 46 |
| 20 | 14 | 26 |
| 21 | 14 | 36 |
| 22 | 14 | 60 |
| 23 | 14 | 80 |
| 24 | 15 | 20 |
| 25 | 15 | 26 |
| 26 | 15 | 54 |
| 27 | 16 | 32 |
| 28 | 16 | 40 |
| 29 | 17 | 32 |
| 30 | 17 | 40 |
| 31 | 17 | 50 |
| 32 | 18 | 42 |
| 33 | 18 | 56 |
| 34 | 18 | 76 |
| 35 | 18 | 84 |
| 36 | 19 | 36 |
| 37 | 19 | 46 |
| 38 | 19 | 68 |
| 39 | 20 | 32 |
| 40 | 20 | 48 |
| 41 | 20 | 52 |
| 42 | 20 | 56 |
| 43 | 20 | 64 |
| 44 | 22 | 66 |
| 45 | 23 | 54 |
| 46 | 24 | 70 |
| 47 | 24 | 92 |
| 48 | 24 | 93 |
| 49 | 24 | 120 |
| 50 | 25 | 85 |

1. **SKEWNESS :**

Speed = -0.1139548 Distance = 0.7824835

**KURTOSIS :**

Speed = 2.422853 Distance = 3.248019

**Inferences :**

From the skewness and kurtosis values, we can infer that the data is slightly skewed and has a moderate kurtosis.

**SP and Weight(WT)**

**Use Q9\_b.csv**

|  |  |  |
| --- | --- | --- |
|  | SP | WT |
| 1 | 104.1854 | 28.76206 |
| 2 | 105.4613 | 30.46683 |
| 3 | 105.4613 | 30.1936 |
| 4 | 113.4613 | 30.63211 |
| 5 | 104.4613 | 29.88915 |
| 6 | 113.1854 | 29.59177 |
| 7 | 105.4613 | 30.30848 |
| 8 | 102.5985 | 15.84776 |
| 9 | 102.5985 | 16.35948 |
| 10 | 115.6452 | 30.92015 |
| 11 | 111.1854 | 29.36334 |
| 12 | 117.5985 | 15.75353 |
| 13 | 122.1051 | 32.81359 |
| 14 | 111.1854 | 29.37844 |
| 15 | 108.1854 | 29.34728 |
| 16 | 111.1854 | 29.60453 |
| 17 | 114.3693 | 29.53578 |
| 18 | 117.5985 | 16.19412 |
| 19 | 114.3693 | 29.92939 |
| 20 | 118.4729 | 33.51697 |
| 21 | 119.1051 | 32.32465 |
| 22 | 110.8408 | 34.90821 |
| 23 | 120.289 | 32.67583 |
| 24 | 113.8291 | 31.83712 |
| 25 | 119.1854 | 28.78173 |
| 26 | 114.5985 | 16.04317 |
| 27 | 120.7605 | 38.06282 |
| 28 | 119.1051 | 32.83507 |
| 29 | 99.56491 | 34.48321 |
| 30 | 121.8408 | 35.54936 |
| 31 | 113.4846 | 37.04235 |
| 32 | 112.289 | 33.23436 |
| 33 | 119.9211 | 31.38004 |
| 34 | 121.3926 | 37.57329 |
| 35 | 111.289 | 32.70164 |
| 36 | 115.0131 | 31.91122 |
| 37 | 114.0934 | 28.754 |
| 38 | 116.9094 | 27.87992 |
| 39 | 116.9094 | 28.6305 |
| 40 | 128.4613 | 30.11543 |
| 41 | 116.3926 | 37.39252 |
| 42 | 115.7488 | 35.02718 |
| 43 | 117.4613 | 30.52743 |
| 44 | 114.0934 | 28.34398 |
| 45 | 114.381 | 33.07863 |
| 46 | 117.1051 | 32.62192 |
| 47 | 118.2087 | 36.49862 |
| 48 | 116.4729 | 33.91006 |
| 49 | 127.9094 | 28.0706 |
| 50 | 118.289 | 33.45847 |
| 51 | 118.289 | 33.21395 |
| 52 | 118.289 | 33.43671 |
| 53 | 120.4043 | 40.39816 |
| 54 | 143.3926 | 37.62069 |
| 55 | 135.3926 | 37.25439 |
| 56 | 126.4043 | 40.58907 |
| 57 | 110.4613 | 30.14754 |
| 58 | 118.289 | 32.73452 |
| 59 | 112.6452 | 30.61528 |
| 60 | 115.5766 | 37.66287 |
| 61 | 130.2087 | 36.88815 |
| 62 | 117.6685 | 37.86041 |
| 63 | 126.0481 | 43.39099 |
| 64 | 125.3123 | 40.72283 |
| 65 | 128.1284 | 40.15948 |
| 66 | 126.5985 | 15.71286 |
| 67 | 132.4846 | 37.97996 |
| 68 | 133.6802 | 41.57397 |
| 69 | 133.3123 | 40.47204 |
| 70 | 158.3007 | 37.14173 |
| 71 | 164.5985 | 15.82306 |
| 72 | 133.416 | 44.01314 |
| 73 | 133.1401 | 43.35312 |
| 74 | 124.7152 | 52.99775 |
| 75 | 121.8642 | 42.6187 |
| 76 | 132.8642 | 42.77822 |
| 77 | 169.5985 | 16.13295 |
| 78 | 150.5766 | 37.92311 |
| 79 | 151.5985 | 15.76963 |
| 80 | 167.9445 | 39.4231 |
| 81 | 139.8408 | 34.94861 |

1. **KURTOSIS :**

SP = 5.723521 WT = 3.819466

**SKEWNESS :**

SP = 1.581454 WT = -0.6033099

**Inferences :**

From the above calculations , it can be inferred that the data is moderately skewed and leptokurtic

**Q10) Draw inferences about the following boxplot & histogram**



1. From the histogram we can see that :
2. mode is between 50 – 100
3. median is approximately 200
4. As mode is less than median, the above distribution is positively skewed



1. The boxplot is negatively skewed (left skewed)

**Q11)** Suppose we want to estimate the average weight of an adult male in Mexico. We draw a random sample of 2,000 men from a population of 3,000,000 men and weigh them. We find that the average person in our sample weighs 200 pounds, and the standard deviation of the sample is 30 pounds. Calculate 94%,98%,96% confidence interval?

1. Here n=2000, sample-average=200, sample-std=30, C.I=94%, alpha=0.06, C.I=98%, alpha=0.02, C.I=96%, alpha=0.04

[Q11 - Jupyter Notebook](http://localhost:8888/notebooks/Q11.ipynb)

* Confidence interval for 94% is = 198.73798748893051, 201.26201251106949
* Confidence interval for 96% is = 198.62193448096605, 201.37806551903395
* Confidence interval for 98% is = 198.4390205765186, 201.5609794234814

**Q12)** Below are the scores obtained by a student in tests

**34,36,36,38,38,39,39,40,40,41,41,41,41,42,42,45,49,56**

1. Find mean, median, variance, standard deviation.
2. What can we say about the student marks?

[Q12 - Jupyter Notebook](http://localhost:8888/notebooks/Q12.ipynb)

Mean is : 41.0

Median is : 40.5

Standard deviation is : 4.910306620885412

Variance is : 24.11111111111111

Mode is : mode result (mode = array ([41]), count = array ([41]))

Q13) What is the nature of skewness when mean, median of data are equal?

1. The skewness is 0 when mean = median = mode

Q14) What is the nature of skewness when mean > median ?

1. The distribution is positively skewed when mean>median

Q15) What is the nature of skewness when median > mean?

1. Distribution is negatively skewed when median>mean

Q16) What does positive kurtosis value indicates for a data ?

1. A distribution with a positive kurtosis value indicates that the distribution has heavier tails than the normal distribution.

Q17) What does negative kurtosis value indicates for a data?

1. A distribution with a negative kurtosis value indicates that the distribution has lighter tails than the normal distribution.

Q18) Answer the below questions using the below boxplot visualization.



What can we say about the distribution of the data?

What is nature of skewness of the data?  
**A)** 1. The data has a range from approx 1 to 19.There are no outliers present in the data.

2. The data is negatively skewed or left skewed.

Q19) Comment on the below Boxplot visualizations?



Draw an Inference from the distribution of data for Boxplot 1 with respect Boxplot 2.

**A)**

* Data 1 and data 2 both have the same median values(~262.5).
* Both datasets are symmetrically distributed as evident from the nature of their boxplots.
* The variation in dataset 1 is less compared to dataset 2. Dataset 1 is spread over a smaller range compared to dataset 2 whose range is wider.

Q 20) Calculate probability from the given dataset for the below cases

Data \_set: Cars.csv

Calculate the probability of MPG of Cars for the below cases.

MPG <- Cars$MPG

* 1. P(MPG>38)
  2. P(MPG<40)

c. P (20<MPG<50)

**A)** [Q20 - Jupyter Notebook](http://localhost:8888/notebooks/Q20.ipynb)

a. P(MPG>38) = 0.3475939251582705

b. P(MPG<40) = 0.7293498762151616

c. P (20<MPG<50) = 0.8988689169682046

Q 21) Check whether the data follows normal distribution

1. Check whether the MPG of Cars follows Normal Distribution

Dataset: Cars.csv

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| HP | MPG | VOL | SP | WT |
| 49 | 53.70068 | 89 | 104.1854 | 28.76206 |
| 55 | 50.0134 | 92 | 105.4613 | 30.46683 |
| 55 | 50.0134 | 92 | 105.4613 | 30.1936 |
| 70 | 45.69632 | 92 | 113.4613 | 30.63211 |
| 53 | 50.50423 | 92 | 104.4613 | 29.88915 |
| 70 | 45.69632 | 89 | 113.1854 | 29.59177 |
| 55 | 50.0134 | 92 | 105.4613 | 30.30848 |
| 62 | 46.71655 | 50 | 102.5985 | 15.84776 |
| 62 | 46.71655 | 50 | 102.5985 | 16.35948 |
| 80 | 42.29908 | 94 | 115.6452 | 30.92015 |
| 73 | 44.65283 | 89 | 111.1854 | 29.36334 |
| 92 | 39.35409 | 50 | 117.5985 | 15.75353 |
| 92 | 39.35409 | 99 | 122.1051 | 32.81359 |
| 73 | 44.65283 | 89 | 111.1854 | 29.37844 |
| 66 | 45.73489 | 89 | 108.1854 | 29.34728 |
| 73 | 44.65283 | 89 | 111.1854 | 29.60453 |
| 78 | 42.78991 | 91 | 114.3693 | 29.53578 |
| 92 | 39.35409 | 50 | 117.5985 | 16.19412 |
| 78 | 42.78991 | 91 | 114.3693 | 29.92939 |
| 90 | 38.90183 | 103 | 118.4729 | 33.51697 |
| 92 | 38.411 | 99 | 119.1051 | 32.32465 |
| 74 | 42.82848 | 107 | 110.8408 | 34.90821 |
| 95 | 38.31061 | 101 | 120.289 | 32.67583 |
| 81 | 40.47472 | 96 | 113.8291 | 31.83712 |
| 95 | 38.31061 | 89 | 119.1854 | 28.78173 |
| 92 | 38.411 | 50 | 114.5985 | 16.04317 |
| 92 | 38.411 | 117 | 120.7605 | 38.06282 |
| 92 | 38.411 | 99 | 119.1051 | 32.83507 |
| 52 | 43.46943 | 104 | 99.56491 | 34.48321 |
| 103 | 35.40419 | 107 | 121.8408 | 35.54936 |
| 84 | 39.43124 | 114 | 113.4846 | 37.04235 |
| 84 | 39.43124 | 101 | 112.289 | 33.23436 |
| 102 | 36.28546 | 97 | 119.9211 | 31.38004 |
| 102 | 36.28546 | 113 | 121.3926 | 37.57329 |
| 81 | 39.53163 | 101 | 111.289 | 32.70164 |
| 90 | 37.95874 | 98 | 115.0131 | 31.91122 |
| 90 | 37.95874 | 88 | 114.0934 | 28.754 |
| 102 | 34.07067 | 86 | 116.9094 | 27.87992 |
| 102 | 34.07067 | 86 | 116.9094 | 28.6305 |
| 130 | 31.01413 | 92 | 128.4613 | 30.11543 |
| 95 | 35.15273 | 113 | 116.3926 | 37.39252 |
| 95 | 35.15273 | 106 | 115.7488 | 35.02718 |
| 102 | 34.07067 | 92 | 117.4613 | 30.52743 |
| 95 | 35.15273 | 88 | 114.0934 | 28.34398 |
| 93 | 35.64356 | 102 | 114.381 | 33.07863 |
| 100 | 34.5615 | 99 | 117.1051 | 32.62192 |
| 100 | 34.5615 | 111 | 118.2087 | 36.49862 |
| 98 | 35.05233 | 103 | 116.4729 | 33.91006 |
| 130 | 31.01413 | 86 | 127.9094 | 28.0706 |
| 115 | 29.62994 | 101 | 118.289 | 33.45847 |
| 115 | 29.62994 | 101 | 118.289 | 33.21395 |
| 115 | 29.62994 | 101 | 118.289 | 33.43671 |
| 115 | 29.62994 | 124 | 120.4043 | 40.39816 |
| 180 | 24.48737 | 113 | 143.3926 | 37.62069 |
| 160 | 26.85228 | 113 | 135.3926 | 37.25439 |
| 130 | 27.85625 | 124 | 126.4043 | 40.58907 |
| 96 | 31.11358 | 92 | 110.4613 | 30.14754 |
| 115 | 29.62994 | 101 | 118.289 | 32.73452 |
| 100 | 30.13192 | 94 | 112.6452 | 30.61528 |
| 100 | 28.86023 | 115 | 115.5766 | 37.66287 |
| 145 | 27.35427 | 111 | 130.2087 | 36.88815 |
| 120 | 24.60913 | 116 | 117.6685 | 37.86041 |
| 140 | 23.51592 | 131 | 126.0481 | 43.39099 |
| 140 | 23.51592 | 123 | 125.3123 | 40.72283 |
| 150 | 23.60516 | 121 | 128.1284 | 40.15948 |
| 165 | 40.05 | 50 | 126.5985 | 15.71286 |
| 165 | 23.10317 | 114 | 132.4846 | 37.97996 |
| 165 | 23.10317 | 127 | 133.6802 | 41.57397 |
| 165 | 23.10317 | 123 | 133.3123 | 40.47204 |
| 245 | 21.27371 | 112 | 158.3007 | 37.14173 |
| 280 | 19.67851 | 50 | 164.5985 | 15.82306 |
| 162 | 23.20357 | 135 | 133.416 | 44.01314 |
| 162 | 23.20357 | 132 | 133.1401 | 43.35312 |
| 140 | 19.08634 | 160 | 124.7152 | 52.99775 |
| 140 | 19.08634 | 129 | 121.8642 | 42.6187 |
| 175 | 18.76284 | 129 | 132.8642 | 42.77822 |
| 322 | 36.9 | 50 | 169.5985 | 16.13295 |
| 238 | 19.19789 | 115 | 150.5766 | 37.92311 |
| 263 | 34 | 50 | 151.5985 | 15.76963 |
| 295 | 19.83373 | 119 | 167.9445 | 39.4231 |
| 236 | 12.10126 | 107 | 139.8408 | 34.94861 |

1. [Q21 - Jupyter Notebook](http://localhost:8888/notebooks/Q21.ipynb)

MPG data follows a normal distribution

1. Check Whether the Adipose Tissue (AT) and Waist Circumference(Waist) from wc-at data set follows Normal Distribution

Dataset: wc-at.csv

|  |  |
| --- | --- |
| Waist | AT |
| 74.75 | 25.72 |
| 72.6 | 25.89 |
| 81.8 | 42.6 |
| 83.95 | 42.8 |
| 74.65 | 29.84 |
| 71.85 | 21.68 |
| 80.9 | 29.08 |
| 83.4 | 32.98 |
| 63.5 | 11.44 |
| 73.2 | 32.22 |
| 71.9 | 28.32 |
| 75 | 43.86 |
| 73.1 | 38.21 |
| 79 | 42.48 |
| 77 | 30.96 |
| 68.85 | 55.78 |
| 75.95 | 43.78 |
| 74.15 | 33.41 |
| 73.8 | 43.35 |
| 75.9 | 29.31 |
| 76.85 | 36.6 |
| 80.9 | 40.25 |
| 79.9 | 35.43 |
| 89.2 | 60.09 |
| 82 | 45.84 |
| 92 | 70.4 |
| 86.6 | 83.45 |
| 80.5 | 84.3 |
| 86 | 78.89 |
| 82.5 | 64.75 |
| 83.5 | 72.56 |
| 88.1 | 89.31 |
| 90.8 | 78.94 |
| 89.4 | 83.55 |
| 102 | 127 |
| 94.5 | 121 |
| 91 | 107 |
| 103 | 129 |
| 80 | 74.02 |
| 79 | 55.48 |
| 83.5 | 73.13 |
| 76 | 50.5 |
| 80.5 | 50.88 |
| 86.5 | 140 |
| 83 | 96.54 |
| 107.1 | 118 |
| 94.3 | 107 |
| 94.5 | 123 |
| 79.7 | 65.92 |
| 79.3 | 81.29 |
| 89.8 | 111 |
| 83.8 | 90.73 |
| 85.2 | 133 |
| 75.5 | 41.9 |
| 78.4 | 41.71 |
| 78.6 | 58.16 |
| 87.8 | 88.85 |
| 86.3 | 155 |
| 85.5 | 70.77 |
| 83.7 | 75.08 |
| 77.6 | 57.05 |
| 84.9 | 99.73 |
| 79.8 | 27.96 |
| 108.3 | 123 |
| 119.6 | 90.41 |
| 119.9 | 106 |
| 96.5 | 144 |
| 105.5 | 121 |
| 105 | 97.13 |
| 107 | 166 |
| 107 | 87.99 |
| 101 | 154 |
| 97 | 100 |
| 100 | 123 |
| 108 | 217 |
| 100 | 140 |
| 103 | 109 |
| 104 | 127 |
| 106 | 112 |
| 109 | 192 |
| 103.5 | 132 |
| 110 | 126 |
| 110 | 153 |
| 112 | 158 |
| 108.5 | 183 |
| 104 | 184 |
| 111 | 121 |
| 108.5 | 159 |
| 121 | 245 |
| 109 | 137 |
| 97.5 | 165 |
| 105.5 | 152 |
| 98 | 181 |
| 94.5 | 80.95 |
| 97 | 137 |
| 105 | 125 |
| 106 | 241 |
| 99 | 134 |
| 91 | 150 |
| 102.5 | 198 |
| 106 | 151 |
| 109.1 | 229 |
| 115 | 253 |
| 101 | 188 |
| 100.1 | 124 |
| 93.3 | 62.2 |
| 101.8 | 133 |
| 107.9 | 208 |
| 108.5 | 208 |

[Q21 (b) - Jupyter Notebook](http://localhost:8888/notebooks/Q21%20(b).ipynb)

Waist data does not follow normal distribution

Q 22) Calculate the Z scores of 90% confidence interval,94% confidence interval, 60% confidence interval

**A)** [Q22 - Jupyter Notebook](http://localhost:8888/notebooks/Q22.ipynb)

Z-score of 90% C.I is: 1.6448536269514722

Z-score of 94% C.I is: 1.8807936081512509

Z-score of 60% C.I is: 0.8416212335729143

Q 23) Calculate the t scores of 95% confidence interval, 96% confidence interval, 99% confidence interval for sample size of 25

**A)** [Q23 - Jupyter Notebook](http://localhost:8888/notebooks/Q23.ipynb)

T-score of 95% C.I is: 2.0638985616280205

T-score of 96% C.I is: 2.1715446760080677

T-score of 99% C.I is: 2.796939504772804

Q 24**)** A Government company claims that an average light bulb lasts 270 days. A researcher randomly selects 18 bulbs for testing. The sampled bulbs last an average of 260 days, with a standard deviation of 90 days. If the CEO's claim were true, what is the probability that 18 randomly selected bulbs would have an average life of no more than 260 days

Hint:

rcode 🡪 pt(tscore,df)

df 🡪 degrees of freedom

1. [Q24 - Jupyter Notebook](http://localhost:8888/notebooks/Q24.ipynb)

T-score is: -0.4714045207910317

Corresponding probability is: 0.32167253567098364