INTRODUCTION TO

PROBABILITY AND STATISTICS

IE 5317 - 00

PROJECT PART – 1

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NOVEMBER 9, 2022

DATA SET

<u>DEFINITION OF DATA:</u> A production engineer working in a manufacturing firm wants to examine the capability of the processes that is used for manufacturing Support Beam. The engineer measures the thickness of support beam from 10 boxes from each shift.

DATA COLLECTION: The data was collected from the following link, https://support.minitab.com/en-us/datasets/capability-data-sets/support-beam-thickness/

DATA SET (UNIT OF DATA: Millimeter (MM))

	SUPPORT BEAM THICKNESS								
10.87	10.89	10.86	10.89	10.9	10.85	10.86	10.92	10.91	10.88
10.88	10.92	10.9	10.91	10.9	10.87	10.85	10.91	10.89	10.91
10.89	10.91	10.91	10.9	10.92	10.91	10.87	10.89	10.89	10.88
10.95	10.88	10.91	10.9	10.88	10.89	10.86	10.88	10.9	10.91
10.92	10.86	10.88	10.85	10.87	10.88	10.95	10.87	10.9	10.92
10.9	10.92	10.9	10.89	10.89	10.87	10.89	10.88	10.89	10.89
10.9	10.85	10.91	10.91	10.91	10.86	10.88	10.9	10.9	10.92
10.93	10.89	10.93	10.91	10.89	10.93	10.89	10.84	10.86	10.89
10.88	10.86	10.9	10.87	10.93	10.91	10.9	10.87	10.91	10.9
10.89	10.9	10.87	10.87	10.89	10.85	10.9	10.9	10.89	10.89

MEAN = 1089.2 / 100 = 10.892

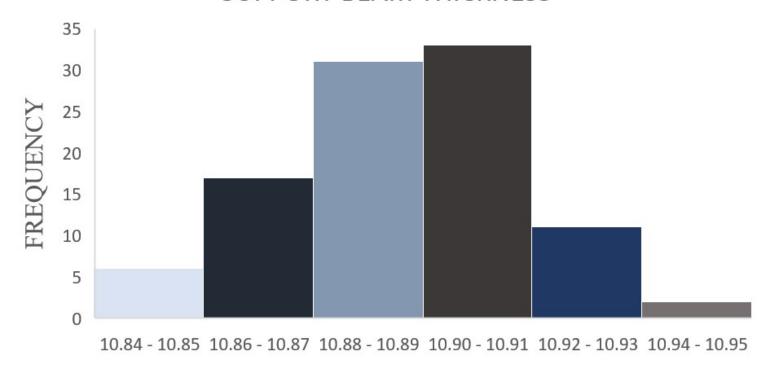
STANDARD DEVIATION (STD) = 0.022181

FREQUENCY TABLE FOR SUPPORT BEAM THICKNESS

CLASS INTERVALS	FREQUENCY	CUMULATIVE FREQUENCY	RELATIVE FREQUENCY	CUMULATIVE RELATIVE FREQUENCY
10.84 - 10.85	6	6	0.06	0.06
10.86 - 10.87	17	23	0.17	0.23
10.88 - 10.89	31	54	0.31	0.54
10.90 - 10.91	33	87	0.33	0.87
10.92 - 10.93	11	98	0.11	0.98
10.94 - 10.95	2	100	0.02	1

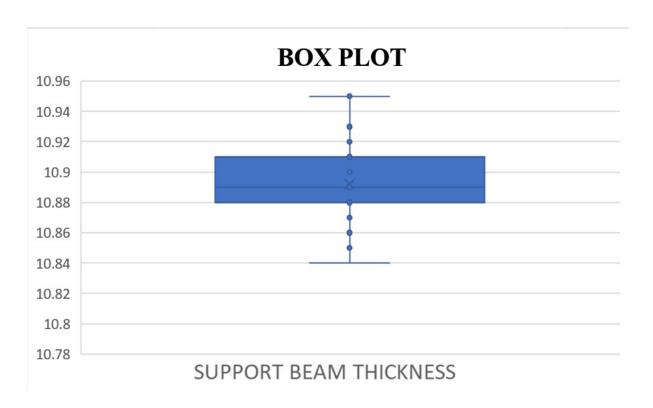
HISTOGRAM FOR SUPPORT BEAM THICKNESS

SUPPORT BEAM THICKNESS



SUPPORT BEAM THICKNESS

BOX PLOT



Quartile Values of SUPPORT BEAM THICKNESS

Q1: 10.88

Q2: 10.89

Q3: 10.91

DATA SET

<u>DEFINITION</u>: The data represents the length of camshafts, which was monitored by the Quality engineer in the Automotive parts plant.

<u>DATA COLLECTION:</u> The data was gathered from the following website:

https://support.minitab.com/en-us/datasets/control-charts-datasets/camshaft-length-data/

DATA SET (UNIT OF DATA: MM)

		CA	M SH	AFT I	LENG	ГН (М	IM)		
597.2	598.2	598.8	599	599.4	600.6	601	601.2	601.4	601.6
597.6	598.2	598.8	599	599.6	600.8	601	601.2	601.4	601.6
597.8	598.2	598.8	599	599.6	600.8	601	601.2	601.4	601.6
597.8	598.4	598.8	599.2	599.6	600.8	601	601.2	601.4	601.6
598	598.4	598.8	599.2	600	600.8	601	601.2	601.4	601.6
598	598.4	598.8	599.2	600	601	601.2	601.2	601.4	601.6
598	598.4	598.8	599.4	600.2	601	601.2	601.2	601.4	601.8
598	598.8	598.8	599.4	600.2	601	601.2	601.4	601.4	601.8
598.2	598.8	599	599.4	600.4	601	601.2	601.4	601.4	601.8
598.2	598.8	599	599.4	600.6	601	601.2	601.4	601.4	602.2

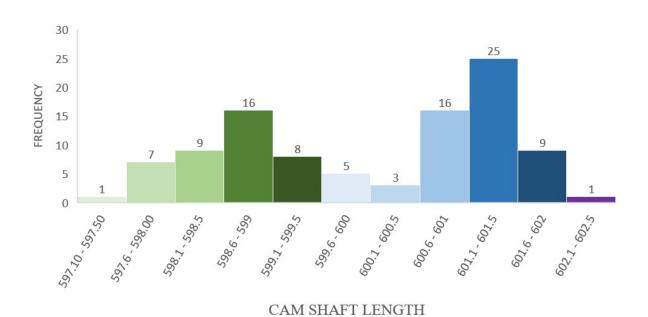
MEAN = 600.07

STANDARD DEVIATIOMN = 1.328313

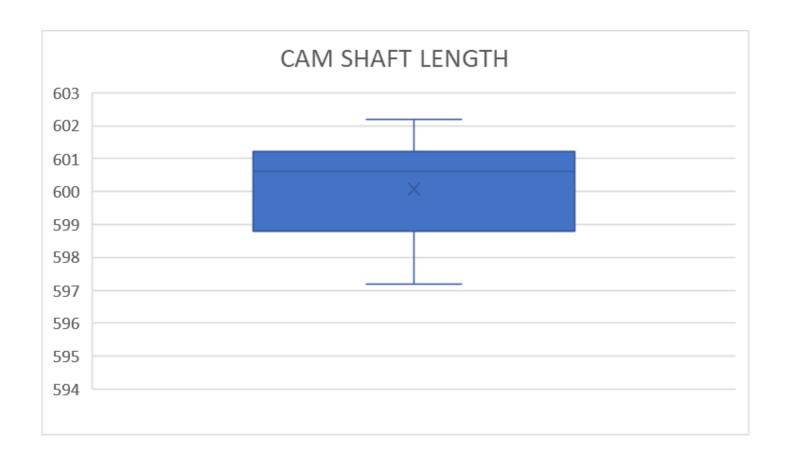
FREQUENCY TABLE FOR CAMSHAFT LENGTH

CLASS INTERVAL	MIDPOINT	FREQUENCY	RELATIVE FREQUENCY	CUMULATIVE FREQUENCY	CUMULATIVE RELATIVE FREQUENCY
597.10 - 597.50	597.3	1	0.01	1	0.01
597.6 - 598.00	597.8	7	0.07	8	0.08
598.1 - 598.5	598.3	9	0.09	17	0.17
598.6 - 599	598.8	16	0.16	33	0.33
599.1 - 599.5	599.3	8	0.08	41	0.41
599.6 - 600	599.8	5	0.05	46	0.46
600.1 - 600.5	600.3	3	0.03	49	0.49
600.6 - 601	600.8	16	0.16	65	0.65
601.1 - 601.5	601.3	25	0.25	90	0.9
601.6 - 602	601.8	9	0.09	99	0.99
602.1 - 602.5	602.3	1	0.01	100	1

HISTOGRAM: FOR LENGTH OF CAM SHAFT



BOX PLOT



Q1: 598.8

Q2: 606.6

Q3: 601.2

INTRODUCTION TO

PROBABILITY AND STATISTICS

IE 5317 - 00

PROJECT PART – 2

NOV 9, 2022

DATA SET

<u>DEFINITION OF VARIABLE:</u> The data describes the starting time of Astronomical Twilight of the North Dakota, USA for the year 2022.

<u>DATA COLLECTION:</u> The data was collected from the following website:

https://www.timeanddate.com/sun/@5058015?month=10&year=2022

DATA SET (UNIT OF DATA: AM)

					22				
86580	86580	86580	86580	86580	86520	86520	86520	86520	86460
86520	86640	86580	86580	86520	86520	86520	86520	86520	86520
86580	86580	86520	86520	86520	86520	86520	86460	86460	86460
86580	86580	86580	86580	86580	86520	86520	86520	86520	86520
86580	86580	86580	86580	86520	86520	86520	86520	86520	86460
86580	86520	86520	86520	86520	86580	86520	86520	86420	86520
86580	86580	86580	86580	86520	86520	86460	86460	86520	86460
86580	86580	86580	86520	86520	86520	86520	86520	86420	86520
86580	86580	86580	86580	86520	86520	86520	86520	86520	86460
86580	86580	86520	86520	86580	86520	86520	86460	86520	86520
86460									

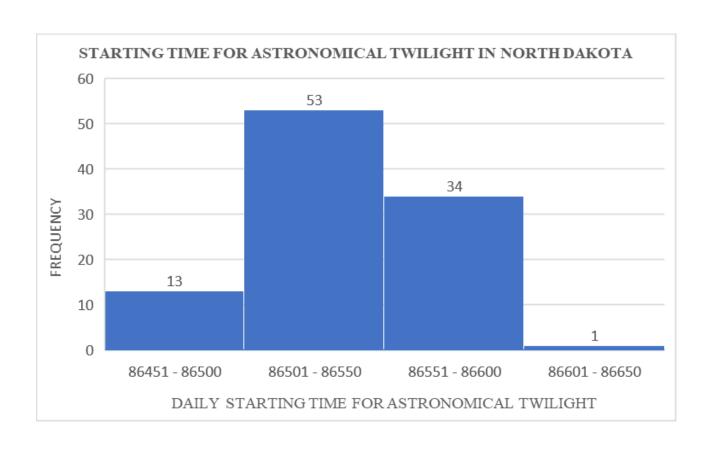
MEAN: 86533.66337

STANDARD DEVIATION:

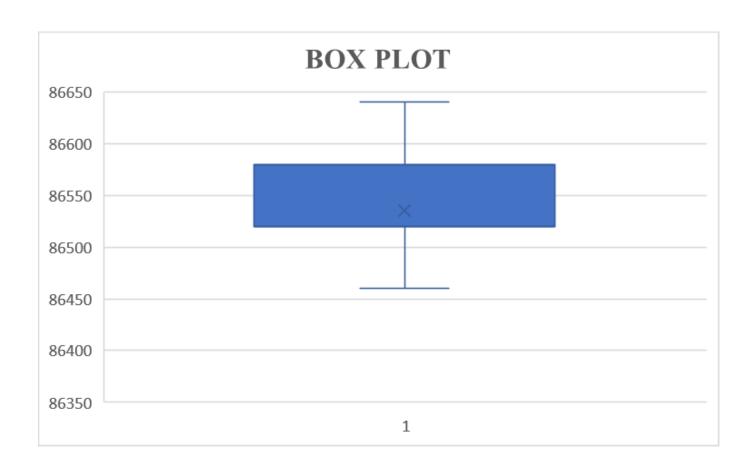
FREQUENCY TABLE FOR INTERVAL ARRIVAL TIME (SECONDS)

CLASS INTERVAL	MID - POINT	FREQUENCY	CUMULATIVE FREQUENCY	RELATIVE FREQUENCY
86451 - 86500	86475.5	13	13	0.128712871
86501 - 86550	86525.5	53	66	0.524752475
86551 - 86600	86575.5	34	100	0.336633663
86601 - 86650	86625.5	1	101	0.00990099
		101		1

HISTOGRAM FOR ASTRONOMICAL TWILIGHT IN NORTH DAKOTA



BOX PLOT



QUARTILE VALUE:

Q1: 86520

Q2: 86520

Q3: 86580

RAW DATA

<u>DATA VALUES:</u> ASTRONOMICAL TWILIGHT IN NORTH DAKOTA.

INTERVAL: TIME DIFFERENCE BETWEEN COMMENCING TIME OF ASTRONOMICAL TWILIGHT IN NORTH DAKOTA.

DATA SET:

TIME	INTERVAL
2.13 AM	
2.16 AM	86580
2.18 AM	86520
2.21AM	86580
2.24 AM	86580
2.27 AM	86580
2.30 AM	86580
2.33 AM	86580
2.36 AM	86580
2.39 AM	86580
2.42 AM	86580
2.45 AM	86580
2.49 AM	86640
2.52 AM	86580
2.55 AM	86580
2.58 AM	86580
3.00 AM	86520
3.03 AM	86580
3.06 AM	86580
3.09 AM	86580
3.12 AM	86580
3.15 AM	86580
3.18 AM	86580
3.21 AM	86520
3.24 AM	86580
3.27 AM	86580
3.29 AM	86520
3.32 AM	86580
3.35 AM	86580
3.38 AM	86580
3.40 AM	86520
3.43 AM	86580
3.46 AM	86580
3.48 AM	86520
3.51 AM	86580

3.54 AM	86580
3.56 AM	86520
3.59 AM	86580
4.01 AM	86520
4.04 AM	86580
4.06 AM	86520
4.09 AM	86580
4.11 AM	86520
4.13 AM	86520
4.16 AM	86580
4.18 AM	86520
4.21 AM	86520
4.23 AM	86520
4.25 AM	86520
4.27 AM	86520
4.30 AM	86580
4.32 AM	86520
4.34 AM	86520
4.36 AM	86520
4.38 AM	86520
4.40 AM	86520
4.43 AM	86580
4.45 AM	86520
4.47 AM	86520
4.49 AM	86520
4.51 AM	86520
4.53 AM	86520
4.55 AM	86520
4.57 AM	86520
4.59 AM	86520
5.01 AM	86520
5.03 AM	86520
5.04 AM	86460
5.06 AM	86520
5.08 AM	86520
5.10 AM	86520
5.12 AM	86520
5.14 AM	86520
5.15 AM	86460
5.15 AW	00400

5.17 AM	86520
5.19 AM	86520
5.21 AM	86520
5.22 AM	86460
5.24 AM	86520
5.26 AM	86520
5.27 AM	86460
5.29 AM	86520
5.31 AM	86520
5.32 AM	86460
5.34 AM	86520
5.36 AM	86520
5.37 AM	86460
5.39 AM	86520
5.40 AM	86460
5.42 AM	86520
5.44 AM	86520
5.45 AM	86460
5.47 AM	86520
5.48 AM	86460
5.50 AM	86520
5.51 AM	86460
5.53 AM	86520
5.54 AM	86460
5.56 AM	86520
5.57 AM	86460
5.59 AM	86520
6.00 AM	86460