Labs ABC branch analysis

We want to get some insights in branch output of lab results in 4 differents branches:

- Center
- North
- Industrial
- Express Service

First we need to clean the data. Since the Industrial branch works two shifts we need to divide their outputs by 2.

```
labs_abc_branches.industrial = labs_abc_branches.industrial ./ 2
```

`labs_abc_branches` = 195×7 table

...

	id	date	center	north	industrial	express_service
1	1	01-Jan-2021	147	148	155	2
2	2	02-Jan-2021	166	150	155	16
3	3	03-Jan-2021	153	149	154	23
4	4	04-Jan-2021	157	152	155	45
5	5	05-Jan-2021	154	149	157.5000	15
6	6	06-Jan-2021	153	147	70	3
7	7	07-Jan-2021	163	153	155.5000	6
8	8	08-Jan-2021	161	152	155	8
9	9	09-Jan-2021	172	151	157	29
10	10	10-Jan-2021	158	152	155.5000	18
11	11	11-Jan-2021	162	148	153.5000	83
12	12	12-Jan-2021	176	148	155	13
13	13	13-Jan-2021	158	151	157	7
14	14	14-Jan-2021	158	150	154	14
15	15	15-Jan-2021	162	148	154.5000	25
16	16	16-Jan-2021	155	150	154.5000	77
17	17	17-Jan-2021	170	148	153.5000	3
18	18	18-Jan-2021	155	148	158.5000	6
19	19	19-Jan-2021	169	149	156	37
20	20	20-Jan-2021	150	150	87	13
21	21	21-Jan-2021	157	151	155.5000	2
22	22	22-Jan-2021	169	148	155.5000	2

	id	date	center	north	industrial	express_service
23	23	23-Jan-2021	157	152	155.5000	28
24	24	24-Jan-2021	157	149	155.5000	18
25	25	25-Jan-2021	162	147	155.5000	30
26	26	26-Jan-2021	172	149	154.5000	3
27	27	27-Jan-2021	156	149	156	23
28	28	28-Jan-2021	167	150	153.5000	54
29	29	29-Jan-2021	167	151	155.5000	30
30	30	30-Jan-2021	154	151	154.5000	1
31	31	31-Jan-2021	167	149	154	33
32	32	01-Feb-2021	157	151	155	80
33	33	02-Feb-2021	153	150	155.5000	2
34	34	03-Feb-2021	167	149	154.5000	1
35	35	04-Feb-2021	169	148	154	21
36	36	05-Feb-2021	154	148	154.5000	47
37	37	06-Feb-2021	160	152	155	52
38	38	07-Feb-2021	149	151	154.5000	31
39	39	08-Feb-2021	155	151	154.5000	38
40	40	09-Feb-2021	168	148	153	5
41	41	10-Feb-2021	157	150	153.5000	28
42	42	11-Feb-2021	158	150	155.5000	29
43	43	12-Feb-2021	150	147	156.5000	24
44	44	13-Feb-2021	160	149	155.5000	73
45	45	14-Feb-2021	156	150	155.5000	28
46	46	15-Feb-2021	158	153	153	2
47	47	16-Feb-2021	152	151	155.5000	14
48	48	17-Feb-2021	156	150	154	62
49	49	18-Feb-2021	155	151	154.5000	39
50	50	19-Feb-2021	154	149	155	15
51	51	20-Feb-2021	170	145	155	57
52	52	21-Feb-2021	161	148	155	25
53	53	22-Feb-2021	163	152	155.5000	14
54	54	23-Feb-2021	170	149	157	51
55	55	24-Feb-2021	152	154	156	55

	id	date	center	north	industrial	express_service
56	56	25-Feb-2021	172	150	154.5000	17
57	57	26-Feb-2021	166	150	153.5000	20
58	58	27-Feb-2021	161	151	156	20
59	59	28-Feb-2021	159	153	154	84
60	60	01-Mar-2021	161	151	155.5000	13
61	61	02-Mar-2021	166	152	155.5000	10
62	62	03-Mar-2021	168	152	155	13
63	63	04-Mar-2021	165	155	154	0
64	64	05-Mar-2021	164	132	155	86
65	65	06-Mar-2021	163	151	154.5000	3
66	66	07-Mar-2021	152	148	158	88
67	67	08-Mar-2021	158	149	153.5000	35
68	68	09-Mar-2021	169	147	154.5000	112
69	69	10-Mar-2021	145	149	154.5000	8
70	70	11-Mar-2021	160	150	155	15
71	71	12-Mar-2021	153	149	153.5000	22
72	72	13-Mar-2021	151	152	155	59
73	73	14-Mar-2021	157	152	156.5000	6
74	74	15-Mar-2021	161	151	153	75
75	75	16-Mar-2021	153	150	157	78
76	76	17-Mar-2021	166	147	155	51
77	77	18-Mar-2021	174	147	154	12
78	78	19-Mar-2021	157	152	155	42
79	79	20-Mar-2021	162	150	152.5000	111
80	80	21-Mar-2021	169	147	155.5000	10
81	81	22-Mar-2021	154	150	152.5000	45
82	82	23-Mar-2021	160	149	156	30
83	83	24-Mar-2021	164	152	154.5000	30
84	84	25-Mar-2021	164	148	155.5000	80
85	85	26-Mar-2021	144	148	155.5000	12
86	86	27-Mar-2021	173	151	155	19
87	87	28-Mar-2021	150	150	157.5000	58
88	88	29-Mar-2021	163	150	153	35

	id	date	center	north	industrial	express_service
89	89	30-Mar-2021	158	149	157	16
90	90	31-Mar-2021	52	151	155	3
91	91	01-Apr-2021	162	146	152.5000	37
92	92	02-Apr-2021	175	147	153.5000	26
93	93	03-Apr-2021	149	147	154.5000	8
94	94	04-Apr-2021	144	155	62	6
95	95	05-Apr-2021	168	150	61	45
96	96	06-Apr-2021	166	146	61.5000	8
97	97	07-Apr-2021	162	149	62	19
98	98	08-Apr-2021	164	150	61	8
99	99	09-Apr-2021	166	150	63	7
100	100	10-Apr-2021	159	152	61	93

⋮

Then we need to remove the outliers, we'll use $\mu \pm \frac{3}{2}\sigma$

```
branches = table2array(labs_abc_branches(:, 3:6))
```

```
branches = 195×4
  147.0000  148.0000  155.0000    2.0000
  166.0000  150.0000  155.0000   16.0000
  153.0000  149.0000  154.0000   23.0000
  157.0000  152.0000  155.0000   45.0000
  154.0000  149.0000  157.5000   15.0000
  153.0000  147.0000   70.0000    3.0000
  163.0000  153.0000  155.5000    6.0000
  161.0000  152.0000  155.0000    8.0000
  172.0000  151.0000  157.0000   29.0000
  158.0000  152.0000  155.5000   18.0000
     ⋮
```

```
avg = mean(branches);
std_dev = std(branches);
% calc top outliers limit
top = avg + 3/2 .* std_dev
```

```
top = 1×4
  178.9157  159.9112  189.8418   74.0293
```

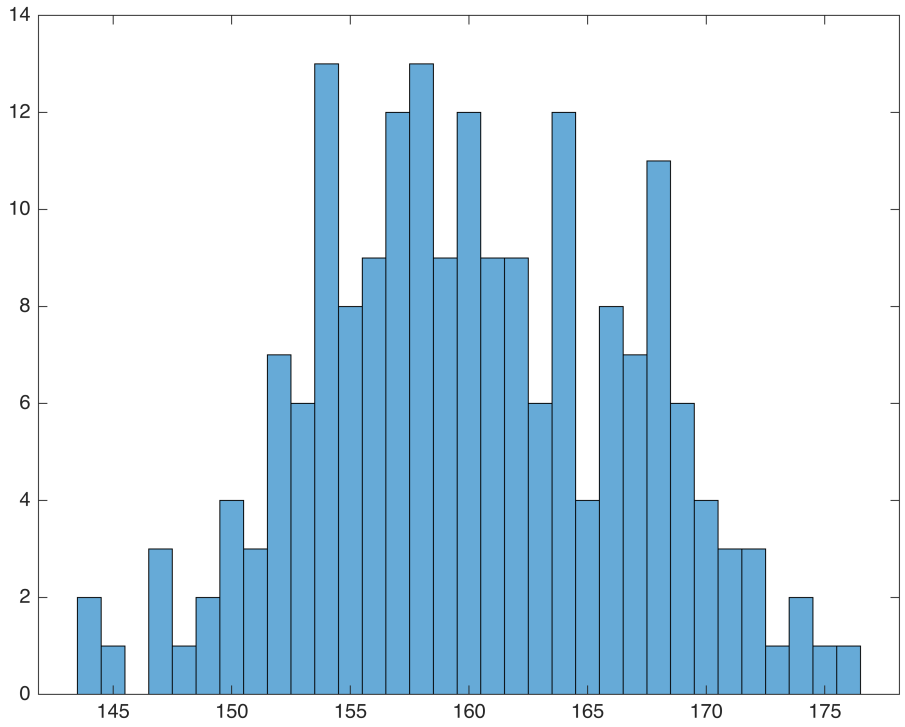
```
% calc bottom outliers limit
bottom = avg - 3/2 .* std_dev
```

```
bottom = 1×4
  138.6843  138.8581   95.6249  -11.4242
```

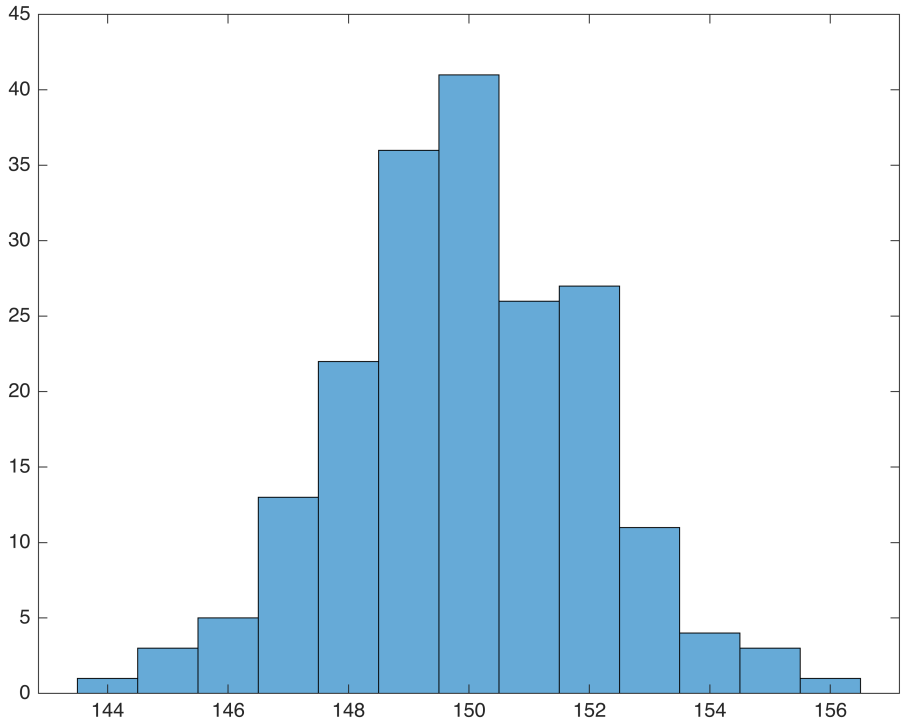
```
center = branches(:, 1);
north = branches(:, 2);
industrial = branches(:, 3);
express = branches(:, 4);

center = center(center < top(1) & center > bottom(1));
north = north(north < top(2) & north > bottom(2));
industrial = industrial(industrial < top(3) & industrial > bottom(3));
express = express(express < top(4) & express > bottom(4));
```

now we can check the historgrams for each branch

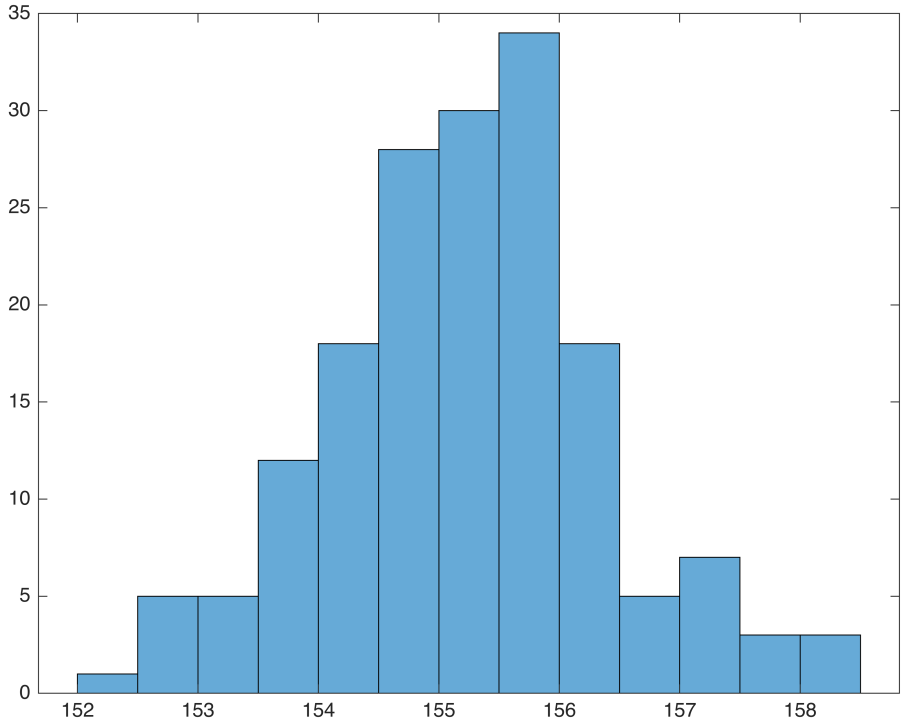
```
histogram(center)
```



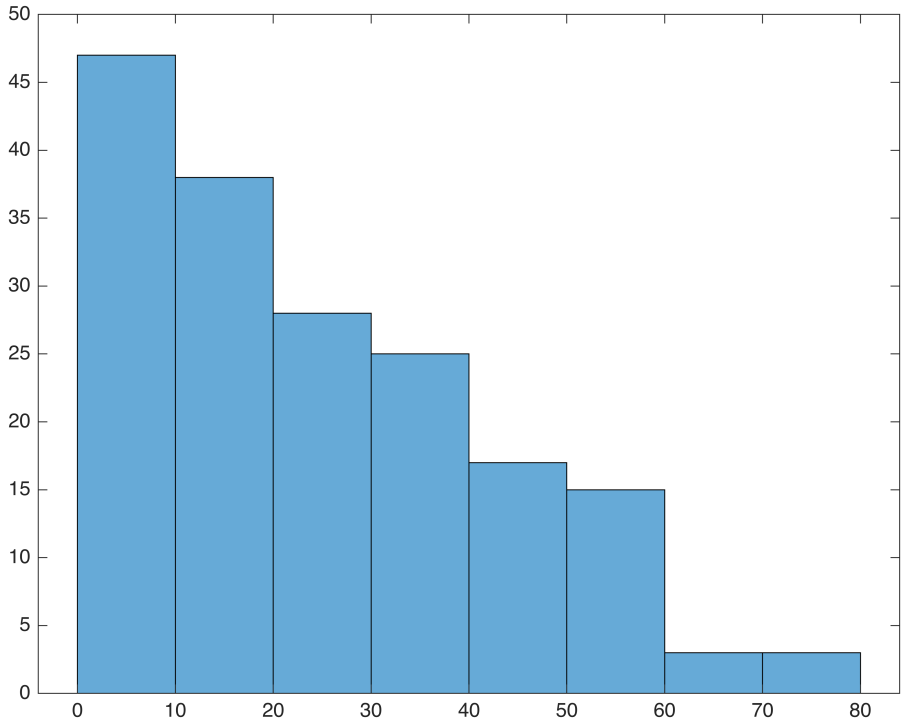

```
histogram(north)
```




```
histogram(industrial)
```



```
histogram(express)
```




```

```