

S3N03 /BJ40 2004-09-13  
1-1

DATA (SORTED)

1, 5, 6, 7, 9, 10, 10<sup>←</sup> MEDIAN, 12, 12, 13, 15, 18, 20

$n=13$  OBSERVATIONS

MEDIAN : MIDDLE VALUE = 10

LOWER HINGE :

MEDIAN OF LOWER VALUES

$$x_{(4)} = 7$$

UPPER HINGE :

MEDIAN OF HIGHER VALUES

$$x_{(10)} = 13$$

NOTATION:

SAMPLE IN ARBITRARY ORDER  
(E.G. ORDER YOU GOT DATA)

$$x_1, \dots, x_{13}$$

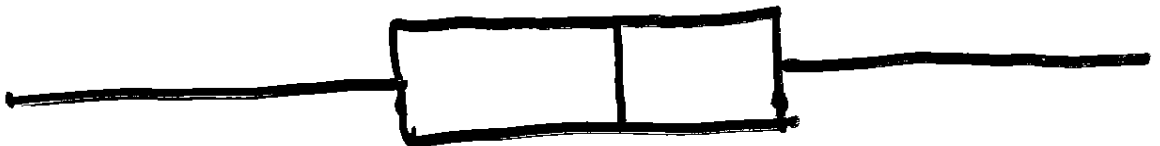
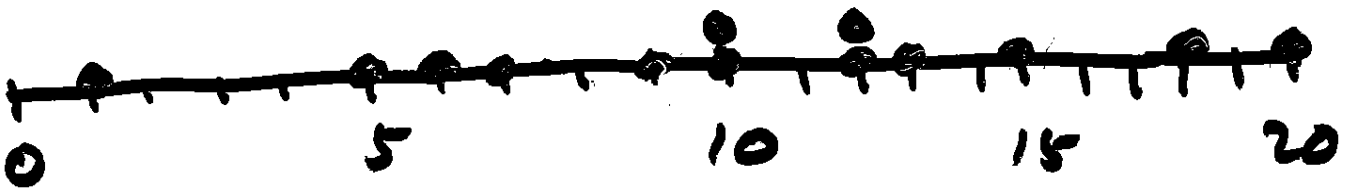
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SORTED DATA:

$$x_{(1)}, \dots, x_{(n)}$$

TERMINOLOGY: JOHN TUKEY

DOT PLOT



MEDIAN:

n ODD

$$x_{\left(\frac{n+1}{2}\right)}$$

n EVEN

$$\frac{1}{2} \left\{ x_{\left(\frac{n}{2}\right)} + x_{\left(\frac{n}{2}+1\right)} \right\}$$

1-3

## BOX PLOT IN R

CREATE AN OBJECT  $x$  TO  
HOLD THE DATA.

$x$  VECTOR OR 1-DIM ARRAY  
"COMBINE"

$x \leftarrow c(1, 5, 6, 7, 9, 10, 10, 12, 12, 13, 15, 15, 20)$

↑  
"GETS"

← -

$x$  NOW SITS IN YOUR  
WORKSPACE

SAVE CURRENT TO DISK:

`save.image()`

WRITES WORKSPACE TO FILE  
CALLED .RData IN WORKING  
DIRECTORY

`boxplot(x)`

OPENS GRAPHICS WINDOW  
AND DRAWS BOX PLOT

1-4

$xbp \leftarrow \text{boxplot}(x)$

$xbp$

\$ stats

1  
7  
10  
13  
20

} DISPLAYED  
OUTPUT

(AND  
OTHER  
STUFF)

IN R, ENTER THE NAME OF  
AN OBJECT TO SEE WHAT IS  
IN IT.

SOME USEFUL FUNCTIONS:

ls()

LISTS CONTENTS OF  
WORKSPACE

q()

QUITS SESSION

^()

# 1-5

## DENSITY OF BRICKS AT DIFFERENT FIRING TEMPERATURES

TEMP:	100	125	150	175
	21.8	21.7	21.9	21.9
	21.9	21.4	21.8	21.7
	21.7	21.5	21.8	21.8
	21.6	21.5	21.6	21.7
	21.7		21.5	21.6
	21.5			21.8
	21.8			

"UNBALANCED DESIGN"

PRESENT DATA "STANDARD FORMAT"

- EACH ROW IS AN OBSERVATION OR SUBJECT
- EACH COL. IS A VARIABLE

OBS	DENSITY	TEMP
1	21.8	100
2	21.9	100
⋮		⋮

1-6

IN R "DATA FRAME"

```
bricks ← data.frame(
```

```
  density = r(21.8, 21.9, ...),
```

```
  temp = r(rep(100, 7), rep(125, 4),  
           rep(150, 5), rep(175, 6)) )
```

```
bricks
```

1-7

```
> bricks
  density temp
1    21.8  100
2    21.9  100
3    21.7  100
4    21.6  100
5    21.7  100
6    21.5  100
7    21.8  100
8    21.7  125
9    21.4  125
10   21.5  125
11   21.5  125
12   21.9  150
13   21.8  150
14   21.8  150
15   21.6  150
16   21.5  150
17   21.9  175
18   21.7  175
19   21.8  175
20   21.7  175
21   21.6  175
22   21.8  175
```

```
> plot(density~temp, data=bricks,
xlab="Firing Temperature", ylab="Density")
```

```
> boxplot(density~temp, data=bricks,
xlab="Firing Temperature", ylab="Density")
```