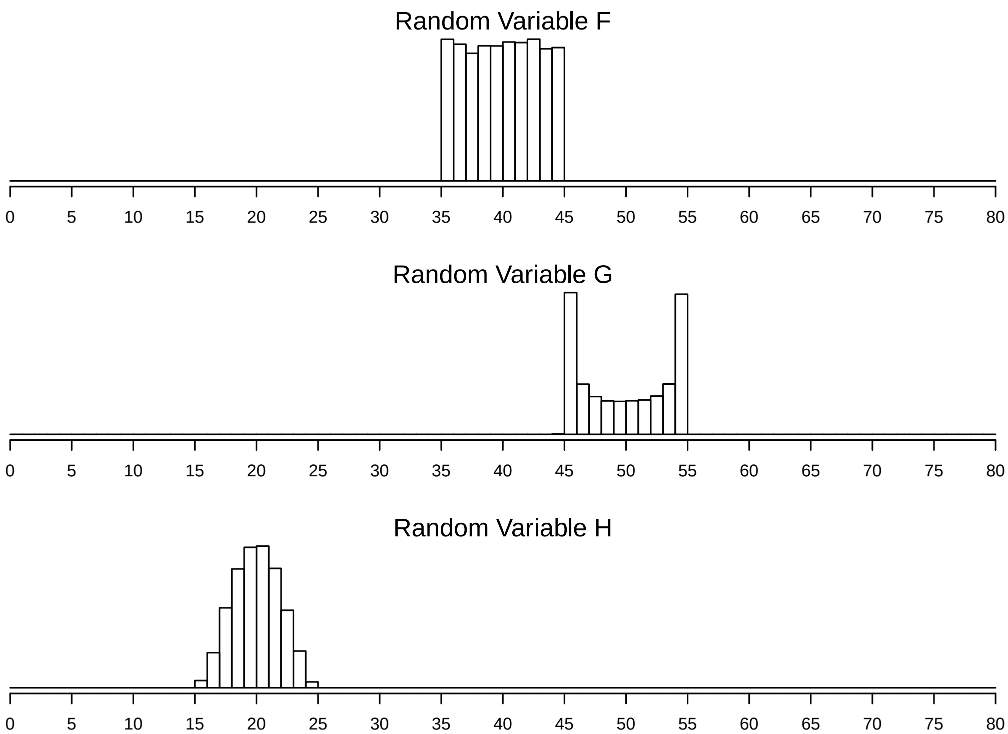
1. **Problem**
   We can estimate the mean of a **symmetric** distribution.

$$\bar{x} \approx \frac{\max(x) + \min(x)}{2}$$

We can **roughly** estimate the standard deviation of certain distributions.

Shape	SD estimate
bell	range/6
uniform	range/4
bimodal	range/2

Three random variables (F, G, and H) were measured 10000 times each. The resulting histograms show the three distributions.



(a) Estimate the mean of F.

(b) Estimate the mean of G.

(c) Estimate the mean of H.

(d) Estimate the standard deviation of F.

(e) Estimate the standard deviation of G.

(f) Estimate the standard deviation of H.

2. **Problem**

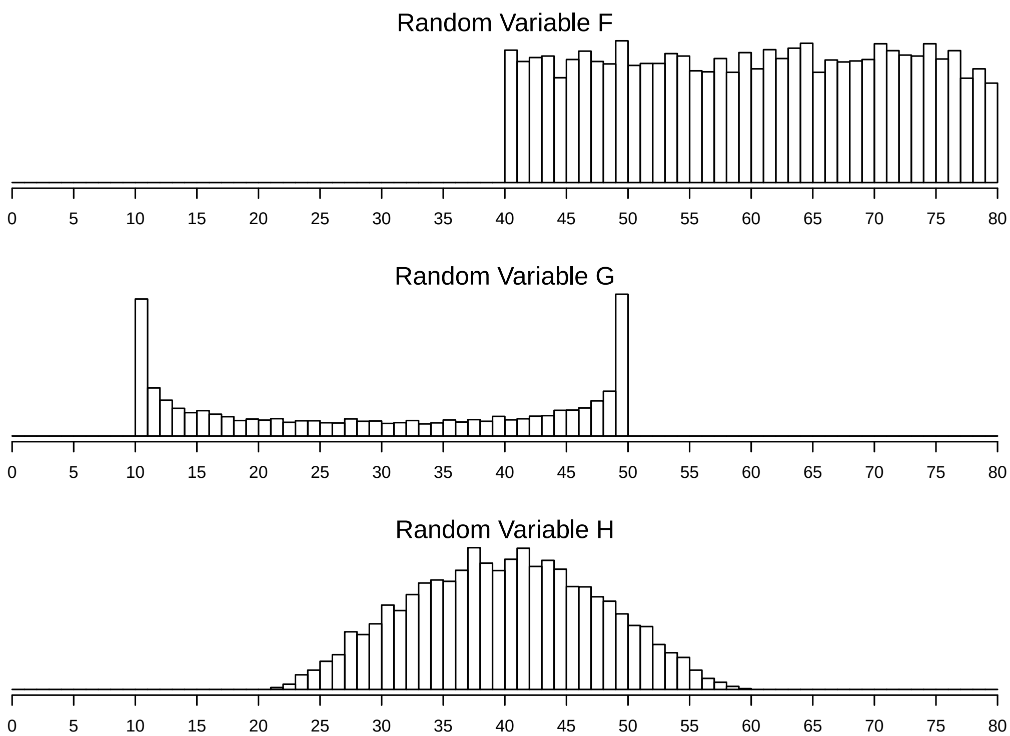
We can estimate the mean of a **symmetric** distribution.

$$\bar{x} \approx \frac{\max(x) + \min(x)}{2}$$

We can **roughly** estimate the standard deviation of certain distributions.

Shape	SD estimate
bell	range/6
uniform	range/4
bimodal	range/2

Three random variables (F, G, and H) were measured 10000 times each. The resulting histograms show the three distributions.



(a) Estimate the mean of F.

(b) Estimate the mean of G.

(c) Estimate the mean of H.

(d) Estimate the standard deviation of F.

(e) Estimate the standard deviation of G.

(f) Estimate the standard deviation of H.

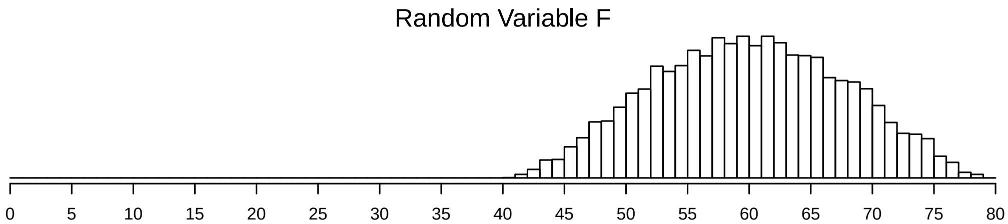
3. **Problem**
We can estimate the mean of a **symmetric** distribution.

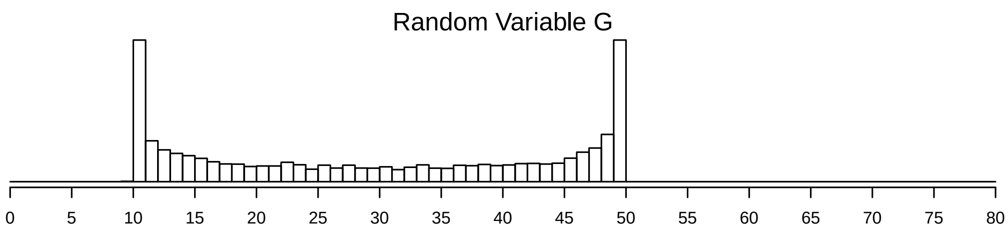
$$\bar{x} \approx \frac{\max(x) + \min(x)}{2}$$

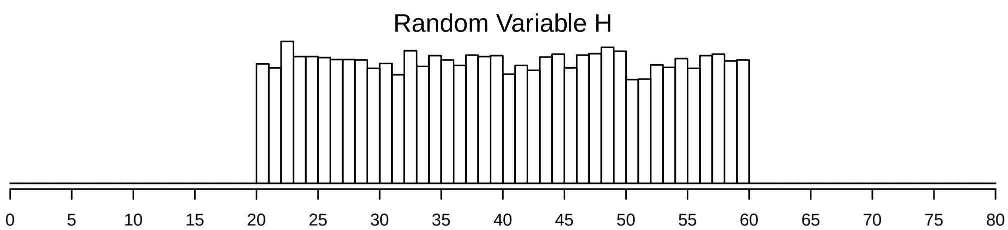
We can **roughly** estimate the standard deviation of certain distributions.

Shape	SD estimate
bell	range/6
uniform	range/4
bimodal	range/2

Three random variables (F, G, and H) were measured 10000 times each. The resulting histograms show the three distributions.

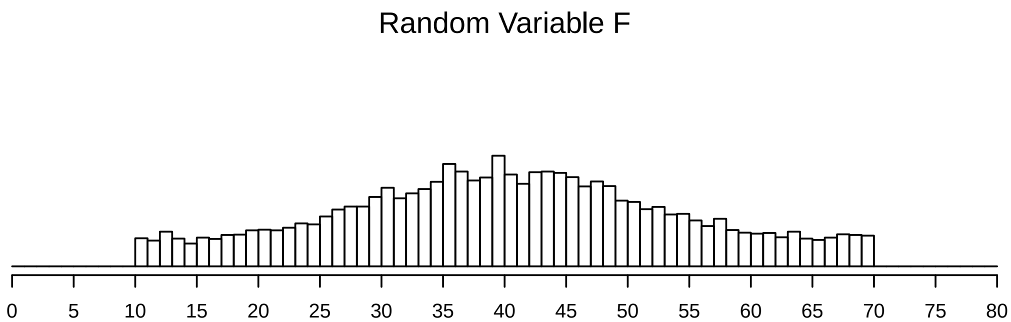


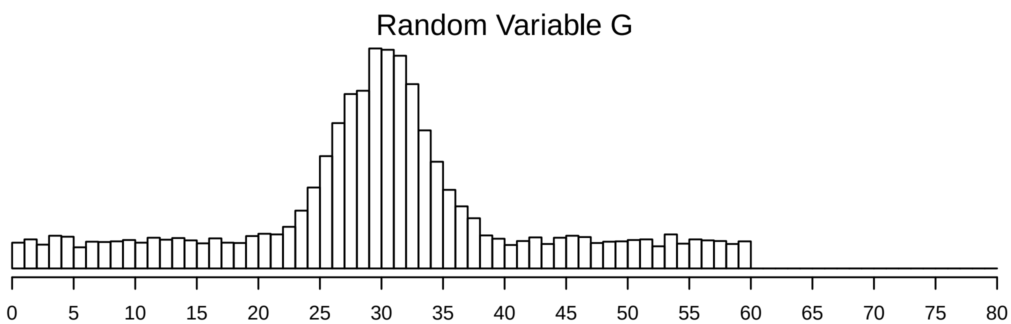


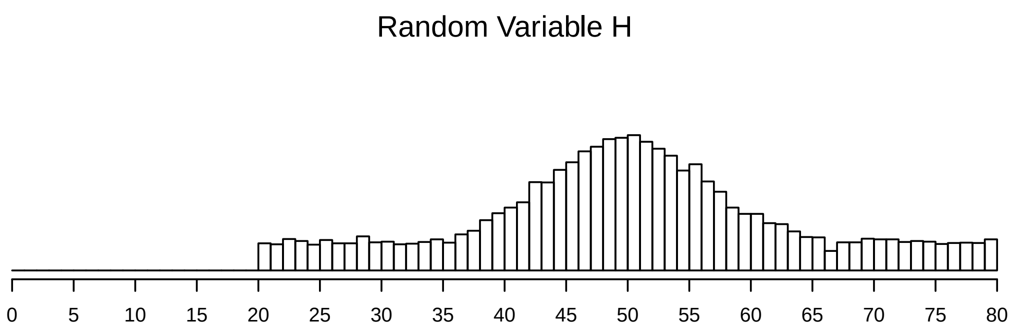


(a) Estimate the mean of F.
(b) Estimate the mean of G.
(c) Estimate the mean of H.
(d) Estimate the standard deviation of F.
(e) Estimate the standard deviation of G.
(f) Estimate the standard deviation of H.

4. **Problem**
   Three random variables (F, G, and H) were measured 1000 times each. The resulting histograms show the three distributions.







(a) Which distribution has the highest mean? (F, G, or H)

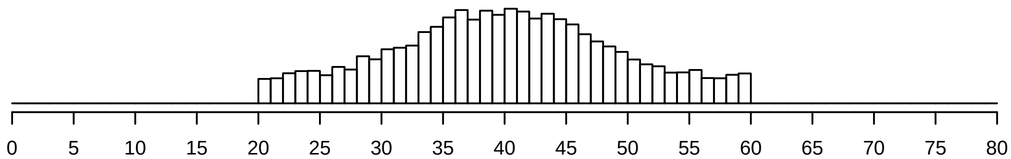
(b) Which distribution has the lowest mean? (F, G, or H)

(c) Which distribution has the largest standard deviation? (F, G, or H)

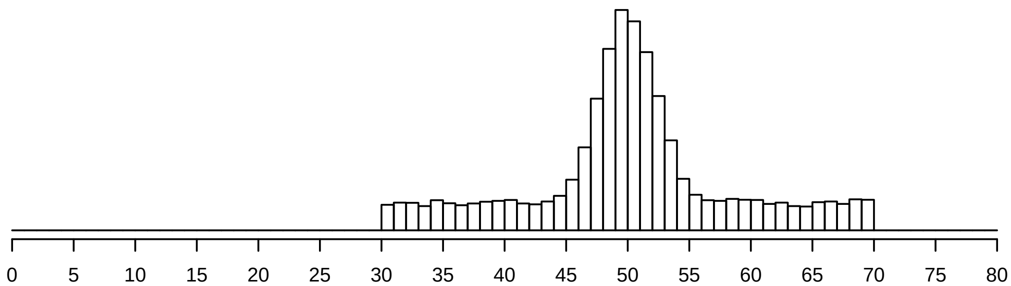
(d) Which distribution has the smallest standard deviation? (F, G, or H)

5. **Problem**
Three random variables (F, G, and H) were measured 1000 times each. The resulting histograms show the three distributions.

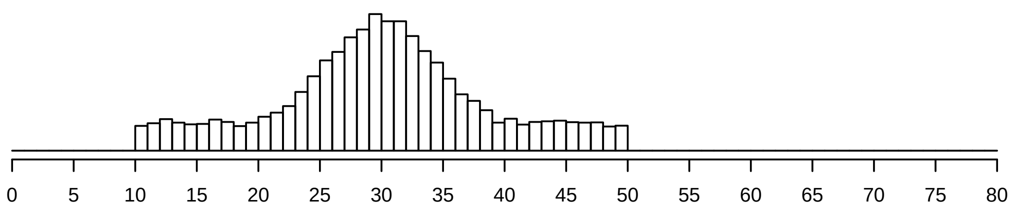
Random Variable F



Random Variable G



Random Variable H



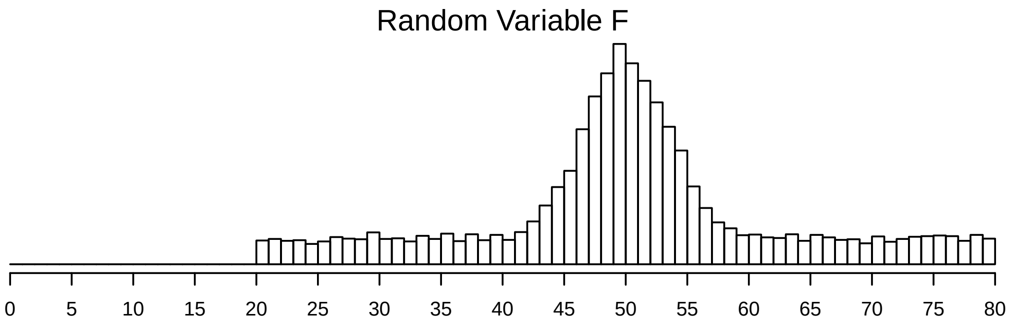
(a) Which distribution has the highest mean? (F, G, or H)

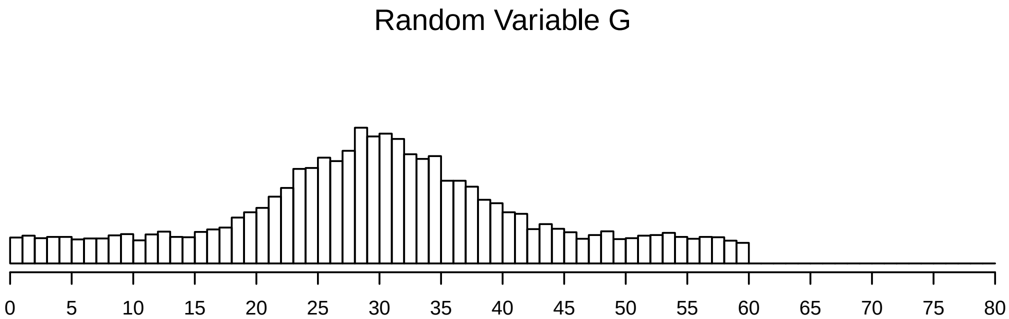
(b) Which distribution has the lowest mean? (F, G, or H)

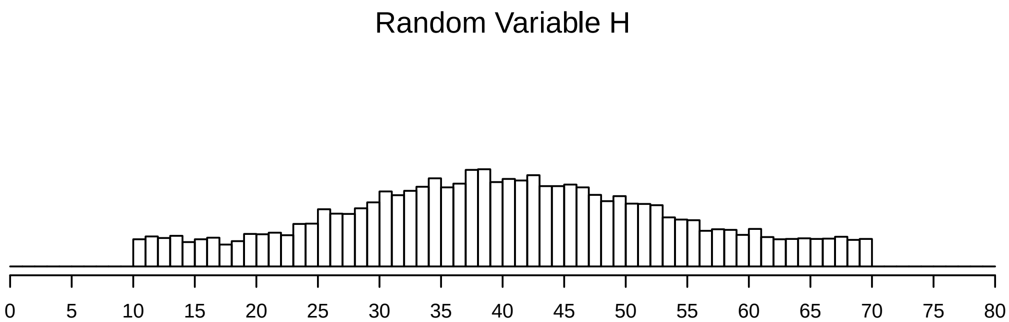
(c) Which distribution has the largest standard deviation? (F, G, or H)

(d) Which distribution has the smallest standard deviation? (F, G, or H)

6. **Problem**
Three random variables (F, G, and H) were measured 1000 times each. The resulting histograms show the three distributions.







(a) Which distribution has the highest mean? (F, G, or H)

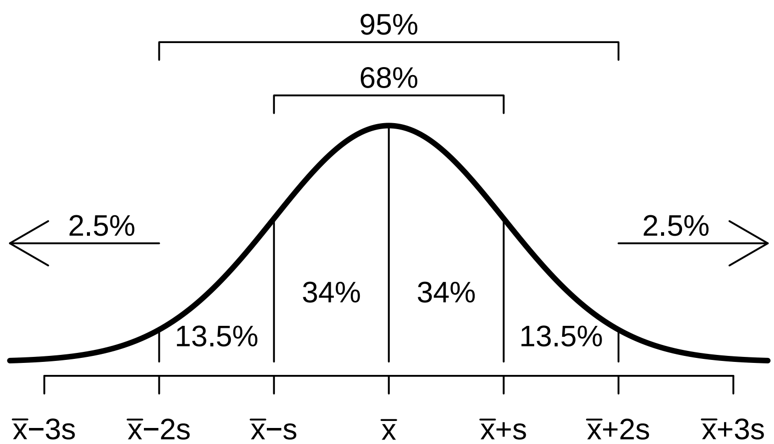
(b) Which distribution has the lowest mean? (F, G, or H)

(c) Which distribution has the largest standard deviation? (F, G, or H)

(d) Which distribution has the smallest standard deviation? (F, G, or H)

7. **Problem**

The figure below summarizes the *standard deviation rule* for normal distributions. In the figure, $\bar{x}$ is the mean and s is the standard deviation. The percentages show the fraction of measurements that fall within various intervals.



A specific distribution is approximately normal with mean $\bar{x} = 220$ and standard deviation $s = 60$.

(a) What percent of the measurements are greater than 340?

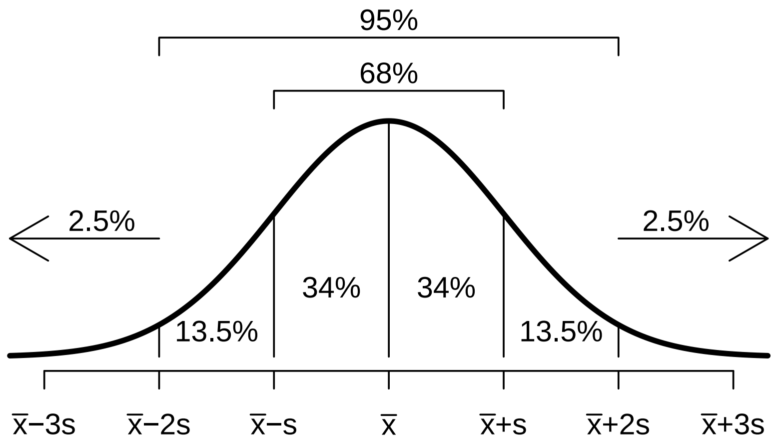
(b) What percent of the measurements are less than 100?

(c) What measurement is greater than 50% of the measurements?

(d) What measurement is less than 16% of the measurements?

(e) What percent of the measurements are between 100 and 340?

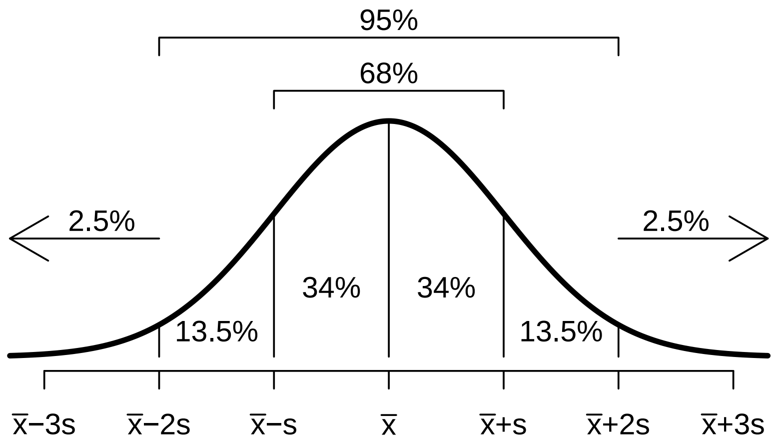
8. **Problem**
The figure below summarizes the *standard deviation rule* for normal distributions. In the figure, $\bar{x}$ is the mean and s is the standard deviation. The percentages show the fraction of measurements that fall within various intervals.



A specific distribution is approximately normal with mean $\bar{x} = 0.67$ and standard deviation $s = 0.06$.

(a) What percent of the measurements are greater than 0.79?
(b) What percent of the measurements are less than 0.55?
(c) What measurement is greater than 50% of the measurements?
(d) What measurement is less than 84% of the measurements?
(e) What percent of the measurements are between 0.55 and 0.79?

9. **Problem**
The figure below summarizes the *standard deviation rule* for normal distributions. In the figure, $\bar{x}$ is the mean and s is the standard deviation. The percentages show the fraction of measurements that fall within various intervals.



A specific distribution is approximately normal with mean $\bar{x} = 11$ and standard deviation $s = 3$.

(a) What percent of the measurements are greater than 5?
(b) What percent of the measurements are less than 17?
(c) What measurement is greater than 50% of the measurements?
(d) What measurement is less than 16% of the measurements?
(e) What percent of the measurements are between 5 and 17?

10. **Problem**
Two random variables (A and B) are both approximately normal (bell-shaped). Their means and standard deviations are shown in the table.

variable	mean	standard deviation
A	498	160
B	93.9	24

Let the *interval of typical measurements* be defined as within 1 SD from the mean.

$$\text{interval of typical measurements} = (\text{mean} - \text{SD}, \text{mean} + \text{SD})$$

For each variable, provide an interval of typical measurements. Notice that an interval requires two numbers: the bottom and the top.

(a) Determine the interval of typical measurements for A.

(b) Determine the interval of typical measurements for B.

11. **Problem**
Two random variables (A and B) are both approximately normal (bell-shaped). Their means and standard deviations are shown in the table.

variable	mean	standard deviation
A	99.3	12
B	311	75

Let the *interval of typical measurements* be defined as within 1 SD from the mean.

$$\text{interval of typical measurements} = (\text{mean} - \text{SD}, \text{mean} + \text{SD})$$

For each variable, provide an interval of typical measurements. Notice that an interval requires two numbers: the bottom and the top.

(a) Determine the interval of typical measurements for A.

(b) Determine the interval of typical measurements for B.

12. **Problem**
Two random variables (A and B) are both approximately normal (bell-shaped). Their means and standard deviations are shown in the table.

variable	mean	standard deviation
A	59.1	11
B	125	37

Let the *interval of typical measurements* be defined as within 1 SD from the mean.

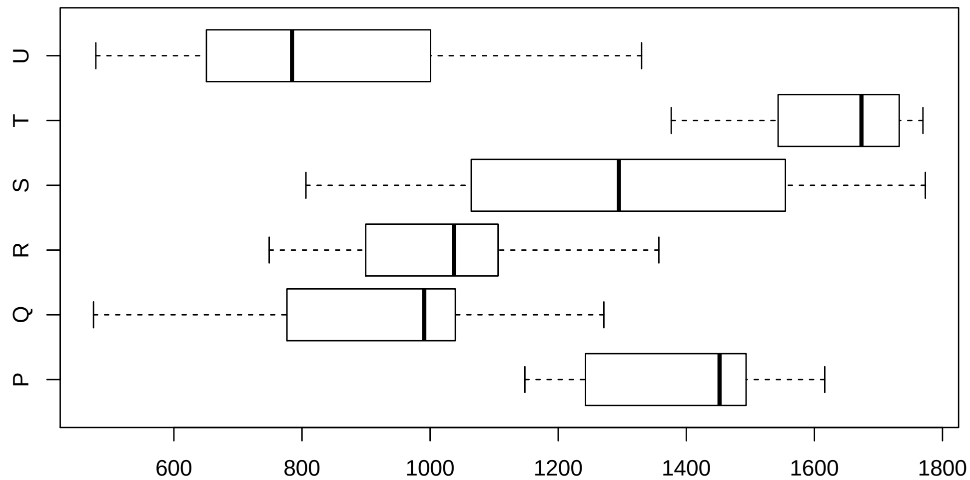
$$\text{interval of typical measurements} = (\text{mean} - \text{SD}, \text{mean} + \text{SD})$$

For each variable, provide an interval of typical measurements. Notice that an interval requires two numbers: the bottom and the top.

(a) Determine the interval of typical measurements for A.

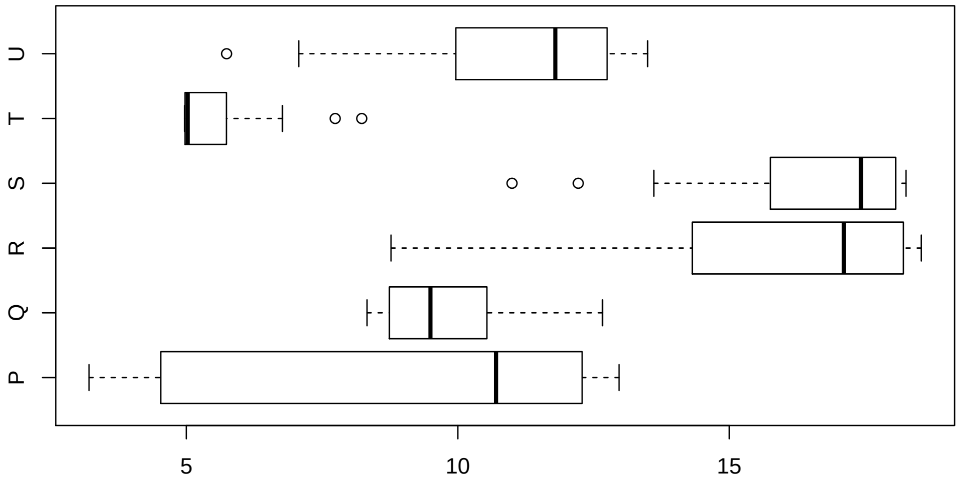
(b) Determine the interval of typical measurements for B.

13. **Problem**
Six random variables were each measured 25 times. The resulting boxplots are shown.



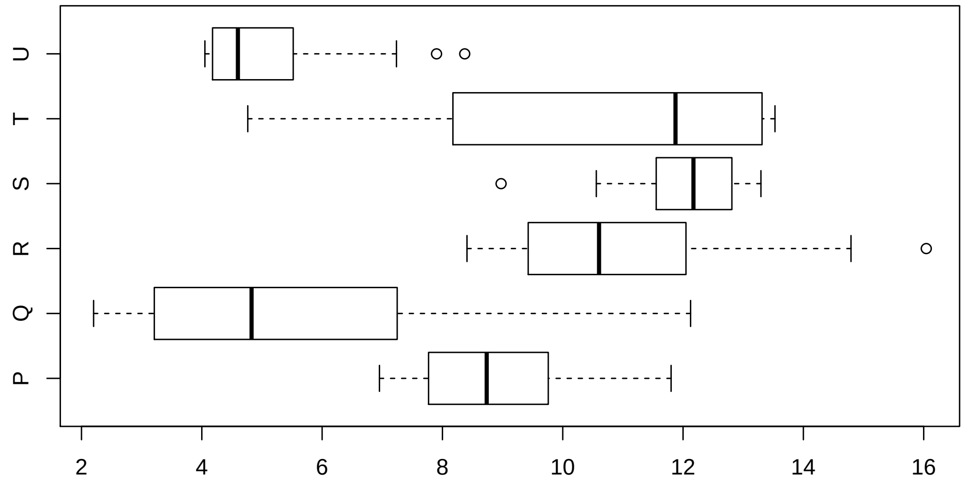
(a) Which variable produced the largest measurment?
(b) Which variable produced the smallest measurment?
(c) Which distribution has the largest median?
(d) Which distribution has the smallest median?
(e) Which distribution has the largest 25th percentile?
(f) Which distribution has the smallest 25th percentile?
(g) Which distribution has the largest 75th percentile?
(h) Which distribution has the smallest 75th percentile?
(i) Which distribution has the largest IQR?
(j) Which distribution has the smallest IQR?

14. **Problem**
Six random variables were each measured 25 times. The resulting boxplots are shown.



(a) Which variable produced the largest measurment?
(b) Which variable produced the smallest measurment?
(c) Which distribution has the largest median?
(d) Which distribution has the smallest median?
(e) Which distribution has the largest 25th percentile?
(f) Which distribution has the smallest 25th percentile?
(g) Which distribution has the largest 75th percentile?
(h) Which distribution has the smallest 75th percentile?
(i) Which distribution has the largest IQR?
(j) Which distribution has the smallest IQR?

15. **Problem**
Six random variables were each measured 25 times. The resulting boxplots are shown.

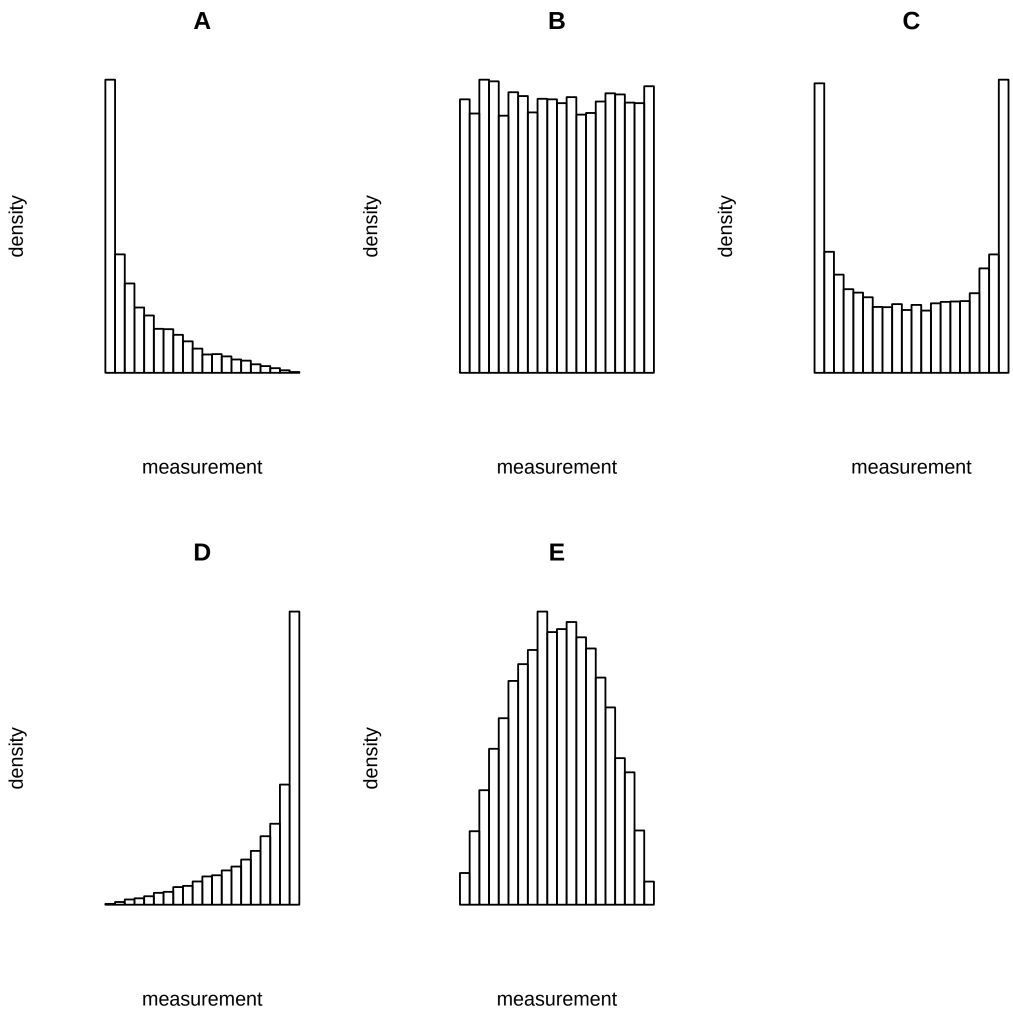


(a) Which variable produced the largest measurment?
(b) Which variable produced the smallest measurment?
(c) Which distribution has the largest median?
(d) Which distribution has the smallest median?
(e) Which distribution has the largest 25th percentile?
(f) Which distribution has the smallest 25th percentile?
(g) Which distribution has the largest 75th percentile?
(h) Which distribution has the smallest 75th percentile?
(i) Which distribution has the largest IQR?
(j) Which distribution has the smallest IQR?

16. **Problem**

For **each** of the histograms:

- Determine if the mean is higher than, lower than, or equal to the median.
- Would you caution against using the mean?

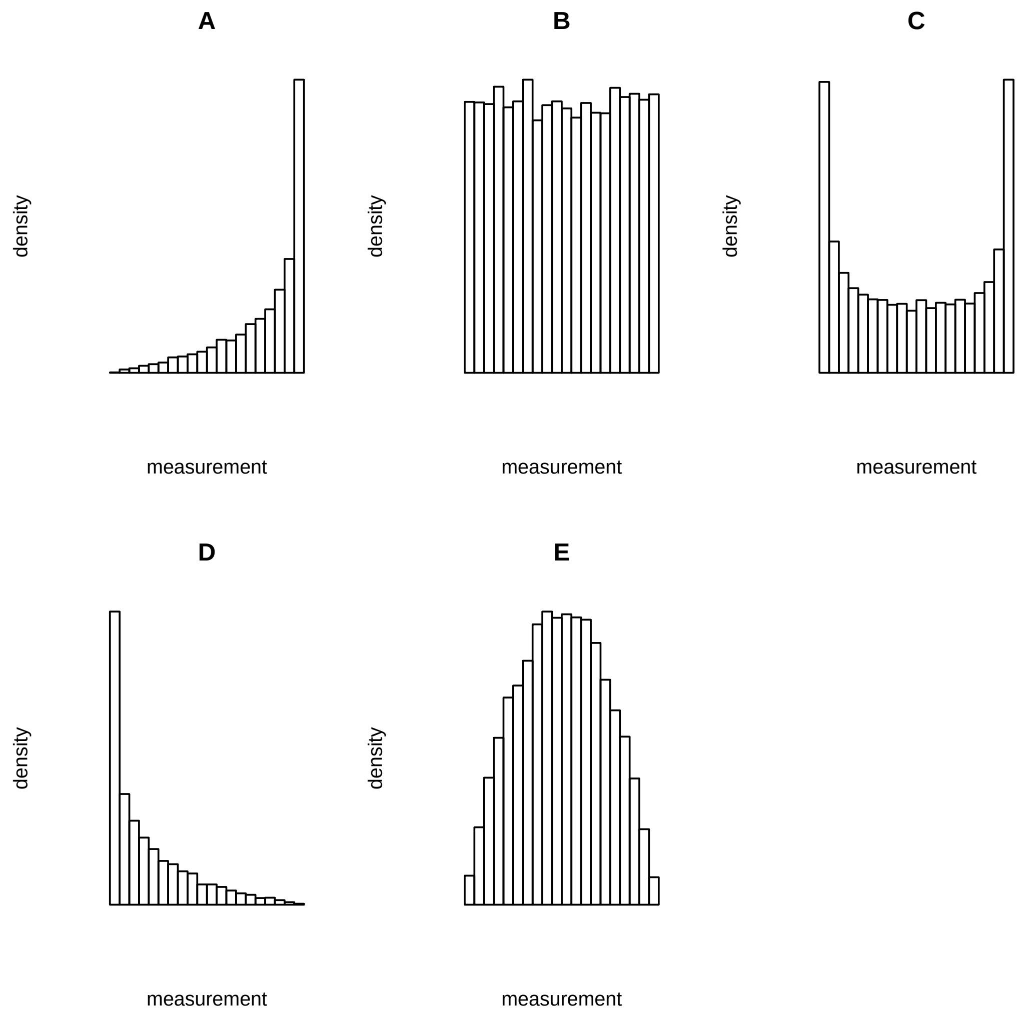


plot of chunk hists

(a) Answer both questions about distribution A.
(b) Answer both questions about distribution B.
(c) Answer both questions about distribution C.
(d) Answer both questions about distribution D.
(e) Answer both questions about distribution E.

17. **Problem**
For **each** of the histograms:

- Determine if the mean is higher than, lower than, or equal to the median.
- Would you caution against using the mean?

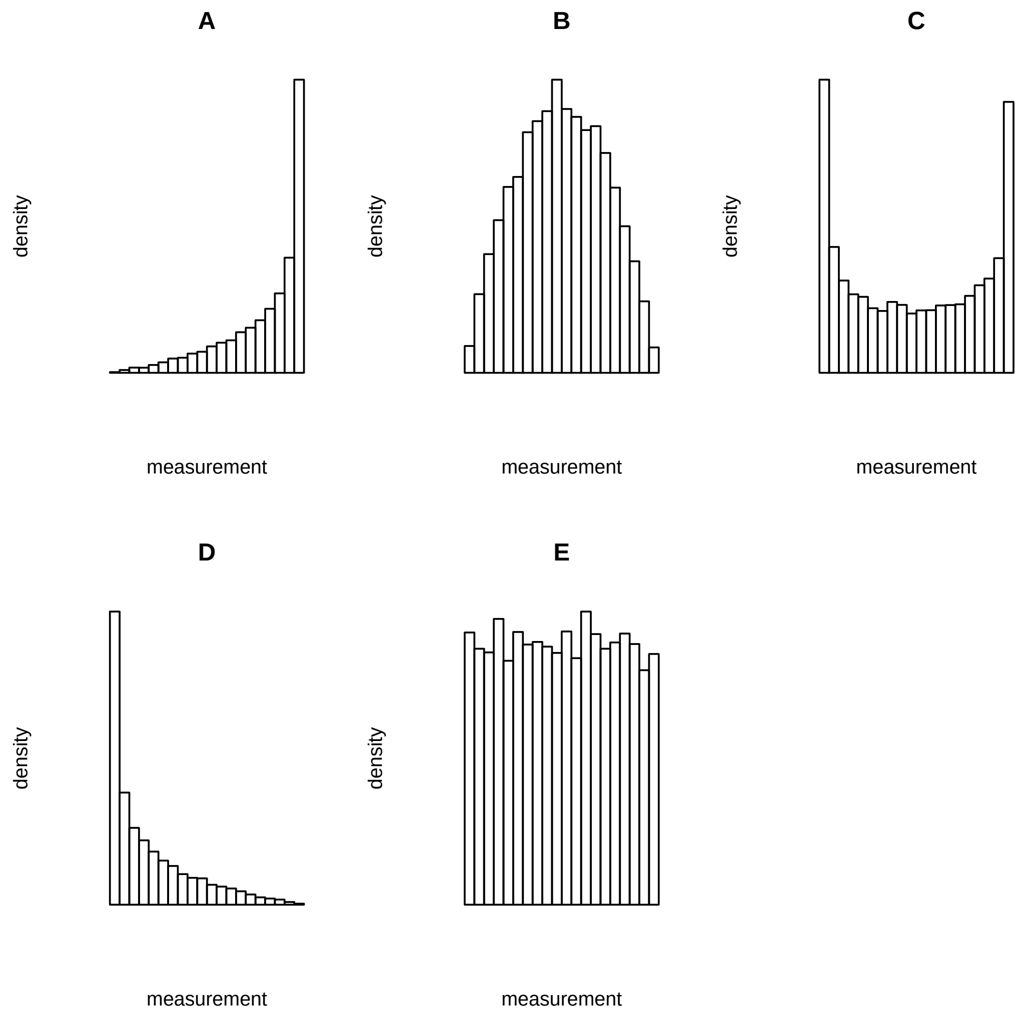


plot of chunk hists

(a) Answer both questions about distribution A.
(b) Answer both questions about distribution B.
(c) Answer both questions about distribution C.
(d) Answer both questions about distribution D.
(e) Answer both questions about distribution E.

18. **Problem**
For **each** of the histograms:

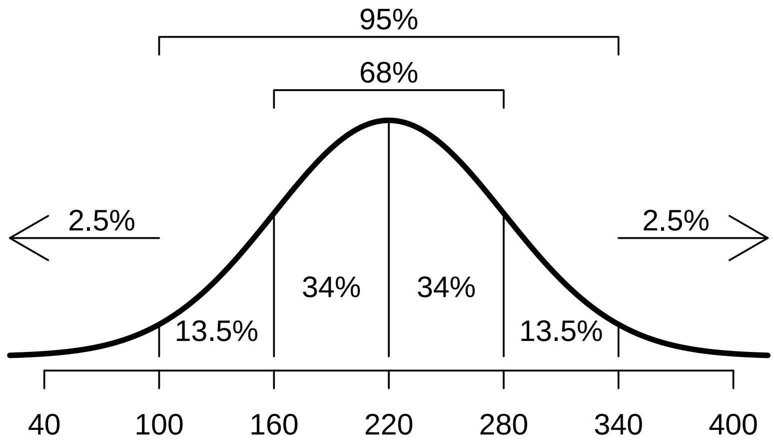
- Determine if the mean is higher than, lower than, or equal to the median.
- Would you caution against using the mean?



plot of chunk hists

(a) Answer both questions about distribution A.
(b) Answer both questions about distribution B.
(c) Answer both questions about distribution C.
(d) Answer both questions about distribution D.
(e) Answer both questions about distribution E.

1. (a) 40
   (b) 50
   (c) 20
   (d) 2.5
   (e) 5
   (f) 1.6666667
2. (a) 60
   (b) 30
   (c) 40
   (d) 10
   (e) 20
   (f) 6.6666667
3. (a) 60
   (b) 30
   (c) 40
   (d) 6.6666667
   (e) 20
   (f) 10
4. (a) H
   (b) G
   (c) F
   (d) G
5. (a) G
   (b) H
   (c) F
   (d) G
6. (a) F
   (b) G
   (c) H
   (d) F
7. It is probably best to start by redrawing (relabeling) the normal distribution with the specific values.



(a) Because we are asked for the percent of measurements *greater* than 340, we add the areas to the right of 340.

$\boxed{2.5\%}$

(b) Because we are asked for the percent of measurements *less* than 100, we add the areas to the left of 100.

$\boxed{2.5\%}$

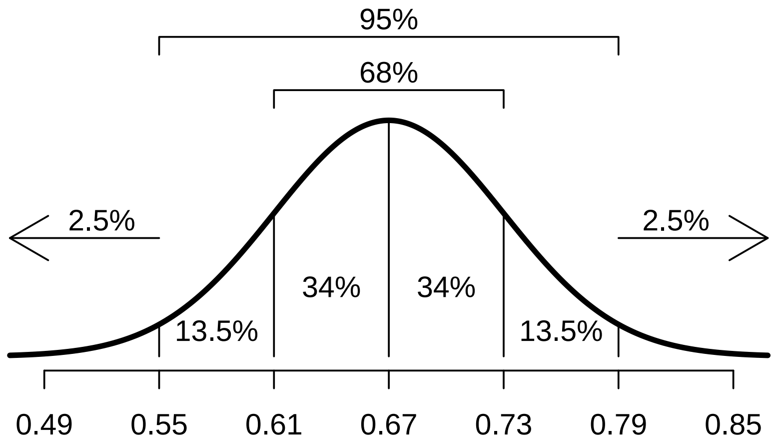
(c) We determine which leftward area has a total of 50%. This occurs at $\boxed{220}$.

(d) We determine which rightward area has a total of 16%. This occurs at $\boxed{280}$.

(e) We add the areas from 100 to 340.

$\boxed{95\%}$

8. It is probably best to start by redrawing (relabeling) the normal distribution with the specific values.



(a) Because we are asked for the percent of measurements *greater* than 0.79, we add the areas to the right of 0.79.

$\boxed{2.5\%}$

(b) Because we are asked for the percent of measurements *less* than 0.55, we add the areas to the left of 0.55.

$\boxed{2.5\%}$

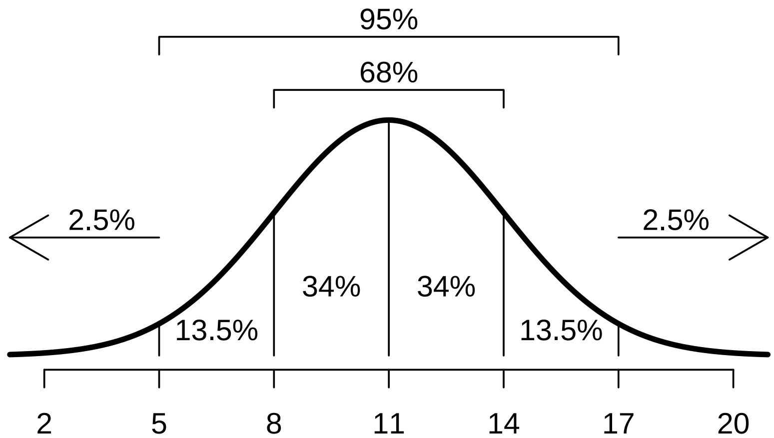
(c) We determine which leftward area has a total of 50%. This occurs at $\boxed{0.67}$.

(d) We determine which rightward area has a total of 84%. This occurs at $\boxed{0.61}$.

(e) We add the areas from 0.55 to 0.79.

$\boxed{95\%}$

9. It is probably best to start by redrawing (relabeling) the normal distribution with the specific values.



(a) Because we are asked for the percent of measurements *greater* than 5, we add the areas to the right of 5.

$$\boxed{97.5\%}$$

(b) Because we are asked for the percent of measurements *less* than 17, we add the areas to the left of 17.

$$\boxed{97.5\%}$$

(c) We determine which leftward area has a total of 50%. This occurs at $\boxed{11}$.

(d) We determine which rightward area has a total of 16%. This occurs at $\boxed{14}$.

(e) We add the areas from 5 to 17.

$$\boxed{95\%}$$

10. (a)

$$\begin{aligned}\text{interval of typical measurements for } A &= (\text{mean} - \text{SD}, \text{mean} + \text{SD})\\ &= (498 - 160, 498 + 160)\\ &= \boxed{(338, 658)}\end{aligned}$$

(b)

$$\begin{aligned}\text{interval of typical measurements for } B &= (\text{mean} - \text{SD}, \text{mean} + \text{SD})\\ &= (93.9 - 24, 93.9 + 24)\\ &= \boxed{(69.9, 117.9)}\end{aligned}$$

11. (a)

$$\begin{aligned}\text{interval of typical measurements for } A &= (\text{mean} - \text{SD}, \text{mean} + \text{SD})\\ &= (99.3 - 12, 99.3 + 12)\\ &= \boxed{(87.3, 111.3)}\end{aligned}$$

(b)

$$\begin{aligned}\text{interval of typical measurements for } B &= (\text{mean} - \text{SD}, \text{mean} + \text{SD})\\ &= (311 - 75, 311 + 75)\\ &= \boxed{(236, 386)}\end{aligned}$$

12. (a)

$$\begin{aligned}\text{interval of typical measurements for } A &= (\text{mean} - \text{SD}, \text{mean} + \text{SD})\\ &= (59.1 - 11, 59.1 + 11)\\ &= \boxed{(48.1, 70.1)}\end{aligned}$$

(b)

$$\begin{aligned}\text{interval of typical measurements for } B &= (\text{mean} - \text{SD}, \text{mean} + \text{SD})\\ &= (125 - 37, 125 + 37)\\ &= \boxed{(88, 162)}\end{aligned}$$

13. (a) S
 (b) Q
 (c) T
 (d) U
 (e) T
 (f) U
 (g) T
 (h) U
 (i) S
 (j) T

14. (a) R
 (b) P
 (c) S
 (d) T
 (e) S
 (f) P
 (g) R
 (h) T
 (i) P
 (j) T

15. (a) R
 (b) Q
 (c) S

(d) U
(e) S
(f) Q
(g) T
(h) U
(i) T
(j) S

16. (a) The mean is higher than the median. Also, I would caution against using the mean.
    (b) The mean is equal to the median. Also, I would not caution against using the mean.
    (c) The mean is equal to the median. Also, I would not caution against using the mean.
    (d) The mean is lower than the median. Also, I would caution against using the mean.
    (e) The mean is equal to the median. Also, I would not caution against using the mean.

17. (a) The mean is lower than the median. Also, I would caution against using the mean.
    (b) The mean is equal to the median. Also, I would not caution against using the mean.
    (c) The mean is equal to the median. Also, I would not caution against using the mean.
    (d) The mean is higher than the median. Also, I would caution against using the mean.
    (e) The mean is equal to the median. Also, I would not caution against using the mean.

18. (a) The mean is lower than the median. Also, I would caution against using the mean.
    (b) The mean is equal to the median. Also, I would not caution against using the mean.
    (c) The mean is equal to the median. Also, I would not caution against using the mean.
    (d) The mean is higher than the median. Also, I would caution against using the mean.
    (e) The mean is equal to the median. Also, I would not caution against using the mean.