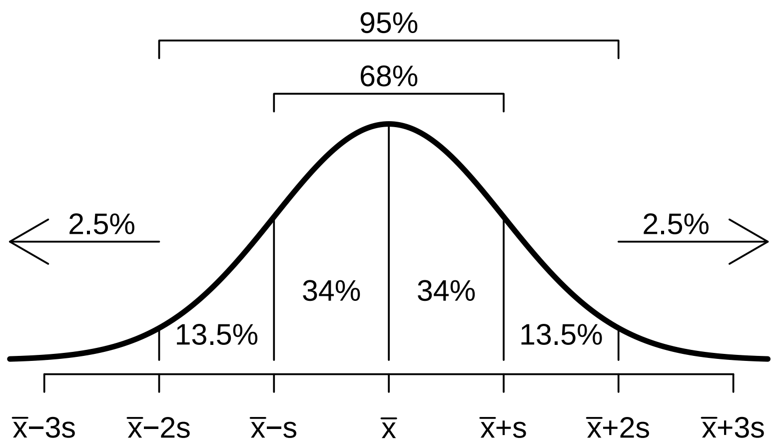
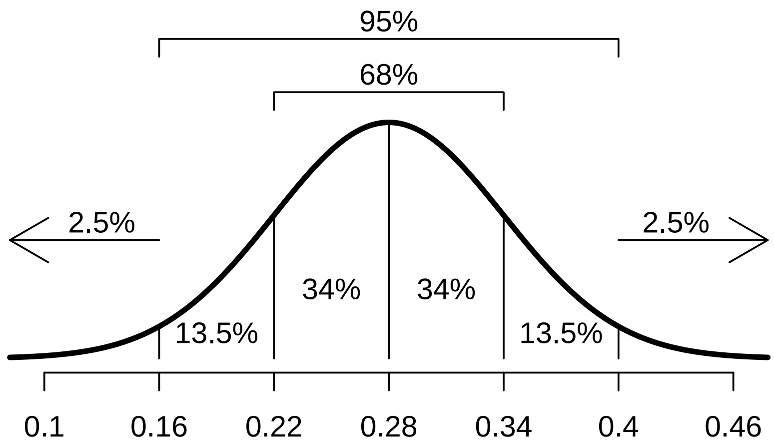
1. **Problem:**
The figure below summarizes the *standard deviation rule* for normal distributions. In the figure, $\bar{x}$ is the mean and s is the standard deviation. The percentages show the fraction of measurements that fall within various intervals.



A specific distribution is approximately normal with mean $\bar{x} = 0.28$ and standard deviation $s = 0.06$.

(a) What percent of the measurements are greater than 0.34?
(b) What percent of the measurements are less than 0.28?
(c) What measurement is greater than 97.5% of the measurements?
(d) What measurement is less than 84% of the measurements?
(e) What percent of the measurements are between 0.22 and 0.34?

Solution: 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 0.34, we add the areas to the right of 0.34.

$$\boxed{16\%}$$

(b) Because we are asked for the percent of measurements *less* than 0.28, we add the areas to the left of 0.28.

$$\boxed{50\%}$$

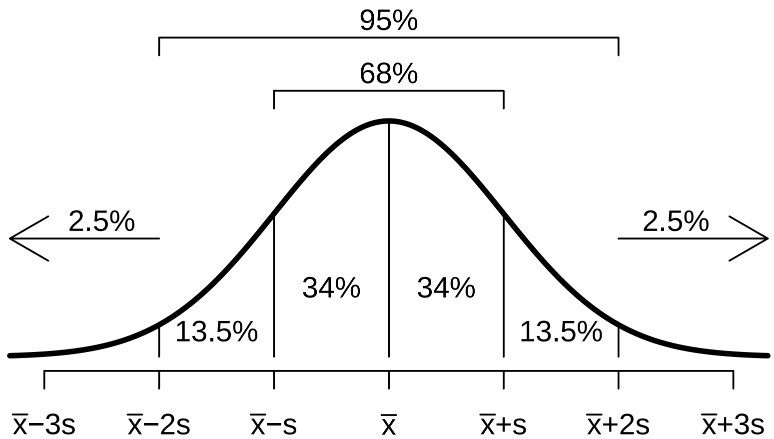
(c) We determine which leftward area has a total of 97.5%. This occurs at $\boxed{0.4}$.

(d) We determine which rightward area has a total of 84%. This occurs at $\boxed{0.22}$.

(e) We add the areas from 0.22 to 0.34.

$$\boxed{68\%}$$

2. **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 11?

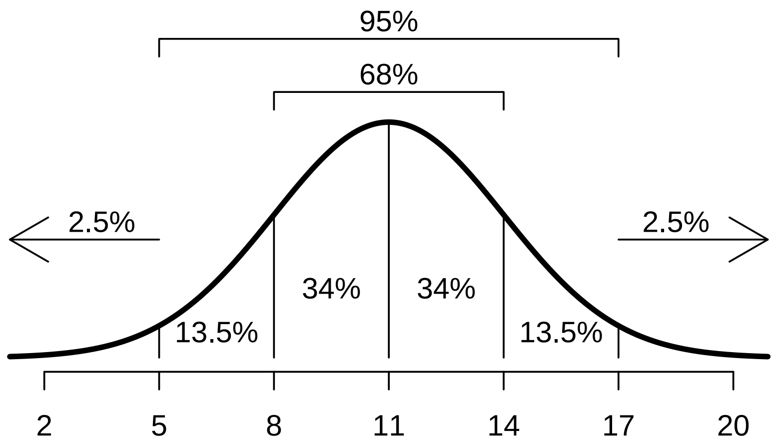
(b) What percent of the measurements are less than 8?

(c) What measurement is greater than 97.5% of the measurements?

(d) What measurement is less than 97.5% of the measurements?

(e) What percent of the measurements are between 5 and 17?

Solution: 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 11, we add the areas to the right of 11.

$\boxed{50\%}$

(b) Because we are asked for the percent of measurements *less* than 8, we add the areas to the left of 8.

$\boxed{16\%}$

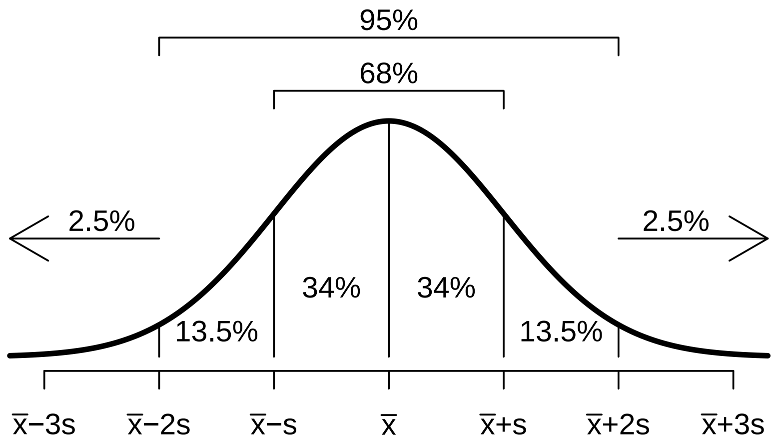
(c) We determine which leftward area has a total of 97.5%. This occurs at $\boxed{17}$.

(d) We determine which rightward area has a total of 97.5%. This occurs at $\boxed{5}$.

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

$\boxed{95\%}$

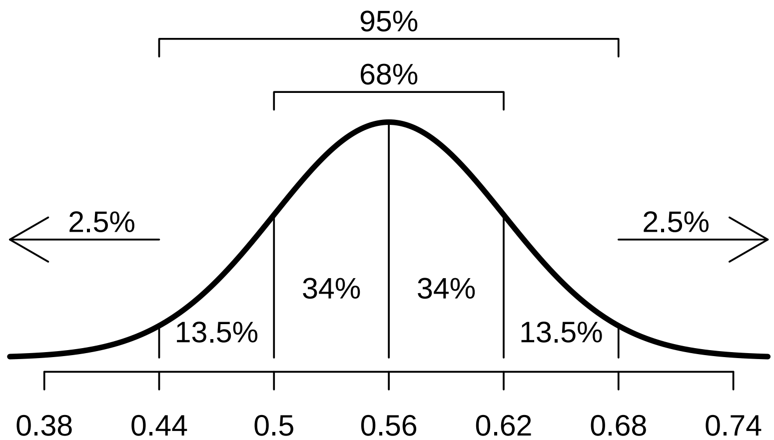
3. **Problem:**
The figure below summarizes the *standard deviation rule* for normal distributions. In the figure, $\bar{x}$ is the mean and s is the standard deviation. The percentages show the fraction of measurements that fall within various intervals.



A specific distribution is approximately normal with mean $\bar{x} = 0.56$ and standard deviation $s = 0.06$.

(a) What percent of the measurements are greater than 0.5?
(b) What percent of the measurements are less than 0.68?
(c) What measurement is greater than 2.5% of the measurements?
(d) What measurement is less than 50% of the measurements?
(e) What percent of the measurements are between 0.5 and 0.62?

Solution: 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 0.5, we add the areas to the right of 0.5.

$$\boxed{84\%}$$

(b) Because we are asked for the percent of measurements *less* than 0.68, we add the areas to the left of 0.68.

$$\boxed{97.5\%}$$

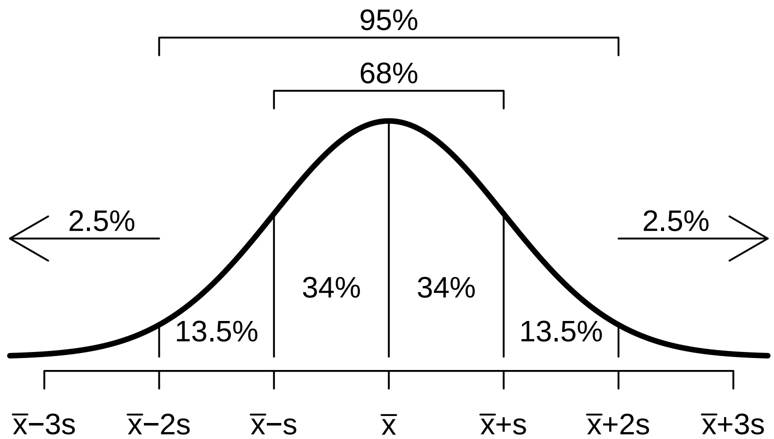
(c) We determine which leftward area has a total of 2.5%. This occurs at $\boxed{0.44}$.

(d) We determine which rightward area has a total of 50%. This occurs at $\boxed{0.56}$.

(e) We add the areas from 0.5 to 0.62.

$$\boxed{68\%}$$

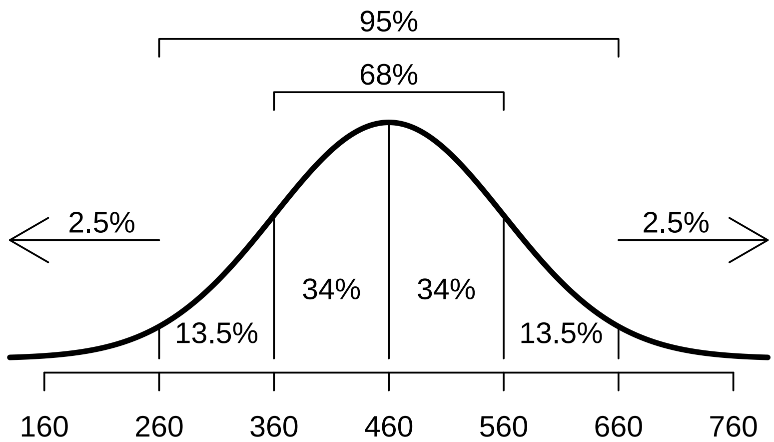
4. **Problem:**
The figure below summarizes the *standard deviation rule* for normal distributions. In the figure, $\bar{x}$ is the mean and s is the standard deviation. The percentages show the fraction of measurements that fall within various intervals.



A specific distribution is approximately normal with mean $\bar{x} = 460$ and standard deviation $s = 100$.

(a) What percent of the measurements are greater than 260?
(b) What percent of the measurements are less than 360?
(c) What measurement is greater than 97.5% of the measurements?
(d) What measurement is less than 50% of the measurements?
(e) What percent of the measurements are between 260 and 660?

Solution: 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 260, we add the areas to the right of 260.

$\boxed{97.5\%}$

(b) Because we are asked for the percent of measurements *less* than 360, we add the areas to the left of 360.

$\boxed{16\%}$

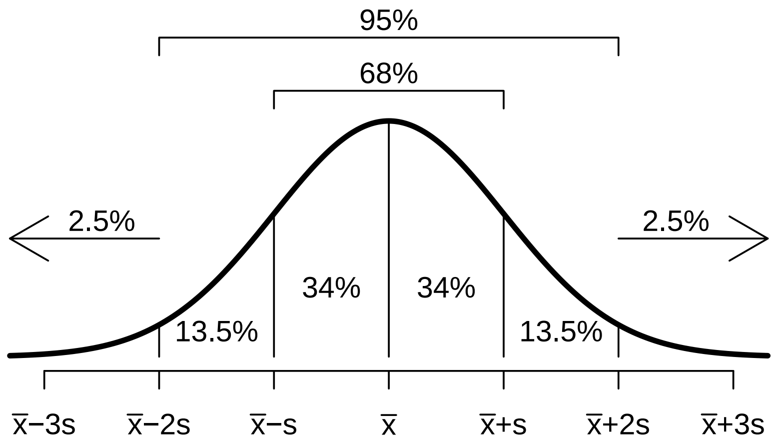
(c) We determine which leftward area has a total of 97.5%. This occurs at $\boxed{660}$.

(d) We determine which rightward area has a total of 50%. This occurs at $\boxed{460}$.

(e) We add the areas from 260 to 660.

$\boxed{95\%}$

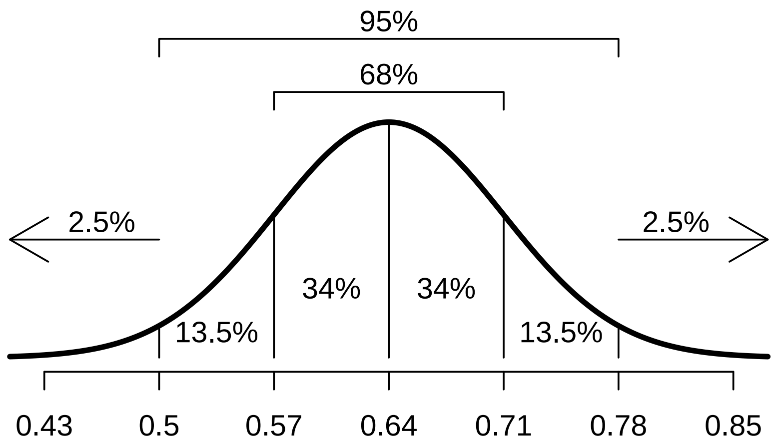
5. **Problem:**
The figure below summarizes the *standard deviation rule* for normal distributions. In the figure, $\bar{x}$ is the mean and s is the standard deviation. The percentages show the fraction of measurements that fall within various intervals.



A specific distribution is approximately normal with mean $\bar{x} = 0.64$ and standard deviation $s = 0.07$.

(a) What percent of the measurements are greater than 0.78?
(b) What percent of the measurements are less than 0.71?
(c) What measurement is greater than 16% of the measurements?
(d) What measurement is less than 50% of the measurements?
(e) What percent of the measurements are between 0.57 and 0.71?

Solution: 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 0.78, we add the areas to the right of 0.78.

$$\boxed{2.5\%}$$

(b) Because we are asked for the percent of measurements *less* than 0.71, we add the areas to the left of 0.71.

$$\boxed{84\%}$$

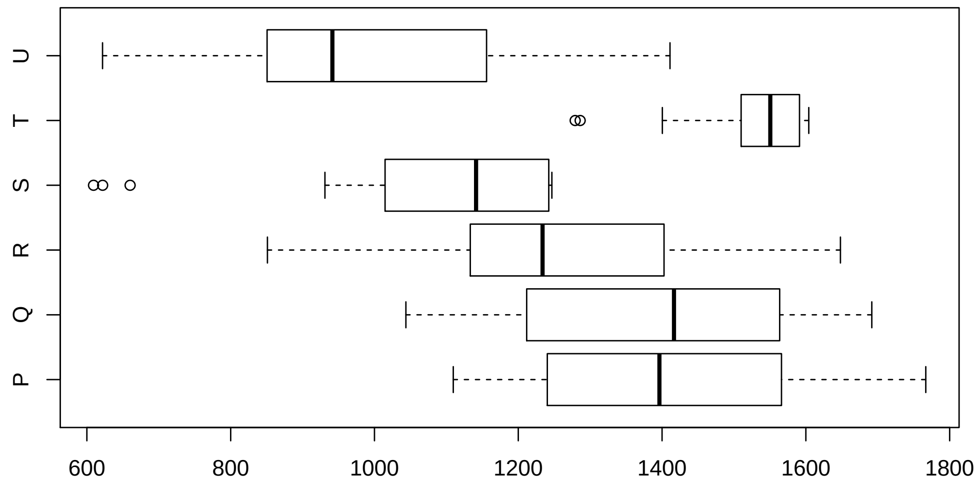
(c) We determine which leftward area has a total of 16%. This occurs at $\boxed{0.57}$.

(d) We determine which rightward area has a total of 50%. This occurs at $\boxed{0.64}$.

(e) We add the areas from 0.57 to 0.71.

$$\boxed{68\%}$$

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

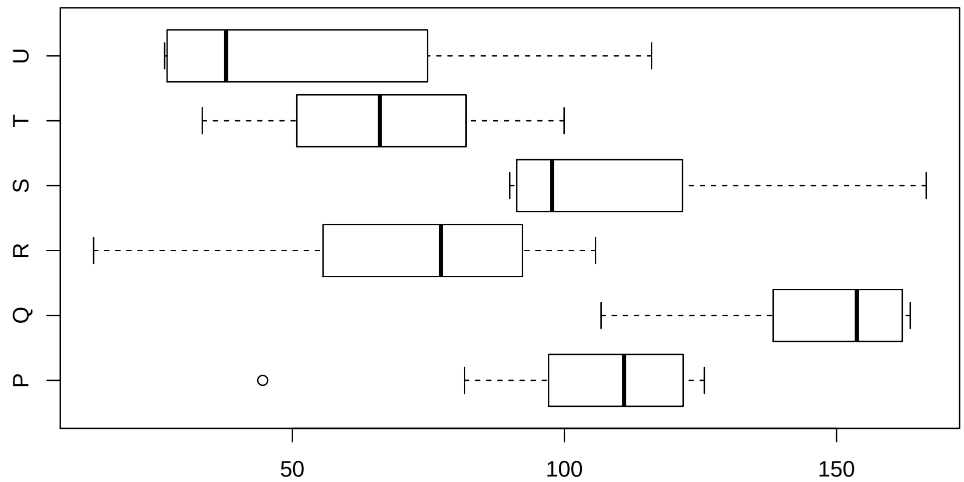


(a) Which variable produced the largest measurment?
(b) Which variable produced the smallest measurment?
(c) Which distribution has the largest median?
(d) Which distribution has the smallest median?
(e) Which distribution has the largest 25th percentile?
(f) Which distribution has the smallest 25th 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?

Solution:

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

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

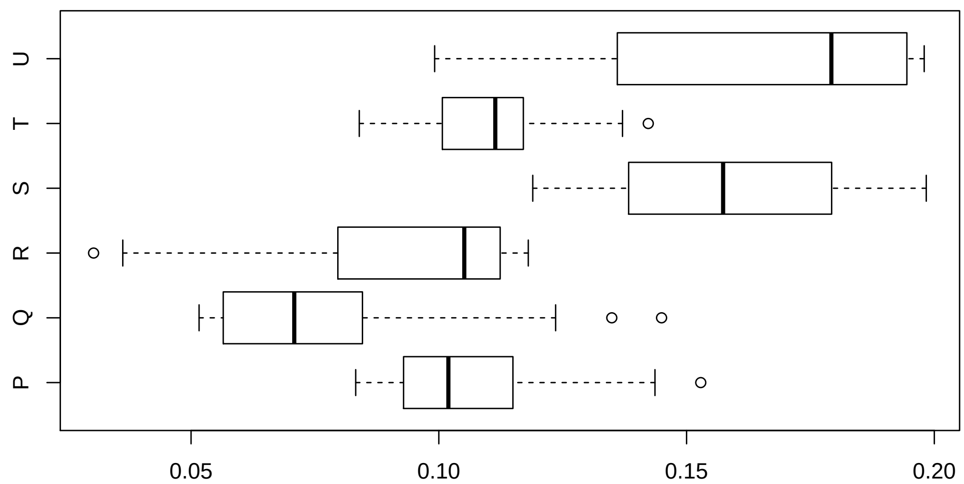


(a) Which variable produced the largest measurment?
(b) Which variable produced the smallest measurment?
(c) Which distribution has the largest median?
(d) Which distribution has the smallest median?
(e) Which distribution has the largest 25th percentile?
(f) Which distribution has the smallest 25th 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?

Solution:

(a) S
(b) R
(c) Q
(d) U
(e) Q
(f) U
(g) Q
(h) U
(i) U
(j) Q

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

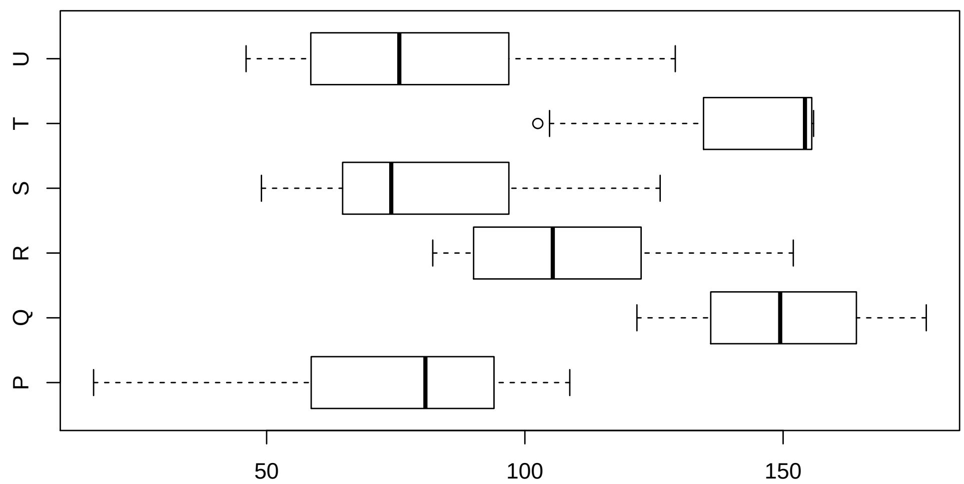


(a) Which variable produced the largest measurment?
(b) Which variable produced the smallest measurment?
(c) Which distribution has the largest median?
(d) Which distribution has the smallest median?
(e) Which distribution has the largest 25th percentile?
(f) Which distribution has the smallest 25th 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?

Solution:

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

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

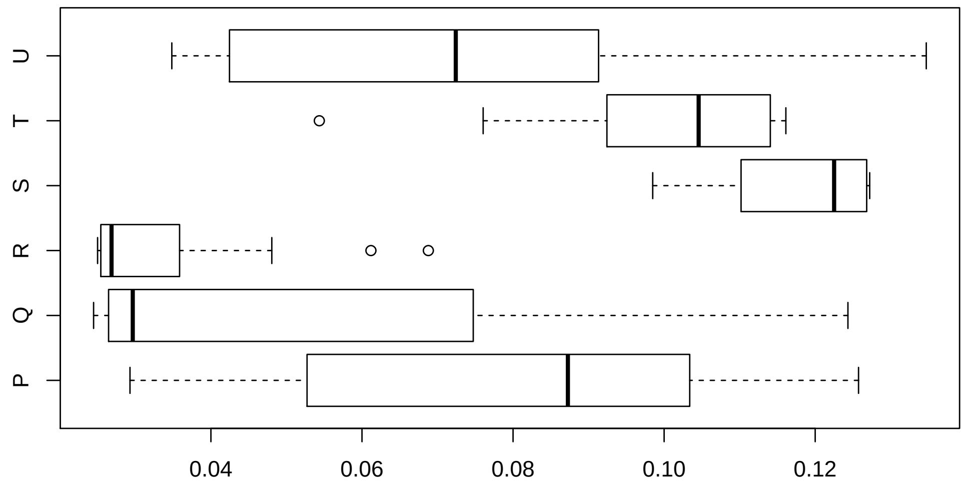


(a) Which variable produced the largest measurment?
(b) Which variable produced the smallest measurment?
(c) Which distribution has the largest median?
(d) Which distribution has the smallest median?
(e) Which distribution has the largest 25th percentile?
(f) Which distribution has the smallest 25th 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?

Solution:

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

10. **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?

Solution:

(a) U

(b) Q

(c) S

(d) R

(e) S

(f) R

(g) S

(h) R

(i) P

(j) R

11. **Problem:**
We can estimate the mean of **symmetric** distributions.

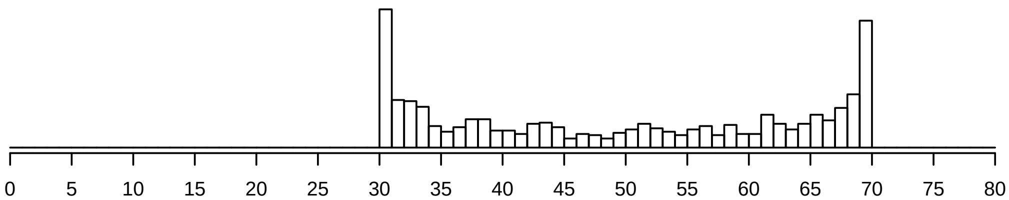
$$\bar{x} \approx \frac{\max(x) + \min(x)}{2}$$

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

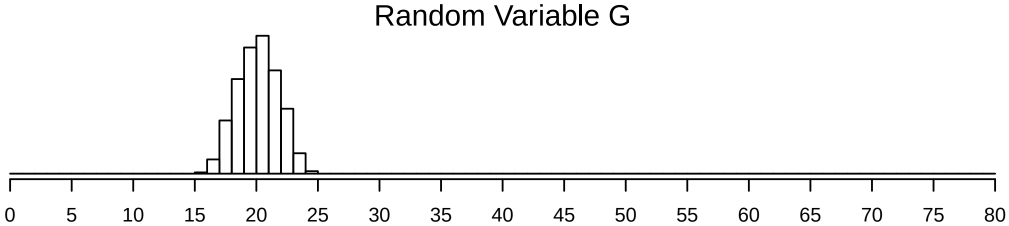
Shape	SD estimate
bell	range/6
uniform	range/4
bimodal	range/2

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

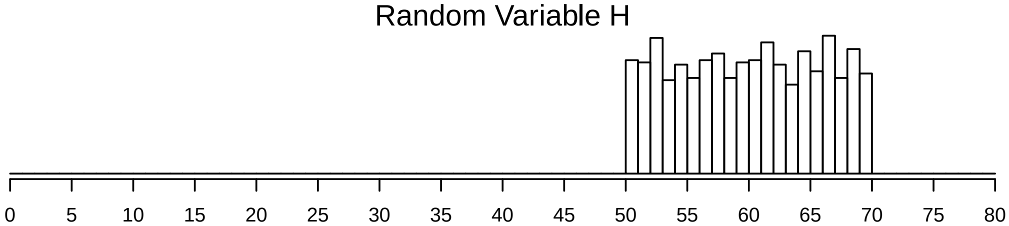
Random Variable F



Random Variable G



Random Variable H



(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.

Solution:

(a) 50

(b) 20

(c) 60

(d) 20

(e) 1.6666667

(f) 5

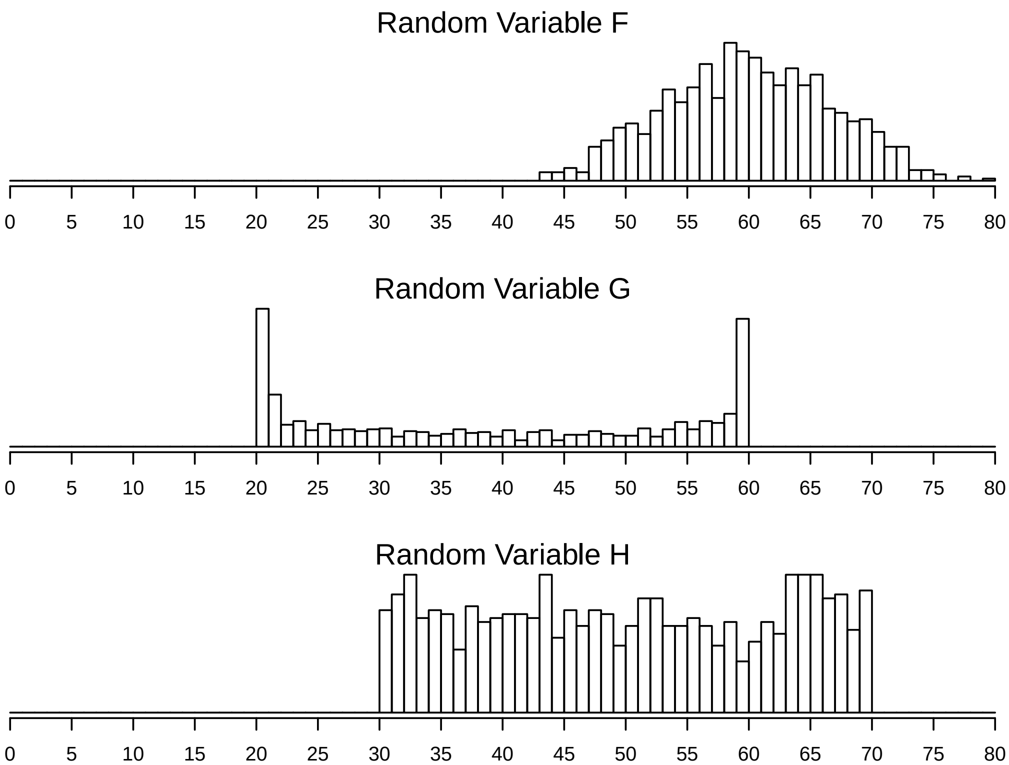
12. **Problem:**
We can estimate the mean of **symmetric** distributions.

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

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 1000 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.

Solution:

(a) 60

(b) 40

(c) 50

(d) 6.6666667

(e) 20

(f) 10

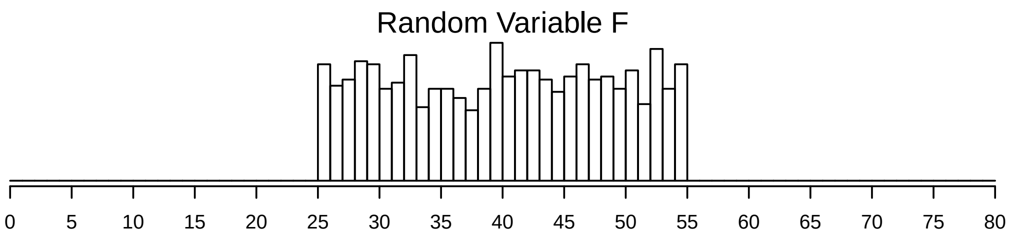
13. **Problem:**
We can estimate the mean of **symmetric** distributions.

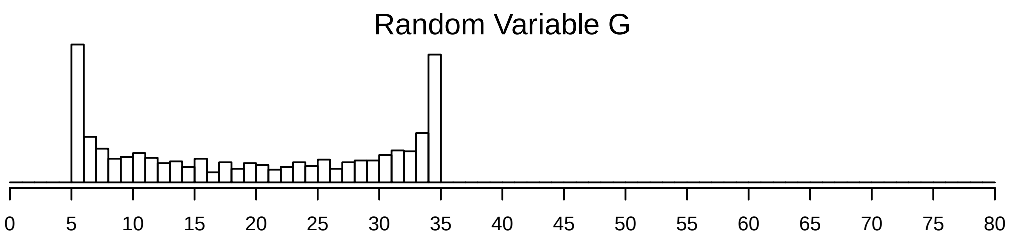
$$\bar{x} \approx \frac{\max(x) + \min(x)}{2}$$

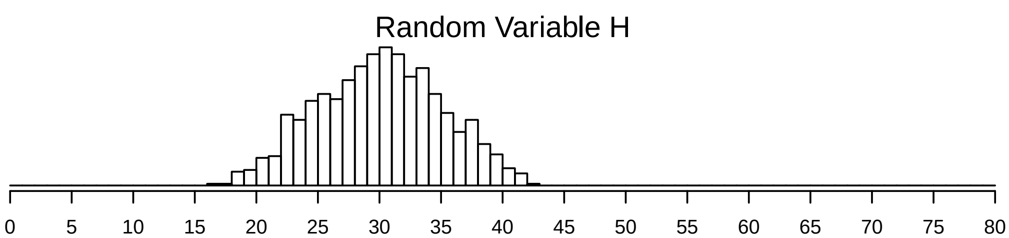
We can **roughly** estimate the standard deviation of certain distributions.

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

Three random variables (F, G, and H) were measured 1000 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.

Solution:

(a) 40

(b) 20

(c) 30

(d) 7.5

(e) 15

(f) 5

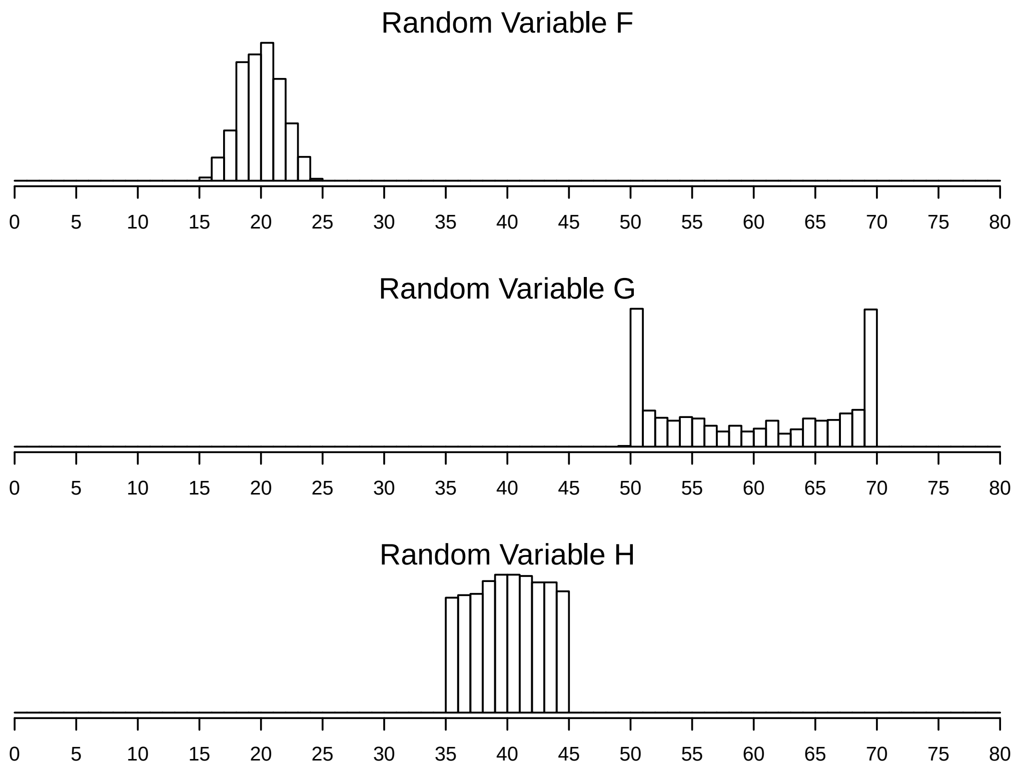
14. **Problem:**
We can estimate the mean of **symmetric** distributions.

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

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 1000 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.

Solution:

(a) 20

(b) 60

(c) 40

(d) 1.6666667

(e) 10

(f) 2.5

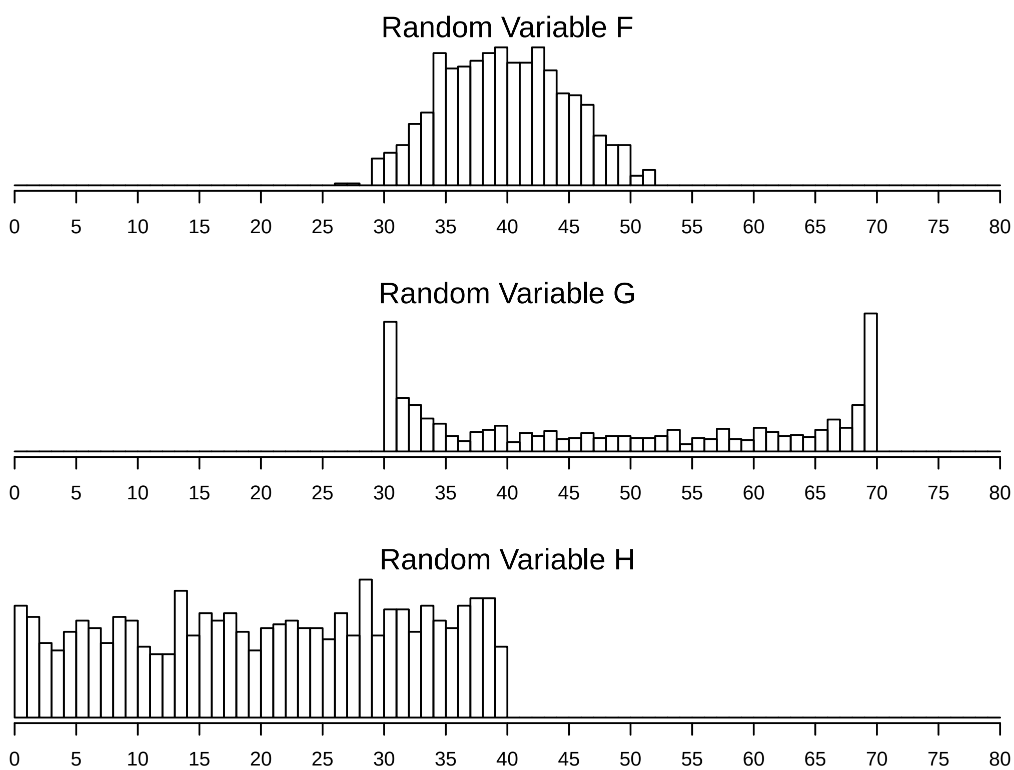
15. **Problem:**
We can estimate the mean of **symmetric** distributions.

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

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 1000 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.

Solution:

(a) 40
(b) 50
(c) 20
(d) 5
(e) 20
(f) 10