

**1. Solution**

Let  $x$  represent a datum of interest. Let  $i$  represent that datum's index. Let  $\ell$  represent that datum's percentile. Let  $n$  represent the sample size (number of measurements). In general,

$$\ell = \frac{i}{n}$$

(a) We are given  $x = 91.452$ . This means  $i = 3$ . We know  $n = 9$ . Determine the percentile  $\ell$ .

$$\ell = \frac{3}{9}$$

$$\ell = 0.333$$

So, the percentile rank is  $\boxed{0.333}$ , or 33.3th percentile.

(b) We are given  $\ell = 0.889$ . We can use algebra to solve for  $i$ .

$$\ell = \frac{i}{n}$$

Multiply both sides by  $n$ .

$$n \cdot (\ell) = n \cdot \left( \frac{i}{n} \right)$$

Simplify both sides.

$$n\ell = i$$

To make me happy, switch the sides.

$$i = n\ell$$

Now, we can evaluate  $i$ .

$$i = (9)(0.889)$$

$$i = 8$$

Determine the  $x$  associated with  $i = 8$ .

$$x = \boxed{91.644}$$

(c) The mean:  $\bar{x} = \frac{823.107}{9} = \boxed{91.456}$

(d) If  $n$  is odd, then median is  $x_{i=\frac{n+1}{2}}$ , the value of  $x$  when  $i = \frac{n+1}{2}$ . Otherwise, if  $n$  is even, the median is mean of  $x_{i=\frac{n}{2}}$  and  $x_{i=\frac{n}{2}+1}$ . In this case,  $n = 9$  and so  $n$  is odd.

$$\text{median} = x_{(9+1)/2} = x_5$$

So, median =  $\boxed{91.453}$ .

**2. Solution**

Let  $x$  represent a datum of interest. Let  $i$  represent that datum's index. Let  $\ell$  represent that datum's percentile. Let  $n$  represent the sample size (number of measurements). In general,

$$\ell = \frac{i}{n}$$

(a) We are given  $x = 70.177$ . This means  $i = 4$ . We know  $n = 21$ . Determine the percentile  $\ell$ .

$$\ell = \frac{4}{21}$$

$$\ell = 0.19$$

So, the percentile rank is 0.19, or 19th percentile.

(b) We are given  $\ell = 0.238$ . We can use algebra to solve for  $i$ .

$$\ell = \frac{i}{n}$$

Multiply both sides by  $n$ .

$$n \cdot (\ell) = n \cdot \left( \frac{i}{n} \right)$$

Simplify both sides.

$$n\ell = i$$

To make me happy, switch the sides.

$$i = n\ell$$

Now, we can evaluate  $i$ .

$$i = (21)(0.238)$$

$$i = 5$$

Determine the  $x$  associated with  $i = 5$ .

$$x = \text{70.245}$$

(c) The mean:  $\bar{x} = \frac{1484.624}{21} = \text{70.696}$

(d) If  $n$  is odd, then median is  $x_{i=\frac{n+1}{2}}$ , the value of  $x$  when  $i = \frac{n+1}{2}$ . Otherwise, if  $n$  is even, the median is mean of  $x_{i=\frac{n}{2}}$  and  $x_{i=\frac{n}{2}+1}$ . In this case,  $n = 21$  and so  $n$  is odd.

$$\text{median} = x_{(21+1)/2} = x_{11}$$

So, median = 70.615.