1. **Solution**
Let x represent a datum of interest. Let i represent that datum's index. Let ℓ represent that datum's percentile. Let n represent the sample size (number of measurements). In general,

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

(a) We are given $x = 81.494$. This means $i = 3$. We know $n = 10$. Determine the percentile ℓ.

$$\ell = \frac{3}{10}$$

$$\ell = 0.3$$

So, the percentile rank is $\boxed{0.3}$, or 30th percentile.

(b) We are given $\ell = 0.8$. 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.

$$i = (10)(0.8)$$

$$i = 8$$

Determine the x associated with $i = 8$.

$$x = \boxed{88.949}$$

(c) The mean: $\bar{x} = \frac{855.258}{10} = \boxed{85.526}$

(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, $n = 10$ and so n is even.

$$\text{median} = \frac{x_5 + x_6}{2} = \frac{83.011 + 87.131}{2}$$

So, median = $\boxed{85.071}$.

2. **Solution**
Let x represent a datum of interest. Let i represent that datum's index. Let ℓ represent that datum's percentile. Let n represent the sample size (number of measurements). In general,

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

(a) We are given $x = 12.976$. This means $i = 10$. We know $n = 42$. Determine the percentile ℓ.

$$\ell = \frac{10}{42}$$

$$\ell = 0.238$$

So, the percentile rank is $\boxed{0.238}$, or 23.8th percentile.

(b) We are given $\ell = 1$. 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.

$$i = (42)(1)$$

$$i = 42$$

Determine the x associated with $i = 42$.

$$x = \boxed{29.796}$$

(c) The mean: $\bar{x} = \frac{851.084}{42} = \boxed{20.264}$

(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, $n = 42$ and so n is even.

$$\text{median} = \frac{x_{21} + x_{22}}{2} = \frac{18.18 + 19.605}{2}$$

So, median = $\boxed{18.8925}$.