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 $x = 81.306$. This means $i = 2$. We know $n = 7$. Determine the percentile ℓ.

$$\ell = \frac{2}{7}$$

$$\ell = 0.286$$

So, the percentile rank is $\boxed{0.286}$, or 28.6th percentile.

(b) We are given $\ell = 0.857$. 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.

$$i = (7)(0.857)$$

$$i = 6$$

Determine the x associated with $i = 6$.

$$x = \boxed{81.967}$$

(c) The mean: $\bar{x} = \frac{571.089}{7} = \boxed{81.584}$

(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, $n = 7$ and so n is odd.

$$\text{median} = x_{(7+1)/2,} = x_4$$

So, median = $\boxed{81.553}$.

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 $x = 117.66$. This means $i = 16$. We know $n = 28$. Determine the percentile ℓ.

$$\ell = \frac{16}{28}$$

$$\ell = 0.571$$

So, the percentile rank is $\boxed{0.571}$, or 57.1th percentile.

(b) We are given $\ell = 0.821$. 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.

$$i = (28)(0.821)$$

$$i = 23$$

Determine the x associated with $i = 23$.

$$x = \boxed{135.447}$$

(c) The mean: $\bar{x} = \frac{2734.823}{28} = \boxed{97.672}$

(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, $n = 28$ and so n is even.

$$\text{median} = \frac{x_{14} + x_{15}}{2} = \frac{104.777 + 106.75}{2}$$

So, median = $\boxed{105.7635}$.