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 $x = 73.005$. This means $i = 4$. We know $n = 10$. Determine the percentile ℓ.

   $$\ell = \frac{4}{10}$$

   $$\ell = 0.4$$

   So, the percentile rank is $\boxed{0.4}$, or 40th 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.

   $$i = (10)(1)$$
   $$i = 10$$

   Determine the x associated with $i = 10$.

   $$x = \boxed{89.548}$$

   (c) The mean: $\bar{x} = \frac{800.657}{10} = \boxed{80.066}$

   (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.

   $$\text{median} = \frac{x_5 + x_6}{2} = \frac{77.524 + 83.296}{2}$$

   So, median = $\boxed{80.41}$.

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 $x = 81.691$. This means $i = 21$. We know $n = 35$. Determine the percentile ℓ.

$$\ell = \frac{21}{35}$$

$$\ell = 0.6$$

So, the percentile rank is $\boxed{0.6}$, or 60th percentile.

(b) We are given $\ell = 0.2$. 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.

$$i = (35)(0.2)$$

$$i = 7$$

Determine the x associated with $i = 7$.

$$x = \boxed{80.406}$$

(c) The mean: $\bar{x} = \frac{2853.248}{35} = \boxed{81.521}$

(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, $n = 35$ and so n is odd.

$$\text{median} = x_{(35+1)/2,} = x_{18}$$

So, median = $\boxed{81.622}$.