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 $x = 72.781$. This means $i = 8$. We know $n = 11$. Determine the percentile ℓ.

   $$\ell = \frac{8}{11}$$

   $$\ell = 0.727$$

   So, the percentile rank is $\boxed{0.727}$, or 72.7th percentile.

   (b) We are given $\ell = 0.909$. 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.

   $$i = (11)(0.909)$$

   $$i = 10$$

   Determine the x associated with $i = 10$.

   $$x = \boxed{72.873}$$

   (c) The mean: $\bar{x} = \frac{796.853}{11} = \boxed{72.441}$

   (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, $n = 11$ and so n is odd.

   $$\text{median} = x_{(11+1)/2,} = x_6$$

   So, median = $\boxed{72.503}$.

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 $x = 81.786$. This means $i = 26$. We know $n = 42$. Determine the percentile ℓ.

   $$\ell = \frac{26}{42}$$

   $$\ell = 0.619$$

   So, the percentile rank is $\boxed{0.619}$, or 61.9th percentile.

   (b) We are given $\ell = 0.81$. 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.

   $$i = (42)(0.81)$$
   $$i = 34$$

   Determine the x associated with $i = 34$.

   $$x = \boxed{82.392}$$

   (c) The mean: $\bar{x} = \frac{3425.536}{42} = \boxed{81.56}$

   (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.

   $$\text{median} = \frac{x_{21} + x_{22}}{2} = \frac{81.474 + 81.541}{2}$$

   So, median $= \boxed{81.5075}$.