We want to calculate the median with the observations in $\mathcal{X}$ using the L_1 distance function as below.

1. Equal weights.

   (a) We have $\mathcal{X} = \{1, 2, 3, 4, 5\}$. (The number of observations is odd).

   Sketch $y = 0.2 \cdot |x - 1| + 0.2 \cdot |x - 2| + 0.2 \cdot |x - 3| + 0.2 \cdot |x - 4| + 0.2 \cdot |x - 5|$.

   What did you find it?

   (b) We have $\mathcal{X} = \{1, 2, 3, 4\}$. (The number of observations is even).

   Sketch $y = 0.25 \cdot |x - 1| + 0.25 \cdot |x - 2| + 0.25 \cdot |x - 3| + 0.25 \cdot |x - 4|$.

   What did you find it?

2. Unequal weights.

   (a) We have $\mathcal{X} = \{1, 2, 3, 4, 5\}$. (The number of observations is odd).

   Sketch $y = 0.3 \cdot |x - 1| + 0.2 \cdot |x - 2| + 0.1 \cdot |x - 3| + 0.2 \cdot |x - 4| + 0.2 \cdot |x - 5|$.

   What did you find it?

   (b) We have $\mathcal{X} = \{1, 2, 3, 4\}$. (The number of observations is even).

   Sketch $y = 0.25 \cdot |x - 1| + 0.30 \cdot |x - 2| + 0.20 \cdot |x - 3| + 0.25 \cdot |x - 4|$.

   What did you find it?

3. Can you generalize the above results? What is the optimal location (weighted median) with $y = \sum_{i=1}^{n} w_i |x - x_i|$?