Exercise 1:

Let the 2D feature vectors in the following figure be with two different numeric target values (2 and 4). Predict the point (7,6) - represented by the grey point in the picture - with the k-nearest neighbor method. Distance function should be the L_1 norm (Manhattan distance):

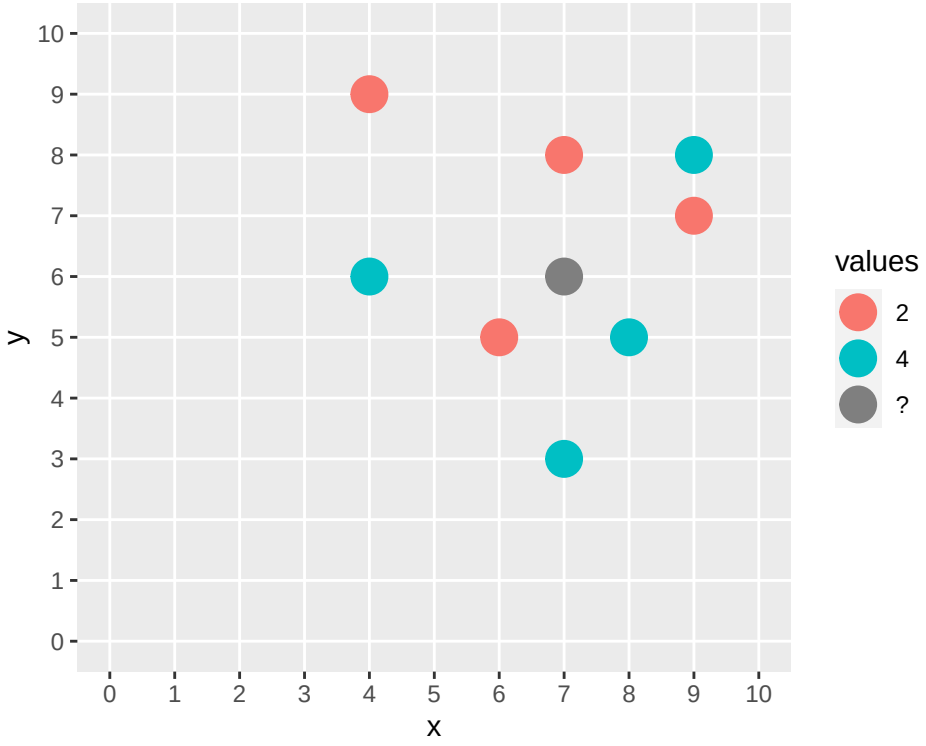
$$d_{\text{manhattan}}(x, \tilde{x}) = \sum_{j=1}^{p} |x_j - \tilde{x}_j|$$

State as the prediction the unweighted and the weighted (according to the Manhattan distance) mean of the values of the k-nearest neighbors.

a) $k = 3$

b) $k = 5$

c) $k = 7$



Exercise 2:

How in mlr3 a learner can be constructed and what it represents can be found at `https://mlr3book.mlr-org.com/learners.html`.

a) How does a learner in mlr3 compare to what you've learned in the videos?

b) Pick an mlr3 learner of your choice. What are the different settings for this learner?
(Hint: Use `mlr_learners$keys()` to see all available learners)

Exercise 3:

We want to predict the age of an abalone using its longest shell measurement and its weight.

See: `http://archive.ics.uci.edu/ml/datasets/Abalone` for more details.

a) Plot `LongestShell`, `WholeWeight` on the x- and y-axis and color points with `Rings`

Using the mlr3-package:

b) Fit a linear model

c) Fit a k-nearest-neighbors model

d) Plot the prediction surface of lm and of knn (Hint: Use `autoplot()`)

Hint: See the official book manual of the mlr3 package for usage:

`https://mlr3book.mlr-org.com/index.html`