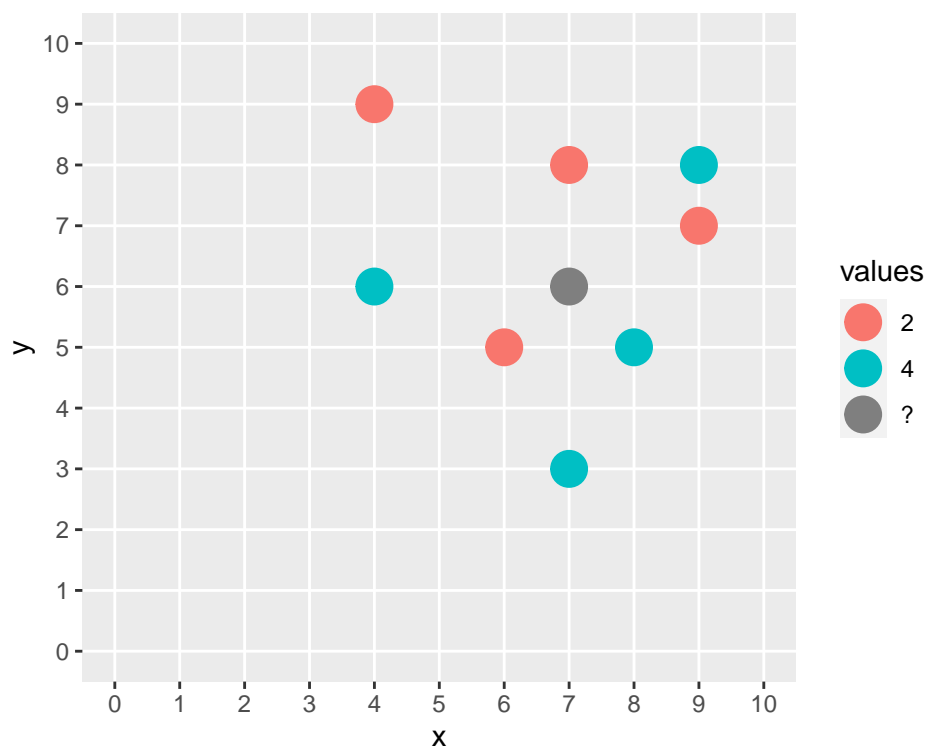**Exercise 1:**

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):

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

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) Compare the fitted and observed targets for lm and knn, respectively (Hint: Use `autoplot()`)

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

$$\text{https://mlr3book.mlr-org.com/index.html}$$