

**Bernoulli distribution**

40% of drivers pass test first time.

0=fail, 1=pass.

Start with a single simulation in Main using randBin(n,p)

Now try a random sample of 25 drivers using randBin(n,p,N) and use mean to determine the sample proportion.

Just tap EXE to repeat simulation.

Recall that mean and standard deviation of a Bernoulli distribution are given by  $\bar{x} = p$  and  $sd = \sqrt{p(1-p)}$ .

In this example  $\bar{x} = 0.4$  and  $sd \approx 0.49$ .

Calculator interface showing a single simulation of a Bernoulli trial. The input is `randBin(1, 0.4)` and the result is 0. The calculator is in the 'Edit Action Interactive' mode. The 'Number' field is highlighted, and the 'randBin(' function is selected in the catalog.

Calculator interface showing a sample of 25 Bernoulli trials. The input is `randBin(1, 0.4, 25)` and the result is a list: `{0, 1, 0, 0, 1, 0, 1, 0, 1, 0, 1, 0}`. The calculator is in the 'Edit Action Interactive' mode. The 'Number' field is highlighted, and the 'mean(' function is selected in the catalog.

Calculator interface showing multiple simulations of a sample of 25 Bernoulli trials. The input is `randBin(1, 0.4, 25)` and the result is a list: `{0, 1, 0, 0, 1, 0, 1, 0, 1, 0, 1, 0}`. The calculator is in the 'Edit Action Interactive' mode. The 'Number' field is highlighted, and the 'mean(' function is selected in the catalog. The results of multiple simulations are shown: 0.36, 0.44, 0.32, 0.4, 0.28.

Calculator interface showing the theoretical standard deviation of a Bernoulli distribution. The input is `sqrt(0.4*(1-0.4))` and the result is 0.4898979486. The calculator is in the 'Edit Action Interactive' mode. The 'Number' field is highlighted, and the 'sqrt(' function is selected in the catalog.

In Main, take a copy of the line to calculate the sample proportion and then start a new spreadsheet, pasting the formula into cell A1.

Use Edit, Fill, Fill Range to copy the formula into cells A1 to A50.

Put cursor into cell B1 and use Calc, List-Statistics, mean to calculate the mean of the 50 proportions, each based on a random sample of size 25.

Then cursor into B2 and repeat but use stdDev.

Select column A, tap Graph, Histogram.

Tap into the top window and use File, Recalculate to simulate measuring another 50 sample proportions.

You may want to File, Save your spreadsheet.

The histogram mostly resembles a normal distribution and the mean in cell B1 is always close to the known proportion of 0.4.

The standard deviation in cell B2 is always close to  $\sqrt{\frac{0.4(1-0.4)}{25}} \approx 0.098$ .

