From a line on a chart to a function

A local car showroom has data on **12 used cars**. For each car we know the age (years) and the asking price.

Important: prices are recorded in **thousands of CHF**. A price of 18 in the table means **CHF 18 000**, not 18 francs.

Open `car_showroom_functions.xlsx` in Google Sheets (File → Import → Upload) and work on the **Cars** tab.

1. Find the line of best fit

(a) Plot the data: select `A4:B16`, then Insert → Chart → Scatter. In the chart editor, tick Trendline (Linear) and set the label to Use Equation. The equation appears on the chart.

(b) Confirm using technology. In the yellow cells, enter: `=SLOPE(B5:B16, A5:A16)` and `=INTERCEPT(B5:B16, A5:A16)`

Write the equation of the line of best fit, to 2 d.p.:

$$y = \_\_\_\_\_\, x + \_\_\_\_\_$$

2. Rewrite as a function

Let x be the age of a car (in years), and let $f(x)$ be the predicted price (in 1000s of CHF).

Write the line of best fit using function notation:

$$f(x) = \_\_\_\_\_$$

We have just turned a *line on a graph* into a *function*. We can now **evaluate** f at any x, and we can **solve** equations of the form $f(x) = k$.

3. Evaluate the function: what is $f(5)$?

(a) Calculate $f(5)$. Show your substitution.

(b) Interpret $f(5)$ in context. **Watch the units** — your final answer should be in CHF, not in "thousands".

4. Solve the equation $f(x) = 10$

A customer has a budget of CHF 10 000 — that is a price of 10 in our units. **Solve algebraically** for x, then interpret your answer in context.

Reading a function in context

You now have a function $f(x) = mx + c$ that predicts the price of a used car of age x. On this side you will **interpret** the function and **question** how far it can be trusted.

5. Interpret the slope and the intercept

(a) The slope of f is $m \approx$ _____. Explain what this number tells us about used car prices. **Include units** (CHF per year).

(b) The y-intercept of f is $c \approx$ _____. Explain what this represents in context. **Include units** (CHF). Is this realistic for a brand-new car?

6. How good is the model? Reading r and testing limits

(a) In a yellow cell, enter `=CORREL(A5:A16, B5:B16)`. State the value of r to 3 d.p., and explain what it tells us about the model.

(b) A car has a price of CHF 1 000. Use f to estimate its age. Is your answer **inside the data** (1–12 years) or **outside**? Comment on the reliability.

(c) A neighbour wants to use f to value their **25-year-old** car. Calculate $f(25)$, then explain why this model should *not* be used here.