**Linear Decrease: Tucson Ice Break**

MEAD January 22, 2022

Deborah Hughes Hallett

dhh@math.arizona.edu

Mathematics Consortium Working Group

mcwg.contact@gmail.com

**More climate change resources at:** https://mcwg.github.io/climate/

1. Download the Ice Break data between 1900 and 2021 at <https://www.wrh.noaa.gov/twc/climate/Tucson100s/Tucson100s_1st100.php>. Add a column with days since April 15. (For example, first add a column with April 15 and then take the difference.) Make a scatter plot with years since 1900 along horizontal axis and days since April 15 vertically.

Why are we doing this? We imagine that global warming may have made Ice Break on average earlier in the year. We measure Ice Break from a fixed date and see if it is decreasing. (Which date is arbitrary; we used April 15.)

ANS:

1. Fit a **linear function** to the scatter plot and show the equation.

ANS:

1. Interpret the slope of the line in terms of temperature and time.

ANS: The $−0.093$ is rate at which the date is moving back per year. In other words, the date moves back about 0.093 days each year, or about 1 day in a decade.

1. Interpret the intercept in terms of the temperature and time.

ANS: The 299.2 is the predicted number of days after April 15 when $t=0$, that is 2021 years ago, in the year 0 AD. This assumes the warming has continued at the same rate throughout the whole period—which is unlikely. Since 299 is about 10 months, we can see this prediction is not reliable.