

Lesson Plan Title: Nenana Ice Break-up

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Discipline / Subject: Statistics

Topic: Exploring data and statistical inference

Grade Level: high school - Intro to Statistics courses; AP Statistics

Resources / References / Materials Teacher Needs: websites listed below for information about the Nenana Ice Classic

Lesson Summary: Students will analyze the data from the Nenana, Alaska, Ice Classic using statistical methods

Standards Addressed: (Local, State, or National)

AP I Exploring Data

- Exploring bivariate data

IV. Statistical Inference

- Estimating population parameters and testing hypotheses
- Tests of significance

Virginia SOL

Probability and Statistics

- PS.4 The student will analyze scatterplots to identify and describe the relationship between two variables, using shape; strength of relationship; clusters; positive, negative, or no association; outliers; and influential points.
- PS.5 The student will find and interpret linear correlation, use the method of least squares regression to model the linear relationship between two variables, and use the residual plots to assess linearity.
- PS.17 The student, given data from a large sample, will find and interpret point estimates and confidence intervals for parameters. The parameters will include proportion and mean, difference between two proportions, and difference between two means (independent and paired).
- PS.20 The student will identify properties of a t-distribution and apply t-distributions to single-sample and two-sample (independent and matched pairs) t-procedures, using tables or graphing calculators.

Common Core**Interpret linear models**

CCSS.MATH.CONTENT.HSS.ID.C.7

Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

CCSS.MATH.CONTENT.HSS.ID.C.8

Compute (using technology) and interpret the correlation coefficient of a linear fit.

Make inferences and justify conclusions from sample surveys, experiments, and observational studies

CCSS.MATH.CONTENT.HSS.IC.A.1

Understand statistics as a process for making inferences about population parameters based on a random sample from that population.

CCSS.MATH.CONTENT.HSS.IC.B.4

Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.

Learning objectives:

1. Students will analyze the data from the Nenana, Alaska, Ice Break Up Classic using statistical methods such as interpreting linear models

Assessment:

In class activity – student work observed by teacher

Procedural Activities

1. Go to the following Websites for information about the Nenana Ice Classic:

https://en.wikipedia.org/wiki/Nenana_Ice_Classic

<https://nsidc.org/data/nsidc-0064>

<https://www.climate.gov/news-features/climate-tech/when-will-tanana-river-ice-break>

2. Data for the Nenana Ice Classic can be obtained from either of these web sites

https://public.tableau.com/views/NenanaIceClassicWinningDatesTimes1917-2016/NenanaIceClassicWinningDatesTimes1917-2016?:embed=y&:display_count=yes&:showVizHome=no

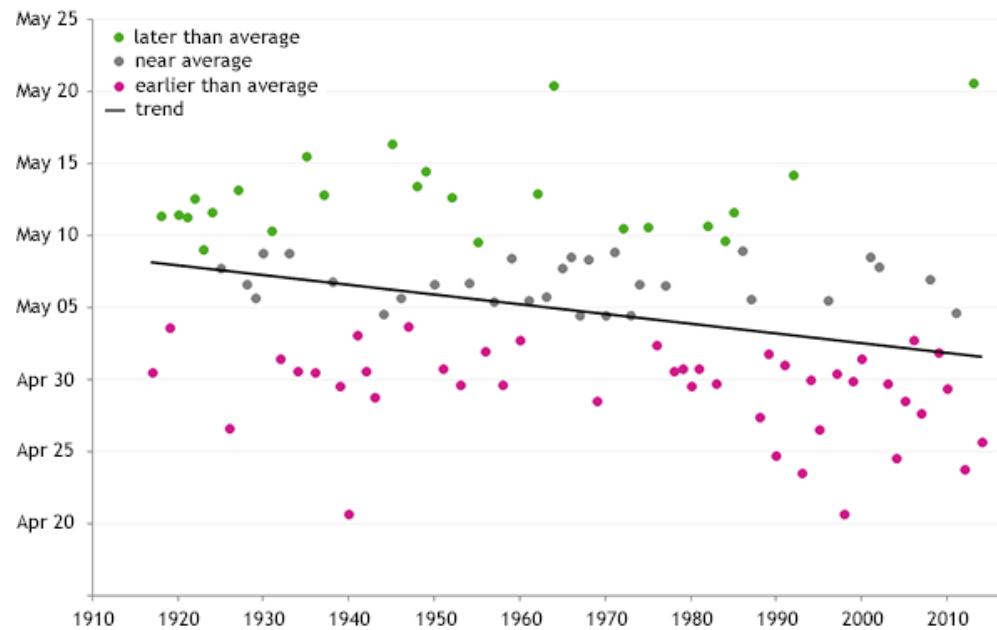
OR

<https://nsidc.org/data/nsidc-0064>

3. Given below is a scatter plot for the data from 1917 to 2014. The actual data is on the last page.

Using the graph and data, discuss the trends you see in the data.

Nenana River ice breakup dates (1917-2014)



Kennedy, Caitlyn. "When will the Tanana River ice break up?" *When will the Tanana River ice break up?*, NOAA Climate.Gov, 14 Apr. 2015, www.climate.gov/news-features/climate-tech/when-will-tanana-river-ice-break. Accessed 9 Feb. 2018.

3. Use the data at the end of the document and a statistical package to find the least squares regression line for year versus break up day.
 - a. Give the regression line for the data.
 - b. What is the slope of the line? What does the slope tell you?
 - c. What is the y-intercept of the line? What does this tell you?
 - d. Find the r value. What does this tell you?
 - e. Find the coefficient of determination for the data. What does this tell you about the data?
 - f. Look at a graph of the residuals. Do you think a linear model is a good fit for this data?
 - g. Are there any outliers in the data? How did you decide?
4. Take a random sample of 30 of the data points. Use these to create a confidence interval for the slope of the regression line. Does this give you a good idea of the actual slope? Why or why not?
5. Compare your confidence interval to others. How do these compare?

Materials Students Need:

Calculators/Computers with Statistical Capability
Internet Access

