Olympic Sport Climbing (2 Variables)

The objective of this activity is to use data from the 2021 Speed Climbing and Lead Climbing Olympic to investigate relationships, create regression models, make predictions, and examine residuals.

During the 2021 Summer Olympics in Tokyo, competition climbing became an Olympic sport for the first time ever. Athletes competed in three separate disciplines: speed climbing, bouldering, and lead climbing. There were 20 men and 20 women who competed in the 2021 Olympic Sports Climbing Qualification Rounds.

In **speed climbing**, two climbers race side-by-side to scale identical routes on a 15m high wall set at an angle of 95 degrees.

The walls used for **bouldering** present a range of challenges, with overhangs and some holds so small that they can only be held by the fingertips. Climbers must plan each move carefully while constantly being aware of the 4 minute time limit. The goal is to complete as many routes as possible.

When **lead climbing**, athletes wearing harnesses attached to a climbing rope attempt to climb as high as they can on a taller wall measuring 15-20 meter within six minutes. The wall features 40-60 handholds. Climbers are scored on how far they progress, with each handhold earning 1 point.

Asking Statistical Questions

The table below data gives information about the three disciplines for each athlete in the women's qualification rounds. The data include the time, in seconds, of the speed climb, the number of holds attained in lead climbing, and their ranking in the bouldering competition.

1. What do you notice?

2. What do you wonder?

Athlete	Speed (s)	Lead (holds)	Bouldering (rank)
MIROSLAW Aleksandra	6.97	12	20
JAUBERT Anouck	7.12	16	13
SONG Yiling	7.46	13	19
NONAKA Miho	7.55	30	8
KAPLINA Iuliia	7.65	14	18
YIP Alannah	7.99	21	16
CONDIE Kyra	8.08	22	11
CHANOURDIE Julia	8.17	25	15
NOGUCHI Akiyo	8.23	27	3
KLINGLER Petra	8.42	16	10
PILZ Jessica	8.51	33	9
RABOUTOU Brooke	8.67	26	2
MACKENZIE Oceania	8.83	15	12
GARNBRET Janja	9.44	26	1
MESHKOVA Viktoriia	9.54	29	6
COXSEY Shauna	9.65	21	4
SEO Chaehyun	10.01	40	5
KRAMPL Mia	10.43	26	14
ROGORA Laura	10.5	25	7
STERKENBURG Erin	11.1	7	17

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Making Predicitons

We wish to investigate the relationship between the athlete's time in Speed Climbing and the number of holds they attained during Lead Climbing. How would you predict the relationship to behave? Would you expect a fast climber in Speed Climbing to attain a high number of holds or a low number of holds in Lead Climbing? Explain your reasoning.
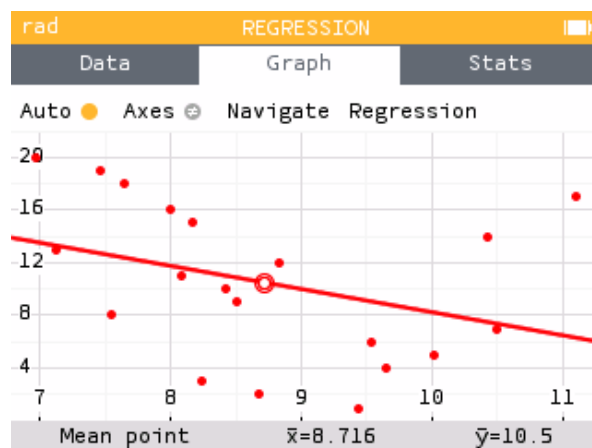
Scatterplot and Correlation

1. Use your calculator to make a scatter plot of the data on time and number of holds and describe the association between the two variables.

2. Fit a linear function to model the relationship of speed and hold attained. Write the equation of your model and interpret the slope in context.

3. Determine the correlation coefficient for the data and describe what it means in regards to the data.

Regression and Residuals

To investigate the relationship between the athlete's time in Speed Climbing and their rank in Bouldering, a scatterplot and linear model was created as shown below.

The linear function

$$R(t) = 25.753 - 1.75t$$

has been suggested as a good fit for the data. The table below displays the 20 athlete's time in seconds during Speed Climbing.

1. Using the model, determine the predicted rank for the third athlete, Yiling Song. Then compute their residual.

2. Interpret the value of the residual for Yiling Song.

3. Create a residual plot for the linear regression of rank on speed for the 20 athletes.

4. For which athlete did the model under predict by the most?

5. Use the residual plot to determine the goodness of fit of the linear function for the data.

A Better Model

Perform a quadratic regression on the athlete's time in Speed Climbing and their rank in Bouldering. Assess the fit of the quadratic function by plotting and analyzing the residuals.