GRADES 6-8

Capstone

The Best Team, Statistically

Objective: Students will compare baseball players using qualitative descriptions and qualitative statistics. Students will evaluate the best team by using statistics to play a simulated baseball game.

Standards

Common Core State Standards Connections

CCSS.MATH.CONTENT.8.SP.A.1
Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

CCSS.MATH.CONTENT.7.SP.C.5
Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

CCSS.MATH.CONTENT.7.SP.C.6
Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. *For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.*

CCSS.MATH.CONTENT.6.SP.B.5.C
Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.

Supplies Provided

Statistical Data Table/Guide: STEMSports.com, then click on STEM Baseball under Resources
Hitters/Fielders
Pitchers

Materials Needed

Calculators, Dice, and Colored Pencils

Engage: Create your own professional baseball team with partner. Spend time selecting a team name, mascot, and design.

Explore: Look at the players available to draft. Select the top five players and justify why you want those players on your team. Meet with four other students and compare your lists. Use sentence frame, such as:

- "I think this was a good pick because..."
- "I didn't think of that, I thought of this skill..."
- "I would have selected Xx _____ because..."

Discuss with your team: Is there a better way to evaluate players?

Explain: Review baseball statistics with the students. Model how they are calculated.

Elaborate: Ask students to review the list of players and a mathematical way to compare the players across their statistical values. (i.e. add all of the scores together for a sum, average the scores, assign each score a value (1-5) and then sum the values. 8th grade: plot two probabilities on a scatter plot). Have students use that method to select a team of 9 players and 1 pitcher.

Evaluate: Have student teams play each other in a simulated statistics match. Use dice or numbers out of a hat that represent the statistics. Allow students to play multiple games as time allows. Set up a bracket with the students team name and design from the statistical data table.

Extend: For students who finish *Elaborate* early: A new player enters the draft at the last minute, so their statistics haven't been calculated. Using the raw data, calculate the statistics and compare the player to the rest of the team. Would they change out this player for another?

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Game Simulation

Probability generators:

- https://stattrek.com/statistics/random-number-generator.aspx
- Dice (ten sided)
- Numbers in a hat (0-9)
- https://www.omnicalculator.com/statistics/dice
- Random.org
- #numbers 1-999

Inning one:

Offense: Hitting

(Probability generator 1-999 needed)

Using the batting average probability, determine if you 'got a hit'. Mark a hit with a "O."

To determine if you "got a hit," use the probability generator. If you roll, select or draw a number within your probability: you "got a hit."

Example: Your player's batting average is 0.362. You roll a 272, you 'got a hit'. You roll a 585 or 891, no hit.

	Player 1	Player 2	Player 3	Player 4	Player 5	Player 6	Player 7	Player 8	Player 9
Team 1	answer here	answer here	answer here	answer here	answer here	answer here	answer here	answer here	answer here
Team 2	answer here	answer here	answer here	answer here	answer here	answer here	answer here	answer here	answer here

If you have a player with a Slugging Percentage probability greater than 0.450, **score one (1) run per inning.*

Defense: Outfield Play and Pitching

(Probability generator 1-9 needed)

1. Review your *put-out* probabilities. Roll the dice for every hit the opposing team made. If you roll a number within your probability, cross out a hit. For example, If your put out probability is 0.2 and you roll a 2, cross out a hit. If you roll a 3-9 all hits remain.
2. Review your error probabilities. Roll the dice for every hit the opposing team made. If you roll a number within your probability, put a '2' in the circle: the hitter got a double.
   For example: If you have an error probability of 0.6, anything you roll 1-6 the hitter scores a double.

Name: Name _____ **Class:** _____

Repeat for as many innings as your teacher assigned.

Score:

1. Review your opponent's pitcher's ERA (earned run average). For every single (O) hit you made within the average is a run. If the average is 2, and you have 10 hits, you score 2 runs.
2. Count your remaining hits for every four bases you score a run. (O) = 1 base; (O w/ two inside) = two bases. Unlike regular baseball players on base in one inning can be used for runs in a different inning. For example: If you had a double and three singles in the 1st inning. And three singles in 2nd inning. You would have a total of 2 runs.

	Player 1	Player 2	Player 3	Player 4	Player 5	Player 6	Player 7	Player 8	Player 9
Team 1	answer here	answer here	answer here	answer here	answer here	answer here	answer here	answer here	answer here
Team 2	answer here	answer here	answer here	answer here	answer here	answer here	answer here	answer here	answer here

Pitchers

	Defensive	
Player Name	ERA (earned run average)	ERA (earned run average)
Billy Smith	3.00	Good
Christie Clark	2.00	Very good
Christopher Marks	1.00	Excellent
Darren Willis	4.00	Fair
Hannah Wall	5.00	Poor
Jack Snell	5.00	Poor
James Knight	4.00	Fair
Jamie Welch	2.00	Very good
Kellie Wallace	7.00	Poor
Larry Smith	3.00	Good
Matt Davis	4.00	Fair
Matt Palmer	8.00	Poor
Megan Reagan	10.00	Poor
Mick Stein	2.00	Very good
Miles Corey	12.00	Poor
Nellie Ward	6.00	Poor
Phil Bradley	5.00	Poor
William Bradshaw	3.00	Good

Hitters + Fielders

	OFFENSE				DEFENSE			
Player Name	BA (Batting Average)	BA (Batting Average)	SLG (Slugging Percertage %)	SLG (Slugging Percertage %)	Put Outs	Put Outs	Errors	Errors
Addison Rush	0.274	Fair	0.472	Good	0.7	Very Good	0.6	Poor
Adrian Steele	0.236	Poor	0.409	Fair	0.2	Poor	0.2	Very good
Alejandro Philip	0.345	Excellent	0.667	Excellent	0.9	Excellent	0.4	Fair
Alex Donovan	0.277	Good	0.461	Fair	0.5	Fair	0.3	Good
Andre Whitaker	0.302	Very good	0.488	Good	0.9	Excellent	0.2	Very Good
Anna Kelly	0.264	Fair	0.403	Fair	0.4	Fair	0.9	Poor
Ari Goodman	0.203	Poor	0.273	Poor	0.7	Very good	0.4	Fair
Ariel Boyer	0.281	Good	0.387	Fair	0.5	Fair	0.3	Good
Armani Curtis	0.255	Fair	0.491	Good	0.3	Poor	0.8	Poor
Averi Norris	0.304	Very good	0.406	Fair	0.8	Very good	0.2	Very good
Bernard Greer	0.291	Good	0.388	Fair	0.5	Fair	0.5	Fair
Bo Friedman	0.214	Poor	0.353	Fair	0.2	Poor	0.4	Fair
Braelyn Rios	0.299	Good	0.566	Very good	0.3	Poor	0.8	Poor
Bruce Wallace	0.266	Fair	0.408	Fair	0.5	Fair	0.2	Very good
Carl Williams	0.231	Poor	0.391	Fair	0.2	Poor	0.6	Poor
Carmen Yang	0.265	Fair	0.441	Good	0.6	Good	0.9	Poor
Casey Finnegan	0.362	Excellent	0.714	Excellent	0.3	Poor	0.1	Excellent
Caylee Kennedy	0.268	Fair	0.399	Fair	0.8	Very good	0.2	Very good
Cecilia McGiffin	0.222	Poor	0.422	Fair	0.6	Good	0.4	Fair
Charles Corsini	0.275	Fair	0.494	Good	0.8	Very good	0.1	Excellent
Chris Kim	0.194	Poor	0.303	Fair	0.9	Excellent	0.1	Excellent
Chris Wilson	0.283	Good	0.443	Good	0.4	Fair	0.6	Poor
Claire Oswald	0.331	Excellent	0.584	Very good	0.3	Fair	0.6	Poor
Dale Michaels	0.297	Good	0.501	Very good	0.7	Very good	0.2	Very good
Damaris Gould	0.223	Poor	0.359	Fair	0.4	Fair	0.8	Poor
Dan Reynolds	0.242	Fair	0.366	Fair	0.7	Good	0.3	Fair
Daniel Weiss	0.279	Good	0.555	Very good	0.8	Very good	0.2	Very good
Darrren Monroe	0.236	Poor	0.324	Fair	0.2	Poor	0.5	Fair
Dave Lewis	0.363	Excellent	0.506	Very good	0.8	Very good	0.1	Excellent
Devin Walker	0.281	Good	0.401	Fair	0.6	Good	0.3	Fair
DJ Witmore	0.258	Fair	0.403	Fair	0.8	Very good	0.4	Fair
Donald Thorpe	0.248	Fair	0.355	Fair	0.2	Poor	0.7	Poor
Elaina Stewart	0.196	Poor	0.289	Poor	0.3	Fair	0.9	Poor
Emiliano Hull	0.366	Excellent	0.681	Excellent	0.8	Very good	0.3	Good
Emilio Gibson	0.286	Good	0.498	Good	0.6	Good	0.3	Good
Emily Carr	0.233	Poor	0.378	Fair	0.5	Fair	0.4	Fair
Esmeralda Good	0.264	Fair	0.506	Good	0.3	Poor	0.3	Good
Ethan Garvey	0.252	Fair	0.413	Fair	0.2	Poor	0.7	Poor
Fred Watkins	0.289	Good	0.492	Good	0.8	Very good	0.2	Very good
Genevieve Mathieu	0.262	Fair	0.371	Fair	0.6	Good	0.1	Excellent
Grant Rogers	0.295	Good	0.443	Fair	0.4	Fair	0.3	Good
Haley Park	0.259	Fair	0.401	Fair	0.6	Good	0.2	Very good
Isabel Bautista	0.321	Very good	0.629	Excellent	0.5	Fair	0.3	Good
Jaliyah Harris	0.302	Very good	0.473	Fair	0.7	Good	0.2	Very good
James Brooks	0.285	Good	0.431	Fair	0.5	Fair	0.8	Poor
Jamie Kemp	0.261	Fair	0.483	Good	0.6	Good	0.4	Fair
Jared Villegas	0.314	Very good	0.436	Fair	0.8	Very good	0.2	Very good
Javier Edwards	0.279	Good	0.552	Good	0.4	Fair	0.4	Fair
Jenna Klink	0.274	Fair	0.472	Fair	0.7	Good	0.6	Poor
Jerry White	0.236	Poor	0.409	Fair	0.2	Poor	0.2	Very good

Hitters + Fielders

	OFFENSE				DEFENSE			
Player Name	BA (Batting Average)	BA (Batting Average)	SLG (Slugging Percertage %)	SLG (Slugging Percertage %)	Put Outs	Put Outs	Errors	Errors
Jordan Johnson	0.345	Excellent	0.667	Fair	0.9	Excellent	0.4	Fair
Joshua Martin	0.277	Good	0.461	Fair	0.5	Fair	0.3	Good
Julio Daniels	0.302	Very good	0.488	Good	0.9	Excellent	0.2	Very good
Kalvin Henry	0.264	Fair	0.403	Fair	0.4	Fair	0.9	Poor
Kathleen Reilly	0.203	Poor	0.273	Poor	0.7	Good	0.4	Fair
Kathy Jackson	0.281	Good	0.387	Fair	0.5	Fair	0.3	Good
Katie Smith	0.255	Fair	0.491	Good	0.3	Poor	0.8	Poor
Kenneth Howell	0.304	Very good	0.406	Fair	0.8	Very good	0.2	Very good
Kevin Matlock	0.291	Good	0.388	Fair	0.5	Fair	0.5	Fair
Kevin Watts	0.214	Poor	0.353	Good	0.2	Poor	0.4	Fair
Kian Lutz	0.299	Very good	0.566	Very good	0.3	Poor	0.8	Poor
Koen Rodriguez	0.266	Fair	0.408	Good	0.5	Fair	0.2	Very good
Larry Frazier	0.231	Poor	0.391	Good	0.2	Poor	0.6	Poor
Laura Matson	0.265	Fair	0.441	Good	0.6	Fair	0.9	Poor
Lillian Paige	0.362	Excellent	0.714	Excellent	0.3	Fair	0.1	Excellent
Luca Dean	0.268	Fair	0.399	Fair	0.8	Very good	0.2	Very good
Lucy Conner	0.222	Poor	0.422	Good	0.6	Good	0.4	Fair
Luis Valez	0.275	Fair	0.494	Good	0.8	Very good	0.1	Excellent
Lyle Moore	0.194	Poor	0.303	Good	0.9	Excellent	0.1	Excellent
Madeline Grady	0.283	Good	0.443	Fair	0.4	Fair	0.6	Poor
Marian Hancock	0.331	Very good	0.584	Very good	0.3	Poor	0.6	Poor
Mary Oliver	0.297	Good	0.501	Good	0.7	Good	0.2	Very good
Mary Phillips	0.223	Poor	0.359	Good	0.4	Fair	0.8	Poor
Melanie McCarthy	0.242	Poor	0.366	Good	0.7	Good	0.3	Fair
Micheal Polese	0.279	Good	0.555	Good	0.8	Very good	0.2	Very good
Miguel Ortiz	0.236	Poor	0.324	Fair	0.2	Poor	0.5	Poor
Nathalie Herman	0.363	Excellent	0.506	Fair	0.8	Very good	0.1	Excellent
Nathan Avery	0.281	Good	0.401	Fair	0.6	Good	0.3	Good
Norman Levi	0.258	Fair	0.403	Good	0.8	Very good	0.4	Fair
Omari Arellano	0.248	Fair	0.355	Fair	0.2	Poor	0.7	Poor
Raphael Savage	0.196	Poor	0.289	Fair	0.3	Poor	0.9	Poor
Reggie Davis	0.366	Excellent	0.681	Very good	0.8	Very good	0.3	Good
Rob Lowenthal	0.286	Good	0.498	Good	0.6	Good	0.3	Good
Rolando Avery	0.233	Poor	0.378	Good	0.5	Fair	0.4	Fair
Rose Howe	0.264	Fair	0.506	Good	0.3	Poor	0.3	Fair
Ryleigh Kelly	0.252	Fair	0.413	Fair	0.2	Poor	0.7	Poor
Salma Beard	0.289	Good	0.492	Good	0.8	Very good	0.2	Very good
Sean Haggerty	0.262	Fair	0.371	Fair	0.6	Good	0.1	Excellent
Sharon Kelly	0.295	Good	0.443	Fair	0.4	Fair	0.3	Good
Sofia Mousseau	0.259	Fair	0.401	Good	0.6	Good	0.2	Very Good
Sue Thrive	0.321	Fair	0.629	Fair	0.5	Very good	0.3	Very good
Taylor Webb	0.302	Very good	0.473	Good	0.7	Good	0.2	Very good
Ted Dawson	0.285	Good	0.431	Good	0.5	Good	0.8	Poor
Timothy Ramirez	0.261	Fair	0.483	Good	0.6	Good	0.4	Fair
Todd Carlsen	0.314	Very good	0.436	Fair	0.8	Very good	0.2	Very good
Trevor Blankenship	0.279	Good	0.552	Very good	0.4	Fair	0.4	Fair
Turner McBribe	0.196	Poor	0.289	Fair	0.3	Poor	0.9	Poor
Valentina Stevens	0.366	Excellent	0.681	Very good	0.8	Very good	0.3	Good
William Elston	0.288	Good	0.561	Good	0.8	Very good	0.2	Very good
Zion Morrison	0.254	Fair	0.508	Good	0.6	Good	0.6	Poor